



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Infrastructure  
Highway Design and Construction Division

Attention Users of the Department of Transportation and Infrastructure Specifications Book

Effective August 19, 2020, all references to “Transportation and Works” in the March 2011 Specifications Book , the 2012 and 2013 amendments to the Specifications Book as well as the 2015 Equipment Rental Rate documents should reflect the Department’s new name “Transportation and Infrastructure”.

Formal changes of the Department’s name will be reflected in a future update of the Department’s Specifications Book.



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

**THE DEPARTMENT OF TRANSPORTATION AND WORKS SPECIFICATIONS BOOK**

**<http://www.tw.gov.nl.ca/publications/specbook2011.pdf>**

**Available at the following web page <http://www.tw.gov.nl.ca/publications/index.html>**

This is the Seventh Edition of our Specifications Book dated March 2011. The Specifications Book has received a major update, and you are encouraged to review the specifications in entirety.

**The Specifications Book applies to all Projects for the Departments Highway Design Division.**

**MARCH 2011**

**SPECIFICATIONS BOOK  
SEVENTH EDITION  
MARCH 2011**

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## DIVISION 1 SPECIFICATIONS GENERAL INDEX

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**SECTION 110**

**ENGINEER'S FIELD OFFICE**

On projects having a total estimated tender value of \$250 000.00 or over, the Contractor shall supply a Field Office together with furniture for the use of engineering staff. The Field Office and furniture shall be of a standard not less than that shown and described in the plan in Section 1201 "Field Office". Should the Contractor wish to supply an office and furniture other than that shown and described on this plan then prior written approval of the Department must first be obtained before a substitution may be made.

The field office is to have a plain paper fax and separate photo copier. The copier must be capable of copying bound field books.

On projects having a total estimated tender value of less than \$250 000.00 the Contractor must still supply a field office and furniture, but the field office and furniture may be to a lower standard than that shown in Section 1201 "Field Office". Furniture and facilities may be reduced accordingly as agreed to by the Engineer, however, floor area shall not be less than fifteen square metres.

On contracts which involve the construction of a concrete bridge or concrete pavement, the Contractor shall equip the office with a concrete test cylinder curing tank of capacity not less than 0.2 cubic metres.

The field office must be located on the site of the project and shall be ready for use from the first day the Contractor commences work and it shall remain available for use for the duration of the contract. All doors for accessing the Engineer's Field Office shall be secured by means of an exterior latch suitable for a Department supplied padlock. Any other means of accessing the Field Office shall be securable and accessible from the inside only.

The Contractor shall periodically clean the office and maintain all electric lights, heating, hot and cold water, and the water-closet in good working condition at all times.

All costs of providing the office, furniture, and equipment and providing and maintaining the required heat, light, hot and cold water, and sanitary provisions together with periodic clean out shall be borne by the Contractor. No payment will be made for this item. The provision and maintenance of the Field Office shall be considered as part of carrying out the other contract items.

**SECTION 111**

**FIELD LABORATORY**

On projects having a total estimated tender value of \$250 000.00 or over and on which soils testing will be required, the Contractor shall supply a field laboratory together with furniture for use by engineering staff.

The field laboratory shall be heated, have 110 volts 60 cycle electrical outlets, electric light, work benches, clean running water, washroom facilities, electric laboratory oven, propane table top stove, and be suitable for the type of testing called for in the specifications. The field laboratory and furniture shall be of a standard not less than that shown on the plan in Section 1203 "Field Laboratory". Should the Contractor wish to supply a field laboratory and furniture other than that shown in Section 1203, then prior written approval of the Engineer must first be obtained.

The field laboratory is to have a photo copier capable of copying letter (8.5" x 11") and legal (8.5" x 14") sized paper as well as bound field books. The office area in the laboratory shall also be fitted with an air conditioning unit.

Whenever asphalt testing is conducted, the Contractor is required to supply a minimum of one asphalt content ignition oven. The asphalt content ignition oven and integrated weighing system must be designed to continuously measure the weight loss of an asphalt paving mixture during combustion and

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automatically display and print out the asphalt content by percentage. Following cooling, a gradation analysis will be carried out on the remaining aggregate.

Ignition ovens models must be approved by the Materials Engineering Division prior to purchase. An acceptable oven is the Troxler New Technology Oven, Model 4730. The ignition oven must come complete with the standard manufacturer's equipment (e.g. sample baskets, carriers, safety cage, insulated gloves, etc.) Site selection and installation of the oven and exhaust system shall be carried out by the Contractor according to the Manufacturer's recommendations. The field laboratory shall be equipped with a separate electrical circuit to supply power to the ignition oven. The power supply for the laboratory must be adequate to properly operate all laboratory equipment and building services.

The Contractor shall maintain the ignition oven in good working conditions at all times and is responsible for all hardware and software updates for the ignition oven. The Contractor is responsible for decommissioning of the oven on completion of the project. Printer tape and a wet / dry vacuum cleaner, with an appropriate filter must be provided by the Contractor.

The field laboratory shall be located on the site of the project and shall be ready for use from the first day the Contractor commences work for which testing is required, and it shall remain available for use for the duration of the contract. All doors for accessing the Field Laboratory shall be secured by means of an exterior latch suitable for a Department supplied padlock. Any other means of accessing the Field Laboratory shall be securable and accessible from the inside only.

The Contractor shall supply a separate vented steel storage locker for the Department's coring machine and mixed gas. The storage unit shall be located near the field laboratory and have a means of properly securing its contents.

The Contractor shall periodically clean the laboratory and maintain all electric lights, heating, running water, and sanitary provisions in good working condition during the time the laboratory is required.

On projects having a total estimated tender value of less than \$250 000.00, the Contractor shall provide and maintain a field laboratory as described, or provide transportation of all Test Samples from the job site to the Department's Soils Laboratory at LeMarchant Road in St. John's.

Test samples shall be selected by the Engineer, or his representatives, and the number and the frequency of taking test samples shall be at the sole discretion of the Engineer.

All costs of providing and maintaining the field laboratory as described, or of transporting test samples shall be borne by the Contractor. No payment will be made for this item. The provision and maintenance of the field laboratory shall be considered as part of carrying out those contract items for which tests are required.

**SECTION 112**

**BOARD AND LODGING FOR DEPARTMENTAL PERSONNEL**

The Contractor shall supply board and lodging to the Department's Engineering staff, or their representatives, employed on the work, providing that the Contractor is maintaining accommodations for his staff. Board and lodging shall include furnished sleeping quarters, comparable to those supplied to the Contractor's own staff.

Payment for board and lodging will be made at the following rates (including HST):

EFFECTIVE DATE	BREAKFAST	LUNCH	DINNER	LODGING	TOTAL
April 1, 2000	\$7.30	\$10.95	\$18.25	\$25.00	\$61.50

The Contractor shall not charge the Department for meals not availed of by the Department's Engineering staff as long as three (3) hours notice previous to meal time is given by the Engineer. When the Department's employees do not avail of the meals and accommodations supplied by the Contractor on

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weekends and holidays, payment will be made for lodging only.

Should the Contractor provide accommodations for his staff, and insufficient space is made available for Department personnel, alternate arrangements will be made for Department personnel and costs associated for the alternate arrangements, in excess of the \$25.00 for lodging specified above, are to be borne by the Contractor.

### **SECTION 113**

#### **SANITARY PROVISIONS**

The Contractor shall provide and maintain sanitary provisions for the use of his employees. The sanitary provisions shall be in accordance with the various Provincial Government and Municipal Government Regulations.

## **SECTION 120 PURCHASE OF LUMBER**

Whenever the Contractor is required to purchase lumber for use on this contract he must use lumber that has been manufactured in the Province of Newfoundland when such lumber is available in suitable quality.

## **SECTION 121 MOVEMENT OF CONTRACTOR'S PLANT**

Whenever it becomes necessary to transport Contractor's plant, machinery or materials, the Contractor shall have no claim against the Department for any cost or delay that may be incurred or occasioned by reason of the condition of any road, bridge, or any natural obstruction.

## **SECTION 122 LINES AND GRADES**

All lines and grades shall be furnished by the Engineer on the offset stakes. Slope stakes will be placed as required by the Engineer.

For contracts involving the construction of structures, the Engineer will furnish the road centerline, centerline of one bearing and a bench mark.

Whenever necessary the Contractor's operations shall be suspended to permit the placing of stakes and the setting of grades. Every effort will be made to make such suspensions as brief as practicable, but the Contractor shall not be allowed any compensation for such suspensions.

The Contractor shall give the Engineer ample notice of the time and places where the lines and grades will be needed. All stakes, marks, etc., shall be carefully preserved by the Contractor and in the case of their destruction or removal by him, or his employees, such stakes or marks, etc., shall be replaced by the Engineer at the Contractor's expense.

The Contractor shall be responsible for transferring the lines and grades from the offset stakes.

## **SECTION 123 STORAGE FACILITIES**

The Contractor shall supply proper storage facilities at his own expense and shall be responsible for the care of all materials until placed in the works.

## **SECTION 124 NOTICES BY CONTRACTOR**

All necessary notices to waterworks, gas, electric light or power, cable television, telephone or telegraph companies, owners or occupants of property, or other interested parties shall be given by the Contractor at least two weeks in advance of the work, except where the serving of such notice is the express duty of the Department. One copy of all such notices shall be forwarded by registered mail to Engineer/Architect of the Department.

## **SECTION 125 WAGES OF FLAGPERSON**

Where flagpersons are required for the control and direction of traffic, either in accordance with Section 715 "Flagperson's Operations", or as requested by the Engineer, then the Contractor shall be compensated at the contract price for flagperson hours.



Measurement for payment will be the number of hours, rounded to the nearest half hour, that each flagperson works as required by the Engineer. No payment will be made for meal periods unless the flagperson actually works through the meal periods.

Payment at the contract price for flagperson hours shall be compensation in full for all costs to provide the flagperson; including wages, board and lodging, U.I.C., premiums, etc., and profit.

Contractors are advised that only employees who have received proper training can be claimed for under this section. Flagpersons shall be equipped with either 2-way or 3-way radios for communications only. Flagpersons shall not be permitted to use any cellular devices during hours of operation unless it is deemed an emergency. Flagpersons seen using cellular devices for any other purposes will be requested to leave site and shall be replaced immediately.

## **SECTION 126**

### **HARMONIZED SALES TAX**

Contractors are advised that government is not exempt from the Harmonized Sales Tax (HST). The total tender price quoted by the Contractor on the tender form shall include the HST in accordance with the HST amount shown separately at the end of the unit price table. HST is not to be included with the individual unit prices in the unit price table. The Dept. Of Works, Services and Transportation will pay the HST to the Contractor with each regular progress billing.

## **SECTION 128**

### **CERTIFICATE OF RECOGNITION**

The Contractor shall within 14 days of award of the contract, and prior to commencement of the work, provide a Letter of Good Standing under the Certificate of Recognition Program from the Newfoundland and Labrador Construction Safety Association.

At anytime during the term of the Contract, when requested by the Owner, the Contractor shall provide such evidence of compliance by any or all of his or her Subcontractors.

# FORM 130



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 130

### PROTECTION AGAINST NEGLIGENCE AND DAMAGE

The Contractor shall at all times carry on the work in a manner that will create the least interference with traffic consistent with the faithful performance of the work. He shall not close any portion of the highway except by written order of the Engineer, and when such closure is so authorized, the Contractor shall furnish, erect, and maintain at his own expense, such barriers, lights, and notices, and employ such security and flag persons as are required by Section 715 "Flag person Operations" or as the Engineer may direct. He shall use all proper precautions by good and efficient barriers, notices, lights, and security, for the prevention of accident, and he shall indemnify and save harmless the Minister from all suits and action for damages and costs to which they may be put by reason of injury to persons or property resulting from negligence, carelessness or any other cause whatsoever in the performance of the work, in guarding the same, or from any improper material used in construction, or by or on account of any act or omission of said contractor or his agent or/and sub-contractor, employee, or workman. The Contractor shall assume all damage liability to persons or properties caused by reason of his operations on this contract. The Contractor shall at his own expense save from injury all trees adjoining the highway unless the engineer shall otherwise direct, and shall handle carefully and satisfactorily replace at his own expense all fences which it may be necessary to remove in order to carry on the work.

Before commencing work, the Contractor shall establish extent and exact location of all known existing underground services including pipelines, cables, structures and other obstructions in the area of work and notify the Engineer in writing of findings. The Contractor shall proceed with caution in the performance of the work to protect all known underground services and be responsible for all associated repairs when such underground services are broken or otherwise damaged as a result of the Contractor's operations, either directly or indirectly.

Where underground services must be removed or relocated as directed by the Engineer, then the removal or relocation shall be carried out and paid in accordance with the appropriate specification and contract item on the Unit Price Table for that work. Should there not be a contract item for the removal or relocation of the particular type of structure encountered, then the removal or relocation will be paid for in accordance with the provisions of Section 150 "Force Account".

The Contractor is reminded of the requirements of Section 124 "Notices By The Contractor".

## SECTION 131

### ROAD OR BRIDGE DIVERSIONS

Where the work involves a diversion or diversions from the existing highway alignment, the Contractor shall be responsible for the maintenance of the existing road and bridges until the completion of the work. The contractor shall be aware of the requirements of Division 8.

However, should the Contractor establish that his equipment does not use the existing road and bridges, then maintenance of the existing road and bridges will be the responsibility of the Department.

## SECTION 132

### DISCONTINUATION OF WORK

Where the work is discontinued, and will not be resumed until after an extended period, or until the next working season, then the Contractor shall, when so directed by the Engineer, open and place the roadway together with any bridges in a satisfactory condition suitable for safe public travel and snow ploughing.

Concrete bridge decks over which it is proposed to run traffic shall be cured in accordance with Section 919 "Rehabilitation of Concrete Structures". The bridge structure and railing shall be in a condition adequate to sustain all traffic without damage.

Once opened, the roadway shall not again be closed to traffic, or traffic thereon be obstructed without written authority of the Engineer.

The Contractor may request that the Department take over maintenance responsibilities for the roadway during periods when work is discontinued. In which case, the Contractor must first place the roadway together with any bridges in a condition that is acceptable to the Engineer before the Department will relieve the Contractor of his responsibility for maintenance. However, the Department will not undertake to maintain; temporary signs, temporary culverts, and temporary bridges provided by the Contractor, responsibility for the maintenance of these shall rest with the Contractor throughout the period of discontinuation of work.

During a discontinuation of work period when the Department has taken over maintenance responsibility, should any bridge damage occur, for example damage to an expansion joint or to a bridge railing, then the Contractor shall indemnify and hold harmless the Department for the damage, and any consequences of the damage. The Contractor shall make good any such damage at his own expense.

### **SECTION 133**

#### **REMOVAL OF SNOW AND ICE**

During the construction period, the Contractor shall remove snow and ice from any portion of the work in any of its stages, whenever deemed necessary by the Engineer, no additional payment will be made for this work.

### **SECTION 134**

#### **FINISHING OF PROJECT**

After all other work embraced in the contract is completed, and before acceptance and final payment will be made, the entire project shall be neatly finished and trimmed to the lines, grades, and cross sections shown on the plans, or as directed by the Engineer, to produce smooth surfaces and slopes and a uniform cross section. All construction operations related debris, fallen trees, boulders, bog, and surplus materials, shall be disposed of as provided by these specifications.

All drainage ditches, waterways, and culverts shall be opened up and cleared out to restore same to their full effectiveness.

Should the surface of any structure or road be contaminated as a result of the Contractor's operations, then the Contractor shall clean off all such mud, or deleterious substances, and restore the surface to the satisfaction of the Engineer.

All grubbed areas adjoining excavations or embankments shall be graded to conform to the general ground lines.

Finishing of project will be considered as subsidiary work pertaining to the contract and no extra payment will be made.

### **SECTION 135**

#### **DELAYS CAUSED BY UTILITIES AND PROPERTY OWNERS**

Before work begins the Department will make every effort to acquire all of the right of way, and to arrange for the moving of those utility poles, wires, cables, and underground facilities that are in the way. However, should the Contractor be delayed, due to all of the right of way not being acquired, or due to utility poles, wires, cables, and underground facilities not being moved, then the Department will not assume responsibility for such delays and the Contractor shall indemnify and save harmless the Minister from all suits and action for damages and costs resulting from the delay.

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## **SECTION 136**

### **CONTRACTOR'S LIABILITY FOR ENGINEERING SUPERVISION COSTS**

Should the Contractor fail to meet the date to substantially perform the work as indicated in the Agreement between the Owner and Contractor, and is unable to provide justification acceptable to the Owner for the delay, then the Contractor may be held liable for payment to the Owner for the additional costs for engineering supervision as occasioned by the Contractor's delay, and as calculated by the Engineer.

## **SECTION 137**

### **CLEARANCES DURING CONSTRUCTION**

Where vertical clearance for vehicular traffic is restricted, the Contractor shall make provision to ensure that adequate clearance remains. The vertical clearance during construction shall be not less than 4500 mm.

In addition, the entire leading edge of such vertical obstruction shall be clearly marked in fluorescent orange or red paint at the beginning of each project or each construction season, whichever is most frequent. At least two signs shall be posted; one at, and one before the opening, indicating the exact vertical clearance less 100 mm. The signs shall be of a reflective type and the lettering shall be standard size or larger. At least one of these signs shall be placed far enough in advance to permit large and heavy trucks to decelerate. This procedure shall be repeated on each side of the opening facing oncoming traffic.

Where falsework restricts the lateral clearance afforded to vehicles, the contractor shall make adequate provision for protection of the work and traveling public, including but not necessarily limited to the installation of guide rail.

Where one lane of traffic on a bridge, overpass or underpass is closed to traffic, the Contractor shall make adequate provision for the same.

This shall include proper signs and concrete median type barriers separating the work and traffic areas. The various concrete median barriers shall have a minimum height of 813 mm, minimum base width of 610 mm, a nominal mass of 17.0 kN and be connected by chain to each other with a nominal separation of 500 mm between barriers. Each anchor and chain shall be capable of lifting a mass equal to 1.3 times the mass of the median barrier.

## **SECTION 138**

### **UPGRADING OF ROADS OPEN TO TRAFFIC**

The Contractor shall be responsible for insuring that the driving surface of the road is always at an acceptable standard for traffic, as approved by the Engineer.

For the projects, other than the Trans Canada Highway, where placing of a Selected Granular Base Course is an item, the application of this material shall be carried out in such a way that no more than a total of 1km of reconstructed subgrade is left without selected granular base course at any time.

On Trans Canada Highway projects where pavement is to be removed and replaced without provision for diverting traffic over other paved areas, the work shall be carried out in conformance with the following provisions.

For projects of length less than 6km, initially no more than one continuous stretch of pavement, of length no greater than 1km, may be removed. After completion of subgrade and after completion of the placing of Granular "B" and when at least 75% of the Granular "A" operations have been carried out over this initial pavement removed section, then more old pavement may be removed in a continuous stretch, for an addition length of up to 1km.

After at least 1km of road has been paved, and at least 75% of the Granular "A" operations have been completed on the remaining unpaved part, then an additional 1km of pavement may be removed. The operations shall continue in this fashion until the paving is completed. At no time during operations shall an unpaved work area exceed 2km in length.

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Furthermore, the Contractor shall carry out his operations in such a way that no one place on a public traveled roadway on the Trans Canada Highway will be unpaved for more than 28 calendar days.

Prior to commencing paving operations, the Contractor shall discuss with the Engineer the proposed locations of longitudinal joints. The Contractor shall carry out his paving operations so that the longitudinal joints are at locations approved by the Engineer.

Surface course asphalt shall not be laid on short sections. For projects of length greater than 3.0 km, the Surface Course shall not be laid in lengths less than 3.0 km. Minimum width of application for the Surface Course shall be the full base course width.

For projects of length 6.0 km or more, the work shall proceed as previously stipulated for the shorter projects, except that the contractor has the option of working with two unpaved work areas, instead of just the one as previously stipulated. The work areas shall initially be at opposite ends of the project, and both operations shall proceed toward each other. Work areas shall not be at random places throughout the project.

## FORM 142



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 142

#### NAVIGABLE WATERS PROTECTION ACT

All regulations of the Navigable Waters Protection Act shall be strictly adhered to.

The Navigable Waters Protection Act, R.S.C., 1986, Chapter N-22, is a Federal Statute designed to protect the public right of navigation in navigable waters, as defined in the Statute, by prohibiting the building or placement of any "work" in, upon, over, under, through, or across navigable water without approval of the Minister of Fisheries & Oceans. The Act is administered by the Canadian Coast Guard, Department of Fisheries & Oceans.

Written comments concerning NWPA should be directed to:

MANAGER, NAVIGATION WATERS PROTECTION  
NAVIGABLE WATERS PROTECTION PROGRAM  
TRANSPORT CANADA  
P.O. BOX 1300 ST. JOHN'S, NEWFOUNDLAND  
A1C 6H8

PHONE(709) 772-7563 FAX (709) 772-3072

## FORM 150



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 150

#### FORCE ACCOUNT PAYMENT

Where work is required for which no contract unit prices exist, then this work will be paid for in accordance with Clause GC 19.1(c) of the General Conditions of Unit Price Contract.

With reference to Actual Cost as mentioned in Clause GC 19.1(c), Payroll Burden together with Board and Lodging shall be considered as components of Actual Cost.

For Contractor's personnel, working on Force Account Work, who are lodged in the Contractor's own accommodations, then, Board and Lodging expenses allowed shall be at the same rates as those given in Section 112 "Board and Lodging for Departmental Personnel".

However, for Contractor's personnel, working on Force Account work, who are Lodged in a hotel, then, Board and Lodging expenses allowed shall be the actual billed cost of hotel accommodation, plus compensation for meals at the same rates as those given in Section 112 Board and Lodging for Departmental Personnel."

When the Contractor does work with his own forces, including his own equipment, the rental rate for equipment which includes overhead and profit shall be as specified in Division 10, Equipment Rental Rate Schedule. Additional allowance for overhead and profit in accordance with General Conditions of the Contract. Clause 19.1(c) shall be calculated upon materials, labour and payroll burden only.

When the Contractor does work with rented equipment and the equipment is approved by the Engineer, the Contractor shall be entitled to reimbursement equal to the rental cost of the equipment, supported by detailed invoices, plus a markup of ten (10%) percent on the rental cost to cover overhead and profit.

When the Contractor does work with his own forces including his own equipment, but a rental rate for the equipment is not included in Division 10, "Equipment Rental Rate Schedule", the rental rate for the equipment in question shall be calculated by the Department.

If force account work is being carried out under a formal contract which has been tendered by the Department and changes in the work are made through the General Conditions of the contract, Clause 18 and/or 19, as the case may be, then payroll burden shall be calculated to be 35% of the cost of labour.

Where a flag person is required during the carrying out of Force Account work, then the flag person shall be compensated for in accordance with the provisions given in section 125 dealing with flag person hours, without any additional mark-up for overhead or profit.

### SECTION 151

#### FENCES

The Contractor shall, when as directed by the Engineer, remove and replace fences in new positions and shall not, without the expressed consent of the Engineer leave any land from which a fence has been removed open to the public overnight. The Contractor shall supply materials, tools and labour necessary for the removal and re-erection of fences and shall perform the work to the satisfaction of the Engineer.

Payment will be made in accordance with the appropriate contract Unit Price. However, on those jobs where fencing is not a contract item, payment will be made in accordance with the provisions of Section 150 "Force Account Payment".

## **SECTION 153**

### **WEIGHT RESTRICTIONS**

The Contractor shall be responsible for the compliance with the Department weight restrictions, by both his own vehicles and any hired trucks hauling materials for use on this contract, or on any departmental or private work the Contractor may undertake. Should the Contractor wish to haul materials for use in this contract over a Department maintained road before first weighing the materials, then, the Contractor shall give the appropriate Regional Director adequate forewarning as to the proposed travel route and the times at which loads will be transported, so that portable scales may be set up to check for compliance with the highway weight regulations.

The Resident Engineer is empowered to take immediate action to ensure compliance with all acts and regulations.

## **SECTION 154**

### **TEMPORARY RAILWAY CROSSING**

Where a railway line crosses the job, and should the Contractor want to use a temporary crossing to obtain access to the job site on both sides of the tracks, then it shall be the responsibility of the Contractor to obtain a permit from the railway company and to co-ordinate all the necessary details of the construction of the temporary crossing with the railway company.

The Contractor shall be responsible for all costs associated with the application for permission, the installation and the maintenance of the temporary railway crossing during the time until the contract is completed.

The Department shall not be held responsible for any delays caused to the Contractor by problems in co-ordinating the work with the railway company.

No payment will be made to the Contractor for this item.

## **SECTION 155**

### **EXTENSIONS TO ROAD CONTRACT**

Contractors are advised that they may be required to undertake work in addition to the sections of road covered in this contract. Should the Engineer request the contractor to undertake additional work and the contractor agrees, the work will be performed as per Contract unit prices subject to adjustments, plus or minus, for the difference in haulage cost of the additional work and that of the contract.

In contracts where overhaul is a bid price, haulage cost will be based on the appropriate bid unit price. Otherwise, payment adjustment for each item is given by the subtraction of the cost calculated at the rates set below to haul the quantity of the item placed on the extension minus the product of the "Specific Haul Cost" for the item, times the quantity of the item placed at the extension.

"Specific Haul Cost" for each item shall be defined as the cost calculated at the rates set below to haul the actual quantities of the item placed on the contract divided by the actual quantity, in tonnes, of the item placed on the contract.

In contracts where overhaul is not a bid price, haulage rates will be set at \$0.22/t-km for excavated rock and asphalt and \$0.16/t-km for all other excavated materials and granulars."

## **SECTION 156**

### **CONTINGENCY AMOUNT**

This amount is estimated to cover expenditures for foreseeable work to be carried out by the Contractor, the cost of which is not included in the tendered unit prices for the contract. This work will include but is not restricted to payment for such items as fencing, repairs to private property, etc. This amount will also

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cover payment for expenditures incurred by the Contractor which could not be foreseen when the contract was prepared such as but not limited to, increase in taxes during the life of the contract, etc. This is not a lump sum payment to Contractors. No payment will be made except if the expenses are properly invoiced.

## SECTION 157

### MOBILIZATION AND DEMOBILIZATION

Mobilization shall be defined as the loading, transportation, unloading, and complete set-up of all plant, materials, and equipment necessary to complete the work associated with the contract. Demobilization shall be defined as the decommissioning, loading, transportation, unloading and moth balling of all plant, excess materials and equipment after the work associated with the contract is complete.

Where excess materials are demobilized and the Department purchases these materials, demobilization shall include the loading, transportation and unloading of the same from the job site to the nearest district or regional depot. Demobilization does not apply to the loading, transportation to a storage site, and removing of existing materials which are to be salvaged.

The Contractor is advised that payment at the lump sum price for Mobilization and Demobilization shall be compensation in full for all labour, supplies, materials and equipment use required to mobilize and demobilize plus the provision of storage and security required during the mobilization and demobilization phases of the work.

The price bid for this item in contracts on the island portion of the province shall not exceed the limits given in the following table for the Island Portion of Province:

<b>Island Portion of Province</b>	
Total Estimated Tender (including Mobilization & Demobilization but not including HST)	Mobilization & Demobilization Tender Item Maximum Bid Permitted
Less than \$500,000	10% of Total Estimated Tender
Between \$500,000 & \$1,000,000	\$50,000 + 7.5% of the amount that the Total Estimated Tender exceeds \$500,000.
Greater than \$1,000,000	\$87,500 + 5.0% of the amount that the Total Estimated Tender exceeds \$1,000,000)

The price bid for this item in contracts in the Labrador portion of the province shall not exceed the limits given in the following table for Labrador:

<b>Labrador</b>	
Total Estimated Tender (including Mobilization & Demobilization but not incl. HST)	Mobilization & Demobilization Tender Item Maximum Bid Permitted
Less than \$1,000,000	15% of Total Estimated Tender
Between \$1,000,000 & \$2,000,000	\$150,000 + 12.5% of the amount that the Total Estimated Tender exceeds \$1,000,000)
Greater than \$2,000,000	\$275,000 + 10.0% of the amount that the Total Estimated Tender exceeds \$2,000,000)

Should the amount bid exceed the limits specified, the tender will be considered unbalanced and shall be rejected. Fifty percent of the total of this item shall be paid on the first progress estimate provided that the contractor has fully mobilized, and 50% will be paid on the final progress estimate.

# FORM 160



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 160

### CONTRACTOR PERFORMANCE EVALUATION SYSTEM

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- 160.1 General**

The Contractor Performance Evaluation System is a process designed to maintain an acceptable level of performance from Contractors carrying out work for the Department of Transportation and Works (hereafter the "Department"). It will also provide a means to identify contractors with acceptable performance records and to provide a means to identify and deal with contractors with unsatisfactory or unacceptable performance records.

A record of the performance of Contractors will be maintained to identify the following:

- (a) Those Contractors who by virtue of satisfactory performance (as defined herein) will continue to be eligible to submit tenders for work with the Department.
- (b) Those Contractors who by virtue of unacceptable performance (as defined herein) may be subject to having their bidding privileges suspended by the Department for a period of time determined by the Department based on a review and an evaluation of their contract work on a particular project.
- (c) Those Contractors who by virtue of unsatisfactory performance (as defined herein) who may have their bidding privileges suspended based on an evaluation of their contract work on a particular project and other projects completed for the Department.

During the execution of the work of the contract before the issuance of a Final Completion Certificate under the contract, and during or related to the execution of warranty work related to GC 31 of the contract the Contractor is to be notified immediately if the work is not proceeding or being completed in a satisfactory manner. This notification in the case of contract work before the issuance of a Final Completion certificate would normally be confirmed in job meeting records or correspondence to the Contractor. In the case of warranty related work required under GC 31 notification would normally be confirmed by correspondence to the Contractor. In this respect the Contractor Performance Evaluation System is not intended to interfere with, or substitute for, the normal written communication that a Resident Engineer would initiate when confronted with unsatisfactory performance.

## **160.2 Performance Rating Methodology**

The performance of a Contractor on a contract will be conducted by the Regional Engineer in two parts in accordance with the methodology laid out in the Forms attached hereto as Form 160A being the "Contractor Performance Evaluation Report Part I: Contract Work Other Than Warranty Work" and as Form 160B being the "Contractor Performance Evaluation Report Part II: Warranty Work Under The Contract."

Unacceptable performance (as defined herein) on a single project may result in the suspension of bidding privileges for a period of time to be determined by the Department.

Unsatisfactory performance (as defined herein) on a particular project subject to a review of Contractor performance on other projects for the Department may result in the suspension of bidding privileges for a period of time to be determined by the Department.

The Performance Rating Methodology under each of these two parts of the Contractor Performance Evaluation System is now discussed in turn.

### **Performance Rating Methodology for Contractor's Work Other Than Warranty Work**

The Contractor's performance in this category will be evaluated on a points rating system relative to quality of work performed, timeliness in completing work, and management/administration of contracts/work. This evaluation will be completed within thirty (30) days of the earlier of: the issuance of a Final Completion Certificate for the project; or the abandonment of the work by the Contractor; or the termination of the work of the Contractor under the contract by the Department.

#### **(a) Quality of Work Performed (50 points)**

The quality of the Contractor's work in conformance with contract documents and industry standards will form the basis for points awarded in this category.

Where the Contractor's performance is in conformity with the contract documents and industry standards the Contractor's work will be defined to be "Acceptable" and the Contractor will receive a score of fifty (50) points on Form 160A.

Where the Contractor's performance is not in conformity with the contract documents and industry standards the Contractor's work will be defined to be "Unacceptable" and the Contractor will receive a score of zero (0) points on Form 160A.

#### **(b) Timeliness in Completing Work (25 points)**

Conformance to the specified schedule in the contract in relation to circumstances within the Contractors' control will form the basis of points awarded in this category.

Time shall be of the essence in all Department contracts with Contractors.

The normal risks associated with contracting are not to be considered as causes beyond the Contractor's control.

Delays caused by sub-Contractors are the prime Contractor's responsibility. However, if the prime Contractor has taken all possible action to expedite a sub-Contractor's work, the effectiveness of this effort shall be considered by the Department when evaluating the Contractor's performance.

Timeliness deals with the Contractor's performance from the date of award to the date of substantial completion. The Contractor's performance on post completion activities (other than warranty work under the contract), such as clean up and addressing identified deficiencies in the work, should be taken into account under the Management rating.

Where the Contractor completes the work on time in accordance with the schedule for completion of the work as set out in the contract documents or the schedule of completion of the work as revised by the Contractor and accepted by the Department pursuant to the contract documents,

the Contractor's work will be defined to be "On Time" and the Contractor shall receive a score of twenty five (25) points on Form 160A.

Where the Contractor completes the work during the same fiscal year that the work was scheduled to be completed in but not in accordance with the schedule for completion of the work as set out in the contract documents or the schedule of completion of the work as revised by the Contractor and accepted by the Department pursuant to the contract documents, the Contractor's work will be defined to be "Late" and the Contractor shall receive a score of fifteen (15) points on Form 160A.

Where the Contractor completes the work during the following or a subsequent fiscal year other than the fiscal year that the work was scheduled to be completed in, not in accordance with the schedule for completion of the work as set out in the contract documents or the schedule of completion of the work as revised by the Contractor and accepted by the Department pursuant to the contract documents the Contractor's work will be defined to be "Very Late" and the Contractor shall receive a score of zero (0) points on Form 160A.

The term "fiscal year" as used in this section means a period from April 1 of a given calendar year to March 31 of an immediately following calendar year.

(c) Management/Administration of Contract (25 points)

This category evaluates the extent to which the Contractor takes charge of and effectively manages/administers a project without undue effort required by Department staff or Consultants.

Items to be considered include:

- (i) superintendence, work site coordination;
- (ii) scheduling of work;
- (iii) ordering of materials;
- (iv) shop drawings submission;
- (v) completion of deficiencies identified by or as of the date of substantial completion (other than warranty work under GC 31);
- (vi) interpretation of contract documents;
- (vii) clean up of the work area;
- (viii) administration of change orders, progress claims and other pertinent documentation;
- (ix) responsiveness to direction and instructions of owner, cooperation with Resident Supervisor;
- (x) quotation reasonableness on change orders;
- (xi) payment of accounts to suppliers, sub-Contractors, employees, etc.; and
- (xii) adherence to safety and environmental regulations.

Where the Contractor preponderantly, properly performs the work, complies with time frames/submission of paperwork without errors, effectively coordinates the work with good communication, planning and organization with its staff, suppliers and sub-contractors, effectively coordinates the work with good communication, planning and organization with the Department, effectively coordinates the work with good communication, planning and organization with all other interested and involved Departments or agencies and effectively coordinates the work with good communication, planning and organization to meet all the paper requirements of the contract documents the Contractor will be defined to be "Above Average" and the Contractor shall receive a score of twenty five (25) points on Form 160A.

Where the Contractor preponderantly, properly performs the work with minor direction from the Department, complies with time frames/submission of paperwork with minor errors and limited resubmissions of documents, coordinates the work with good communication, planning and organization with its staff, suppliers and sub-contractors with some minor problems, coordinates the work with good communication, planning and organization with the Department with some minor problems, coordinates the work with good communication, planning and organization with all other interested and involved Departments or agencies with some minor problems, and coordinates the work with good communication, planning and organization to meet all the paper requirements of the contract documents with some minor problems the Contractor will be defined to be "Average" and the Contractor shall receive a score of fifteen (15) points on Form 160A.

Where the Contractor preponderantly, performs the work with constant attention and direction from the Department, paperwork is late and/or has numerous errors and/or numerous re-submissions are required, ineffectively coordinates the work through communication, planning and organization with its staff, suppliers and sub-contractors, ineffectively coordinates the work through communication, planning and organization with the Department, ineffectively coordinates the work through communication, planning and organization with all other interested and involved Departments or agencies, and ineffectively coordinates the work through communication, planning and organization to meet all the paper requirements of the contract documents, the Contractor will be defined to be "Below Average" and the Contractor shall receive a score of zero (0) points on Form 160A.

### **Performance Rating Methodology For Contractor's Warranty Work Contractor's Under the Contract**

The Contractor's performance in this category will be evaluated on a points rating system relative to quality of work performed and timeliness in completing work. This evaluation will be completed by the earlier of the following periods of time: within thirty (30) days of the completion of warranty work under GC 31; or where the Contractor refuses to do warranty work under GC 31 or abandons that warranty work without completing the same or the Contractor is terminated by the Department pursuant to the contract within thirty (30) days of that refusal, abandonment or termination (as the case might be).

(a) Quality of Work Performed (50 points)

The quality of the Contractor's work in conformance with contract documents and industry standards will form the basis for points awarded in this category.

Where the Contractor's performance warranty work is in conformity with the contract documents and industry standards the Contractor's work will be defined to be "Acceptable" and the Contractor will receive a score of fifty (50) points on Form 160B.

Where the Contractor's performance of warranty work is not in conformity with the contract documents and industry standards, or where the Contractor refuses to undertake the warranty work under GC 31 as directed by the Engineer/Architect or fails to provide the Engineer/Architect with an acceptable schedule for the completion of warranty work under GC 31 within thirty (30) days of receipt of request for the same from the Engineer/Architect, the Contractor's work will be defined to be "Unacceptable" and the Contractor will receive a score of zero (0) points on Form 160B.

(b) Timeliness in Completing Work (25 points)

Conformance to the specified schedule in the contract in relation to circumstances within the Contractors' control will form the basis of points awarded in this category.

Time is of the essence in all Department contracts with Contractors.

The normal risks associated with contracting are not to be considered as causes beyond the Contractor's control.

Delays caused by sub-Contractors are the prime Contractor's responsibility. However, if the prime Contractor has taken all possible action to expedite a sub-Contractor's work, the effectiveness of this effort shall be considered when evaluating the Contractor's performance.

Timeliness deals with the Contractor's performance of warranty work from the date of the Contractor is notified by the Department that such work is required to the date of completion of the warranty work.

Where the Contractor completes the warranty work on time in accordance with the schedule for completion of the work initially accepted by the Engineer/Architect for the warranty work under GC 31, or any revised schedule for the completion of the warranty work proposed by the Contractor and accepted by the Department pursuant to the contract, the timeliness of the Contractor's work will be defined to be "Acceptable" and the Contractor shall receive a score of fifty (50) points on Form 160B.

Where the Contractor completes the work during the same calendar year but not in accordance with the schedule for completion of the work initially accepted by the Engineer/Architect for the warranty work or any revised schedule for the completion of the warranty work proposed by the Contractor and accepted by the Department pursuant to the contract the timeliness of the Contractor's work will be defined to be "Unacceptable" and the Contractor shall receive a score of zero (0) points on Form 160B.

### **160.3 Interpretation of Rating for Form 160A Contractor Performance Evaluation Report Part I: Contract Work Other Than Warranty Work**

The interpretation of points rating under Form 160A will be as follows:

- (a) 80 - 100 shall be defined as "Satisfactory Performance". A Contractor in this category will continue to be eligible to bid on work for the Department;
- (b) 51 - 79 shall be defined as "Unsatisfactory Performance" That Contractor's level of performance needs to be improved A Contractor in this category will be put on notice that a review of that Contractor's bidding privileges is to occur and that that Contractor's bidding privileges on work for the Department may be suspended based upon a review of the Contractor's performance on the current contract and on previous contracts for the Department; and
- (c) 0 - 50 shall be defined as "Unacceptable Performance". A Contractor in this category will be put on notice that a review of that Contractor's bidding privileges is to occur and that that Contractor's bidding privileges on work for the Department may be suspended based upon a review of the Contractor's performance on the current contract.

### **160.4 Interpretation of Rating for Form 160B Contractor Performance Evaluation Report Part II: Warranty Work Under The Contract**

The interpretation of points rating under Form 160B will be as follows:

- (a) > 50 shall be defined as "Satisfactory Performance". A Contractor in this category will continue to be eligible to bid on work for the Department; and
- (b) ≤ 50 shall be defined as "Unacceptable Performance". A Contractor in this category will be put on notice that a review of that Contractor's bidding privileges is to occur and that that Contractor's bidding privileges on work for the Department may be suspended based upon a review of the Contractor's performance on the current contract.

### **160.5 Completion of the Evaluation Report**

Completion of a Contractor Contract Performance Evaluation Report i.e., Form 160A and Form 160B being the Contractor Performance Evaluation Report Part I: Contract Work Other Than Warranty Work and the Contractor Performance Evaluation Report Part II: Warranty Work Under The Contract is required for all publicly tendered roadwork contracts.

The Form 160A Contractor Performance Evaluation Report Part I: Contract Work Other Than Warranty Work report will be completed by the Resident Engineer within thirty (30) days of the earlier of: the issuance of a Final Completion Certificate for the project; or the abandonment of the work by the Contractor; or the termination of the work of the Contractor under the contract by the Department. This report will be signed by the Regional Engineer and the Regional Director, and distributed to the Contractor with the Final Completion Certificate. A copy of the report will also be forwarded to the Tendering & Contracts office.

The Form 160B Contract Work Other Than Warranty Work and the Contractor Performance Evaluation Report Part II: Warranty Work Under The Contract report will be completed by the Resident Engineer if Department makes a claim against the Contractor in respect of warranty work under GC 31 by the earlier of the following periods of time: within thirty (30) days of the completion of warranty work under GC 31; or where the Contractor refuses to do warranty work under GC 31 or abandons that warranty work without

completing the same or the Contractor is terminated by the Department pursuant to the contract within thirty (30) days of that refusal, abandonment or termination (as the case might be).

If no warranty claim is made by the Department against the Contractor under GC 31 then Form 160B Contract Work Other Than Warranty Work and the Contractor Performance Evaluation Report Part II: Warranty Work Under The Contract report will be completed by the Resident Engineer within thirty (30) days of the expiration of the GC 31 warranty period related to the work. This report will be signed by the Regional Engineer and the Regional Director, and distributed to the Contractor. A copy of the form will also be forwarded to the Tendering & Contracts office.

#### **160.6 Suspension of Bidding Privileges**

Tendering and Contracts will record the Form 160A Contractor Performance Evaluation Report Part I: Contract Work Other Than Warranty Work for the Contractor rating on each contract and maintain a record of the Contractor's assessment on previous contracts.

Tendering and Contracts will record the Form 160B Contract Work Other Than Warranty Work and the Contractor Performance Evaluation Report Part II: Warranty Work Under The Contract rating on each contract and maintain a record of the Contractor's assessment on previous contracts.

Contractors receiving an "Unsatisfactory" rating on the Form 160A Contractor Performance Evaluation Report Part I: Contract Work Other Than Warranty Work for the Contractor Report will be notified in writing by Tendering and Contracts that their performance needs to be improved. A Contractor in this category will be put on notice that a review of that Contractor's bidding privileges is to occur and that that Contractor's bidding privileges on work for the Department may be suspended based upon a review of the Contractor's performance on the current contract and on previous contracts for the Department.

Contractors receiving an "Unacceptable" rating on the Form 160A Contractor Performance Evaluation Report Part I: Contract Work Other Than Warranty Work Report or the Contractor the Contractor's Contract Performance Evaluation Report Form or the Form 160B Contract Work Other Than Warranty Work and the Contractor Performance Evaluation Report Part II: Warranty Work Under The Contract Report have been identified for possible suspension of bidding privileges. The review will be based upon the Contractor's overall performance on previous contracts and, if necessary, a more detailed report from the Resident Engineer on the current contract including any warranty work related to that contract. The results of the review will be communicated to the Contractor in writing by Tendering and Contracts.

The decision to suspend the bidding privileges of a Contractor and for what period of time in any particular instance shall rest with the Deputy Minister of the Department after he has reviewed the facts and circumstances, including any and all Contractor Performance Evaluation Reports related to the same and will be communicated to the Contractor concerned by a letter from the Deputy Minister to the Contractor copied to Tendering and Contracts.

If a suspension of bidding privileges is approved by the Department, then all future bids from the Contractor will be rejected prior to tender opening.

Alternatively, any tenders from a Contractor under suspension, discovered after tender opening, will be marked "disqualified". [PT Act Regulations 3.(4)]

Suspensions apply to all Department tendered projects. Attempts by suspended companies to submit tenders under a new company name or structure (successor corporations) are to be rejected. It is incumbent on the "new" company to establish the merits of having the opportunity to tender.

#### **160.7 Reinstatement of Bidding Privileges**

The duration of suspensions may vary depending upon individual circumstances but will generally be for at least one (1) year and/or until the circumstance giving to the suspension is addressed to the satisfaction of the Deputy Minister of the Department.

A Contractor's suspension may be lifted by the Deputy Minister of the Department upon written request from the Contractor and demonstration to the satisfaction of the Deputy Minister of the Department of the Contractor's ability to perform satisfactorily in future: for instance, successful completion of comparable projects for others since the time of suspension, identification and correction of problems that led to the suspension, etc. , or where the suspension relates to the Contractor's failure to perform corrective work related to a GC 31 warranty that suspension may be lifted by the Deputy Minister of the Department when the warranty work has been completed to the satisfaction of the Resident Engineer and that Contractor has satisfied the Department regarding the steps that that Contractor will take in future to avoid the occurrence of such defects.

In the event of reinstatement, the Contractor must achieve a "Satisfactory" rating on the first subsequent contract in order to retain eligibility to continue bidding Transportation and Works projects.

#### **160.8 Contractor Requested Review of Form 160A and/or Form 160B Evaluation**

A Contractor may request a review be conducted by the Department of a Performance Evaluation done by a Resident Engineer as countersigned by the Regional Engineer and the Regional Director on Form 160A being the "Contractor Performance Evaluation Report Part I: Contract Work Other Than Warranty Work" and/or on Form 160B being the "Contractor Performance Evaluation Report Part II: Warranty Work Under The Contract" in respect of a particular project by submitting a written request, with supporting documentation, to Tendering and Contracts.

The review in question will be conducted by a committee established by the Assistant Deputy Minister (Transportation). The results of that review which will be completed within sixty (60) days of the request for a review will be communicated in writing to the Contractor.

#### **160.9 Confidentiality of Information**

Information compiled through the Contractor Performance Evaluation System is intended solely for internal use by the Department of Transportation and Works. Evaluation information related to a particular contractor(s) will not be released to outside parties, such as reference checks from other tendering agencies, without the consent of the affected contractor(s).



## **SECTION 162**

### **FAILURE TO COMPLY WITH REGULATORY STANDARDS**

Contractor's failure to comply with the regulations of any authority having jurisdiction over the works, or part thereof, or any aspect of the performance of the work and the manner of carrying out the work, will entitle and result in the Owner appointing such engineer, engineers, compliance officer or officers as may be necessary to more fully cause compliance by the Contractor with the requirements of the relevant regulatory authority.

The Owner may thereafter, and for so long as the Owner may keep such engineer, engineers, compliance officer or officers, on the site of the works, deduct from the progress payments otherwise due to the Contractor the costs including but not limited to payroll, payroll burdens, accommodations, meals, and transportation costs associated with the work of such engineer, engineers, compliance officer or officers as the case may be. The Contractor shall have no right to dispute the Owner's right to appoint such engineer, engineers, compliance officer or officers, the reasonableness of the deduction of such costs or the amount thereof and the Engineer's certificate of the amount of such costs shall be final and binding upon the Contractor and the Owner.

## FORM 180



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 180

#### UNWATERING INCIDENTAL TO WORK

The term "Unwatering" shall mean the removal or keeping out of water from the site, in order that work may be carried out in accordance with the specifications.

Where unwatering is not a pay item, but is required in order to carry out other work, then such necessary unwatering shall be provided by the Contractor. The Contractor shall provide such temporary water-tight structures and pumps as are required for unwatering, and then after completion of the work, remove the unwatering facilities and clean-up and trim the site to sightly proportions, all at his own expense.

In an unwatering operation silt laden water containing more than 30 milligrams of suspended solids per litre shall not be disposed of directly into a watercourse or water body, and also silt laden water containing more than 350 milligrams of suspended solids per litre shall not be disposed of directly into a sewer. Silt laden water exceeding these limits shall be discharged to a vegetated area or to a sedimentation basin for removal of silt to within the appropriate limits before being disposed of into a water course or water body, or into a sewer. Where possible the vegetated areas shall be not less than 60 m from a water course or water body, unless otherwise directly by the Engineer.

Cofferdams when used shall be constructed with suitable materials so as to render the cofferdam non-erodible and non-polluting. Earth fill cofferdams shall be faced with plastic sheeting followed by sand bags, or equivalent if approved by the Engineer. The purpose of the plastic is to produce a dam that produces the least amount of infiltration.

Should silt fences be required in connection with unwatering, then the silt fences shall be included in the cost of unwaterings.

## SECTION 190 OCCUPATIONAL HEALTH AND SAFETY

### 190.1 GENERAL

- .1 All work is to be performed in accordance with the requirements of the Newfoundland Occupational Health and Safety Act and regulations as amended.
- .2 Subsequent to awarding of the tender and at least 10 (ten) working days prior to commencement of work, the contractor must submit to the Engineer copies of:
  - .1 A detailed Health and Safety Risk Assessment and Management Plan for the owner.

#### When Blasting is Required

- .2 Valid Blaster's Journey Person Certificate and Certificates of Qualification identifying the Level of Qualification for the project requirements. An acceptable letter of extension of blasters certificate from the Industrial Training Division of the Provincial Department of Education is required when certificate expires(5 years max.). Certificate numbers and names are required for all blasters proposed for the project.
- .3 Temporary Magazine License, when required
- .4 Explosives Vehicle Certificate, when required, issued by Transport Canada for transport of explosives regulated under the Transportation of Dangerous Goods Act.
- .5 Blaster resume which clearly states and demonstrates:
  - .1 Minimum five (5) years of experience in handling, storage and detonation of explosives.
  - .2 Training at a blaster's school which is acceptable to the provincial government.

#### When Diving is Required

- .6 Diver(s) and dive supervisor (s).
  - .1 Copy of valid Diving Certificate and Supervisor Certificate from the Diving Certification Board of Canada (or equivalent) for the required work on the project. (i.e. Restricted SCUBA Diver, Unrestricted SCUBA Diver, SCUBA Supervisor, Restricted Surface-Supplied Diver, Unrestricted Surface-Supplied Diver, etc. (See [www.divercertification.com](http://www.divercertification.com))
  - .2 Resume which clearly demonstrates years of experience for the specific type (SCUBA, Surface Supplied Air, etc.) of diving to be performed at the site and projects completed to achieve minimum number of logged bottom time, hours
  - .3 First Aid and CPR Training Certification.
- .7 Dive tender(s) resume which clearly states relevant training (including first aid and CPR) and experience for the specific task (i.e. dive tender log book)
- .8 Current (less than one year) medical examination certificate (s) from a licensed medical doctor in the Province of Newfoundland and Labrador who is knowledgeable and competent in diving and hyperbaric medicine for all dives.
- .9 Certificates of Analysis for quality/purity of breathing air to be used by diver(s).
- .10 Documentation showing that diving life support equipment is in good working order and properly maintained.
- .11 Copies of documentation shall be submitted to show:
  - .1 An up-to-date dive site listing of the contact Hyperbaric facility and phone numbers for each location.
  - .2 Written arrangements with standby physician(s) specializing in diving/hyperbaric medicine for contingent emergency response and post dive follow-up for 48 hours after dive is completed.
  - .3 Effective means of communication between the diving supervisor and physician are available
  - .4 The name, location and telephone number of the hospital and emergency department nearest the dive site.

### **When Confined Space Entry is Required**

- .12 Copies of confined space entry training certificates where entry to confined spaces may be required
  
- .3 Acceptance of the Project Health and Safety Risk Assessment and Management Plan and other submitted documents by the Engineer shall only be viewed as acknowledgment that the contractor has submitted the required documentation under this specification section. The Engineer makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Project Health and Safety Risk Management Plan and other submitted documents by this acceptance. Responsibility for errors and omissions in the Project Health and Safety risk Assessment and Management Plan and other submitted documents is not relieved by acceptance by Engineer.

### **190.2 PROJECT HEALTH AND SAFETY RISK ASSESSMENT AND MANAGEMENT PLANS**

The contractor shall:

- .1 Conduct operations in accordance with latest edition of the Newfoundland Occupational Health and Safety (OH&S) Act and Regulations.
- .2 Prepare a detailed Project Health and Safety Risk Assessment and Management Plan for the Owner. The assessment shall identify, evaluate and control job specific hazards and the necessary control measures to be implemented for managing hazards.
- .3 Provide a copy of the Project Health and Safety Risk Assessment and Management Plan to the Owner/Engineer. The written Health and Safety Risk Assessment and Management Plan shall incorporate the following:
  - .1 A site specific health and safety plan, refer **Section 190.3 Site Specific Health and Safety Risk Assessment and Management Plan** for requirements.
  - .2 An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractors employees at the work site.
  - .3 A comprehensive work plan which shall:
    - .1 define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives
    - .2 establish personnel requirements for implementing the plan, and establish site specific training and notification requirements and schedules.
  - .4 A personal protected equipment (PPE) Program which shall detail PPE:
    - .1 Selection criteria based on site hazards.
    - .2 Use, maintenance, inspection and storage requirements and procedures.
    - .3 Decontamination and disposal procedures.
    - .4 Inspection procedures prior to during and after use, and other appropriate medical considerations.
    - .5 Limitations during temperature extremes, heat stress and other appropriate medical consideration.
  - .5 An emergency response procedure
  - .6 A hazard communication program for informing workers, visitors and individuals outside of the work area as required
  - .7 A diving program which shall contain standard operating procedures to be followed in the diving operation
  - .8 A health and safety training program
  - .9 General safety rules
  - .10 The contractor shall provide to the Engineer, as part of the safety plan, a recent (current year) inspection form for all powered mobile equipment that will be used in fulfilling the terms of the contract. The inspection form shall, at a minimum, state that the equipment is in a safe operating condition. Confirmation of the inspection shall be provided on the "Record of Inspection" attached and signed by a person qualified to do so in accordance with Part 1, Section 2(1)(u) of the Occupational Health and Safety Regulations, 2009. A sample "Powered Mobile Equipment Annual Inspection Form" is attached at end of this section
  - .11 The contractor shall provide to the Engineer as part of the safety plan, a complete listing of employee names, their driver's license classification, expiry date, endorsements and the type of equipment (excavator, paver, loader etc...)

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that they are qualified to operate for the complete scope of work on the project. The Driver's License Number should not be provided as this is confidential information. Provision of the License Number may breach *PIPEDA* - the Personal Information Protection and Electronic Documents Act. (Federal Act) or *ATIPPA* - Access to Information and Protection of Privacy Act - Part IV. (Provincial Act of NL & Lab).

- .12 The contractor shall provide to the Engineer as part of the safety plan an acceptable parking policy for all powered mobile equipment to be used on the project. The policy shall, at a minimum, be based on a hazard assessment that considers factors such as equipment type, potential for roll over, load capacity of the parking area, pedestrian and vehicular traffic, and potential for equipment tampering, equipment energy, and equipment contact with power lines. The following checklist be included as a component of the site specific hazard assessment completed by the contractor:

<b>Powered Mobile Equipment Parking Areas</b>	<b>Yes</b>	<b>No</b>	<b>Priority Level</b>	<b>Action By</b>	<b>Date Corrected</b>	<b>Initials</b>
Potential for Rollover <ul style="list-style-type: none"> <li>• Light vehicle</li> <li>• Heavy equipment</li> <li>• ROPS equipped?</li> </ul>						
Capacity of parking area based on a visual review by an experienced operator <ul style="list-style-type: none"> <li>• Bearing capacity</li> <li>• Slope of area</li> </ul>						
Affect on other users <ul style="list-style-type: none"> <li>• Vehicles</li> <li>• Pedestrians</li> </ul>						
Can equipment be tampered with						
Can equipment contact power lines						

Contractors are advised the powered mobile equipment inspection form referred to above is attached at the end of Section 190

- .4 Periodically review and modify as required each component of the Project Health and Safety Risk Assessment and Management Plan when a new hazard is identified during completion of work and when an error or omission is identified in any part of the Project Health and Safety Risk Assessment and Management Plan
- .5 Implement all requirements of the Project Health and Safety Risk Assessment and Management Plan.
- .1 Ensure that every person entering the project site is informed of requirements under the Project Health and Safety Risk Assessment and Management Plan
- .2 Take all necessary measures to immediately implement any engineering controls, administrative controls, personal protective equipment required or termination of work procedures to ensure compliance with the Project Health and Safety Risk Assessment and Management Plan.

### **190.3 SITE SPECIFIC HEALTH AND SAFETY PLAN**

The contractor shall:

- .1 Prepare a detailed site Specific Project Health and Safety Plan which shall:
- .1 Contain certain hazard assessment results
- .2 Identify engineering and administrative demonstrative controls (work practices and procedures) to be implemented for managing identified and potential hazards, and comply with applicable federal and provincial legislation and more stringent requirements that have been specified in these specifications.

- .2 Review for completeness the hazard assessment results immediately prior to commencing work, when a new hazard is identified during completion of work and when an error or omission is identified.
  - .1 Be solely responsible for investigating, evaluation and managing any report of actual or potential hazards
  - .2 Retain copies of all completed hazard assessments at the project site and provide a copy to the Engineer/Architect

#### **190.4 SUPERVISION AND EMERGENCY RESCUE PROCEDURE**

The contractor shall:

- .1 Carry out work under the direct supervision of competent persons responsible for safety by ensuring the work complies with the appropriate section of OH&S Act and Regulations, latest edition
- .2 Assign a sufficient number of supervisory personnel to the work site
- .3 Provide a suitable means of communications for workers required to work alone
- .4 Develop an emergency rescue plan for the job site and ensure that supervisors and workers are trained in the emergency rescue plan
- .5 The emergency response plan shall address, as a minimum:
  - .1 Pre-emergency planning
  - .2 Personnel roles, lines of authority and communication.
  - .3 Emergency recognition and prevention.
  - .4 Safe distances and places of refuge
  - .5 Site security and control
  - .6 Evacuation routes and procedures
  - .7 Decontamination procedures which are not covered by the site specific safety and health plan
  - .8 Emergency medical treatment and first aid.
  - .9 Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial and federal government departments.
  - .10 PPE and emergency equipment.
  - .11 Procedures for handling emergency incidents.
  - .12 Site specific emergency response training requirements and schedules.
  - .13 For diving operation, include procedures for:
    - .1 Managing deteriorating environmental conditions
    - .2 Managing unexpected weather or sea state condition
    - .3 Evacuation of diver(s) under pressures greater than atmospheric pressure
    - .4 In water emergency transfers
    - .5 Managing failing of equipment below the surface that impairs the ability of a diver to complete a dive
    - .6 Managing failure of any major component of diving plant or equipment
    - .7 Emergency signaling between divers involved in the diving program and between the diver(s) and the attendants using umbilical, tethers or other suitable methods
    - .8 Mobilizing standby divers
    - .9 Mobilizing crafts, standby boats and any other devices to be used for rescue
    - .10 Contacting evacuation, rescue, treatment facilities and medical services that will be used in the diving program
    - .11 Operation of emergency power and lighting facilities
- .6 The emergency response procedures shall be rehearsed regularly as part of the overall training program
- .7 Provide adequate first aid facilities for the job site and ensure that a minimum number of workers are trained in first aid in accordance with the First Aid Regulations.

#### **190.5 CONTRACTORS SAFETY OFFICER**

- .1 The contractor's Safety Officer will be solely responsible for the implementation and monitoring of the Project Health and Safety Risk Assessment and Management Plan, and will have the authority to implement health and safety changes as directed by the Engineer. The Safety Officer shall have as a minimum:
  - .1 Completed training in hazardous occurrence management and response/protocols
  - .2 Completed training in the use, maintenance of fall protection systems
  - .3 Completed training in the design and construction of scaffolding

**March 2011**

- .4 Completed training in confined space entry protocols and techniques.
- .5 Completed training in First Aid.
- .2 With respect to project tasks and elements, the contractor safety officer shall be competent and qualified.

#### **190.6 HEALTH AND SAFETY COMMITTEE**

The contractor shall:

- .1 Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site as per the OH&S Act and Regulations
- .2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site specific Health and Safety Plan.

#### **190.7 RESPONSIBILITY**

- .1 Should any unforeseen or peculiar safety related factor, hazard, or condition become evident during performance of Work, the contractor must:
  - .1 Follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations
  - .2 Advise Engineer verbally and in writing

#### **190.8 INSTRUCTION AND TRAINING**

- .1 Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall, as a minimum, thoroughly cover the following:
  - .1 Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring and enforcing health and safety requirements.
  - .2 Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.
  - .3 Limitations, use, maintenance and disinfection – decontamination of personal protective equipment associated with completing work.
  - .4 Limitations, use, maintenance and care of engineering controls and equipment.
  - .5 Limitations and use of emergency notifications and response equipment including emergency response protocol.
  - .6 Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.
- .2 Contractors must provide and maintain training of workers, as required, by Federal and Provincial legislation.
- .3 Copies of all training certificates shall be provided to the Engineer for review, before a worker is to enter the work site.
- .4 Authorized visitors shall not access the work site until they have been:
  - .1 Notified of the names of persons responsible for implementing, monitoring and enforcing the health and Safety Risk Assessment and Management Plan.
  - .2 Briefed on safety and health hazards present on the site.
  - .3 Instructed in the proper use and limitations of personal protective equipment.
  - .4 Briefed as the emergency response protocol including notification and evacuation process.
  - .5 Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.

#### **190.9 CONSTRUCTION SAFETY MEASURES**

The contractor shall:

- .1 Observe construction safety measures of Provincial Government, OH&S Act and Regulations, Workplace Health and Safety and Compensation Commission and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply

- .2 Administer the project in a manner that will ensure, at all times, full compliance with Federal and Provincial Acts, regulations and applicable safety codes and the site Health and Safety Risk Assessment and Management Plan.
- .3 Provide Engineer/Architect with copies of all orders, directions and any other documentation, issued by the Provincial Department of Government Services and Human Resources Development Canada (HRDC).
- .4 Forward copies of all orders, directions or any other documentation immediately after receipt.

**190.10 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices, minutes and orders are posted in conspicuous location on site in accordance with all Acts and Regulations.

**190.11 HEALTH AND SAFETY MONITORING**

- .1 Periodic inspections of the contractor's work may be carried out by the Engineer and/ or the Department of Transportation and Works Occupational Health and Safety Consultants to maintain compliance with the Health and Safety Program. Inspections will include visual inspections as well as testing and sampling as required.
- .2 The contractor shall be responsible for any and all costs associated with delays as a result of contractor's failure to comply with the requirements outlined in this section.

**190.12 NOTIFICATION**

- .1 For projects exceeding thirty (30) days or more, the contractor shall, prior to the commencement of work, notify in writing the Work Place Health and Safety Division, Department of Government Services with the following information:
  - .1 Name and location of construction site
  - .2 Company name and mailing address of contractor doing the work
  - .3 The number of workers to be employed
  - .4 A copy of the Health and Safety Risk Assessment and Management Plan if requested

**190.13 CORRECTION OF NONCOMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Engineer
- .2 Provide Engineer/Architect with written report of action taken to correct non-compliance of health and safety issues identified
- .3 Engineer/Architect may stop work if noncompliance of health and safety regulations is not corrected

**190.14 WHMIS**

- .1 Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labeling, storage, and disposal of hazardous materials
- .2 Deliver copies of relevant Material Safety Data Sheets (MSDS) to job site and the Engineer. The MSDS must be acceptable to Labour Canada and Health and Welfare Canada for all controlled products that will be used in the performance of this work.
- .3 Train workers required to use or work in close proximity to controlled products as per OH&S Act and Regulations.
- .4 Label controlled products at jobsite as per OH&S and Regulations.
- .5 Provide appropriate emergency facilities as specified in the MSDS where workers might be exposed to contact with chemicals, e.g. eyewash facilities, emergency shower.
  - .1 Workers to be trained in use of such emergency equipment.
- .6 Contractor shall provide appropriate personal protective equipment as specified in the MSDS where workers are required to use controlled products.
  - .1 Properly fit workers for personal protective equipment
  - .2 Train workers in care, use and maintenance of personal protective equipment.
- .7 No controlled products are to be brought onsite without prior approved MSDS.
- .8 The MSDS are to remain on site at all times.

**190.15 OVERLOADING**

- .1 Ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.



- 190.16 FALSEWORK**  
.1 Design and construct falsework in accordance with CSA S269.1.
- 190.17 SCAFFOLDING**  
.1 Design, erect and maintain scaffolding in accordance with CSA S269.2M87: *Access Scaffolding for Construction Purposes* and Part XI: sections 147-249 of the OH&S Regulations.  
.2 Ensure that fall restraint or fall arrest devices are used by all workers working at elevations greater than 3.05 metres above grade or floor level in accordance with CSA Z259.
- 190.18 PERSONAL PROTECTIVE EQUIPMENT**  
.1 In addition to those requirements set forth in the Occupational Health and Safety Act and Regulations, all persons, including those employed by the contractor or sub-contractors, working on projects for The Department of Transportation and Works shall wear the following mandatory Personal Protective Equipment at **ALL** times while working on the project.  
.1 CSA approved safety boots  
.2 CSA approved hard hat meeting the 1992 standard  
.3 vest with retro-reflective stripes (High Visibility)  
.4 other personal protective equipment, as may be required from time to time by the engineer, depending on duties being performed, shall also be worn
- 190.19 TRAFFIC CONTROL**  
.1 Provide traffic control measures when working on, or adjacent to, roadways.  
.2 Traffic control measures to conform with "Traffic Control Manual for Roadway Work Operations", Department of Transportation and Works.
- 190.20 EXCAVATION SAFETY**  
.1 Protect excavations more than 1.25 metres deep against cave ins or wall collapse by side wall sloping to the appropriate angle of repose, an engineered shoring/sheathing system or an approved trench box  
.2 Provide a ladder where excavation greater than 1.25 meters deep, extending from the bottom of the excavation to at least 0.91 meters above the top of the excavation.  
.3 Ensure that all excavations less than 1.25 metres deep are effectively protected when hazardous ground movement may be expected  
.4 Design trench boxes, certified by a registered Professional Engineer, and fabricated by a reputable manufacturer. Provide the manufacturer's Depth Certificate Statement permanently affixed. Use trench boxes in strict accordance with manufacturer's instructions and depth certification data  
.5 For excavations deeper than six (6) metres, provide a certificate from a registered Professional Engineer stating that the protection methods proposed have been properly designed in accordance with accepted engineering practice. The engineer's certificate shall verify that the trench boxes, if used, are properly designed and constructed to suit the depth and soil conditions  
.6 Ensure that the superintendent and every crew chief, foreperson and lead hand engaged in trenching operations or working in trenches have in his/her possession a copy of the Occupational Health and Safety Regulations: Part XVII: Construction, Excavation and Demolition and Part XVIII: Excavation, Underground Work and Rock Crushing.
- 190.21 BLASTING OPERATIONS**  
.1 Ensure blasting operations are carried out under the direct visual supervision of a qualified Blaster registered with the Provincial Department of Government Services. Comply with the requirements of:  
.1 Explosives Act.  
.2 Explosives Regulations.  
.3 Newfoundland Regulation 70/09, Occupational Health and Safety Regulations.  
.2 Store explosives in accordance with the "Explosives Act (Canada)" and transport, handle and use in the manner prescribed by the manufacturer of the substance and subject to specific regulations.

- .3 Ensure that workers required to transport explosives have a valid Transportation of Dangerous Goods Training Certification in accordance with the “Act to Promote Public Safety in the Transportation of Dangerous Goods, and the “Explosives Act (Canada)”.
- .4 Advise the public by suitable public notices, advertisements, house to house contacts etc. for blasting operations in close proximity to areas occupied by the public. Advise of the warning device to be sounded and the procedure to be used before detonation of individual blasts.
- .5 Prior to detonation of a blast, give sufficient warning in every direction and ensure that all persons have reached a place of safety before the blast is fired.
- .6 File an Emergency Response Assistance Plan with the Explosives Branch, Natural Resources Canada.
- .7 Blaster shall:
  - .1 Be solely responsible for implementation of the Explosives Management Program
  - .2 Have a valid blaster’s safety certificate from the Department of Education Division of Institutions and Industrial Education, and have a valid temporary Magazine License, when required, issued by Natural Resources Canada, for storage and explosives
  - .3 Possess a thorough working knowledge of the Federal Explosives Act and Provincial Regulations
  - .4 Possess a specialized training in handling storage and detonation of explosives

**190.22 HEAVY EQUIPMENT**

- .1 Ensure mobile equipment used on job site is of the type specified in OH&S Act and Regulations fitted with a Roll Over Protective Structure (ROPS).
- .2 Operators of mobile equipment shall have adequate instruction and competent in the operation of mobile equipment.
- .3 Provide certificate of training in Power Line Hazards for operators of heavy equipment.
- .4 Obtain written clearance from the power utility where equipment is used in close proximity to (within 5.5 metres) overhead or underground power lines
- .5 Equip cranes with:
  - .1 A mechanism which will effectively prevent the hook assembly from running into the top boom pulley.
  - .2 A legible load chart
  - .3 A maintenance log book

**190.23 TREE AND BRUSH CLEARING**

- .1 Ensure workers using chain saws wear the following safety equipment:
  - .1 CSA approved safety hat
  - .2 Hearing protection, e.g. ear muffs
  - .3 CSA approved chain saw pants
  - .4 CSA approved chain saw boots
  - .5 Approved eye protection
- .2 Ensure that all workers using brush saws wear the following safety equipment:
  - .1 CSA approved safety hat fitted with face screen or shield or approved safety glasses
  - .2 Hearing protection, e.g. ear muffs
  - .3 CSA approved safety footwear
- .3 Chain saws must be equipped with a chain brake

**190.24 DIVING OPERATIONS**

- .1 Ensure diving operations conform to CSA Z275.2-92 Occupational Safety Code for Diving Operations and CSA Z275.4-97 Competency Standard for Diving Operations or later edition.
- .2 Sampling:
  - .1 Prior to commencing diving activities, sample water and analyze sample(s) for:
    - .1 Fecal Coliforms (Escherichia coli)
    - .2 Total Coliforms.
    - .3 Any health hazard identified during the site specific hazard assessment.
    - .4 Any parameter as directed by the Department of Government Services, Government of Newfoundland and Labrador.
  - .2 Water will be designated a contaminant if the chemical concentration of a contaminant exceeds:
    - .1 200 fecal Coliforms (Escherichia coli) per 1000 milliliter of water.

- .2 100 times the guidelines concentration established in the most recent Guidelines of Canadian Drinking Water Quality.
- .3 Any other criteria established by the Newfoundland Department of Government Services.
- .3 Sample analysis is to be completed by a laboratory that is accredited by the Canadian Associates of Environmental and Analytical Laboratories (CAEAL) or other national equivalent.
- .4 Dive personnel must meet the minimum competency requirements of CSA 275.4-97.
  - .1 The Dive supervisor(s) shall as a minimum:
    - .1 Possess a Valid Diving Certificate, or equivalent, for a minimum of three (3) years for the type of diving to be performed.
    - .2 Have completed one hundred and fifty (150) hours of logged diving time for the type of diving to be performed.
    - .3 Have completed fifty (50 ) hours of dive supervision for the type of diving to be performed.
  - .2 Diver(s) shall as a minimum:
    - .1 Possess a valid Diving Certificate or equivalent, for the type of diving to be performed.
    - .2 Have completed fifty (50) hours of logged dive time for the type of diving to be performed.
- .5 A diving operation shall be interrupted or discontinued or not commenced when:
  - .1 Continuation of the diving operation would or is likely to compromise the safety of any person involved in the diving operation.
  - .2 The water currents at the underwater work site are likely to compromise the safety of any person involved in the diving operation.
  - .3 Combustible material is stored too close for safety to any diving plant and equipment used in the diving operation.
- .6 A diving operation shall:
  - .1 Not be conducted in the vicinity for any other activity that might pose a danger to any person involved in the diving operation.
  - .2 Not use any craft that has insufficient power or stability for the safe continuity of the diving operation.
  - .3 Provide measures for making work area boundary and stopping unauthorized entry into the work area.
  - .4 Provide adequate illumination of the dive site and the underwater work site of the diving operation.
- .7 Provide, at the work site while completing diving operations, a diving operations log book that is permanently bound and has numbered pages.
  - .1 Produce on request, any log books, records or other documentation associated with the diving operation, for inspection by Engineer/Architect.
  - .2 As a minimum, for each diving operation enter into the diving operation logbook:
    - .1 date and time the diving operation commenced and terminated including any time the diving operation was interrupted
    - .2 name of supervisor; names of all other persons involved
    - .3 the procedures followed
    - .4 the decompression table and the schedule in that the decompression table was used
    - .5 the maximum depth, bottom time, dive time and total dive time for each dive
    - .6 the type of diving plant and equipment and the type of breathing mixture used
    - .7 the type of discomfort, injury or illness including decompression sickness, suffered by any person involved
    - .8 any environmental conditions that affected or might have affected the diving operation
    - .9 any other factors relevant to the safety to health of any person involved
- .8 Diving in free swim mode is not permitted at the work site.
- .9 Provide separate first aid supplies for dive operation. All dive team personnel shall be trained in first aid and cardiopulmonary resuscitation (CPR)
- .10 Provide medical oxygen for emergency response at work site. The dive supervisor shall be trained in administering medical oxygen.

**190.25    CONFINED SPACE OPERATIONS**

- .1    Ensure confined operations are carried out under the Occupational Health and Safety Act and Newfoundland Regulation 70/09, Occupational Health and Safety Regulations PART XXVII CONFINED SPACE ENTRY.

**190.26    *The owner shall not be responsible for injury or damage occasioned by a failure of the Contractor to adhere to these provisions.***

**POWERED MOBILE EQUIPMENT INSPECTION FORM**

This is to confirm that as of (Date) \_\_\_\_\_ the unit described below is in safe operating condition in accordance with s.251(1) & s.251(3) of the OHS Regulations.



Contract No: \_\_\_\_\_

Company Name: \_\_\_\_\_

Company Number: \_\_\_\_\_

Equipment Description: \_\_\_\_\_

Serial Number / Identification Number: \_\_\_\_\_

Hours: \_\_\_\_\_

Odometer: \_\_\_\_\_



**CONTRACTOR SIGN OFF**

Signed by: \_\_\_\_\_

Print Name: \_\_\_\_\_

Position: \_\_\_\_\_



**INSPECTOR SIGN-OFF**

Signed by: \_\_\_\_\_

Print Name: \_\_\_\_\_

Qualifications of Inspector - see attached documentation, if applicable (Note that OHS Regs s.251(1) & s.251(3) outline the requirements for the maintenance, inspection and repair of mobile equipment.)

\_\_\_\_\_

\_\_\_\_\_

Journeyman License No. & Issuing Province (if applicable): \_\_\_\_\_

# FORM 200



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## DIVISION 2 SPECIFICATIONS FOR GRADING INDEX

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205	Classification of Excavated Materials	1
206	Grading of Cuts	3
207	Borrow	4
208	Excavation of Ditches	2
211	Excavation Overhanging Rock and Rock Slide Debris	2
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# FORM 201



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 201 CLEARING AND GRUBBING

### INDEX

#### 201.01 DESCRIPTION

#### 201.02 PERMITS AND AUTHORIZATION

#### 201.03 CLEARING AND GRUBBING OPERATIONS

#### 201.04 MEASUREMENT FOR PAYMENT

#### 201.05 BASIS OF PAYMENT

#### 201.01 DESCRIPTION

Clearing and grubbing shall consist of the removal and disposal of all trees, brush, logs, surface boulders, stumps, roots, matted roots and other vegetation from within areas selected by the Engineer.

#### 201.02 PERMITS AND AUTHORIZATION

The Contractor is required to obtain a permit to cut trees. Application for a permit should be made to the local office of the Department of Forest Resources and Agrifoods.

Should the Contractor wish to burn brush, then prior permission must first be obtained from the Department of Forest Resources and Agrifoods.

#### 201.03 CLEARING AND GRUBBING OPERATIONS

Areas in which clearing and grubbing are to be carried out will be staked on the ground beforehand by the Engineer.

Where clearing and grubbing operations are required near a watercourse or water body, the Contractor shall ensure that a minimum 15 m "no grub" zone is left between the watercourse or water body and adjacent work area. This "no grub" buffer shall be clearly marked in the field by the Engineer prior to any grubbing so that the area is visible to heavy equipment operators.

The cutting of trees shall not commence until the Contractor has obtained a cutting permit.

The Department, should it so wish, may permit the Contractor to dispose of any timber cut on Crown Land to his advantage providing the requirements of the Crown Lands Act, with respect to royalties, etc., are met.

Where timber to be cleared and grubbed is on land belonging or leased to private individuals, crown corporations or companies, the timber does not become the property of the Contractor. The Contractor must make prior arrangements with land owners or lessee for the disposal of the timber.

The Contractor shall not proceed with any burning operations during the fire season without securing the permission of the Department of Forest Resources and Agrifoods. The Contractor shall take all necessary precautions to guard against damage to surrounding timber and shall assume all liability for claims which may arise from any such damage.

Surface boulders, regardless of their size, shall be considered as part of clearing and grubbing. All surface boulders shall be removed and disposed of along with the other clearing and grubbing debris.

## **FORM 201**

Clearing and grubbing debris shall be disposed of in a manner approved by the Engineer. The Contractor shall haul away and dispose of the clearing and grubbing debris in an approved waste disposal area. The approved waste disposal area shall be provided by the Contractor at his own expense. Clearing and grubbing debris shall be trimmed to sightly proportions.

Where clearing and grubbing takes place in preparation for a borrow area outside of the right of way then clearing and grubbing debris may be pushed upon adjacent land provided that in so doing the debris is not pushed onto land belonging to others, or pushed in or around stands of mature trees.

Where a significant quantity of topsoil exists and as directed by the Engineer, the Contractor shall stockpile topsoil separately from other material for possible rehabilitation work.

### **201.04 MEASUREMENT FOR PAYMENT**

Measurements will be made of the horizontal area actually cleared and grubbed from within the area staked out by the Engineer. These measurements shall be computed to obtain the area in hectares, measured to three decimal places.

Clearing and grubbing beyond the limits staked will not be measured for payment.

### **201.05 BASIS OF PAYMENT**

Payment at the contract price for Clearing and Grubbing shall be compensation in full for all labour, materials and equipment-use to carry out the work indicated in this specification or in any way connected with these operations.

No payment, other than that provided for in the contract price for Clearing and Grubbing, will be made for topsoil and surface boulders removed by clearing and grubbing operations, or for any and all haulage involved in clearing and grubbing debris disposal.



# FORM 202



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## CLEARING

### INDEX

#### 202.01 DESCRIPTION

#### 202.02 ENVIRONMENTAL PERMITS AND AUTHORIZATION

#### 202.03 CLEARING OPERATIONS

#### 202.04 MEASUREMENT FOR PAYMENT

#### 202.05 BASIS OF PAYMENT

#### 202.01 DESCRIPTION

Clearing shall consist of the cutting of trees and brush and the removal, piling and burning or other disposal of all trees, brush and logs from within areas designated by the Engineer. However, clearing will not normally be performed within areas selected as borrow pits and quarries, unless otherwise directed by the Engineer.

#### 202.02 ENVIRONMENTAL PERMITS AND AUTHORIZATION

The Contractor is required to obtain a permit to cut trees within the highway right of way. Application for a permit should be made to the local office of the Forestry Division.

Should the Contractor wish to burn brush, then prior permission must first be obtained from the Forestry Division. Tires are not to be used in burning operations. Additionally, burning operations in residential areas should be carried out in a manner where airborne fire emissions will not impact these properties.

#### 202.03 CLEARING OPERATIONS

Areas in which clearing is to be carried out will be staked on the ground beforehand by the Engineer.

Clearing operations shall not commence until the Contractor has obtained a cutting permit.

If so ordered by the Engineer, certain trees within the right of way shall be preserved. Underbrush, down timber, snags and roots shall be removed from the vicinity of such preserved trees to a cleared space within the right of way and then burned. Where possible, a 15 m vegetated buffer (trees, shrubs) shall be retained upstream and downstream of stream crossing structures.

All tree branches extending into the right of way which hang within six metres of the ground shall be cut off close to the trunk in a neat and workmanlike manner.

No trees shall be cut down outside the limits of the right of way except any tree or trees considered unsafe by the Engineer and no tree may be so cut down unless marked for cutting by the Engineer.

No timber, brush or logs shall in any event be piled upon adjacent lands unless authority is first obtained from the Engineer.

The limits of the right of way shall be left in proper shape for fencing.

Trees cut within the right of way and not required for departmental use will become the property of the Contractor.

The Contractor shall be permitted to use for construction purposes under the contract any timber cut on the right of way provided that the sizes and quality of such timber meets the requirements of the plans and specifications and is acceptable to the Engineer.

The Contractor shall dispose of all brush and logs not suitable for salvage. Disposal shall be by burning, or by removal and disposal in an approved waste disposal area provided by the Contractor at his own expense.

The Contractor shall not proceed with any burning operations during the fire season without securing the permission of the Forestry Division.

The Contractor shall take all necessary precautions to guard against damage to surrounding timber and shall assume all liability for claims which may arise from any such damage.

#### **202.04 MEASUREMENT FOR PAYMENT**

Measurement will be made of the horizontal area actually cleared from within the area staked out by the Engineer. These measurements shall be computed to obtain the area in hectares, measured to three decimal places.

Clearing beyond the limits staked will not be measured for payment.

#### **202.05 BASIS OF PAYMENT**

Payment at the contract price for clearing shall be compensation in full for all labour, materials and equipment-use to carry out the work indicated in this specification and shall include all costs involved in obtaining and conforming to the conditions of required permits, together with either burning the debris, or obtaining an approved waste disposal area and hauling away and disposing of the debris in the waste disposal area.

# FORM 203



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 203

### GRUBBING

#### INDEX

#### 203.01 DESCRIPTION

#### 203.02 GRUBBING OPERATION

#### 203.03 MEASUREMENT AND BASIS OF PAYMENT

#### 203.01 DESCRIPTION

Grubbing shall consist of the removal and disposal of all stumps, roots, surface boulders, embedded logs, debris, matted roots, and other vegetation from areas designed to be grubbed, and shall be performed by the Contractor on the sites of excavation and embankments together with other areas not affected by grading operations as directed by the Engineer. However, grubbing will not normally be performed on areas selected as borrow pits and quarries unless otherwise directed by the Engineer.

Where directed by the Engineer, trees, stumps and brush shall be cut even with the ground in order not to disturb the natural matting and this "close cutting" will be paid for as grubbing.

#### 203.02 GRUBBING OPERATIONS

Areas in which grubbing is to be carried out will be staked on the ground beforehand by the Engineer. Under fills, areas to be grubbed will normally be determined in accordance with the spirit of the guidelines in Section 1208.

Where grubbing is required near a watercourse or water body; the Contractor shall ensure that a minimum 15 m "no grub" zone is left between the watercourse or water body and adjacent work area. This "No Grub" buffer area shall be clearly marked in the field by the Engineer prior to any grubbing so that the area is visible to heavy equipment operators. Where possible, ditch waters shall be directed to existing vegetation at least 30 m from watercourse crossing locations rather than directly discharging to the watercourse.

Surface boulders, regardless of their size, shall be considered as part of grubbing debris. All surface boulders shall be removed and disposed of along with the other grubbing debris, except such boulders which in the opinion of the Engineer can be incorporated in the project.

Grubbing shall be disposed of in a manner approved by the Engineer. The Contractor shall haul away and dispose of the grubbing debris in an approved waste disposal area. The approved waste disposal area shall be provided by the Contractor at his own expense. Grubbing debris shall be trimmed to sightly proportions.

Grubbing operations as directed by the Engineer shall be carried out for a distance of at least one kilometre in advance of grading operations, excepting where grubbing and excavation are permitted as a joint operation.

#### 203.03 MEASUREMENT AND BASIS OF PAYMENT

Measurements will be made of the horizontal area actually grubbed or close cut, as required by the Engineer. These measurements shall be computed to obtain the area in hectares, measured to three decimal places.

Grubbing or close cutting beyond the limits staked will not be measured for payment.

No payment, other than that provided for in the contract price for grubbing, will be made for topsoils and surface boulders removed by grubbing operations, or for any and all haulage involved in grubbing disposal.

Cross sectioning for purposes of payment for excavated quantities for other items appearing in the contract documents will not be done until grubbing or clearing and grubbing operations in the designated area are completed.

Payment at the contract price for grubbing shall be compensation in full for all labour, materials and equipment-use to carry out the work indicated in this specification or in any way connected with these operations.

**SECTION 204  
GRADING OF FILL**

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**204.01 FILL MATERIALS**

All material from cuts, excavation for foundation and ditch excavation shall be used in fill construction, provided that material is required to complete fills and provided that the material is suitable for this purpose.

All materials that are proposed to be incorporated into fills shall be subject to test by the Engineer to determine their suitability for the portions of the fill in which it is proposed that they be placed.

Only such materials as are approved by the Engineer shall be placed in fills.

Fill material shall not contain frozen lumps, weeds, sod, roots, logs, stumps or any other objectionable matter.

Material from rock cuts and quarries shall be thoroughly fragmented, well graded with fragments of greatest dimension of not more than 500 mm.

Surface boulders and stones larger than 150 mm present in other material may be placed in fill provided that they are placed in accordance with the requirements of this specification.

**204.02 PLACING OF FILL**

The Contractor shall remove such grubbing and unsuitable material as the Engineer requires removed from the area on which the fill is to be placed. The limits of the toe of the fill shall be staked by the Engineer. All culverts and drainage structures shall be constructed and no fill material shall be placed in the area until the ground has been inspected and approved by the Engineer.

The Contractor shall construct fills to the lines, grades and cross sections required by the Engineer.

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The Contractor shall maintain a minimum 15 m undisturbed buffer strip between the fill area and watercourses to be crossed until such time that the crossing structure is ready for installation. The width of the buffer strip shall be determined by the Engineer.

Fill construction shall not be performed when the ground is frozen or when the fill material is frozen or when a blanket of snow prevents proper compaction.

On no account will the Contractor be allowed to construct a core through the fill and complete the fill by side dumping.

Fill material shall be deposited and spread in layers of a loose thickness, before compaction, not exceeding 500 mm for the full width of the fill, except that the Engineer may order this thickness reduced, if in his opinion, such thickness does not respond to compaction methods. The top surface of each layer shall be suitably sloped with a cross-fall not to exceed five percent in order to shed surplus rain water, and the thickness of each successive layer shall be maintained uniform for the full width of the fill. Each layer of the section of the fill under construction at the time shall be brought up to its required grade and properly compacted as herein specified before the succeeding layer is applied.

### **204.02.01 Construction of Fill Adjacent to Steep Slopes**

Where fill is to be placed on a side hill, sloping areas, or against an existing embankment, or where fill is to be built one half width at a time, then the slopes of the original side hill, sloping area, existing or new embankment, as the case may be, shall be cut into a minimum of two metres horizontally, or as may be directed by the Engineer. The fill shall then be placed in layers. After successive layers have brought the fill up to the level of the top of the aforesaid two metre wide cut, another horizontal cut of a similar nature shall be made into the original side hill or sloping area or into the existing or new embankment, so that proper bonding of new work to old may be obtained.

This procedure shall be followed throughout the entire construction of the fill. All material thus cut out shall be recompacted along with the new fill material.

### **204.02.02 Construction of Fill by the Sandwich Method**

Embankments may, at the discretion of the Engineer, be constructed by the "sandwich" method. Under this system, alternate layers of materials from other material and rock sources shall be spread and compacted. The Contractor shall direct and organize his excavation forces so that an adequate supply of both materials is available at all times during embankment construction. The upper 500 mm of embankment subgrade shall consist of rock fill and all stones larger than 150 mm shall be removed from the material comprising the top 300 mm of the sub-grade.

### **204.02.03 Special Requirements for Placing O.M. Fill Containing Large Rocks**

Surface boulders, removed during grubbing operations or stones larger than 150 mm present in other material may be used in other material fill provided that:

- (i) All boulders or stones larger than 500 mm shall be placed such that there will be at least 2 m of cover on all sides.
- (ii) All stones larger than 150 mm, but less than 500 mm in size, shall be kept at least 300 mm below sub-grade.
- (iii) No two boulders or stones larger than 500 mm shall be in contact with each other. All boulders and stones larger than 150 mm must be of such shape and placed in such position within the fill, that compaction equipment may operate efficiently between the rocks, and close up to all faces of each of the rocks, while successive layers of fill are being placed.
- (iv) The position of each boulder in the embankment shall be such that when resting on a horizontal surface, each boulder shall be in a stable position with the centre of gravity as low as possible.

## **204.03 FILL COMPACTION**

Fill consisting of other material shall be compacted to at least 95% of the Standard Proctor Density (ASTM D698-78) by using approved compaction equipment.

In rock fill material where Standard Proctor tests cannot be carried out, compaction shall be continued until there is no visible movement of the fill under an approved vibratory compactor which is vibrating. The vibratory compactor shall be of a type designed for fill compaction, weigh at least 9 tonnes and exert a load when vibrating of at least 4.5 tonnes per metre of wheel width.

**204.04 CLASSIFICATION**

Where materials placed in the fill are from excavations within the highway right of way, or from borrow sources provided by the Department, then the fill materials will be classified in excavation in accordance with Section 205 "Classification of Excavated Materials".

However, where the fill material is supplied by the Contractor then the fill will be classified as either "Rock Fill in Place" or "Other Material Fill in Place". Rock Fill in Place and Other Material Fill in Place shall conform to the physical and other requirements given in Section 310 "Use of Pits and Quarries and Stockpiles for Production of Materials Supplied by the Contractor".

**204.05 MEASUREMENT FOR PAYMENT**

Where materials placed in the fill are from excavations within the highway right of way, or from borrow sources provided by the Department, then measurement for payment will be based on measurements of either volume of excavation or on weight, as given in other sections of this book.

However, for the fill materials supplied by the Contractor; "Rock Fill in Place" and "Other Material Fill in Place", the measurement for payment will be made of either; the volume of fill placed, or the weight of fill placed, depending on whether the unit price is given in cubic metres or tonnes.

**204.05.01 Volume Measurement for Payment for Fill in Place**

The quantity to be measured shall be the number of cubic metres (rounded to the nearest whole number) of fill as shown on the cross-section sheets between the position of the ground lines as cross sectioned before the "Fill in Place" material was placed, and the completed and accepted fill lines. Material placed outside of the required chainage limits, shoulders and toes of slopes will not be included in the calculations.

The volume of the fill shall be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

During the placing of fill operations whenever the fill material, as classified in 204.04 classification, changes from one type to another, the Contractor shall notify the Engineer so that proper measurements or cross sections may be made.

**204.05.02 Weight Measurement for Payment for Fill in Place**

Where "Rock Fill in Place" or "Other Material Fill in Place" is to be paid for in terms of the number of tonnes, then such materials shall be weighed on scales. The scales shall be provided by the Contractor and they shall conform with the requirements of Section 501 "Weighing of Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker as being placed in the works shall be included in measurement for payment. The weight shall be computed in tonnes, rounded to one decimal place.

Materials placed outside of the required chainage limits, shoulders and toes of slopes will be excluded in computations for quantities.

**204.06 BASIS OF PAYMENT**

The basis of payment will depend on whether the fill material is from sources provided by the Department or from sources provided by the Contractor.

Where benching of slopes is required as part of the grading of fill operation, no payment shall be made in respect of quantities excavated to form the benches.

**204.06.01 Basis of Payment for Grading of Fill where Materials are from Sources Provided by the Department**

Where the materials placed in the fill are from excavations within the highway right of way or from borrow sources provided by the Department, then no separate payment will be made for the grading of fill. The grading of fill is part of the operation of excavating the material used in the fill, and payment at the appropriate contract price for the excavation material, depending on the source and type of material, shall be compensation in full for all labour, materials and equipment use for; excavating, handling, and hauling the excavated material up to 1 km, excavating such slope benches as may be required and placing and compacting both the excavated material and the material excavated from any slope benches in a fill in accordance with the specification for grading of fill.

Where the Engineer requires that excavation material be hauled in excess of 1 km before being placed in a fill, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Materials".

**204.06.02 Basis of Payment for Grading of Fill where the Materials are from Sources Provided by the Contractor**

Where the materials placed in the fill are from borrow sources provided by the Contractor, then payment shall be at the contract unit price per cubic metre, or per tonne, for either "Supply Rock Fill in Place", or "Supply Other Material Fill in Place", as appropriate. Such payment shall be compensation in full for all labour, materials, equipment-use and any other expenses to; provide a pit or quarry, obtain all required permits and approvals, clear, grub, and strip the pit or quarry, excavate the material, handle the material, provide all haulage of the material from the source to the fill, provide provision for weighing (if appropriate), place and compact the fill to the lines, grades and cross sections required, pay any royalties for the material, clean up and provide such other restoration to the pit or quarry as may be required, together with any other work necessary to complete the contract item.



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#### CLASSIFICATION OF EXCAVATED MATERIALS

Excavated materials shall be classified for the purposes of payment as "Solid Rock", or "Other Material" in conformity with the following:

- (a) Solid Rock - shall include all rock, in masses or ledges in their original or stratified bed or position, and all boulders and detached pieces or rock exceeding zero decimal five cubic metres in measurement which are present in Other Material.
- (b) Other Material - shall include all earth, sand, gravel, cemented gravel, clay, hardpan and boulders less than zero decimal five cubic metres in measurement and all excavated materials not classed as Solid Rock.

However, in those contract documents where quantities appear for items of excavated materials in addition to "Solid Rock" and "Other Material", as defined above, then these excavated materials shall be further classified for the purposes of payment in conformity with the following:

- (i) Quarried Rock - shall mean Solid Rock that is taken from a borrow area.
- (ii) Other Material Borrow - shall mean Other Material that is taken from a borrow area.
- (iii) Unsuitable Material - shall mean Other Material that is not suitable for use in grading of fill operations.
- (iv) Muskeg or Bog - shall mean Other Material consisting of bog and underlying pug together with such tree stumps, roots and vegetation that are present on and in the bog.
- (v) Ditching Solid Rock - shall mean Solid Rock that is taken from ditch excavation.
- (vi) Ditching Other Material - shall mean Other Material that is taken from ditch excavation.

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## SECTION 206 GRADING OF CUTS

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This work shall include labour and materials required to carry out all excavation such as that required to complete road cuts, roadside ditches, bench excavation of cuts and sub-excavations and shall include hauling up to 1 km, handling and incorporation of all suitable materials into fill construction in accordance with Section 204 "Grading of Fill", and shall include the hauling up to 1 km, and handling of the unsuitable materials and the trimming of such unsuitable materials along the embankment slopes or elsewhere, all as directed by the Engineer.

The Contractor shall excavate cuts to the grade required by the Engineer.

The width and side slopes of all cuts together with roadside ditches shall be made true to the required cross sections and trimmed to the satisfaction of the Engineer.

No undercutting of slopes within the limits of the theoretical slope lines will be permitted by power shovels or other earth moving equipment unless all material above the theoretical slope lines is also removed.

Where the quantity of excavation exceeds that required to construct the fills as directed by the Engineer, the surplus shall be used to widen the fills or otherwise disposed of as directed by the Engineer.

#### 206.02 GENERAL REQUIREMENTS FOR OTHER MATERIAL CUTS

Surface soil and vegetable mold shall be removed when so directed by the Engineer.

The Contractor shall remove stones larger than 150 mm in greatest dimension from the top 300 mm of sub-grade.

#### 206.03 GENERAL REQUIREMENTS FOR ROCK CUTS

All rock cuts shall be excavated and mucked out fully to 300 mm below sub-grade.

In rock cuts where pockets which will not drain are formed below the sub-grade by blasting, the Contractor shall, at his own expense, provide drainage by ditching to a free outlet, as ordered, and then backfill and compact to 95% of Proctor Density both the pockets and the trench to an elevation 300 mm below sub-grade. Backfill material shall be broken rock or coarse gravel.

Back slopes shall be carefully scaled down and all rocks and fragments, liable to slide or roll down the slopes, removed to the satisfaction of the Engineer.

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### Over break

Over break shall be defined as that portion of rock which is excavated, displaced or loosened outside and beyond the slopes or grade as established by the Engineer, with the exception of such material which occurs as slides, regardless of whether any such over break is due to blasting, to the inherent character of any formation encountered, or to any other cause.

All over break as so defined shall be removed by the Contractor at his own expense, at the direction of the Engineer. Provided however, that if the Engineer approves, such over break may be used to replace material which would otherwise have to be borrowed. In which case payment to the Contractor for such over break used will be the contract price bid per cubic metre for material which would otherwise have to be borrowed.

Excepting that if in the opinion of the Engineer, the Contractor has exercised due care in the performance of his work, and due to circumstances beyond his control over break has occurred, over break within 500 mm of the lines of the theoretical cross section will be paid for as solid rock excavation.

### Large Blasts

The use of explosives in large blasts, as in seams, drifts, shafts, or pits, is prohibited unless on written authority of the Engineer.

The Contractor will be responsible for all damages to utility lines or to adjoining property caused by blasting or from any cause whatsoever resulting from any of his operations in connection with his work.

When the Department requires that a pole line be moved in order to safeguard it against damage from blasting operations, the Contractor will be required to pay fifty per cent of the labour cost. An estimate of costs will be obtained by the Department before any relocation or moving is done. This clause in no way relieves the Contractor from responsibility for damage.

### 206.04 CLASSIFICATION

Excavated materials will be classified in accordance with Section 205, Classification of Excavated Materials.

### 206.05 MEASUREMENT FOR PAYMENT

Volumes of all classes of excavation described in 206.04 Classification will be measured in excavation and computed in cubic metres rounded to the nearest whole number. Measurements shall be of the actual amount of material moved only, except as otherwise provided in this specification.

The quantity to be measured shall be the number of cubic metres of excavated material as shown on the cross section sheets between the original position of the ground lines as cross sectioned after grubbing operations have been completed (or when grubbing is to be removed as part of Other Material Excavation, or Unsuitable Material Excavation, the original position of the ground lies on top of the grubbing), and the completed and accepted excavation lines. The volume of this excavation is to be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

For boulders present in other material; the three maximum rectilinear dimensions of boulders, actually moved, will be measured and the volume of each so determined. Volumes of the boulders which are equal to, or greater than, zero decimal five cubic metres in volume will be included for payment as Solid Rock.

During excavation operations whenever the character of material changes from one type to another, as classified in Section 205, then the Contractor shall strip the area, within the slopes, of all overlying material, and notify the Engineer in order that proper measurements or cross

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sections may be made. No allowance will be made for material excavated before such measurements or cross sections have been made.

Where the Engineer instructs that cuts be widened for the purposes of providing borrow, then the demarcation between quantities measured as "Other Material" and "Other Material Borrow", or "Solid Rock" and "Quarried Rock", as the case may be, shall be the theoretical face of cut line given by the cross sections. For rock cuts widened to provide "Quarried Rock", there will be no overbreak allowed for in the measurement of "Solid Rock".

Large rock fragments which are too large to be incorporated into the fill shall be measured and their volumes subtracted from the cross section volumes. Calculations for volume of large rock fragments shall be the product of the three maximum rectilinear dimensions of the fragments.

### **206.06 BASIS OF PAYMENT**

Payment shall be at the contract unit price per cubic metre for either "Solid Rock", "Other Material", or "Unsuitable Material", as the case may be, hauled 1 km or under, except as otherwise provided in Section 206.03, Overbreak.

However should the contract not include quantities for "Muskeg or Bog", then all required excavation of muskeg or bog will be paid for at the contract price for "Unsuitable Material". Should the contract not include quantities for "Unsuitable Material" then all required excavation for muskeg or bog will be paid for at the contract price for "Other Material".

Should the contract not include quantities for "Unsuitable Material" then all required excavation for unsuitable material will be paid for at the contract price for "Other Material".

Should the contract not include quantities for "Other Material", then all required excavation for Other Material will be paid for at the contract price for "Unsuitable Material".

Should the contract not include quantities for "Ditching Solid Rock", then all required excavation for Ditching Solid Rock will be paid for at the contract price for "Solid Rock", and vice versa.

Should the contract not include quantities for "Ditching Other Material", then all required excavation of Ditching Other Material will be paid for at the contract price for "Other Material", or vice versa.

Such payment shall be full compensation for all work herein described together with the labour and materials required for excavating, handling, hauling up to 1 km and placing and compacting in a fill as described in Section 204 "Grading of Fill", or placing and shaping up in a disposal area as required.

Where the Engineer requires that excavation material be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215, "Overhaul on Excavated Materials".

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## SECTION 207

### BORROW

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#### 207.01 SCOPE

This specification concerns borrow where the source of the borrow is supplied by the Department.

However, where the Contractor is required to supply the source of material, as in contract items such as, "Supply Rock Fill in Place" or "Supply Other Material Fill in Place", then the requirements are covered separately in Section 310 "Use of Pits and Quarries and Stockpiles for Production of Materials Supplied by Contractor".

#### 207.02 DESCRIPTION

When sufficient quantities of material suitable for highway fills are not obtainable from the various excavations required for the construction of the highway, then the Engineer will authorize the provision of borrow material to be obtained from a borrow pit or pits or a quarry or quarries as the Engineer requires.

This work shall include all materials and labour required to excavate borrow materials, hauling up to 1 km, the handling and the incorporation of the materials into fill construction in accordance with Section 204 "Grading of Fill".

Where borrow sites are necessary outside the right of way, approval of the Department of Mines and Energy is required.

##### 207.02.01 Delays and Provision of Borrow Sites

Where borrow pits or quarries are located outside the limits of the right of way, they will be provided and paid for by the Department.

Before the Department directs the Contractor to get borrow from a particular borrow area, the Department will make effort to determine the suitability of the material. However, if after borrow operations have begun the Department determines that the borrow is no longer suitable and that the borrow area may no longer be used, and should the Contractor be delayed while another borrow area is being obtained, then

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the Department will not assume responsibility for the first 14 days of such a delay and the Contractor shall indemnify and save harmless the Minister from all suits and actions for damages resulting from the first 14 days of the delay.

### **207.02.02 Siting of Borrow Sites**

Borrow pits and quarries shall be located and confined to such limits as the Engineer may direct.

Where borrow sites are necessary outside the highway right of way, the borrow area shall be hidden from view from the highway as much as possible. A buffer strip of 200 m shall be maintained between the highway right of way and the borrow area. Any trees within the buffer strip shall not be disturbed or damaged.

The borrow area shall not be subject to flooding. The bottom shall be drained to the nearest watercourse or culvert.

All access roads to the borrow area shall be bridged or culverted where watercourses are crossed.

### **207.02.03 Operation of Borrow Sites**

The Contractor shall clear and grub the borrow area before excavation may begin, without causing disturbance or damage to surrounding trees.

The Contractor shall be responsible for all damages to utility lines or adjoining property caused by blasting or from any cause whatsoever resulting from any of his operations in connection with his work.

Any available topsoil or organic matter which overlies the deposit shall be stockpiled at the site without causing disturbance or damage to surrounding trees.

Trees cut within the borrow area and not required for Departmental use will become the property of the Contractor.

Any discharge of water, containing more than 30 mg/l of suspended solids, shall not be disposed of directly into a watercourse or water body. Silt laden water exceeding this limit shall be discharged to a vegetated area or to a sedimentation basin for removal of excess silt, before being disposed of into a watercourse or water body.

### **207.02.04 Abandonment and Rehabilitation**

Before closure, the borrow site shall be trimmed and left neat and regular with side slopes conforming to the requirements set forth in the quarry permit issued by the Department of Mines and Energy.

In all quarry operations, the quarry faces shall be carefully scaled down and all rocks and fragments, liable to slide or roll down the slopes, removed to the satisfaction of the Engineer.

Any available topsoil or organic material that has been stockpiled shall be spread over the slopes to assist in revegetation. Where possible, borrow sites shall be hand seeded with a clover and hayseed mixture.

Waste material shall be disposed of in accordance with Division 8.

After completion of the operation or during periods of winter shutdown, the access road shall be ditched or barriers erected to prevent vehicular access unless instructed otherwise by the Engineer. Earth barriers shall be graded and trimmed to sightly proportions.

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### 207.03 PERMITS

Approval by the Department of Mines and Energy is required for the establishment of borrow sites outside of the highway right of way.

### 207.04 CLASSIFICATION

Borrow materials will be classified as either "Solid Rock", "Quarried Rock", "Other Material", or "Other Material Borrow" in accordance with Section 205, "Classification of Excavated Materials".

### 207.05 MEASUREMENT FOR PAYMENT

Measurement for payment will only include measurement of quantities that are required by the Engineer.

Large rock fragments which are too large to be incorporated into the fill shall be measured and their volumes subtracted from the cross section volumes. Calculations for volume of large rock fragments shall be the product of the three maximum rectilinear dimensions of the fragments.

#### Payment by Volume

For borrow materials described in Section 207.04 Classification, that are to be paid for in terms of the number of cubic metres of borrow material, then such materials shall be measured in cubic metres rounded to the nearest whole number.

The quantity to be measured shall be the number of cubic metres of excavated material as shown on the cross section sheets between the original position of the ground lines as cross sectioned after grubbing operations have been completed, and the completed and accepted excavation lines. The volume of this excavation is to be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

#### Payment by Weight

For borrow materials, described in Section 207.04 Classification, that are to be paid for in terms of the number of tonnes, then such materials shall be weighed on scales. The scales shall be provided by the Contractor and they shall conform with the requirements of Section 501 "Weighing of Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker as being placed in the works shall be included in measurement for payment. The weight shall be computed in tonnes, rounded to one decimal place.

### 207.06 BASIS OF PAYMENT

Where the contract includes quantities for "Quarried Rock", then all required excavation of solid rock from borrow areas will be paid for at the contract price for "Quarried Rock".

However, should the contract not include quantities for quarried rock, then all required excavation of solid rock from borrow areas will be paid for at the contract price for "Excavation Hauled 1 km or Under, Solid Rock".

Where the contract includes quantities for "Other Material Borrow", then all required excavation of other material from borrow areas will be paid for at the contract price for "Other Material Borrow".

However, should the contract not include quantities for other material borrow, then all required excavation of other material from borrow areas will be paid for at the contract price for "Excavation Hauled 1 km or Under, Other Material".

Payment shall be at the contract unit price per cubic metre, or per tonne, for either "Solid Rock", "Quarried Rock", "Other Material" or "Other Material Borrow", as the case may be, hauled 1 km or under. Such payment shall be full compensation for all work herein described together with all materials, labour,

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and equipment use required to carry out excavating, handling, provision for weighing (if appropriate), hauling up to 1 km and placing and compacting in a fill as described in Section 204 "Grading of Fill".

However, clearing and grubbing shall be paid for separately in accordance with Section 201 "Clearing and Grubbing".

Where the Engineer requires that borrow material be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Materials".



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### SECTION 208 EXCAVATION OF DITCHES

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This work shall include labour and materials required to carry out all excavation such as that required to complete roadside ditches and shall include hauling up to 1 km, handling and incorporation of all suitable materials into fill construction in accordance with Section 204 "Grading of Fill". The Contractor shall excavate the ditches to the grade required by the Engineer.

The width and side slopes of all roadside ditches shall be made true to the required cross sections and trimmed to the satisfaction of the Engineer.

To reduce siltation resulting from roadside drainage, the Contractor shall, if possible, terminate roadside ditches a minimum of 30 metres from any watercourse or water body or at a point designated by the Engineer. This will allow roadside drainage water to filter through a vegetated area prior to entering a watercourse or water body.

Where the quantity of excavation exceeds that required to construct the fills as directed by the Engineer, the surplus shall be used to widen the fills or otherwise disposed of as directed by the Engineer.

#### 208.02 GENERAL REQUIREMENTS FOR ROCK CUTS

Over break shall be defined as that portion of rock which is excavated, displaced or loosened outside and beyond the back slopes of the ditches as established by the Engineer, with the exception of such material which occurs as slides, regardless of whether any such overbreak is due to blasting, to the inherent character of any formation encountered, or to any other cause.

All overbreak as so defined shall be removed by the Contractor at his own expense, at the direction of the Engineer. Provided, however, that if the Engineer approves, such overbreak may be used to replace material which would otherwise have to be borrowed. In which case payment to the Contractor for such overbreak used will be the contract price bid per cubic metre for material which would otherwise have to be borrowed.

Excepting that if in the opinion of the Engineer, the Contractor has exercised due care in the performance of his work and due to circumstances beyond his control overbreak has occurred, overbreak within 500 mm of the lines of theoretical back slopes and within 300mm of the theoretical ditch bottom will be paid for as solid rock excavation.

The use of large blasts is prohibited unless on written authority of the Engineer. The Contractor will be responsible for all damages to utility lines or to adjoining property caused by blasting or from any cause whatsoever resulting from any of his operations in connection with his work.

When the Department requires that a pole line be moved in order to safeguard it against damage from blasting operations, the Contractor will be required to pay fifty percent of the labour cost. An estimate of

## FORM 208

costs will be obtained by the Department before any relocation or moving is done. This clause in no way relieves the Contractor from responsibility for damage.

### 208.03 CLASSIFICATION

Excavated materials will be classified in accordance with Section 205, Classification of Excavated Materials.

### 208.04 MEASUREMENT FOR PAYMENT

Volumes of all classes of excavation described in Section 208.03 Classification will be measured in excavation and computed in cubic metres rounded to the nearest whole number. Measurements shall be of the actual amount of material moved only, except as otherwise provided in this specification.

The quantity to be measured shall be the number of cubic metres of excavated material as shown on the cross section sheets between the elevation of the edge of the subgrade shoulder and the theoretical neat lines of the ditches as shown in Section 1205 of the Specifications Book.

These quantities shall be calculated from cross sections taken after grubbing operations have been completed.

If the ditches are widened to provide a source of material for fills, then the materials excavated from areas outside of the ditches as shown on typical cross sections in the Specifications Book will be paid for under Section 207 Borrow.

For boulders present in other material, the three maximum rectilinear dimensions of boulders, actually moved will be measured and the volume of each so determined. Volumes of the boulders which are equal to, or greater than, zero decimal five cubic metres in volume will be included for payment as solid rock.

Large rock fragments which are too large to be incorporated into the fill shall be measured and their volumes subtracted from the cross section volumes. Calculations for volume of large rock fragments shall be the product of the three maximum rectilinear dimensions of the fragments.

### 208.05 BASIS OF PAYMENT

Payment shall be at the contract unit price per cubic metre of either "Ditching Solid Rock", or "Ditching Other Material", as the case may be, hauled 1 km or under, except as otherwise provided in Section 208.02, General Requirements for Rock Cuts.

However, should the contract not include quantities for "Ditching Solid Rock", then all required excavation of "Ditching Solid Rock" will be paid for at the contract price for "Solid Rock".

Should the contract not include quantities for ditching other material, then all required excavation of "Ditching Other Material" will be paid for at the contract price for "Other Material".

However, should the Engineer require that unsuitable material or bog be excavated, then such excavation of unsuitable material or bog shall be paid for at the contract price for excavation hauled 1 km or under "Ditching Other Material".

Payment at the contract price for Ditching Other Material or Ditching Solid Rock, shall be compensation in full for all labour, materials, and equipment use required for all work herein described together with the excavating, handling, hauling up to 1 km and placing and compacting in a fill as described in Section 204 "Grading of Fill", or placing and shaping up in a disposal area as required.

Where the Engineer requires that excavated material be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Materials".

# FORM 211



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 211

### EXCAVATION OVERHANGING ROCK AND ROCK SLIDE DEBRIS

#### INDEX

#### 211.01 DESCRIPTION

#### 211.02 MEASUREMENT FOR PAYMENT

#### 211.03 BASIS OF PAYMENT

#### 211.01 DESCRIPTION

This work shall include labour and materials required to excavate overhanging rock and rock slide debris from the faces of existing rock cuts, the hauling up to 1 km and the placing and compaction of the material in fills.

Overhanging rock shall be excavated true to the slope as staked by the Engineer.

Boulders or large rock fragments, from the excavated overhanging rock or from the rock slide debris shall be broken up with explosives, or other means, so that the resultant pieces may be used as fill material on the job.

The excavated overhanging rock and rock slide debris shall be thoroughly cleaned out from the ditches.

The Contractor shall take every precaution to avoid disturbing the existing shoulder of the road during the operations.

However, should the shoulder be disturbed during the work, then the Contractor shall at his own expense restore the shoulder to its original condition and compact the shoulder.

The excavated overhanging rock and rock slide debris shall be hauled to a fill as directed by the Engineer, and incorporated into the fill and compacted in accordance with Section 204 "Grading of Fill". Should the material not be required for fill construction, then the material shall be trimmed along embankment slopes or elsewhere as directed by the Engineer.

#### 211.02 MEASUREMENT FOR PAYMENT

The volume for payment shall be the net volume of Excavation Overhanging Rock and Rock Slide Debris actually placed in a fill.

Measurement will be made in excavation and will be from the cross section sheets showing the original ground lines and the completed and accepted excavation lines as cross sectioned. The volume of this excavation is to be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

No allowance will be made for material excavated before original cross sections have been made.

Large rock fragments which are too large to be incorporated into the fill shall be measured and their volumes subtracted from the cross section volumes. Calculations for volume of large rock fragments shall be the product of the three maximum rectilinear dimensions of the fragments.

The volume for payment shall be measured in cubic metres rounded to the nearest whole number.

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### **211.03 BASIS OF PAYMENT**

Payment shall be at the contract unit price per cubic metre for Excavation Overhanging Rock and Rock Slide Debris, hauled 1 km or under, and such payment will be compensation in full for all operations herein described

However, where the Engineer requires that materials be hauled in excess of the 1 km freehaul before being placed, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Material", at the appropriate rate for Overhaul on Excavation Rock.

# FORM 212



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 212

### EXCAVATION OF MUSKEG OR BOG

#### INDEX

#### 212.01 DESCRIPTION

#### 212.02 MEASUREMENT FOR PAYMENT

#### 212.03 BASIS OF PAYMENT

#### 212.01 DESCRIPTION

This work shall include labour and materials to excavate muskeg or bog from within areas staked on the ground by the Engineer, together with the spreading and trimming of the excavated material.

Whether or not, and to what width bog is to be excavated will normally be determined in accordance with the spirit of the guidelines in Section 1209.

The Contractor shall ensure that all bog, together with the accompanying pug, if any, is removed from within the designated areas.

The Contractor shall dispose of, within the right of way adjacent to the excavation, as much of the excavated material as is practically possible without the necessity of loading and hauling, by widening embankments, flattening side slopes and constructing such modified cross sections as the Engineer may direct. Excavated material which cannot be accommodated within the right of way adjacent to the excavation shall be loaded and hauled to other disposal areas either within the right of way or in approved waste disposal areas.

The excavated material shall be spread and trimmed to slightly proportions, taking care not to interfere with water courses.

#### 212.02 MEASUREMENT FOR PAYMENT

Volumes of excavation of muskeg or bog will be measured in excavation and computed in cubic metres rounded to the nearest whole number.

Measurements shall be by means of cross sections, or where wet conditions make the obtaining of after sections impractical, by means of a combination of original sections and bog soundings.

The quantity to be measured shall be the number of cubic metres of excavated material as shown between the position of the ground lines as cross sectioned beforehand, and the completed and accepted excavation lines measured either by cross sections or bog soundings. Material excavated outside of the required limits will not be included in measurement for payment. No measurement for payment will be made for the removal of materials that slide or slough into the excavation, nor shall separate payment be made for the removal of such material.

The volume of the excavation is to be computed by the average end area method of computation or as wedges or pyramids, as the case may be when terminating at grade points.

No allowance will be made for material excavated before cross sections have been made.

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### 212.03 BASIS OF PAYMENT

Where the contract includes quantities for "Muskeg or Bog", then all required excavation of muskeg or bog will be paid for at the contract price for "Muskeg or Bog".

However, should the contract not include quantities for muskeg or bog, then all required excavation of muskeg or bog will be paid for at the contract price for "Excavation Hauled 1 km or Under, Unsuitable Material". Should the contract not include quantities for unsuitable material, then all required excavation for muskeg or bog will be paid for at the contract price for "Excavation Hauled 1 km or Under, Other Material".

Payment shall be at the contract unit price per cubic metre for "Muskeg or Bog" or "Unsuitable Material" or "Other Material" as the case may be, hauled 1 km or under. Such payment shall be full compensation for labour, materials and equipment use required to carry out the operations herein described. However, where the Engineer requires that excavated muskeg or bog be hauled in excess of the 1 km freehaul before being placed, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Material", at the appropriate rate for overhaul on excavation Other Material.

## FORM 215



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 215 OVERHAUL ON EXCAVATION

#### 215.01 DESCRIPTION, MEASUREMENT AND BASIS OF PAYMENT

Where indicated in the specifications, additional payment will be made for excavated materials hauled in excess of one kilometre. Clearing and Grubbing, Clearing, Grubbing, Granular Base Courses, Asphaltic Courses, etc., are not considered as excavated materials, and no payment for overhaul will be made in connection with these items.

The overhaul distance will be measured in one kilometre units from the end of the one kilometre freehaul limit. Fractional kilometres will be allowed as full kilometres.

Overhaul payment will be at the Unit Price Bid for each cubic metre for each additional kilometre beyond the one kilometre freehaul limit for rock or other material, as the case may be, or for each tonne for each additional kilometre beyond one kilometre freehaul.

# FORM 250



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 250 BACKHOE HOURS

### INDEX

#### 250.01 SCOPE

#### 250.02 EQUIPMENT

#### 250.03 DESCRIPTION

#### 250.04 MEASUREMENT FOR PAYMENT

#### 250.05 BASIS OF PAYMENT

#### 250.01 SCOPE

This specification deals with excavation work and disposal or salvage work, usually of a relatively minor nature, where the basis of payment is backhoe machine hours.

#### 250.02 EQUIPMENT

The equipment shall consist of a backhoe and at least two tandem axle dump trucks. Should the Engineer determine that additional trucks are required, then the additional trucks shall be compensated for at the Department's rental rates as specified in Division 10.

The backhoe shall have a horsepower rating of at least 135, and the bucket shall have a capacity of at least 0.75 m<sup>3</sup>.

For ditch clean out operations, a ditching bucket must be used. The bucket is to have a minimum capacity of 0.75m<sup>3</sup> and a minimum width of 1500mm.

Where a hydraulic breaker is required, it will have a minimum impact energy of 3390 Joules.

#### 250.03 DESCRIPTION

Backhoe hours may be required to: excavate ditches in other material including grubbing and small brush, shape other material back slopes, excavate existing culverts or catch basins for disposal or salvage, excavate other material prior to installation of new culverts and extensions, and excavate such other non-solid rock materials as the Engineer may direct. Backhoe hours will not normally be required in connection with the excavation of solid rock. However, in those cases where small points of rock are encountered in the ditch, and their removal is required by the Engineer, the removal will be accomplished by using a hydraulic breaker attachment on the backhoe.

When excavating existing culverts or catch basins or when excavating for new culverts, the excavated other materials shall be stockpiled next to the excavation so that it may be used as backfill. In the case of work in connection with the salvage of culvert, the work shall proceed with caution so as not to damage the culvert to be salvaged.

For excavating an existing culvert, backhoe hours will only be used if there is no contract item for either Disposal of Culvert or Salvage of Culvert.

After the installation of a new culvert, the backfill shall be placed in lifts and compacted to at least 95% of Standard Proctor Density (ASTM D698-78).



## **FORM 250**

Waste materials; including surplus other material, condemned culverts and catch basins, unsuitable material, grubbing, and such other materials as the Engineer may direct, shall be loaded in trucks and hauled away and disposed of at an approved waste disposal area. The waste disposal area shall be provided by the Contractor at his own expense. The debris shall be covered with waste other material and graded and trimmed to sightly proportions.

### **250.04 MEASUREMENT FOR PAYMENT**

Measurement for payment will be by the number of hours, rounded to the nearest quarter hour, that the backhoe actually worked excavating or backfilling, as required by the Engineer. Time spent traveling by the backhoe for the disposal of excavated materials, truck haulage time

by the two trucks to transport the excavated materials, and time spent grading and trimming the waste in the waste disposal area, will not be included in measurement for payment.

### **250.05 BASIS OF PAYMENT**

Payment at the contract price for backhoe hours shall be compensation in full for all labour, materials and equipment use to: make a backhoe and two tandem trucks available, carry out required excavation, backfill and compact the excavation if required, load and provide all transportation of waste materials from the excavation to the waste disposal area, provide an approved waste disposal area, place waste materials in the waste disposal area, and grade and trim the waste materials to sightly proportions.

Should the Engineer determine that more than two tandem trucks are required, then the additional trucks shall be compensated for at the Department's rental rates as specified in Division 10.

For excavation of points of rock, payment for backhoe hours will include the hydraulic breaker in lieu of the two tandem trucks.

## **FORM 260**



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### **SECTION 260 GRADING OF DRIVEWAYS**

Private driveways will be constructed to provide a finished top width, shoulder to shoulder of 6 m, or as required by the Engineer.

See Form 1175 "Private Entrance in Cut" and Form 1176 "Private Entrance in Fill" for details.

# FORM 300



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## DIVISION 3

### SPECIFICATIONS FOR PAVEMENT, SELECTED GRANULAR BASE COURSE AND RELATED MATERIALS

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# FORM 301



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 301 SCARIFYING AND RESHAPING

### INDEX

#### 301.01 SCOPE

#### 301.02 OPERATIONS

#### 301.03 COMPACTION

#### 301.04 MEASUREMENT FOR PAYMENT

301.04.01 Measurement for Payment where subgrade and Select Granular Base Course are in the same contract.

301.04.02 Measurement for Payment where road surface was constructed under a previous contract.

#### 301.05 BASIS OF PAYMENT

301.05.01 Basis of Payment where subgrade and Select Granular Base Course are in the same contract.

301.05.02 Basis of Payment where road surface constructed under a previous contract.

#### 301.01 SCOPE

This specification covers the requirements for the scarifying and reshaping of a road surface prior to the application of Selected Granular Base Course or Asphaltic Pavement.

#### 301.02 OPERATIONS

Where directed by the Engineer, the Contractor shall scarify and reshape a road surface prior to the application of Selected Granular Base Course or Asphaltic Pavement. The scarifying and reshaping shall be carried out within the lengths designated by the Engineer, and within the width to be covered by the proposed pavement plus 0.3m on each side, or to such other width as the Engineer may designate.

Where the road surface consists of Selected Granular Base Course of a particular type, then the scarifying shall be to the full depth of the base course of that type or to a depth of 300 mm, whichever is less.

Where the subgrade consists of subgrade consisting of Other Material, then the scarifying shall be to a depth of not less than 300 mm.

Where the road surface consists of subgrade consisting of rock, then scarifying as such will not be required, and scarifying and reshaping operations shall simply consist of just reshaping the road surface.

Unsuitable roadbed materials, as determined by the Engineer, which are encountered during the scarifying operation shall be excavated to the lateral limits and depth directed by the Engineer and shall be disposed of as directed. Such work shall be carried out in accordance with Section 206 "Grading of Cuts".

## FORM 301

No boulders greater than 150 mm in diameter shall be left within 300 mm of the top of subgrade composed of Other Material. Such boulders over 150 mm in diameter which cannot be removed by the scarifying operation shall be removed by hand excavation, blasting or any other suitable method. All excavated boulders shall be removed from the subgrade and ditches and then disposed of.

Excavations resulting from the removal of boulders or Unsuitable Material shall be backfilled with approved material to the specified grades, in accordance with Section 204 "Grading of Fill".

Whenever the materials incorporated in the existing subgrade are insufficient to provide the required profile and cross section, the Contractor shall add additional approved material as directed by the Engineer. Such work to be carried out in accordance with Section 204 "Grading of Fill".

The maximum variation from the specified profile and cross section of the compacted, scarified and reshaped road surface shall be 30 mm, except in those instances where paving is to take place directly on top of the scarified and reshaped material, in which case the finished surface shall not deviate at any place on a 3m straight edge by more than 10 mm.

Where due to traffic use, or for whatever other reason, the scarified and reshaped road surface no longer lies within the required tolerance, then before placing the next materials, the Contractor shall scarify and reshape the affected area again, at his own expense.

### **301.03 COMPACTION**

Road materials disturbed by the scarifying and reshaping shall be compacted.

Where subgrade is scarified and reshaped, the disturbed materials shall be compacted to not less than 95% of the maximum Standard Proctor Dry Density (ASTM D698-78).

Where select granular base course is scarified and reshaped, the disturbed materials shall be compacted to not less than 100% of the maximum Standard Proctor Dry Density.

### **301.04 MEASUREMENT FOR PAYMENT**

#### **301.04.01 Measurement for Payment where subgrade and Select Granular Base Course are in the same contract.**

Where subgrade was constructed under the same contract which also calls for the placing of selected granular base course, then any required scarifying and reshaping of the subgrade prior to placing granulars will not be measured for payment and no payment for the scarifying and reshaping will be made.

Boulders removed from the top 300 mm of Other Material fill subgrade, on a grading and placing selected granular base course job, will not be measured for payment. However, boulders removed from the top 300 mm of subgrade in Other Material cuts will be measured for payment in accordance with Section 206 "Grading of Cuts".

Additional fill material shall be measured for payment in accordance with the provisions of Section 206 "Grading of Cuts" or Section 207 "Borrow", as appropriate.

#### **301.04.02 Measurement for Payment where road surface was constructed under a previous contract.**

Where subgrade was constructed, or some selected granulars were placed under a previous contract, then such scarifying and reshaping of the road surface as the Engineer requires shall be carried out and measured for payment. This measurement for payment shall be of the horizontal area actually scarified and reshaped from within the limits of length and width as designated by the Engineer, and will be measured in square metres, rounded to the nearest whole number.

## FORM 301

Boulders removed from the top 300 mm of Other Material subgrade, on a job where subgrade was constructed on a previous contract will be measured for payment in accordance with Section 206 "Grading of Cuts". The measurement for payment will be done in this case regardless of whether the boulders were from a cut or a fill.

The excavation of Unsuitable Material in the roadbed shall be measured for payment in accordance with the provisions of Section 206 "Grading of Cuts".

Additional fill material shall be measured for payment in accordance with the provisions of Section 206 "Grading of Cuts" or Section 207 "Borrow", as appropriate.

### **301.05 BASIS OF PAYMENT**

The basis of payment for any excavation of Unsuitable Material in the roadbed, and any additional fill material shall be in accordance with the provisions of Section 206 "Grading of Cuts" or Section 207 "Borrow", as appropriate.

#### **301.05.01 Basis of Payment where subgrade and Select Granular Base Course are in the same contract.**

Where subgrade was constructed under the same contract which also calls for the placing of selected granular base course, then no payment will be made for either the scarifying and reshaping or for the required compaction of the materials disturbed in the scarifying and reshaping operations.

For those boulders, removed from the subgrade in Other Material cuts, and which conform to the definition of Solid Rock as stated in Section 205 "Classification of Excavated Materials" the basis of payment will be the contract unit price per cubic metre for Solid Rock hauled 1 km or under. Such payment shall be full compensation for all labour, materials and equipment-use to excavate, handle, haul up to 1 km and dispose of the boulders of individual size equal to or exceeding zero decimal five cubic metres in measurement.

Where the Engineer requires that "Solid Rock" boulders from Other Material Cuts, be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavation".

The cost of excavating and disposing of the other boulders greater than 150 mm in diameter and of carrying out the scarifying and reshaping and the compaction is considered compensated as part of Section 204 "Grading of Cuts" and Section 207 "Borrow", as appropriate.

#### **301.05.02 Basis of Payment where road surface was constructed under a previous contract.**

Where subgrade was constructed, or some selected granulars were placed under a previous contract, then payment for scarifying and reshaping shall be on the basis of the contract price for scarifying and reshaping, and such payment shall be full compensation for all labour, materials and equipment-use to: scarify and reshape the roadbed, excavate, haul and dispose of all boulders greater than 150 mm in diameter but less than 0.5 cubic metres in volume which occur within the required depth of scarifying in Other Material roadbed, and to compact the area disturbed by the scarifying and reshaping.

However, for those boulders removed from the required depth of scarifying, and which conform to the definition of Solid rock as stated in Section 205 "Classification of Excavated Materials" the basis of payment will be the contract unit price per cubic metre for Solid Rock hauled 1 km or under. Such payment shall be in full compensation for all labour, materials and equipment-use to excavate, handle, haul up to 1 km and dispose of the "Solid Rock" boulders.

Where the Engineer requires that "Solid Rock" boulders be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavation".

No separate or additional payment will be made for second and subsequent scarifying or reshaping made necessary from any cause whatsoever.

## FORM 305



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SUPPLY AND APPLICATION OF CALCIUM CHLORIDE

#### INDEX

- 305.01 SCOPE**
- 305.02 MATERIALS**
- 305.03 APPLICATION**
- 305.04 MEASUREMENT FOR PAYMENT**
- 305.05 BASIS OF PAYMENT**

#### **305.01 SCOPE**

This specification covers the requirements for the supply and application of a solution of calcium chloride in water to such areas of gravel roads that the Engineer may designate.

#### **305.02 MATERIALS**

The calcium chloride shall be delivered to the site in the form of crystal flakes. Only calcium chloride flakes acceptable to the Engineer shall be used. Water for forming the solution with the calcium chloride shall be clean water free of impurities.

The Contractor shall supply the calcium chloride and the water.

#### **305.03 APPLICATION**

The Engineer will designate the limits between which the calcium chloride treatment is to be applied to the road.

The Contractor shall grade up the road to be treated to obtain a smooth grade prior to application of the calcium chloride.

The Contractor shall form a solution of calcium chloride and water of known proportions, so that the rate of application of calcium chloride is known and can be controlled by manipulation of the spreader.

The rate of application of the solution shall be such that the required weight of dissolved flakes is applied to each square metre of road surface. The rate of application shall be 0.9 kilograms of dissolved flakes per square metre, or such other rate of application of calcium chloride as the Engineer may designate.

The calcium chloride shall be applied uniformly by the approved spreader.

The Contractor shall compact the treated gravel surface to 100% of Standard Proctor Dry Density.

Any spill of calcium chloride such as arising from broken bags or otherwise must be immediately cleaned up. Any quantity of calcium chloride that is recovered from a spill and cannot be utilized in the normal manner must be disposed of at an approved waste disposal site at the Contractor's expense. Information on these sites can be obtained from the provincial Newfoundland and Labrador Government Service Centre. See Section 820 "Storage and Handling of Fuels and Other Hazardous, Toxic or Dangerous Material" and the procedure for reporting spills as per the requirement of the Newfoundland and Labrador Government Service Centre..

#### **305.04 MEASUREMENT FOR PAYMENT**

Measurement for payment shall be of the number of tonnes, rounded to two decimal places, of the calcium chloride flakes made into solution and applied within the required limits. This measurement will be made by computing the net weights of the sacks used.

## **FORM 305**

### **305.05 BASIS OF PAYMENT**

Payment at the contract price for calcium chloride shall be compensation in full for all labour, materials and equipment-use to: supply the calcium chloride flakes at the site, supply the water, make up a calcium chloride solution, grade up the area to be treated, apply the calcium chloride solution and compact the road surface.



# FORM 310



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 310

### USE OF PITS, QUARRIES AND STOCKPILES FOR PRODUCTION OF MATERIALS SUPPLIED BY CONTRACTOR

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310.08.04 Physical and Other Requirements for Material to be used as "Other Material In Place"

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  - 310.13.04 Basis of Payment for "Supply Rock Fill in Place" and "Supply Other Material Fill in Place"**

### **310.01 SCOPE**

This specification covers the Department's requirements for the use of pits and quarries for the production of materials to be supplied by the Contractor, namely; selected granular base courses, paving aggregates, winter sand, concrete aggregates, chip seal aggregate, armour stone, rip rap stone, select bedding for storm sewers, and such other materials that may be specified to be supplied by the Contractor, together with Rock Fill In Place and Other Material Fill In Place where the contract item states "Supply Rock Fill In Place", or "Supply Other Material Fill In Place". Also included in this specification are the requirements for the stockpiling of; aggregates, winter sand, and selected granular base courses.

However, this specification will not apply, but Section 201 "Clearing and Grubbing" and Section 207 "Borrow" will both apply for the use of pits and quarries for the production of borrow where the required borrow material is specified in the contract item as "Excavation Hauled 1 km or Under Solid Rock", "Excavation Hauled 1 km or Under Quarried Rock", "Excavation Hauled 1 km or Under Other Material", or "Excavation Hauled 1 km or Under Other Material Borrow".

### **310.02 PIT AND QUARRY INFORMATION**

The Department will make available to the Contractor all information obtained by the Department as to sources of supply. Such information represents only the opinion of the Department as to the location, character or quantity of the material encountered and is available only for the convenience of the Contractor.

The Department assumes no responsibility whatever in respect to the sufficiency or accuracy of the information and there is no guarantee, either expressed or implied, that the conditions indicated are representative of those existing throughout the work or that unanticipated developments may not occur. It shall be the Contractor's responsibility to locate sources and to furnish and haul the aggregate and/or selected granular base course.

### **310.03 PIT AND QUARRY SAMPLING**

The Department will make its testing facilities available to the Contractor for the purposes of testing the suitability of pits or quarries for the production of the required materials. Preliminary approval of

the quality and nature of the material submitted in samples will not constitute general acceptance of all the material in the source of supply.

**310.03.01 Additional Pit and Quarry Sample Requirements for Selected Granular Base Courses, Winter Sand, and all Aggregates**

The Contractor shall submit representative samples of all materials proposed for use as selected granular base courses, winter sand, paving aggregates, concrete aggregates, and chip seal aggregates. The Contractor shall deliver the samples to the Department's Laboratory in St. John's for approval of quality and nature prior to use in the work. Each sample shall contain not less than 25 kg of material.

Unless otherwise specified by the Engineer, initial samples for quality testing may be of the materials in their natural state. The Contractor shall at his own expense, sufficiently expose his proposed source of aggregates either by opening at the face, by excavating test pits, or by core drilling so that representative samples of the material can be obtained. Subsequent and progress samples for quality testing shall be of the processed materials.

**310.04 PERMITS AND AUTHORIZATION FROM OUTSIDE BODIES**

**310.04.01 Municipal or Local Government**

The Contractor is responsible for ensuring that his pit or quarry operations are carried out in conformity with all land-use or zoning regulations which may apply.

**310.04.02 Department of Natural Resources**

Contractors are advised, that should the Contractor wish to carry out his pit or quarry operations on lands for which the mineral and quarry rights are vested in the crown, then the Department of Natural Resources requires that prior approval be obtained before pit or quarry operations may begin. It is the responsibility of the Contractor to obtain the quarry permit from the Department of Natural Resources.

Should the removal of trees be involved in the preparation of a pit or quarry, then the Contractor is required to obtain a permit to cut the trees.

Application for a cutting permit should be made to the local office of the Department of Natural Resources. Should the Contractor wish to burn brush, then prior permission must first be obtained from the Department of Natural Resources.

**310.04.03 Department of Environment and Conservation**

Contractors wishing to set up an aggregate washing operation at a site must first obtain environmental approval before proceeding.

Contractors must apply in writing to the Department of the Environment and conservation for a Ministerial Approval as required in Section 24 of the Department of the Environment Act, 1981. The following information must be supplied with the application:

1) LOCATION OF THE PROPOSED SITE.		3) RATE AT WHICH WATER IS TO BE USED (L/S).
2) EXPECTED DATES OF OPERATION OF THE WASHING PLANT:		4) NUMBER AND DIMENSIONS OF SETTLING PONDS AND THE METHOD OF LINING OF THE PONDS.
-PROPOSED STARTING DATE -TOTAL DAYS IN OPERATION	-HOURS IN OPERATION PER DAY -PROPOSED COMPLETION DATE	

**310.05 CONTRACTOR'S NOTICE OF INTENT TO PRODUCE AGGREGATES, WINTER SAND, AND SELECTED GRANULAR BASE COURSES**

Prior to the production of; aggregates, winter sand, and selected granular base courses, written notice of intent shall be provided to the Manager of Materials Engineering and to the appropriate Regional Engineer. Such notice of intent shall contain the scheduled starting date, pit or quarry location and processing equipment to be used. This notice of intent shall be received by the above mentioned Department personnel at least 7 days prior to any production.

## **310.06 STRIPPING PITS AND QUARRIES**

Prior to excavating materials, the area to be worked shall be cleared, grubbed and stripped of all unsuitable surface materials.

The topsoil shall be removed separately from the underlying materials and stockpiled. The Contractor shall ensure that the quality of the topsoil is not reduced by mixing with other materials removed during the grubbing or stripping operations.

A sufficient area shall be opened ahead of the quarrying or pit excavating operation to positively prevent contamination by deleterious materials.

### **310.06.01 Additional Requirements for Stripping Pits and Quarries Intended for Aggregate, Winter Sand, and Selected Granular Base Course Production**

Where the pit or quarry is intended for use in the production of aggregates, winter sand or selected granular base course, then the pit or quarry shall also be stripped of all weathered zones.

## **310.07 WORKING OF PITS SUITABLE FOR AGGREGATE OR SELECTED GRANULAR BASE COURSE PRODUCTION**

The Contractor will not be permitted to work natural sand or gravel deposits in an indiscriminate manner that results in otherwise usable natural gravels being rendered unfit for future use in aggregate, winter sand or selected granular base course production. In such pits, the Contractor will be required to use equipment which will excavate a vertical face extending from the floor of the pit to the surface of the deposit. The undermining of high faces will not be permitted. The use of scrapers, bulldozers, draglines and other types of equipment, which remove the deposit in more or less horizontal layers is prohibited, except for unique circumstances where it is demonstrated to the satisfaction of the Engineer that an acceptable and consistent product can be obtained by this method.

## **310.08 PHYSICAL AND OTHER REQUIREMENTS**

### **310.08.01 Physical and Other Requirements for Aggregates, Winter Sand and Selected Granular Base Courses**

Paving aggregates, concrete aggregates, chip seal aggregate, winter sand and selected granular base courses shall conform to the appropriate physical and gradation requirements for that required type of material, as expounded in; Section 330 "Hot Mix Asphaltic Concrete", Section 904 "Concrete Structures", Section 340 "Chip Seal", Section 317 "Winter Sand", and Section 315 "Selected Granular Base Course", respectively.

Chip seal aggregate shall be screened and washed over a 6.35 mm screen. If the chip seal aggregate is to be stockpiled then screening and washing shall be performed before stockpiling.

### **310.08.02 Physical and Other Requirements for Armour Stone and Rip Rap Stone**

Armour stone and rip rap stone shall conform to the requirements given in Section 615 "Armour Stone" and Section 610 "Rip Rap Treatment", respectively.

### **310.08.03 Physical and Other Requirements for Material to be used as "Rock Fill in Place"**

Material to be used as rock fill in place, shall only consist of quarry material which before it was excavated consisted entirely of Solid Rock as defined in Section 205 "Classification of Excavated Materials".

The rock fill shall be thoroughly fragmented and well graded with fragments of greatest dimension not more than 500 mm. The rock fragments shall consist of hard durable material.

The rock fill material shall not contain frozen lumps, weeds, sods, roots, logs, stumps or any other objectional matter.

Material that is proposed to be used as rock fill material shall be subject to test by the Engineer to determine its suitability for the portions of the work in which it is proposed that it be placed. Only rock fill material approved by the Engineer shall be placed in the work.

#### **310.08.04 Physical and Other Requirements for Material to be used as "Other Material Fill in Place"**

Material to be used as "Other Material Fill in Place" shall consist of only well graded other material which is approved for use by the Engineer.

Other material containing stones larger than 150 mm will not be acceptable for use as "Other Material in Place" unless the Contractor places the larger stones in accordance with the requirements of Section 204 "Grading of Fill".

For the top 500 mm of fill immediately below subgrade, the material for use as "Other Material In Place" shall have no more than 12% passing the 75 µm sieve, unless otherwise specified.

The other material shall not contain frozen lumps, weeds, sods, roots, logs, stumps or any other objectionable matter.

Material that is proposed to be used as other material fill shall be subject to test by the Engineer to determine its suitability for the portions of the work in which it is proposed that it be placed. Only Other Material Fill material approved by the Engineer shall be placed in the work.

#### **310.09 AGGREGATES AND SELECTED GRANULAR BASE COURSE SAMPLING AND APPROVAL**

A field laboratory conforming to the requirements of Section 111 "Field Laboratory" shall be set up on the site of the project and be ready for use, before any crushing of material may take place. The laboratory shall also be set up and be ready for use before any placing of selected granular base course may take place.

All aggregates and selected granular base courses shall be subject to sampling and testing by the Engineer at all times, and the Engineer shall be provided ample opportunity to sample any material at any time. Any material of a quality or nature not suitable for its intended use will be rejected.

Only materials approved by the Engineer shall be incorporated in the work.

##### **310.09.01 Selected Granular Base Course and Chip Seal Aggregate Sampling and Approval**

Where selected granular base course or chip seal aggregate are taken from the crusher and placed in stockpiles, acceptance or rejection shall be decided on the basis of test results of samples taken from the stockpile as it is being constructed.

However, the Department reserves the right to terminate acceptance of material in stockpile at any time during the stockpiling operation regardless of test results. If acceptance of material in the stockpile is terminated, then material stockpiled previously and accepted for incorporation into the work will not be rejected.

##### **310.09.02 Paving Aggregates Sampling and Approval**

The Department will undertake preliminary testing at any time to assist the Contractor in locating and producing suitable aggregates. The tests will be carried out solely for the benefit and guidance of the Contractor and will not necessarily constitute acceptance of the aggregate.

The Contractor shall take great care in the crushing of aggregates to ensure the production of consistent and uniform material.

#### **310.10 STOCKPILING OF AGGREGATES, WINTER SAND AND SELECTED GRANULAR BASE COURSES**

Paving aggregate, chip seal aggregate, concrete aggregate, winter sand, and selected granular base course aggregate shall be handled, transported and stockpiled at all times in such a manner and with

such equipment that will avoid segregation and/or contamination by any deleterious material. The Contractor will provide and ensure legal access for the Department or its agents to this stockpile area.

Materials shall be stockpiled on a flat, well draining area of sufficient size to accept the entire quantity to be produced. The area shall be free from all foreign material and be of adequate bearing capacity.

Materials shall be stockpiled in layers not exceeding 1 m in depth. Each layer shall be completed over the entire area of the stockpile before beginning the next layer. The back layer of the stockpile shall be spread by a dozer, with a blade of suitable design, in such a manner that the materials are thoroughly mixed to a uniform consistency. Special attention should be given, that each one metre layer is interlocking to the adjoining one. Materials delivered to the stockpile in trucks shall be uniformly spot-dumped and levelled, complying to the method as specified above. Coning stockpiles or spilling material over the edges of the stockpiles will not be permitted under any circumstances.

It is the express responsibility of the Contractor to ensure that stockpiles, when constructed, contain material of acceptable quality, uniformly distributed throughout. Aggregates which have become mixed with foreign matter of any description, segregated by any means, or have become mixed with each other, shall not be used and shall be removed from the stockpile immediately. Aggregates separated during processing, aggregates secured from different sources, and aggregates from the same source but of different gradations, shall be placed in individual stockpiles.

Individual stockpiles shall be either far enough apart or separated by substantial dividers to prevent intermingling.

Where stockpiles are constructed for use by others, the storage area shall be situated on solid ground with a suitable access road provided. Storage and access area must withstand working with heavy equipment and trucks. Such storage area and access road shall be subject to the approval of the Engineer.

## **310.11 ENVIRONMENTAL REQUIREMENT OF PITS AND QUARRIES**

### **310.11.01 Siting**

Pits and quarries shall be hidden from view from the highway as much as possible. A buffer strip of 200 m shall be maintained between the highway right of way and the pit or quarry. Special attention is drawn to Government Directive to have pits or quarries hidden from view from the road.

The Contractor shall ensure that the pit or quarry is not subject to flooding. The bottom of the pit or quarry shall be drained to the nearest watercourse or culvert.

All access roads to the pit or quarry shall be bridged or culverted where watercourses are crossed.

### **310.11.02 Operation Requirements**

Any topsoil or organic matter shall be removed separately from the underlying materials and stockpiled during the grubbing or stripping operations. The Contractor shall ensure that no silting of watercourses occurs due to erosion of the pit or as a result of washing operations.

Any discharge of water, including washing water, containing more than 30 mg/L of suspended solids, shall not be disposed of directly into a watercourse or water body. Silt laden water exceeding this limit shall be discharged to a vegetated area or to a sedimentation basin for removal of excess silt, before being disposed of into a watercourse or water body.

Hydrocarbon storage shall be in accordance with Division 8.

### **310.11.03 Abandonment and Rehabilitation**

Upon completion of operations, all equipment and unnatural features must be removed and the pit or quarry must be restored to the satisfaction of the Engineer and the Department of the Environment. Depending on the location, this restoration will include any or all of the following:

(1) PITS AND QUARRIES SHALL BE TRIMMED TO SMOOTH AND STABLE GRADES WITH SIDE SLOPES CONFORMING TO THE REQUIREMENTS SET FORTH IN THE QUARRY PERMIT ISSUED BY THE DEPARTMENT OF MINES AND ENERGY.	(5) TRENCHING OR OTHERWISE BLOCKING OFF, THE ENTRANCE TO THE PIT OR QUARRY TO PREVENT VEHICULAR ACCESS. ENTRANCE TRENCHES OR BARRIERS SHALL BE GRADED AND TRIMMED TO SIGHTLY PROPORTIONS.
(2) SPREADING OVER THE SIDE SLOPES OF ANY TOPSOIL OR ORGANIC MATTER CONSERVED DURING THE STRIPPING OPERATION.	(6) WASTE MATERIAL SHALL BE DISPOSED OF IN ACCORDANCE WITH DIVISION 8.
(3) RE-VEGETATION OF NEWLY OPENED PITS AND EXTENSIONS OF EXISTING PITS WITHIN ONE YEAR	(7) DRAINING AND FILLING IN OF ANY SETTLING PONDS OR DEPRESSIONS WHICH MAY BECOME A HAZARD.
(4) SCALING DOWN OF QUARRY FACES TO REMOVE ALL ROCKS AND FRAGMENTS LIABLE TO SLIDE OR ROLL DOWN.	

## **310.12 MEASUREMENT FOR PAYMENT**

### **310.12.01 Measurement for Payment for Paving Aggregates and Concrete Aggregates**

For paving aggregates or concrete aggregates no separate measurement for payment is normally made, since the paving aggregates or the concrete aggregates are usually paid for as part of the asphaltic mix or as part of the concrete, respectively.

However, should the contract item state; the supply of stockpiled paving aggregate, or the supply of stockpiled concrete aggregate then the material shall be measured for payment.

### **310.12.02 Measurement for Payment for Chip Seal Aggregate**

For chip seal aggregate, measurement for payment may be by; the amount of chip seal aggregate placed on the road, the area of treated road surface, or the amount of chip seal aggregate stockpiled.

### **310.12.03 Measurement for Payment for Selected Granular Base Courses**

Measurement for payment for selected granular base courses may be by the actual amount of selected granular base course placed in the work, the nominal amount of selected granular base course placed in the work, or the amount of selected granular base course stockpiled.

### **310.12.04 Measurement for Payment for Winter Sand**

Winter sand shall be measured for payment in accordance with the provisions of Section 317 "Winter Sand".

### **310.12.05 Measurement for Payment for Armour Stone and Rip Rap Stone**

Armour stone and stone used in rip rap shall be measured for payment in accordance with the provisions of Section 615 "Armour Stone" and Section 610 "Rip Rap Treatment".

### **310.12.06 Measurement for Payment for "Supply Rock Fill in Place", and "Supply Other Material Fill in Place"**

Measurement for payment for "Supply Rock Fill in Place" and "Supply Other Material Fill in Place" shall be in accordance with the provisions of Section 204 "Grading of Fill".

### **310.12.07 Stockpiled Materials Weight Measurement for Payment**

Where on the contract unit price table it states that aggregate or selected granular base course materials are to be stockpiled and the unit of measurement is stated in tonnes, then such materials shall be weighed on scales before being placed in stockpiles. The scales shall be provided by the Contractor and they shall conform with the requirements of Section 501 "Weighing of Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker as being placed in the stockpile shall be included in measurement for payment. The weight shall be computed in tonnes, rounded to one decimal place.

### **310.12.08 Stockpiled Materials Volume Measurement for Payment**

Where on the contract unit price table it states that aggregate or selected granular base course materials are to be stockpiled and the unit of measurement is stated in cubic metres, then such stockpiles shall be cross sectioned and the volume computed in cubic metres rounded to the nearest whole number.

The quantity to be measured shall be the number of cubic metres of stockpiled material as shown on the cross section sheets between the graded base of the stockpile as cross sectioned before stockpiling begins and the cross sections made over the completed stockpile. The volume of this stockpile being computed by the average end area method of computation or as wedges or pyramids, as the case may be when terminating at grade points.

### **310.13 BASIS OF PAYMENT**

#### **310.13.01 Basis of Payment for Stockpiled Materials**

Where a contract item in the Highway Unit Price Table specifies that a material be stockpiled, then the payment shall be at contract price per tonne or per cubic metre, as the case may be, for the appropriate type of stockpiled material. Such payment shall be full compensation for all labour, equipment-use, materials and any other expenses to; provide a pit or quarry, obtain all required permits and approval, provide and transport pit or quarry samples to the Department's Soils Laboratory in St. John's, clear, grub and strip the pit or quarry, process pit or quarry material to the required gradation and physical requirements, provide and maintain a field laboratory, provide scales if required, provide a site for the stockpile, provide an access road to stockpile, transport and place the material in the stockpile, clean up the pit or quarry, pay any royalties for the material, and provide such other restoration to the pit or quarry as may be required.

In the particular case of stockpiling chip seal aggregate the basis of payment shall also include washing the chip seal aggregate before it is placed in the stockpile.

#### **310.13.02 Basis of Payment for Aggregates and Selected Granular Base Courses**

Where paving aggregates, chip seal aggregates, concrete aggregates, selected granular base courses and select bedding for storm sewers is placed in the work, then payment will be in accordance with the provisions of the appropriate specification for the item.

#### **310.13.03 Basis of Payment for Armour Stone and Rip Rap Stone**

The basis of payment for armour stone and rip rap stone will be in accordance with the provisions of Section 615 "Armour Stone" and Section 610 "Rip Rap Treatment".

#### **310.13.04 Basis of Payment for "Supply Rock Fill in Place" and "Supply Other Material Fill in Place"**

The basis of payment for "Supply Rock Fill in Place" and "Supply Other Material Fill in Place" shall be in accordance with the provisions of Section 204 "Grading of Fill".



# FORM 315



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 315 SELECTED GRANULAR BASE COURSE

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#### 315.01 SCOPE

This specification covers the requirements for the supply and the placing of a road bed, Selected Granular Base Course Granular "A", Granular "B", Granular "C" and Maintenance Grades No. 1, No. 2 and No. 3, included as an integral part of these requirements are the provisions of Section 310 "Use of Pits, Quarries and Stockpiles For Production of Materials Supplied by Contractor".

#### 315.02 MATERIALS

##### 315.02.01 Physical and Gradation Requirements

The granular materials shall be composed of clean, hard, uncoated particles and shall be free from organic matter, clay lumps and deleterious materials such as shale, slate, ochre and schists.

Materials from deposits acceptable as to the quality of the particles, but deficient in sizes to provide the required gradation, may be accepted if the Contractor furnishes and satisfactorily incorporates into the product supplementary sizes from other sources to produce the required grading. If the deficiencies occur in Granular "B" or Granular "C" materials, corrections may be attempted by crushing to a smaller

maximum particle size. In that event, the Department will furnish special grading limits based on the actual maximum particle size.

Materials shall be considered unsuitable even though particle sizes are within the specified gradation limits if particle shape or any other characteristic precludes satisfactory compaction or fails to provide a roadway suitable for traffic. If, in the opinion of the Engineer, an improved particle shape can be achieved by using a different crushing unit from that proposed by the Contractor, then the Contractor shall supply and use a crushing unit of the type directed by the Engineer.

Materials shall conform to the gradation requirement given in Table I and to the physical requirements given in Table II. The gradation shall not show marked fluctuations from opposite extremes of the limiting sizes, and the plotted curve shall flow in a manner free from acute changes in direction.

Granular "A", Granular "B" and all the maintenance grades materials shall be processed by crushing and, when necessary to eliminate surplus fines passing the 4.76 mm sieve, shall be screened and washed.

Crushing of Granular "C" materials shall not be required except that the Contractor may, at his opinion, elect to crush any oversize as an alternative to screening.

### 315.02.02 Recycled Asphalt Pavement (RAP)

The Contractor will be permitted to use RAP in Granular "B". The Recycled Asphalt in the mixture of Virgin Granulars plus RAP will be limited to a maximum of 30% under the asphalt and 50% in the granular shoulders. The quality and gradation of the Virgin Granulars and the mixture of RAP and virgin materials shall meet the requirements for Granular "B", when tested individually. In areas where only surface course asphalt is to be applied, as an overlay, the Contractor will be permitted to use all RAP (100%) in the granular shoulders. In this case, the RAP shall not contain material larger than 5cm. In diameter.

The Contractor shall provide the Department with a minimum 30 day notice of his intention to use RAP. The Department reserves the right to accept or reject any particular source of RAP, irrespective of its quality.

**TABLE 1  
Gradation Requirements**

Sieve Sizes	Percent Passing By Dry Weight			Maintenance Grades		
	Granular "A"	Granular "B"	Granular "C"	No. 1	No. 2	No. 3
101.6 mm			100			
76.1 mm						
50.8 mm		100	75-100			
25.4 mm		50-100			100	100
19.0 mm	100			100		
15.9 mm						
9.51 mm	50-80			55-80	55-80	55-80
4.76 mm	35-60	20-55	20-55	35-60	35-60	35-60
1.20 mm	15-35	10-35	10-35	15-35	15-35	15-35
300 µm	5-20	5-20	5-20	7-20	5-20	5-20
75 µm	2-6 (Pit Source)	2-6 (Pit Source)	0-12	6-10	3-10	6-10
	2-8 (Rock Source)	2-8 (Rock Source)				

1. 1 µm = 0.001 mm
2. If not available, the 80 µm sieve may be substituted for the 75 µm.
3. The percentage of material finer than the 75 µm or 80 µm sieve shall be determined by ASTM C117, or CSA A23.2-5A.
4. While Granular A and Granular B materials are produced from natural gravel deposits, a maximum of 6% passing the 75 µm sieve shall be permitted.
5. Where Granular A and Granular B materials are produced from quarried rock, a maximum of 8% passing the 75 µm sieve shall be permitted.
6. Where forty percent or more of other material is blended to a rock source for the production of granular materials, it shall then be treated as a pit source.

**TABLE 2**  
**Physical Requirements**

Physical Test	ASTM Designation	Granular "A"	Granular "B"	Granular "C"	Maintenance Grades		
					No. 1	No. 2	No. 3
Los Angeles Abrasion*(loss % Maximum)	C131-89 C535-89	35	35	40	35	35	35
Percent Crushed (Minimum)**	D5821	50	50	-	50	50	50
Plasticity Index	D4318-84	0	0	0	0	0	0
Petrographic Number (Max.)	(CSA 23 2-M90)	150	150	-	150	150	150
Micro-Deval Test for Fine Aggregate(% Maximum)	CSA A23.2-23A	30	30	-	-	-	-
Micro-Deval Test for Coarse Aggregate (% Max.)	MTO LS.618	25	25	-	-	-	-

\* For Granular "A", "B" and "C", the rates of the loss after 100 revolutions to the loss after 500 revolutions shall not exceed 0.280.

\*\* The percent of crushed particles will be determined by examining the fraction retained on the 4.76 mm sieve and dividing the weight of the crushed particles by the total weight contained on the 4.76 mm sieve. Pieces having one or more freshly fractured faces only will be considered as crushed material. Pieces with only small chips removed will not be considered as crushed.

### **315.03 SAMPLING AND APPROVAL**

In addition to the requirements for pit and quarry sampling and processed material sampling and approval, as set forth in Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor", where materials are hauled directly from the source to the roadway, acceptance of the material, or rejection of the material shall be decided on the basis of test results of samples taken from the roadways.

### **315.04 PREPARATION OF ROAD SURFACE**

The Contractor shall prepare the road surface to the satisfaction of the Engineer before commencing placement of any selected granular base course materials. Except for the special cases of preparation on an existing or a proposed shoulder, adjacent to existing pavement, the preparation of the road surface shall be carried out in accordance with Section 204 "Grading of Fill", Section 206 "Grading of Cuts" and Section 301 "Scarifying and Reshaping".

#### **315.04.01 Preparation of Existing Shoulder When Recapping with Addition of Paved Shoulder**

Where it is intended to recap existing pavement and simultaneously add a paved shoulder where a gravel shoulder existed before, then the Contractor shall prepare the existing shoulder prior to the placing of additional Granular "A" and paving. The preparation of the existing shoulder shall involve levelling followed by compaction.

#### **315.04.02 Preparation of Existing Granulars Prior to Providing Gravel Shoulder on Previously Paved Area**

Where existing pavement has been removed because it is intended to provide a gravel shoulder, then the Contractor shall level off and compact the existing granulars prior to shouldering with additional selected granular base course.

#### **315.04.03 Excavation of Existing Gravel Shoulder Prior to Butt Jointing Additional Pavement**

Where it is intended to widen existing pavement by butt jointing new pavement against existing pavement, then the existing gravel shoulder material shall be removed so that the required new Granular "B" and Granular "A" may be placed in preparation for the new pavement.

The Contractor shall excavate the existing gravel shoulder to the depth needed so that the required thickness of Granular "B" and Granular "A" may be placed. The excavated shoulder material shall be

spread over the adjacent subgrade. The spread excavated shoulder material and the excavated shoulder shall be leveled and compacted.

### **315.05 PLACING SELECTED GRANULAR BASE COURSE ON ROAD**

The Contractor shall place all granular bases in such a manner as to prevent contamination by other materials and to prevent segregation. If, in the opinion of the Engineer, the methods and techniques used by the Contractor cannot overcome contamination or segregation, then the Engineer may direct a modification in these methods which may require the use of an approved spreader box or other acceptable device. All granular bases shall be placed in uniform layers such that the thickness of the compacted layer does not exceed 150 mm. This requirement may be waived if the Contractor can demonstrate to the complete satisfaction of the Engineer, a method of placing and compacting thicker layers of materials such that the specified density is uniformly attained.

Prior to closing down operations for each working day, all granular materials shall be bladed and compacted to the specified compaction.

The materials shall be sprayed with water when and as directed by the Engineer, either to aid compaction or reduce dust nuisance or both. When water is added to aid compaction, it shall be applied immediately ahead of the compacting unit.

Each layer of granular base shall be bladed, shaped and compacted as necessary to produce the required profile and cross section. The finished surface shall not deviate at any place on a 3m straight edge by more than 20 mm for Granular "B" and "C" and 10 mm for Granular "A". The upper layer shall be maintained to these tolerances and to the specified density upon completion of the contract, or until the surface is paved. This may require keeping the moisture content at the appropriate value during periods of dry weather in addition to regrading and recompacting as frequently as may be deemed necessary by the Engineer.

Calcium chloride shall be applied uniformly by mechanical means when, and as directed by the Engineer.

#### **315.05.01 Special Requirement for Placing Granular Base Course Granular "A" on Paving Contracts**

In paving contracts which also include the placing of Granular Base Course Granular "A", the Contractor shall so coordinate his granular base course Granular "A" placing operations and his paving operations, such that at any given time no more than 3 km of granular base course Granular "A" treated unpaved road is subject to use by public traffic.

On roads used by public traffic where the Granular "B" was produced from a rock source, or if natural gravel source produced Granular "B" gives a rough driving surface, then the Contractor shall place at least a portion of the Granular "A" over the Granular "B" to provide a smoother driving surface. The Contractor shall carry out his operations in such a way that no one place on the road has this type of Granular "B" left without a running surface of Granular "A", for more than 3 days.

### **315.06 SHOULDERING**

The placing of granular materials for shoulder construction shall be carried out by means of an approved spreader. Spreaders shall consist of a box to hold shouldering material and a suitable mechanism to control the width and rate of application and to prevent materials getting onto the pavement.

Granular materials for shoulder construction shall be placed directly on the shoulder and any spillage and materials dragged onto the pavement surface shall be immediately removed, without damage to the pavement, and the area so effected shall be thoroughly cleaned by the use of a power broom or other suitable method.

The shoulders shall be sloped to the specified lines, grades and cross section.

Shouldering operations shall not commence along any section of pavement until 24 hours have elapsed from the time of completion of the final pavement course in that section, but the shouldering operations shall be completed within 7 days of the final pavement course on sections which are open to traffic.

### **315.07 COMPACTION**

All Granular "A", Granular "B", Granular "C" and the maintenance grades materials placed on the roadway, or placed on shoulders, shall be compacted to not less than 100% of the maximum Standard Proctor Dry Density (ASTM D698-78).

Compaction operations shall be carried out as closely as possible behind the placing and spreading operation. At the end of each working day, all materials placed shall have been compacted to the specified density.

Each layer of material shall be graded and compacted as specified before the next layer is placed.

Where necessary to obtain the required compaction, the Contractor shall apply sufficient water by means of an approved distributor.

### **315.08 MEASUREMENT FOR PAYMENT**

Measurement for payment will only be made for those materials accepted for use under this specification. Measurement for payment for Selected Granular Base Course materials may be by: the weight of material placed in the works, the nominal amount of the material placed in the works, or the amount of material stockpiled.

#### **315.08.01 Weight Measurement for Payment**

Where the unit of measurement for a particular type of Selected Granular Base Course material is stated in tonnes on the unit price table, then the material shall be weighed on scales.

The scales shall be provided by the Contractor and they shall conform with the requirements of Section 501 "Weighing of Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker as being placed in the works at the required locations shall be included in measurement for payment.

The weight shall be computed in tonnes, rounded to one decimal place.

For quantities of Selected Granular Base Course material less than or equal to 1 000 tonnes, the Department will measure the material in stockpile by cross sectioning, calculating the number of cubic metres and converting the quantities to tonnes if the Contractor so desires. A standard conversion factor of 2.0 t/m<sup>3</sup> will be applied for Selected Granular Base Course material measured in stockpile. For quantities of Selected Granular Base Course material greater than 1 000 tonnes, the Contractor must provide weight scales.

#### **315.08.02 Volume Measurement for Payment**

Where the unit of measurement for a particular type of Selected Granular Base Course material is stated in cubic metres on the unit price table, then the material shall be assessed for volume in accordance with the specification for stockpiling, select bedding or such other item as the case may be.

### **315.09 BASIS OF PAYMENT**

Payment at the appropriate contract price for the particular type of Selected Granular Base Course shall be full compensation for all labour, materials, equipment-use and any other expenses to; provide a pit or quarry, obtain all required permits and approval, provide and transport pit or quarry samples to the Department's Soils Laboratory in St. John's, clear, grub and strip the pit or quarry, process pit or quarry materials to the gradation and physical requirements for the required type of material, provide and maintain a field laboratory, provide scales if required, construct and maintain access road to the source of

the material, provide for such prior reconditioning of the surface on which the selected granular base course is to be applied and which is required in accordance with Section 301 "Scarifying and Reshaping", but which is not a pay item under that specification, provide all haulage of the material from the source to where the material is to be placed, place, spread, grade and compact the material, provide such watering of the material as is required, maintain the placed material to the required compaction and to the specified cross section and profile tolerances until completion of the contract, pay any royalties for the material, clean up and provide such other restoration to the pit or quarry and the stockpile site as may be required, together with any other work necessary to complete the contract item.

Moreover, where at shoulders minor grading work of the types described in 315.04.01, 315.04.02 and 315.04.03 is required, then payment at the contract unit price for Granular "A" and Granular "B" shall also include compensation in full for all labour, materials and equipment-use to carry out the shoulder excavation, spreading, leveling and compaction as described.

Where instead of placing the required select granular materials, the Contractor had chosen, of his own choice, to place temporary fill material level with the finish grade, then the Contractor shall excavate the fill material to make room for the select granulars, at his own expense. No payment will be made for the work of carrying out this excavation, or re-compacting the underlying materials. An example where this might occur, would be in connection with the installation of a culvert across an existing paved road, and the Contractor chose in one operation to place temporary backfill right up the level of the pavement; instead of placing backfill only to subgrade, and then placing the required select granulars.

# FORM 317



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 317 WINTER SAND

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- 317.05 ENVIRONMENTAL PROVISIONS
- 317.06 MEASUREMENT FOR PAYMENT
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- 317.07 BASIS OF PAYMENT

### 317.01 SCOPE

This specification covers the requirements for the supply and delivery of winter sand.

### 317.02 PHYSICAL AND GRADATION REQUIREMENTS

Materials shall be natural or manufactured from natural aggregates and consist of sound and durable predominately angular particles completely resistant to breakdown under traffic or freezing conditions.

Materials shall be composed of clean, hard uncoated particles and shall be free from organic matter, clay lumps, and deleterious materials such as shale, salts, ochre and schists.

Materials shall conform to the gradation requirements as given in Table I. The gradation shall not show marked fluctuations from opposite extremes of the limiting sizes and the plotted curve shall flow in a manner free from acute changes in direction.

**TABLE 1 GRADATION REQUIREMENTS**

Sieve Sizes	<u>% Passing by Dry Weight</u>
6.35 mm	100
4.76 mm	70-95
2.00mm	50-80
0.420 mm	5-25
0.075 mm	0-6

### 317.03 SAMPLING AND INSPECTION

Materials will be sampled and inspected by the Department at the designated stockpile locations. This acceptance shall not preclude further stockpile sampling, which may or may not lead to material rejection. Materials will not be sampled at the source.

The quantity of these tests shall be determined by the Engineer. They shall be sufficient in number to ensure an acceptable product.

## FORM 317

### 317.04 USE OF PITS AND STOCKPILES

The use of pits for the production of winter sand, together with the requirements for the stockpiling of the winter sand, shall be in compliance with the provisions of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor".

### 317.05 ENVIRONMENTAL PROVISIONS

The work shall be carried out in accordance with the environmental provisions of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor".

### 317.06 MEASUREMENT FOR PAYMENT

The measurement for payment will only be for those materials accepted for use under this specification.

#### 317.06.01 Volume Measurement for Payment

Where the contract unit price table states that winter sand is to be stockpiled and the unit of measurement is stated in cubic metres, then such stockpiles shall be cross sectioned and the volume computed in cubic metres rounded to the nearest whole number.

The quantity to be measured shall be the number of cubic metres of stockpiled winter sand as shown on the cross section sheets between the graded base of the stockpile as cross sectioned before stockpiling begins and the cross sections made over the completed stockpile. The volume of this stockpile being computed by the average end area method of computation or as wedges or pyramids, as the case may be when terminating at grade points.

In the event cross sections determine excess material has been placed in the stockpile, the contractor has five (5) days after this determination is made to remove the sand if he so desires. The owner reserves the right to then do a final cross section. Engineering costs will be free on first quantity measurement and charged to contractors for additional engineering quantity measurements.

#### 317.06.02 Weight Measurement for Payment

Where the contract price table states that winter sand is to be stockpiled and the unit of measurement is stated in tonnes, then the material shall be weighed on scales.

The scales shall be provided by the Contractor and they shall conform with the requirements of Section 501 "Weighing of Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker as being placed in the works at the required locations shall be included in measurement for payment.

The weight shall be computed in tonnes, rounded to one decimal place.

For quantities of winter sand less than or equal to 10 000 tonnes, the department will measure the material in stockpile by cross sectioning, calculating the number of cubic metres and converting the quantities to tonnes if the Contractor so desires. A standard conversion factor of 1.8 t/m<sup>3</sup> will be applied for winter sand measured in stockpile.

For quantities of winter sand greater than 10 000 tonnes, the Contractor must provide weight scales.



## **FORM 317**

### **317.07 BASIS OF PAYMENT**

Payment at the contract price per cubic metre for winter sand shall be full compensation for all labour, equipment-use, materials and any other expenses to; provide a pit, obtain environmental approval, provide and transport pit samples to the Department's Soils Laboratory in St. John's, clear, grub and strip the pit, process pit material to the required gradation and physical requirements, transport and place the material in the stockpile, clean up the pit, pay any royalties for the material, and provide such other restoration to the pit as may be required, together with the provision of scales if required.

# FORM 320



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 320 TACK COAT

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#### 320.07 MEASUREMENT FOR PAYMENT

#### 320.08 BASIS OF PAYMENT

#### 320.01 SCOPE

This section covers the requirements for the supply and application of Tack Coat to pavement surfaces prior to repaving with asphaltic concrete.

#### 320.02 MATERIALS

Tack coat shall consist of SS-1 or SS-1h emulsified asphalt diluted with an equal volume of water prior to the application.

The Engineer should be notified in advance as to which type the Contractor intends to use. Type SS-1 or SS-1h emulsified asphalt shall conform to ASTM D977 Standard Specification for Emulsified Asphalt. Water for forming the solution with the SS-1 or SS-1h shall be clean water free from impurities.

Should the Contractor wish to use an alternate product, then prior written approval of the Engineer must first be obtained. A written request must be submitted to the Engineer a minimum of 14 days prior to the intended use of the alternate product. The Contractor's request must include reasons for the use of the alternate product, manufacturer's product literature and required application rates as well as applicable Material Safety Data Sheets.

#### 320.03 EQUIPMENT

Tack Coat shall be applied by means of an approved pressure distributor designed and equipped so that the emulsion may be applied uniformly at even heat on variable widths at easily determined and controlled application rates under uniform pressure. The distributor shall maintain a constant height of the spray bar as the tank is unloaded.

The distributor shall be equipped with a suitable thermometer with a minimum range from 10° C to 150° C placed to accurately show the temperature of the contents. The approved pressure distributor shall be equipped with a tachometer measuring speeds in meters per minute that is visible to the truck driver so as to maintain constant application speeds at specified rates. The distributor's pump shall be equipped with a tachometer registering liters per minute that is visible to the truck driver. The distributor shall be equipped with a hose and nozzle attachment to be used for spraying by hand, areas inaccessible to the spray bar.

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All spray nozzles shall be in good condition and of the same type, orifice size and manufacturer and capable of producing a uniform fog-type spray without streaking. Clogged nozzles shall be removed and cleaned with solvent. The slot of each nozzle shall be set at 30 degrees to the axis of the spray bar and the spray bar shall be set at a height above the existing pavement that will permit the fan from each nozzle to overlap its neighbouring fan by exactly half. The spray bar shall be provided with a positive shut-off to prevent dribbling.

### 320.04 APPLICATION

Tack Coat shall only be placed on surfaces that are clean and dry, with no threat of precipitation or fog and then only when the atmospheric temperature is at least 10°C. The emulsion shall not be applied to a prepared surface when the surface temperature is less than 2°C.

Should the surface to be treated be dirty, then the Contractor shall thoroughly clean the surface by means of a power broom, or equivalent.

Tack Coat shall only be placed on surfaces that have been approved by the Engineer.

The Contractor shall plan his work so that no more tack coat than is necessary for the days paving operation is applied at one time.

To avoid nuisance and possible property damage to the traveling public, the Contractor shall install portable traffic lights or other means of directing one-way traffic while the Contractor is working on the adjacent part of the road. All other means of traffic control must be in accordance with Division 7 of the Specifications Book, Temporary Condition Signs and Devices.

The type SS-1 or SS-1h emulsions shall be diluted with an equal volume of water prior to the application. Both the mixing temperature and the application temperature shall be between 20°C and 55°C, or the temperature recommended by the manufacturer.

On old pavement the diluted emulsion shall be applied at the rate of 0.2 to 0.5 l/m<sup>2</sup> or the Department approved application rate as recommended from the manufacturer. However, on pavement which was placed during the previous construction season, the rate of application shall be as directed by the Engineer. This rate will not exceed the rate for old pavement.

Tack coat application shall be visually uniform. Areas of insufficient or non-uniform tack coat coverage shall be re-sprayed by the Contractor at no additional cost.

The Contractor shall plan his work so that no more tack coat than is necessary for the days paving operation is applied at one time.

To avoid nuisance and possible property damage to the travelling public, the Contractor shall install portable traffic lights or other means of directing one-way traffic while the Contractor is working on the adjacent part of the road.

### 320.05 ENVIRONMENTAL PROVISIONS

The Contractor shall follow the requirements of Section 820 "Storage and Handling of Fuels and Other Hazardous, Toxic or Dangerous Material", and the procedure for reporting spills.

### 320.06 CURING

No hot mix shall be placed upon the tack coat until it has dried to a proper condition of tackiness, as determined by the Engineer. The Contractor is advised that the period required for such drying will depend upon weather conditions; it will normally be 1 to 2 hours for types SS-1 and SS-1h emulsion tack coats.

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### **320.07 MEASUREMENT FOR PAYMENT**

Measurement for payment shall be by means of the horizontal area actually treated with tack coat

lying within the area designated by the Engineer for treatment. The area shall be computed in square meters, rounded to one decimal place.

### **320.08 BASIS OF PAYMENT**

Payment at the contract price for Tack Coat shall be compensation in full for all labour, materials and equipment-use to; clean the existing surface, supply and apply the tack coat, together with the provision of all required traffic control necessary.

# FORM 330



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 330

### HOT MIX ASPHALT CONCRETE

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## 330.01 SCOPE

This specification covers the Department's requirements for the production, placing and compaction of hot mix, hot laid base course, surface course and leveling course asphalt concrete for pavement construction. Sections 330.02 to 330.04 provides aggregate and asphalt pavement specifications and general requirements that are common to both method specification and end product specification projects. Section 330.05 provides specifications specific to method specifications projects, whilst Section 330.06 details the specifications for end product projects.

Method specification projects are identified as projects where Department personnel conduct all materials testing and engineering services and the contractor's payment is based upon tonnage of production for a specific project with some minimal performance criteria applied.

End product specification projects are defined as projects where the contractor is solely responsible for quality control functions and the Department is responsible for the provision of all quality assurance testing. Payment to the contractor is also based on tonnage of production with a more extensive bonus/penalty system which in turn is based upon the end product quality assurance test results carried out by the Department.

The base, surface and leveling course asphaltic concrete pavement shall consist of asphaltic cement, coarse and fine mineral aggregate, blending sand, plus mineral filler if required, combined as hereinafter specified, placed and compacted on a prepared base in conformity with the lines, grades, dimensions and cross sections, as staked by the Engineer.

The paving of bridge decks and approach slabs shall be in accordance with Section 922 "Asphaltic Paving of Bridge Decks".

## 330.02 MATERIALS

### 330.02.01 Mixture Materials

#### 330.02.01.01 Asphalt Cement

Unless otherwise specified, the asphalt cement (binder) shall conform to the latest edition of AASHTO M320 entitled Standard Specification for Performance Graded Asphalt Binder. The Performance Grade (PG) of asphalt binder shall be PG 58-28 and shall conform to the requirements of Table 1 in the AASHTO Specification. Other PG binders may be specified in individual contracts when warranted.

All PG asphalt binders will be subject to testing for acceptance prior to and during use. Samples failing to meet the relevant performance grade will require classification and be subject to penalty based on the following formulation.

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Temperature Deviation	Price Reduction (% of Asphalt Cement and Mix Prices)
Within 3 degrees of Specified Grade	N/A
From 3 degrees to 6 degrees of Specified Grade	10%
From 6 degrees to 9 degrees of Specified Grade	20%
Greater than 9 degrees of Specified Grade	Rejection

Projects with only one asphalt binder sample collected and not meeting the specified grade will have the penalty applied to all the unit prices of the entire quantity of hot mix asphalt concrete. Projects with multiple samples of asphalt binder will have the penalty applied proportionally to the affected asphalt.

Performance Graded Asphalt Binder with either higher than the maximum or lower than the minimum design temperature will be accepted at full price and no bonus will be applied.

Prior to the start of and throughout pavement production current copies of certification of all project asphalt binders shall be provided to the Department.

Any asphalt binder other than the asphalt binder specified must be removed from the Contractor's tanks to prevent contamination. Binders meeting the performance specifications but obtained from different sources cannot be stored in the same tank unless approved by the asphalt suppliers.

### **330.02.01.01.01 Performance Graded Asphalt Binder (PGAB) Sampling**

The Contractor shall collect samples of asphalt cement as required by the Engineer. At least one sample shall be collected per project and per additional 5000 t of hot mix asphalt produced. The Engineer may opt to request one random sample per day. Samples shall be taken from the Contractor's storage tank in accordance with ASTM D140 Standard Practice for Sampling Bituminous Materials. The sample size shall be at least two litres placed in one litre containers. Collection of the asphalt binder sample shall be witnessed by the Engineer. The sample shall be appropriately identified including the time and date of samples, grade and type of binder, supplier, refinery and the name and proportions of any additives added. The sample shall be immediately forwarded to the witnessing Engineer.

It shall be the Department's responsibility to submit PGAB samples for quality assurance testing.

### **330.02.01.01.02 Asphalt Binder Temperature Viscosity Chart**

The Contractor shall supply a temperature viscosity chart from the manufacturer/supplier for each source or type asphalt binder provided. The contractor shall also request of the manufacturer/supplier any information or recommendations regarding the production and handling of the mix relating to the asphalt binder. All such requested information shall be available in advance of the pre-paving meeting for discussion and review during the meeting. During the hot mix production the maximum mixing temperature shall be the lower of either; the high end temperature for recommended mixing from the temperature viscosity chart provided by manufacturer/supplier or 165° C.

### **330.02.01.02 Crushed Aggregate**

Additional to all other requirements, the designated aggregates shall be split on the 4.75 mm screen during crushing operations, and each material shall be stockpiled separately such that intermixing of each size and type does not occur.

Where aggregates are processed from pits the naturally occurring fines shall be pre-screened prior to crushing, individually stockpiled and referenced as "naturally occurring fine aggregate". No more than 5% naturally occurring fine aggregate passing the 4.75 mm screen shall be permitted with the retained naturally occurring screened coarse aggregate prior to crushing. Naturally occurring coarse aggregate must be stockpiled separately prior to crushing. Fine aggregate sizes generated during the crushing phase shall also be individually stockpiled and identified as "crushed fines". In no cases shall the fine aggregate stockpiles be combined or mixed with other aggregate types. For all mixes the maximum percentage passing the 75 µm sieve is limited to 7% for naturally occurring fine aggregate.

As an alternative to the above pre-screening on the 4.75mm screen, where aggregates are processed from pits, contractors may choose to pre-screen with a 19 mm or larger screen size provided that no more than 10% of the retained material for aggregate production passes the 19 mm sieve. For this prescreening operation a completely safe means of accessing the retained material for sampling is to be provided by the contractor. The Department shall have full control over the time of sampling. If the Contractor chooses to pre-screen with a 19 mm or larger

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screen size, material passing the 19 mm or larger screen size can not be utilized as a naturally occurring fine aggregate.

### 330.02.01.02.01 Coarse Aggregate

Coarse Aggregate shall consist of hard, durable crushed stone or crushed gravel particles, reasonably uniform in quality and free from soft or disintegrated pieces. The portion of material retained on the 4.75 mm sieve shall be known as coarse aggregate. The coarse aggregate stockpile shall contain no more than 10% passing the 4.75 mm screen.

Coarse Aggregates shall be washed if necessary to have clean surfaces free from coatings of foreign matter. Coarse Aggregates shall conform to the physical requirements shown in Table 1.

Irrespective of compliance with the physical requirements of Tables 1, any coarse aggregate may be accepted or rejected on the basis of past field performance at the discretion of the department.

**TABLE 1  
Physical Requirements For Coarse Aggregates**

TEST METHOD	TEST NO.	HIGHWAY CLASSIFICATION		
		RAU & RAD-100 RAU & RAD-90, RCU-80		RLU-60, RLU-70 RLU-80
		SURFACE	BASE	ALL COURSES
LOS ANGELES ABRASION - % MAXIMUM (A)	ASTM C131	35	35	35
ABSORPTION - % MAXIMUM	ASTM C127	1.75	2	2
MAGNESIUM SULPHATE - SOUNDNESS - 5 CYCLES - % MAXIMUM (B)	ASTM C88	12	12	12
PETROGRAPHIC NUMBER - MAXIMUM	CSA A23.2-15A	135	135	135
FREEZE-THAW TEST - 5 CYCLES - % MAXIMUM	CSA A23.2-24A	8	10	10
CRUSHED PARTICLES - % MINIMUM (C)	ASTM D5821	90	90	70
FLAT & ELONGATED PARTICLES - % MAXIMUM (D)	ASTM D 4791	20	20	20
LOSS BY WASHING - % MAXIMUM PASSING (E)	ASTM C117	1.75	1.75	1.75
MICRO DEVAL - % MAXIMUM	ASTM D 6928	20	20	20
CLAY LUMPS - % MAXIMUM	CSA A23.2-3A	1	1	1
LOW DENSITY PARTICLES - % MAXIMUM	CSA A23.2-4A	1	1	1
FRIABLE OR SLATEY SILTSTONE - % MAXIMUM	CSA A23.2-15A	1	1	1

**Notes:**

- (A) The ratio of the loss after 100 revolutions to the loss after 500 revolutions shall not exceed 0.265.
- (B) Test to be conducted on basalt rich or highly absorptive (> 1.5%) aggregates.
- (C) Pieces having two or more freshly fractured faces only will be considered as crushed material. Pieces with only small chips removed will not be considered as crushed.
- (D) Flat and elongated pieces are those whose greatest dimension exceeds four times their least dimension.
- (E) When only quarried rock is used as a source of coarse aggregate, a maximum of 2 percent passing the 75 µm sieve shall be permitted.

The Contractor must meet all the requirements above, while the guidelines below are provided for information purposes. The Contractor is responsible for ensuring the combination of aggregate conforms to the grading requirements of Table 3.

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## Guidelines for Coarse Aggregate Gradation

Sieve Size	Percent Passing by Dry Weight	
	Surface Course & Levelling Course Type I	Base Course & Levelling Course Type II
22.0 mm	100	100
19.0 mm	100	85-100
12.5 mm	85-100	50-80
9.5 mm	45-75	25-60
4.75 mm	0-10	0-10

### 330.02.01.02.02 Fine Aggregate

Fine aggregate shall consist of clean, tough, rough-surfaced grains, free from clay, loam and other foreign matter. The fine aggregate stockpile shall contain no more than 20% retained on the 4.75 mm screen.

For RCU-80 and above highway classifications the maximum allowable percentage of non-crushed fine aggregate in the total combined aggregate shall be 15% inclusive of all natural occurring fines and blending sands. For RLU-80 and below highway classifications the maximum allowable percentage of non-crushed fine aggregate in the total combined aggregate shall be 20% inclusive of all natural occurring fines and blending sands.

For all base and levelling type II course mixes the fine aggregates maximum percentage passing the 75 µm sieve is limited to 7% prior to mix production at the asphalt plant. All surface and levelling type I course mixes the fine aggregates maximum percentage passing the 75 µm sieve is limited to 5% prior to mix production at the asphalt plant.

Irrespective of compliance with the physical requirements of Tables 2 any fine aggregate may be accepted or rejected on the basis of past field performance at the discretion of the department.

**TABLE 2  
Physical Requirements for Fine Aggregates**

Test Method	Test No.	All Courses
MICRO-DEVAL TEST FOR FINE AGGREGATE - % MAXIMUM	CSA A23.2-23A	20
PLASTICITY INDEX	ASTM D4318	0
SAND EQUIVALENT - % MINIMUM	ASTM D 2419	Min 50
FINE AGGREGATE ANGULARITY - % MINIMUM (A)	ASTM C 1252	45

Note:

- (A) FAA tests shall be conducted on a representative sample of the total fine aggregate inclusive of all fine aggregate materials as indicated in the mix design including blending sand. The test will be conducted in accordance with Standard Graded Sample Method A

The Contractor must meet all the requirements above, while the guidelines below are provided for information purposes. The Contractor is responsible for ensuring the combination of aggregate conforms to the grading requirements of Table 3.

### Guidelines for Fine Aggregate Gradation

Sieve Size	Percent Passing by Dry Weight	
	Surface Course & Levelling Course Type I	Base Course & Levelling Course Type II
9.5 mm	100	100
4.75 mm	90-100	85-100
2.00 mm	40-60	40-90
0.425 mm	10-30	20-55
0.150 mm	5-16	10-25
0.075 mm	2-5	2-7

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### 330.02.01.02.03 Crushing Tolerances

After the Contractor starts crushing, an average grading will be determined and tolerances will be applied to subsequent production. The average grading will be determined by averaging at least six washed sieved results on a minimum of 1500 tonnes or 30% of the required amount.

The tolerances for subsequent production are as follows:

Tolerance for Production of Asphalt Aggregate	
Aggregate Passing 25.0 mm to 9.5 mm sieves	± 6%
Aggregate Passing 4.75 mm sieve	± 5%
Aggregate Passing 2.00 mm sieve	± 4%
Aggregate Passing 425 µm sieve	± 4%
Aggregate Passing 150 µm sieve	± 3%
Aggregate Passing 75 µm sieve	± 2%

### 330.02.01.03 Blending Sand (Naturally Occurring Screened Sand)

Blending sand shall consist of clean, tough, rough surfaced grains, free from clay, loam, or any other foreign matter. Blending sand is considered as a fine aggregate and thus must meet the requirements of Table 2.

The gradation of the blending sand shall be such that when used in the asphalt mix, the resulting mix shall meet the requirements of Tables 2 and 3 of this section. In any case, the blending sand shall have 100% (by dry weight) passing the 9.5 mm sieve and at least 80% (by dry weight) passing the 4.75mm sieve. For all mixes the maximum percentage passing the 75 µm sieve is limited to 7% for all blend sands.

For RCU-80 and above highway classifications the maximum allowable percentage of non-crushed fine aggregate in the total combined aggregate shall be 15% (by dry weight) inclusive of all natural occurring fine aggregates and blending sands. For RLU-80 and below highway classifications the maximum allowable percentage of non-crushed fine aggregate in the total combined aggregate shall be 20% (by dry weight) inclusive of all natural occurring fine aggregates and blending sands.

Blending sand shall be supplied by the Contractor.

### 330.02.01.04 Mineral Filler

Material Filler shall meet the requirements of ASTM D242 Standard Specification for Mineral Filler for Bituminous Paving Mixtures. Where filler is required, it shall be supplied by the Contractor.

### 330.02.01.05 Anti-Stripping Additive

An anti-stripping additive may be required in the Hot Mix Asphaltic Concrete. Modified Lottman tests in accordance with AASHTO T 283 Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage shall be completed within the mix design procedure, to determine the need for, and the required amount of anti-stripping additive. Liquid anti-stripping additives and/or hydrated lime (Ca(OH)<sub>2</sub>) can be utilized as an anti-strip additive.

An anti-stripping additive will be required if one of the following conditions occurs as determined by AASHTO T 283:

- The tensile strength ratio of the hot mix asphalt concrete is less than 0.80
- There is visual evidence of stripping. Acceptable specimens shall have a visual stripping rating of 1.0 or lower based on a scale from 0 to 10 (with 0 being no visual stripping and 10 being fully stripped).

Stripping tests are deemed necessary on end product specification projects and the Contractor will conduct the required testing. The test report will contain the following:

- (a) The source and percentage of aggregates used within the proposed asphalt concrete
- (b) The type and percentage of asphalt binder used
- (c) The percentage of anti-stripping additive added.

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- (d) The percentage air voids for both the untreated and treated mix
- (e) The average tensile strength of both the treated and untreated mix
- (f) The Tensile Strength Ratio (TSR)
- (g) Visual inspections of any moisture damage must also be noted

Contractors may choose to use an approved liquid anti-stripping additive in order to meet the AASHTO T283 requirements above. The liquid anti-stripping additive application rate added to the hot mix asphaltic concrete shall be the greater of 0.5% of additive by weight of asphalt cement, or the recommended percentage as determined from Lottman test results. Approved liquid anti-stripping additives include the products AD-here LOF 6500 (ARR-MAZ Custom Chemicals) and Redicote C-3082 (Akzo Nobel Chemicals). All other products must be approved by the Department's Materials Engineering Division.

Suppliers of the asphalt cement and liquid anti-stripping additives shall provide in writing all mixing requirements and proof of product compatibility. The treated asphalt PG binders must meet the relevant performance grade specifications.

Contractors must inform the Engineer and advise workers of the proper procedures, use of protective clothing and equipment when handling anti-stripping additives. Hot mix asphaltic concrete with liquid anti-strip additives is known to produce strong odours. Contractors must ensure the mix materials are used under proper environmental conditions to guarantee the safety and comfort of construction personnel and the public.

In addition to AASHTO T 283 requirements, the asphalt hot mix containing anti-stripping additive shall pass a boiling water test in accordance with ASTM D3625 Standard Practice for the Effect of Water on Bituminous-Coated Aggregate Using Boiling Water within the mix design procedure. The pass criterion for ASTM D 3625 is 95% or greater retained bitumen coating of aggregate.

An additional rate of anti-strip and/or an alternate anti-stripping additive will also be required if the aggregate is known to be prone to stripping from past performance and the minimum application rate was insufficient.

Modified Lottman Tests (AASHTO T 283) and Boiling Water Tests (ASTM D3625) shall also be conducted on field produced samples of hot mix. All field produced samples shall also pass the requirements above.

If liquid anti-stripping additive is required as described above and utilized by the contractor payment is set at twenty five dollars (\$25) per tonne of asphalt cement based on the quantity of cement as determined under 330.05.12.03 or 330.06.13.02 Measurement for Payment for Asphalt Cement as applicable. This payment price is compensation in full for all labor, materials and equipment to supply the liquid anti-stripping additive, mix the additive with the asphalt cement and utilize in accordance with the requirements set forth above.

Hydrated lime ( $\text{Ca}(\text{OH})_2$ ) can also be utilized as an anti-strip additive. Where hydrated lime is used as an anti-strip additive the dosage requirement shall be the greater of one half (1/2) percent by mass of total dry aggregate, or the recommended percentage as determined from the Lottman and Boiling Water test results.

Where hydrated lime is utilized the hydrated lime shall be added to all aggregates by either of the following methods:

- (a) Hydrated lime slurry shall be homogeneously mixed with the aggregate in a pug-mill or tumble mixer prior to entering the asphalt plant (the hydrated lime slurry shall be produced at the approximate rate of 1 part lime to 3-4 parts water).
- (b) Dry hydrated lime shall be homogeneously mixed with wetted aggregate in a pug-mill or tumble mixer prior to entering the asphalt plant. The wetted aggregate shall have a minimum moisture content of 2% by weight for coarse aggregate and 3% by weight for fine aggregate.

Hydrated lime shall be mixed with the aggregate at least 4 hours prior to entering the asphalt plant. Aggregate treated with hydrated lime shall be used within the same construction season. Treatment shall include both coarse and fine aggregate components of the asphalt aggregate.

Where hydrated lime is required, the Contractor shall provide the Department with complete information on how the hydrated lime is to be used in the treatment of aggregates. Hot mix produced containing hydrated lime, shall conform to all requirements of the contract before acceptance.

The requirement for hydrated lime anti-stripping additive will be determined following the mix design. The design amount of hydrated lime will be added as a percentage of the total dry aggregate weight. Measurement for hydrated

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lime anti-stripping additives shall be determined by the Department on the basis of the computed quantity calculated from the percentage of anti-stripping additive specified in the mix design and the total asphalt cement or dry aggregate used by the Contractor. If hydrated lime anti-stripping additive is required, payment is set at three hundred seventy five dollars (\$375) per tonne. This payment price is compensation in full for all labor, materials and equipment to supply the hydrated lime anti-stripping additive, mix the hydrated lime with water (if necessary) and add the hydrated lime in accordance with the requirements set forth above.

If an anti-stripping additive or additional/alternative anti-stripping additives are required, a further 10 working days will be required after the Contractor has advised the Department of its new anti-strip proposal and all materials have been received by the Materials Engineering Division. The Contractor and his supplier shall provide sample materials, any technical information and Manufacturer's recommended application rates.

### **330.02.01.06 Recycled Asphalt Pavement (RAP)**

If the Contractor wishes, the Contractor will be permitted to use Recycled Asphalt Pavement (RAP) in levelling or base course asphalt. The amount of RAP in the pavement mixture will be limited to 20% and subject to the following conditions:

Preparation and submission of a Marshall Asphalt Design Mix Formula (including all supporting documentation) for the asphalt mixture containing RAP, for the Department's approval, is the responsibility of the Contractor. The Contractor shall use professional engineering services and a qualified testing laboratory, to assess the aggregate materials, asphalt binders, blending sands, mineral fillers, anti-stripping agents and asphalt cement rejuvenation agents proposed for use and to carry out the design of the asphalt concrete mix. No compensation will be provided to the Contractor, for the production of the asphalt design mix formula for the asphalt mixture containing RAP.

The asphalt mixture containing RAP shall be designed in accordance with the Ontario Ministry of Transportation, Design Procedure for Recycled Hot Mix Asphalt, latest edition, except that all test methods referred to shall be replaced with the appropriate ASTM Standards. Copies of this document are available from the Departments Materials Engineering Division.

RAP percentages may require the use of asphalt cement rejuvenation agents to ensure the overall asphalt cement characteristics meet the specified Performance Grade. Testing to confirm the rheological characteristics of the combined Performance Graded Asphalt Cement and the RAP asphalt cement shall be supplied as part of the Marshall Mix Design. In all cases the Performance Grade of the asphalt cement shall meet the project specifications.

RAP shall be comprised of asphalt millings and be free of uncoated particles. The use of non-milled reclaimed asphalt pavement is subject to the approval of the Department.

The quality of the aggregate in the RAP and the quality of the final pavement mixture shall meet all requirements set forth in this specification.

Where RAP is included in base or levelling course mixes the following process will be followed:

- RAP shall be fractionated into a minimum of three separate sizes.
- The gradation of the individual fractionated RAP shall be:
  - 9.5mm and above
  - 4.75mm to 9.5mm
  - minus 4.75mm
- The asphalt plant must be equipped with a metering system that allows the fractionated RAP to be added in a controlled manner acceptable to the Department.

The Contractor shall provide the Department with a minimum 30 day notice of his intention to use RAP. The Department reserves the right to accept or reject any particular source of RAP, irrespective of its quality.

### **330.02.02 Composition of Pavement Mixture**

#### **330.02.02.01 General Requirements for Pavement Mixture**

The mixture shall consist of suitably graded fine and coarse aggregate thoroughly mixed with asphalt cement as specified. Blending sand, filler and chemical additives shall be added when required.

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Unless otherwise specified, the aggregates shall be combined in such proportions as to produce a mixture conforming to the grading of Table 3.

**TABLE 3  
Asphalt Aggregate Mixtures**

Sieve Size	Percent Passing by Dry Weight		
	Surface Course	Levelling Course Type I**	Base Course & Levelling Course Type II***
22.0 mm	100	100	100
19.0 mm	100	100	90-100
12.5 mm	93-100	75-100	75-90
9.5 mm	75-92	63-95	63-84
4.75 mm	55-75	35-78	35-55
2.00 mm	32-55	20-55	20-42
0.425 mm	12-25	10-25	10-25
0.150 mm	5-12	5-12	5-12
0.075 mm	2-5*	2-5*	2-6*
Asphalt Cement (% By Weight of Total Mixture)	4.5 – 7.0	4.5 – 7.0	4.5 – 7.0

\* The dust/effective asphalt ratio of all mixtures shall be between 0.6 and 1.2. Dust is defined as material passing the 0.075 mm sieve.

\*\* Levelling Course Type I to be used where thickness of compacted lift is to be less than or equal to 30 mm.

\*\*\* Levelling Course Type II to be used where thickness of compacted lift is to be greater than 30 mm.

Once a mix design has been designated or approved by the Engineer, the Contractor shall be required to produce a pavement mixture conforming to the following mix control tolerances. The mix must still fall inside the gradation envelopes of Table 3.

Individual Sample Tolerance for Production of Combined HMA	
Aggregate Passing 19.0 mm sieve	± 5%
Aggregate Passing 12.5 mm sieve	± 5%
Aggregate Passing 9.5 mm sieve	± 5%
Aggregate Passing 4.75 mm sieve	± 5%
Aggregate Passing 2.00 mm sieve	± 4%
Aggregate Passing 425 µm sieve	± 3%
Aggregate Passing 150 µm sieve	± 2%
Aggregate Passing 75 µm sieve	± 1%

### 330.02.02.02 Physical Requirements for Mixture

The aggregates and the asphalt cement shall be mixed in such proportions as to satisfy the criteria contained in Table 4. These criteria are based on the Standard Marshall Test Procedures and using a compactive effort of 75 blows on each face of the specimen.

All test procedures used shall be the latest versions of ASTM or AASHTO standards, except where indicated.



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**TABLE 4  
Physical Requirements for Asphaltic Concrete Mixture (All Courses)**

	Minimum	Maximum
MARSHALL STABILITY N. AT 60°C (I) FOR HIGHWAY CLASSIFICATIONS RLU-60, RLU-70, RLU-80 (II) FOR HIGHWAY CLASSIFICATIONS RAU & RAD-100, RAU & RAD-90, RCU-80	5 400 8 000	--- ---
MARSHALL FLOW INDEX MM	2.5	4.25
% AIR VOIDS (A) (I) FOR HIGHWAY CLASSIFICATIONS RLU-60, RLU-70, RLU-80 (II) FOR HIGHWAY CLASSIFICATIONS RAU & RAD-100, RAU & RAD-90, RCU-80	2.5 3.0	4.0 5.0
% VOIDS IN COMPACTED MINERAL AGGREGATES (I) LEVELING & BASE COURSE (II) SURFACE COURSE	14.0 15.0	--- ---
MODIFIED LOTMAN AASHTO T283 - TENSILE STRENGTH RATIO	0.8	---
MOISTURE CONTENT OF HOT MIX ASPHALT BY OVEN METHOD, AASHTO T329 AS PERCENT OF HMA	---	0.3

Notes: (A)The test method, ASTM D2041 "Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixture", shall be modified as follows: The residual pressure in the vacuum cell shall be 30 mm ±1 mm.

### 330.03 USE OF PITS, QUARRIES AND STOCKPILES

The use of pits and quarries for the production of the aggregates, together with the requirements for the stockpiling of the aggregates shall be in compliance with the provisions of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor".

### 330.04 ENVIRONMENTAL PROVISIONS

Pits and quarries shall be stripped, worked and at the completion of the work restored, all in compliance with the provisions of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by the Contractor".

Off-specification asphalt shall be disposed of in accordance with Division 8.

#### 330.04.01 Environmental Requirements for Asphalt Mixing Plants

Any asphalt plant being operated within a radius of 1.5 km of a regularly used building, either residential or commercial, or an organized recreational area, must control their dust emissions such that compliance is obtained with the air standards enforced by the Department of Environment and Conservation. In order to comply, the efficient operations of either a bag house dust collector or a water scrubber on the dryer emissions would be necessary.

These controls may be waived in an area where there are three or less regularly used buildings if the Contractor makes satisfactory arrangements with the owners and occupiers of all buildings. Under such circumstances, a written agreement between the Contractor and owner/occupier, signed by both parties, must be submitted to both the Department of Transportation and Works and the Department of Environment and Conservation.

Contractors are referred to the "Environmental Code of Practice for Asphalt Plant Operations" prepared by the Department of Environment and Conservation (Latest Edition). Hydrocarbon storage shall be in accordance with Section 820. The Contractor shall follow the procedure for spill reporting.

All sections of the asphalt plant which could contribute to air or water pollution must be maintained in efficient operating condition.

Where a water scrubber is used, the scrubber effluent must be given retention time in suitably sized artificial settling ponds. Such ponds must be sufficiently impermeable to enable seepage water to meet the Environment Control (water and sewage) Regulations, 2003.

All storage tanks for fuel must be drained within one week after production has been completed. Fuel oil must not remain in tanks over the winter.

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### 330.04.02 Environmental Approval

Contractors wishing to set up an asphalt mixing plant at a site must first obtain environmental approval before proceeding.

Contractors must apply in writing to the Department of Government Services and Lands for a Ministerial Approval as required under the Department of Environment Act, 2002. The following information must be supplied with the application:

1. LOCATION OF THE PROPOSED SITE AND DESCRIPTION OF ITS SURROUNDINGS WITHIN A RADIUS OF 1.5 KM.
2. SOIL TYPE AND PARTICULARS OF PROTECTIVE DYKING NEAR STORAGE TANKS.
3. SIEVE ANALYSIS OF COLD FEED AGGREGATE OR AT LEAST THE PERCENTAGE OF MINUS 75  $\mu$  SIEVE.
4. DESCRIPTION OF THE PLANT AND ASSOCIATED EQUIPMENT TO REDUCE AIR CONTAMINANTS (PLANS IF AVAILABLE).
5. CAPACITY OF PLANT IN TONNES PER HOUR.
6. SOURCE OF HEAT (AND SULPHUR CONTENT IF IT IS OIL).
7. RATE OF AIR FLOW THROUGH THE DRYER AT OPERATING CONDITIONS AND DIAMETER OF THE DRYER.
8. RELEVANT OPERATION DETAILS OF AIR POLLUTION CONTROL EQUIPMENT (IE. PRESSURE DROP ACROSS CYCLONES OR SCRUBBERS)
9. AIR TO CLOTH RATIO IF BAGHOUSE FILTER IS USED.
10. HEIGHT OF EXHAUST STACKS.
11. TEMPERATURE AND VELOCITY OF EXHAUST GASES FROM DRYER AND/OR STACK.
12. EXPECTED DATES OF OPERATION OF THE PLANT:
  - PROPOSED STARTING DATE
  - HOURS IN OPERATION PER DAY
  - PROPOSED COMPLETION DATE
  - TOTAL DAYS IN OPERATION
13. IF USING A WATER SCRUBBER, THE RATE OF USE OF WATER (L/S), THE NUMBER AND DIMENSIONS OF SETTLING PONDS AND THE METHOD OF LINING OF THE PONDS

For inspection purposes, the Contractor is to notify the Department of Environment and Conservation at least five days prior to site closure.

Should the Contractor wish to leave his equipment at the site beyond the completion of his work for this Department, or beyond his proposed completion date as stated in his application, then the Contractor shall state in writing his commitment to undertake the cleanup and restoration requirements of this section and those of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor", and also state his updated proposed completion date. Copies of this letter shall be sent to both the Department of Transportation and Works and the Department of Environment and Conservation.

### 330.05 METHOD SPECIFICATION FOR ASPHALT CONCRETE MIX - HOT PLACED

#### 330.05.01 GENERAL

This item consists of supplying crushed aggregates, sand and mineral filler, anti-stripping additive, asphalt binder, with the production, loading, hauling, placing and compaction of hot mix asphalt concrete. The limits of placement, application rates and the asphalt concrete mixture type shall be as stated in the contract specifications. Production and Placement of hot mix asphalt will be subjected to various quality tests.

All aspects of the production and placement of the Hot Mix Asphalt will be supervised by the Department. All appropriate inspection and testing will be determined by the Department.

The mixing period and temperature shall be such as to produce a uniform mixture in which all the particles are thoroughly coated, and the moisture content of the material as it leaves the mixer must be reduced to 0.3% or less. Facilities for sampling and observing the mix shall be provided.

The temperature of the mix immediately after mixing shall not exceed 165°C.

Quality control tests shall be performed, by the Department, on random samples taken either at the production site or lay-down site.

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Asphalt concrete is defined as a carefully controlled mixture of asphalt cement and mineral aggregate thoroughly mixed to be free from segregation and contamination and then placed and compacted to a uniform density and smooth finish.

The following sections describe the requirements applicable to quality control and quality assurance, manufacturing, transportation, placing, compaction, finishing and measurement and payment of asphalt concrete. The requirements of specific materials for the asphalt concrete are described in Section 330.02.

### **330.05.02 TESTING AND INSPECTION**

The Contractor shall provide a field laboratory in accordance with the provisions of Section 111 "Field Laboratory". The field laboratory shall be provided at the site of the asphalt mixing plant.

The requirements for pit and quarry sampling and processed material sampling and approval as set forth in Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor", shall apply to this section. The Contractor shall send to the Department's Laboratory in St. John's, samples of the proposed paving aggregate for testing as to quality, mix design, and approval by the Engineer. No samples will be accepted for mix design until 100% of the total aggregate required (including filler and blending sand) has been crushed, tested and properly stockpiled.

The Contractor shall be notified of the designated composition of the mixture not later than ten (10) working days after the day on which all necessary samples have been received at the Department's Laboratory and shall not commence mix production before such notification.

#### **330.05.02.01 Designation of Mixture**

The Engineer shall specify or approve a job mixture within the required limits of grading and conforming to the Marshall Test requirements given in Table 4 of Section 330.02.02 for each mix selected. The Engineer may select one or more mix proportions to suit job conditions. The actual grading of the job mix, when plotted, shall so range from course through fine sizes that it will approximate the shape of the plotted average grading for corresponding mix given in Table 3 Section 330.02.02. For that portion of the aggregate passing the 4.75 mm sieve, gradients which range from the maximum of one sieve to the minimum of the next larger sieve, shall not be permitted.

#### **330.05.02.02 Unauthorized Tampering with Plant Settings and Materials**

Any person employed by the Contractor, who, in the opinion of the Engineer, alters or causes to be altered, any settings or screens of an asphalt plant after it has been calibrated, or who adds or causes to be added, any unapproved material to a stockpile or aggregate, or in any way hampers the production of the mix as designed, shall at the written request of the Engineer, be forthwith removed from the project and such persons shall not again be employed in the work.

### **330.05.03 EQUIPMENT**

All manufacturing of asphalt concrete shall be conducted using batch, drum or continuous mixing plants. All plants shall conform to the requirements of ASTM D995 Standard Specification for Mixing Plants for Hot-Mixed, Hot Laid Bituminous Paving Mixtures and as specified herein.

#### **330.05.03.01 Mixing Plants**

##### **330.05.03.01.01 General Requirements and Equipment for Storage of Asphalt Cement**

Tanks for storage of asphalt cement shall be capable of heating and maintaining the temperature of the asphalt cement at a constant temperature range between 120°C and 160°C. The actual working temperature shall not vary by more than  $\pm 5^\circ\text{C}$  when the amount of asphalt cement added to the mixture is measured volumetrically. Heating shall be by steam or oil coils, electricity, or other means such that no flame shall contact the heating tank.

A circulating system for the asphalt cement shall be of adequate capacity to thoroughly mix the asphalt cement and provide continuous circulation between the storage tank and proportioning units during the entire operation period. All pipe lines and fittings shall be steam or oil jacketed and properly insulated to prevent heat loss.

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Storage tank capacity shall be such as to ensure continuous operation of the plant and uniform temperature of the asphalt cement when it is introduced into the mixing unit. Tanks shall be accessible for measuring the volume of asphalt cement at any time.

A sampling outlet shall be provided in the asphalt cement feed lines connecting the plant storage tanks to the weighing system or spray bar. The outlet shall consist of a valve installed in such a manner that samples may be withdrawn from the line slowly at any time during plant operation. The sampling outlet shall be installed between the pump and the return line discharge in a location that is readily accessible and free from obstruction. A drainage receptacle shall be provided for flushing the outlet prior to sampling.

### **330.05.03.01.02 Cold Bins**

All plant types shall be equipped with operational cold bins capable of being calibrated. Cold bins shall be divided into not less than three compartments, each to be equipped with individual gate controls, so as to enable accurate and positive proportioning of each aggregate size. Partitions of sufficient height to eliminate intermingling of the aggregate shall be provided between adjoining bins, if the bins are being fed with a front-end loader the width of each bin must be at least 500 mm wider than the width of the loader bucket.

### **330.05.03.01.03 Dryer**

A rotary dryer, of satisfactory design, for drying and heating the aggregate shall be provided. Dryer units shall be of sufficient capacity to uniformly heat the aggregate and reduce the moisture content to the specified level. Upon request the asphalt contractor shall make available to the Engineer the following information.

- a) The specified rate of production in tonnes per hour versus aggregate moisture content.
- b) Within drum plants the specified location and length of the of the asphalt cement delivery pipe.

### **330.05.03.01.04 Screens**

Plant screens on batch and continuous mix plants shall have adequate capacity and size range to properly separate all of the aggregate into the sizes required for proportioning so that they may be recombined consistently within the specification limits.

All screens shall have square openings and be free any rips or holes. Screen decks shall be stacked in such a manner that cross contamination of aggregates is prevented.

### **330.05.03.01.05 Hot Aggregate Storage Bins**

Batch and continuous mix plants shall have hot bin storage of sufficient capacity to ensure uniform and continuous operation. Bins shall be divided into compartments arranged to ensure separate and adequate storage of appropriate fractions of the aggregate. Each compartment shall be provided with an overflow pipe of such size and at such a location to prevent any backing up of material into other bins or into contact with the screen. Adequate and convenient facilities shall be provided for obtaining aggregate samples from each hot bin.

### **330.05.03.01.06 Asphalt Cement Control Unit**

Satisfactory means, either by weight, metering or volumetric measurements, shall be provided to obtain the proper amount of asphalt cement. All measuring devices shall prove accurate to within  $\pm 2.0\%$  when tested for accuracy.

### **330.05.03.01.07 Thermometric Equipment**

An armoured thermometer of suitable range shall be fixed in the asphalt cement feed line at a convenient location near the discharge of the mixer unit. The plant shall be further equipped with approved recording thermometers, pyrometers, or other approved recording thermometric instruments at the discharge chute of the dryer and in the hot fines bin to register and record automatically the temperature of the heated aggregate.

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### **330.05.03.01.08 Dust Collectors**

Dust collectors shall be provided where required under the provisions of Section 330.04.01 "Environmental Requirements for Asphalt Mixing Plants". Provision shall be made to waste the material so collected, or to return all or any part uniformly to the aggregate mixture.

### **330.05.03.01.09 Safety Requirements**

Adequate and safe stairways to the mixer platform shall be provided, and guarded ladders to other plant units shall be located where requested.

All gears, pulleys, chains, sprockets, and other dangerous moving parts shall be thoroughly protected. Ample unobstructed passage shall be maintained at all times in and around the truck-loading space. This space shall be kept free of drippings from the mixing platform. A ladder or platform shall be located at the truck-loading space to permit easy and safe inspection of the mixture as it is delivered into the trucks.

A suitable sampling platform with stairs or ramp access including railing shall be provided for sampling material in the truck bed. The height of the platform shall be adequate to prevent the inspector from having to climb up on to the truck in order to obtain a sample. The platform shall be constructed such that the truck is able to park on either side. If it is not possible for the platform to be constructed in such a manner, then two separate platforms shall be provided or the truck will be required to reverse direction so that a sample may be obtained. Overhead protection shall be provided where necessary.

### **330.05.03.01.10 Capacity**

Unless indicated otherwise asphalt mixing plants must have a minimum rated capacity of 120 tonnes per hour delivered to the spreader, with a production history to support this requirement.

## **330.05.03.02 Special Requirements for Batching Plants**

### **330.05.03.02.01 Weigh Box or Hopper**

The equipment shall include a means for weighing each bin size of aggregate into a weigh box or hopper, suspended on scales, and ample in size to hold a full batch without running over. The weigh box or hopper shall be supported on fulcrums and knife edges that will not easily be thrown out of alignment or adjustment. Gates both on the bins and the hopper shall be constructed to prevent leakage when closed.

### **330.05.03.02.02 Plant Scales**

Scales shall be of the dial or digital type and of a standard make and design. Scales for weighing aggregates shall be accurate and sensitive to 0.5% of the maximum loading required. All scales shall provide a positive means of balancing the tare weight of the hopper or asphalt bucket. After each plant set-up and prior to batching any materials, and whenever deemed necessary by the Engineer, the Contractor shall, at his own expense, have the plant scales tested to the satisfaction of the Engineer.

### **330.05.03.02.03 Mixer Unit**

The plant shall include a batch mixer of an approved twin shaft pug mill type capable of producing a uniform mixture within the permissible job mix tolerances. The clearance between the mixer blades and liner plates shall not exceed 20 mm. The mixer shall be constructed to prevent leakage of the contents. Mixer discharge shall not cause appreciable segregation. The mixer shall be fitted with separate dry and wet mixing cycle timers and locking devices so that asphalt cement cannot be discharged and the pug mill gate cannot be opened until the desired mixing times have elapsed.

## **330.05.03.03 Special Requirements for Continuous Mixer Plants**

### **330.05.03.03.01 Gradation Control Unit**

The plant shall include means for accurately proportioning by volumetric measurement the aggregate discharged from each hot bin. The unit shall include a feeder, mounted under the compartment bins. Each bin shall have an accurately controlled individual gate to form an orifice for volumetrically measuring the material drawn from each respective bin

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compartment. The orifice shall be rectangular with dimension adjustable by positive mechanical means. Indicators shall be provided on each gate to show the gate opening in millimetres. Each gate will be provided with a lock.

### **330.05.03.03.02 Weight Calibration of Material Feed**

The plant shall include a means for calibration of gate openings by weighted test samples. The equipment shall include a method of obtaining hot aggregates from the bins fully representative of the flow from the specific gate openings. It shall also include platform scales capable of accurately weighing test samples of aggregates and asphalt cement.

All calibration equipment, including revolution counters, shall be kept in good operating order at all times and shall be available whenever required.

### **330.05.03.03.03 Synchronization of Aggregate and Asphalt Feed**

In order to ensure the correct flow of aggregate from the bins and the flow of asphalt from the meter or other proportioning sources, satisfactory means shall be provided to afford positive interlocking control between the flow of aggregate from the bins and the flow of asphalt from the meter or other proportioning sources. In order to ensure the correct flow of asphalt cement to the mixer at all times, the plant shall be equipped with means of maintaining a constant head of asphalt cement to the metering device. A satisfactory pressure gauge shall be installed on the asphalt line between the metering device and the spray bar.

### **330.05.03.03.04 Mixer Unit**

The plant shall include a continuous mixer of an approved twin shaft pug mill type that shall be capable of producing a uniform mixture within the specified tolerances. The clearance of the blades from the inner surfaces of the pug mill liners shall not exceed 20 mm. The paddles shall be of a type adjustable for angular position on the shafts and reversible to retard the flow of the mixture. The mixer shall be equipped with an adjustable dam gate at the discharge end to control the level of the material. The mixer shall carry a manufacturer's plate giving the net volumetric contents of the mixer at several heights.

Unless otherwise required, determination of mixing time shall be by weight method under the following formula. The weights shall be determined for the job by tests made by the Engineer.

$$\text{Mixing time in seconds} = \frac{\text{Pug mill capacity in kg}}{\text{Pug mill output in kg/s}}$$

### **330.05.03.03.05 Discharge Hopper**

All continuous mix plants shall be equipped with a controlled discharge storage hopper. The minimum capacity of the hopper in tonnes shall be equal to 1.5% of the hourly production rate of the plant but shall not be less than one tonne. This hopper shall be kept in satisfactory operating condition at all times and operated to prevent segregation of the mixture.

### **330.05.03.03.06 Material Level Indicators**

Material level indicators shall be installed in each hot aggregate bin at the one-third full level and at the two-thirds full level and they shall be connected to remote high-low indicator lights mounted at the operator's station. Operation of the mixer shall not be permitted when the low-level indicator shows any bin to be less than one-third full.

### **330.05.03.04 Special Requirements for Drum Mixer Plants**

#### **330.05.03.04.01 Aggregate Feed**

Aggregates shall be fed to the dryer drum by means of a multi bin (minimum 3 or 4 bins) cold feed unit and shall be blended to meet the design mix proportions by adjustment of variable speed feed belts and gates on each bin. There shall be no overflow from one bin to another.

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A reliable moisture probe shall be installed in the fine aggregate cold feed bin with a meter mounted in the plant control panel.

The total flow of aggregate shall be metered by an electronic weigh belt system with an indicator that can be monitored by the plant operator and which is interlocked with a variable speed asphalt pump so that the proportions of aggregate and asphalt entering the mixer remain constant.

Cold feed calibration and asphalt cement pump calibration shall be performed at the start of each contract and whenever deemed necessary by the Engineer. The calibration shall be done in the presence of the plant inspector. The cold feed shall be recalibrated whenever the weighing conveyor is moved.

A positive interlocked automatic shut off shall be provided so that the plant shuts down automatically if there is any disruption in the flow of aggregate or asphalt cement.

A vibrating screen of adequate capacity shall be provided to remove oversize from the combined cold feed. An aggregate sampling device shall be provided which will divert a representative combined aggregate sample of adequate size into a container or hopper for the purposes of gradation testing. The sampling device shall be located after the cold feed aggregates have passed through the vibrating screen and prior to mixing with asphalt cement.

### **330.05.03.04.02 Asphalt Cement Feed**

The asphalt cement feed system shall be equipped with a calibration system which will enable approximately 200 litres of asphalt cement to be by-passed into a container which can be weighed. Adequate scales shall be provided by the Contractor.

A temperature gauge, showing the temperature of the asphalt cement at the metering pump, shall be provided in the control trailer. The gauge shall be graduated to cover at least the range 100°C to 200°C with increments of not more than 2.5°C.

A temperature compensating system shall be installed in the asphalt cement metering system designed to provide a volume of asphalt cement which will be constant when referenced to 15°C of regardless of variations in the temperature of the asphalt cement from the storage tank.

### **330.05.03.04.03 Asphalt Cement Mixing**

The heating, coating and mixing of the asphalt mix shall be accomplished in an approved parallel flow dryer-mixer. The aggregate and asphalt shall enter the drum at the burner end and travel parallel to the flame and exhaust gas stream. Heating shall be controlled to prevent fracture of the aggregate or excessive oxidization of the asphalt. The system shall be equipped with automatic burner controls and shall provide for continuous temperature sensing of the bituminous mixture of discharge, with a printing recorder that can be monitored by the plant operator. The printed record of mix temperatures shall be available to the Department for inspection.

The method used to transfer the mixture from the drum mixer to the haulage units shall be designed, constructed and operated so that there shall be no segregation of, or damage to, the mix.

A system for wasting unacceptable asphalt aggregate mixture shall be provided between the drum mixer discharge and holding bin.

The plant shall not be operated below 50% of the rated capacity of the belt scale.

### **330.05.04 Truck Weigh Scales**

The scales shall be in accordance with Section 501 "Weighing Materials in Trucks".

### **330.05.05 Haulage Equipment**

Trucks for hauling asphaltic mix shall be of the metal box type and their use shall be approved by the Engineer. The metal box shall be treated with an approved release agent and be in smooth condition with no rust scales or foreign materials. Where ever possible trucks shall be loaded such that the front and back of the truck body are loaded prior to placement of asphalt in the middle section. .

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Vehicles shall be equipped with tarpaulins of water repellent material (no open mesh types) of sufficient size to completely cover the truck box and overhang the box on all sides by a minimum of 150 mm. The tarpaulins shall have enough tie-down points so that they can be properly secured, and shall be in good condition and be free of holes and tears. They shall be securely tied down as an effective barrier against rain infiltration and air flow over the HMA mixture.

Tarpaulins are to be used at all times for protection of the load of Hot Mix Asphalt. Tarpaulins shall be rolled back to uncover the hot mix for inspection immediately prior to dumping the load into the paver. Trucks will stop ahead of the paver and allow the paver to smoothly pick up the truck.

### **330.05.06 Spreading Equipment**

Mechanical self-powered pavers shall be used which are capable of spreading the mixture true to line, grade and crown as specified and as directed by the Engineer.

Pavers shall be equipped with hoppers and reversing distributing screws to place the mixture evenly in front of the screed. The distributor screws shall always be kept 1/3 to 2/3 covered.

Asphalt concrete shall be dumped into the middle of the paver hopper. The hopper shall not be emptied to less than 25% of its capacity when moving except when the spreading operation is suspended. All cold or segregated asphalt must be shovelled out and wasted. In no case shall cold asphalt be allowed in the pavement mix.

Pavers shall be equipped with heated vibrating screeds and shall be capable of spreading the mixture, without segregation, in thickness of from 10 mm to 200 mm and in widths of from 2500 mm to the greater of the maximum width of the project travel lane and paved shoulder combined or 4000 mm, in increments of 150 mm.

The Contractor shall provide on each paver a 3 m straight edge with a level recessed in its upper surface parallel to the lower face and capable of detecting a variation from the horizontal of 3 mm in 1000 mm.

The term "screed" shall mean any strike-off device operated by cutting, crowding, or other practical action which is effective on the mixture and which produces a finished surface of the evenness and texture required. The screed shall have an approved vibratory application and be adjustable as to level and crown and shall be heated in an approved manner.

Pavers shall be equipped with automatic screed controls, as recommended by the paver manufacturer, for the control of longitudinal grade and transverse slope. The longitudinal grade control shall be equipped to operate from a joint matching shoe except when a spreader with ski is required by the specifications. Longitudinal joints shall be matched by the spreader with ski where ever a spreader with ski is required or specified. The transverse slope control shall be capable of operating from either side of the paver.

A paver with a ski shall be required for paving base course and surface course on the Trans Canada Highway. On other projects, a paver with a ski will also be required where the contract item description includes the phrase "Spreader with Ski".

The paver with a ski shall be equipped with an approved 12 m ski. Where such a ski is a flexible unit, it shall be equipped with a spring tensioned wire extending between brackets fitted on and slightly above each end of the ski. The sensing grid shall ride on the wire, not on the ski.

### **330.05.07 Rollers**

All rollers shall be of the types specifically designed for asphalt compaction.

All rollers shall be in good condition and capable of reversing without backlash. They should be operated at all times by competent and experienced operators.

All rollers shall be weighed in the presence of the Engineer and ballasted, if required, immediately before commencing work and whenever subsequently required by the Engineer. There shall be no additional cost to the Department for meeting these requirements.



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Steel drum rollers shall be equipped with satisfactory means to supply sufficient water to the drum to prevent adhesion of asphalt mixture. The rear wheels of combination rollers shall each be not less than 450 mm in width, drums of tandem rollers shall each be not less than 1250 mm in width. Steel drum rollers shall weigh at least 12 tonnes and shall exert a load on the compression roll of at least 6 tonnes per metre of wheel width. All pneumatic tired rollers shall be self-propelled and shall have not less than nine wheels revolving on two axles. The tires on the front and rear axles shall be staggered to cover the entire area over which the roller travels with a minimum overlap of 15 mm. Under working conditions, the roller shall exert a load of not less than 5 tonnes per metre of tire width on the asphalt surface. The tires shall be inflated to an air pressure of not less than 400 kPa. The roller shall be equipped with an adequate scraping or cleaning device on each tire to prevent the bituminous mixture from accumulating on the tires. The roller shall be equipped with a water system which will keep all tires uniformly wet, and which will have a capacity that will provide not less than two hours continuous operations without refilling.

### **330.05.08 Material Transfer Device/Vehicle**

For all highway classifications, a Material Transfer Device/Vehicle shall be used at no extra cost to transfer the project's top lift of asphalt mixture (base, leveling or surface material) from the transport vehicles to the asphalt spreader. The purpose of the Materials Transfer Device is to minimize segregation during placement of the asphalt pavement and to increase the smoothness of the pavement surface by reducing the number of stops and starts during the placement of the asphalt pavement. The Material Transfer Device shall be utilized in conjunction with a hopper insert in the asphalt spreader. The hopper insert on the asphalt paver shall be kept full at all times. Cycling the hopper wings of the asphalt paver shall be kept to a minimum.

When required to pave on granulars, a self-propelled transfer vehicle is required.

Prior to being utilized the Material Transfer Device/Vehicle shall be approved for use by the Engineer.

### **330.05.09 CONSTRUCTION**

#### **330.05.09.01 Preparation of Gravel Road Surface**

Where paving is to take place directly on top of a gravel surface, then the Contractor shall prepare the road to the satisfaction of the Engineer before paving. Not less than 300 m of prepared grade shall be maintained in front of the paver at all times, except at the end of the paving operation for that day.

Where the top layer of Granular "A" is placed under the same contract as the paving, then the preparation of the Granular "A" prior to paving shall be carried out in accordance with Section 315 "Selected Granular Base Course". However, where the paving is to take place directly on top of materials that were not placed in the paving contract, then such preparation prior to paving as the Engineer may require shall be carried out in accordance with Section 301 "Scarifying and Reshaping".

#### **330.05.09.02 Preparation of Old Paved Surface**

When required by the Engineer, old paved surfaces shall be cleaned and treated with tack coat prior to repaving with asphaltic concrete. Such treatment with tack coat as may be required shall be carried out in accordance with Section 320 "Tack Coat".

#### **330.05.09.03 Placing of Asphaltic Courses**

The base on which paving is to take place shall be cleaned of all loose or foreign material before paving may take place. The asphaltic mixture shall be laid only upon a base which is dry or at least free from standing water, and when weather conditions are suitable. No paving shall take place during rain.

No course shall be placed upon a previously laid course less than 12 hours after final compaction of the latter, except with the permission of the Engineer in circumstances where in his opinion this requirement would be impractical.

No hot mix shall be placed unless the air temperature at the surface of the road is 7°C or above without the written permission of the Engineer. The temperature of the mixture immediately after spreading and prior to initial rolling shall not be less than 125°C.

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The longitudinal joints in the surface course shall correspond to the demarcation between driving lanes, speed change lanes, tapers, etc. indicated in the contract or as directed by the Engineer. The width of succeeding courses shall be adjusted by an offset of width of from 150 mm to 300 mm so that longitudinal joints do not coincide.

Immediately after any pavement course is laid and before roller compaction is started the surface and edges shall be checked and any irregularities adjusted by the addition or removal of mixture.

Pavers must be equipped with heated vibratory screeds. There should be no allowance for pavers with non- vibratory screeds. All mechanical apparatus designed to aid compaction of the mixture shall have such devices operating continuously when the mixture is being placed unless otherwise directed by the Engineer. Where screed extensions are used, such extensions shall be designed so that the tamping or vibratory action of the screed is effectively transferred to the extensions in such manner as to provide a uniform degree of initial compaction across the full width of the freshly laid mat.

To ensure continuous operation of the pavers, they shall operate at whatever speed necessary to match the output of the plant provided that a consistent and satisfactory mat is being laid. However, in no case shall the speed of the paver exceed 0.7 km/h.

When two or more pavers are in echelon in order to match longitudinal joints, pavers following the lead paver shall use joint matching shoes, or an approved 12 m ski as per the contract requirements, designed for the purpose, which shall ride on the previously placed undisturbed mat. Pavers are considered to be paving in echelon when the lead paver is not more than 60 m in advance of an adjacent succeeding paver.

Mixtures may be spread by hand only in places inaccessible to the paver. Hand placing shall be from a steel dump board by means of hot shovels. Hand spreading shall be with rakes of suitable design. The mixture shall be spread to the depth required to give the compacted design thickness after rolling. No loads of mixture shall leave the plant so late in the day as to preclude the spreading and compacting of the mixture during daylight.

Paving of intersections, ramps and driveway tie-ins are integral with the work. No separate payment or compensation will be provided for this work.

### **330.05.09.04 End of Paving Season for Asphaltic Surface Course**

The season for laying asphaltic surface course shall end on the 30th of September each year, unless extended by the Engineer.

No paving of asphaltic surface course shall take place beyond the designated end of the asphaltic surface course paving season. No pavement shall be removed from a roadway that cannot meet the requirement of replacing the asphalt before the end of the paving season.

### **330.05.09.05 Joints**

All joints shall be made in such a manner as to ensure a thorough and continuous bond and to provide a smooth riding surface.

All foreign material and all loose material shall be removed from all faces against which joints are to be made. All cold faces against which joints are to be made shall be cut back to full depth to expose a fresh vertical face and painted with emulsified asphalt (tack coat).

Longitudinal joints shall be rolled immediately upon placement of the fresh mixture and before the adjacent strip has completely cooled. The joint shall be set up with the back of a rake or lute at proper height and grade to receive the required compression under rolling. The depth of the newly laid mat shall be adjusted to allow for compaction. The paver shall overlap the existing mat by approximately 25 to 40 mm.

Prior to placing the adjacent mat, the exposed edge of each longitudinal joint must be coated with emulsified asphalt (tack coat). Upon completion of each day's paving, the maximum length of exposed joint edge shall be 60 meters.

Asphalt mat edges having companion longitudinal joints shall be matched within the maximum allotted time period as determined by the engineer. The maximum allotted time period shall be restricted to a lower limit of one hour with an

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upper limit of two hours. The allotted time limit will be proportioned on the paving lay-down conditions; with the lower time limit applied to least favorable placement conditions and the upper time limit applied to favorable placement conditions. Lay-down conditions considered by the engineer in establishing the time limit will include ground surface temperature, hot mix lay-down temperature, placement capacity, ultraviolet intensity, wind speed and air temperature. Longitudinal joints shall be matched by the end of each day's operations. Unmatched asphalt longitudinal joints left exposed at the end of the day, or exposed to moisture, also shall be painted with a continuous thin coating of hot asphalt cement to the full face.

All joints shall be constructed such that any excess material is not scattered on the surface of the freshly laid mat. Such excess material shall be carefully removed and disposed of as directed.

Transverse joints shall be checked with a straight edge immediately after initial rolling. Any irregularity in the pavement surface at the joint shall immediately be corrected by the addition of or removal of mixture. When possible, the transverse joints shall be initially rolled in a direction perpendicular to the direction of paving.

### **330.05.09.05.01 Keyed Joints**

When overlaying existing asphalt concrete pavement, keyed joints shall be constructed at both ends of the project, at all intersecting roads, ramps and at all bridge decks in the repaving area. Keyed joints will only be required between the final lift of pavement and the existing pavement, unless otherwise directed by the Engineer.

When existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a temporary (hot mix asphalt concrete ramp) taper at the joint area to a slope of at least 50 horizontal to 1 vertical (50H:1V). Temporary tapers (ramps) shall be installed immediately following milling of the keyed joint and prior to opening the area to traffic.

### **330.05.09.06 General Requirements for Compaction**

The pavement mixture shall be compacted to a density of 93% of the Maximum Theoretical Density of the comparative laboratory Marshall mixture based on the criteria given in Section 330.02.02.02 "Physical Requirements for Mixture". Steel drum rollers shall have vibratory capabilities acceptable to the project engineer. Static rolling will only be allowed on bridge decks or where shallow underground utilities are present. The decision to use static rolling will be the responsibility of the project engineer.

It is an express condition of this specification that all mixtures be compacted to the specified density immediately following placement. If, during the course of the paving operation, measured insitu field densities fall below the specified minimum, the Contractor shall revise his compaction process by (a) increasing the number of passes of the compaction train; (b) adjusting the frequency amplitude or tire pressure of individual rollers; or (c) by adding additional rollers to the compaction train. Steel drum rollers should operate with the drive wheel forward in the direction of paving. In all cases, the production and placing of the pavement mixture shall be controlled so that all rolling shall be completed before the pavement mat temperature falls below 80 degrees Celsius. The compaction process shall be completed before sunset.

### **330.05.09.06.01 Compacting Asphaltic Base, Levelling and Surface Courses**

Unless otherwise approved by the Engineer as per Section 330.05.09.06.02, the Contractor shall supply a minimum of two vibratory rollers and one pneumatic tired roller.

The initial compaction shall be obtained by the vibratory roller followed by the pneumatic tired roller. Rolling shall commence as soon after placing as the mixture will bear the roller without checking or undue displacement. Final rolling will be with a roller operating in static mode. Static rolling will be conducted only to remove any irregularities in the pavement surface.

The initial breakdown rolling by a steel wheel roller shall commence as soon after placing as the mixture will bear the roller without checking or undue displacement. Rolling shall start longitudinally at the lower edge and proceed towards the higher edge of the course, overlapping on successive passes. Alternate passes of the roller shall be staggered.

Intermediate rolling, using a pneumatic tire roller, shall follow the breakdown roller as closely as possible. Passes shall be so arranged as to ensure overlapping successive tire paths. The Contractor shall be responsible for ensuring that the tires are in proper condition at all times to prevent pick up of the mixture.

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Finishing rolling, using a steel wheel roller, shall be accomplished with the minimum number of passes required to produce a satisfactory surface. Rolling shall start longitudinally at the higher edge and proceed towards the lower edge.

While rolling longitudinal joints, steel drums or rubber tires shall extend 150 mm over the previously placed mat.

When paving in echelon the contractor shall provide sufficient rollers required to compact the asphalt pavement to the required degree of compaction. As a minimum there shall be four vibratory rollers and one pneumatic roller on site.

### **330.05.09.06.02 Compacting With Static Wheel Rollers**

In areas where a vibratory roller cannot operate (i.e. shallow utilities and bridge decks) compaction shall be obtained using suitable static steel wheel rollers but only under approval from the Engineer.

Where approved by the Engineer (as per above) to compact the mixture using static wheel rollers, a minimum of 2 steel wheel and 1 pneumatic tire rollers will be required to operate with each paver used.

The operating speed of static steel wheel rollers shall not exceed 5 km/h and shall be slow enough to avoid displacement of the mix.

### **330.05.09.06.03 Asphalt Density Measurement and Unit Price Adjustment**

The Contractor shall be responsible for the compaction stage of the work to ensure that the density conforms to requirements.

Compaction testing and unit price adjustments shall be based on daily production. Daily production is defined as the production and placement of 200 tonnes or more of asphalt concrete. If the daily production is less than 200 tonnes, the quantity for that day will be added to the next day or days in accordance with Table 1. If it is the last day of production for the project, the quantity for that day will be added to the previous day's production. If the total quantity of asphalt mix is less than 200 tonnes for the project, two cores will be used to determine asphalt core density.

Test coring must be completed prior to placement of the next lift of asphalt concrete. If the Contractor believes that certain areas to be tested should be excluded from unit price adjustments, then those areas should be identified and submitted to the Department in writing prior to the pre-paving meeting with the Department.

Pavement samples will be taken on the road by Department personnel at random sample locations. Cores shall be a nominal 100 mm diameter. Sample locations will be determined by the Engineer using random sample procedures, in which the daily production is divided into segments as shown in Table 1. A random sample is taken from each segment.

**Table 1  
Number of Segments per Daily Production**

<b>DAILY PRODUCTION OF ASPHALT CONCRETE</b>	<b>NUMBER OF SEGMENTS</b>
200 to 500 t	2
500 to 1000 t	3
1000 to 1500 t	4
More than 1500 t	5

Segments shall be of approximately equal length. In each segment, a test site will be located by using random numbers to determine the longitudinal distance from the end of the segment and the lateral distance from the edge of the segment. Cores shall not be taken within 0.15m of the pavement edge or longitudinal joint, nor closer than 6 m from transverse joint.

Areas not to be cored include; small areas such as tapers, bullnoses, aprons, bridge approaches, bridge decks,

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areas of handwork, and asphalt mix used for isolated levelling.

Cores shall be obtained in accordance with ASTM 5361 after a minimum of 12 hours from mix laydown. Typically cores will be sampled within 24 hours after mix laydown. However, the length of time to core the pavement may be extended as approved by the Engineer in order to exclude Saturdays, Sundays and holidays unless the Contractor is placing asphalt concrete on either day or to meet the minimum 200 tonne production requirement described above.

If the Contractor would like to have the cores removed immediately upon completion of his compaction process (and therefore avail of normal paving construction signage), the Contractor may supply dry ice at his expense for this purpose. With the application of approximately 1.5 kg of dry ice, coring can typically be completed within 20 minutes. Traffic control must be in place prior to and throughout the application of the dry ice, as this area must be protected from traffic.

During the coring operation, the Contractor must provide all traffic control in the form of flag persons and signs which conforms to Division 7 Temporary Condition Signs and Devices of the Department and Transportation and Works Specifications Book. Coring will not be permitted until all traffic control devices are erected and flag persons are in position.

Immediately following each coring operation, the Contractor shall reinstate the pavement at the core sample location in conjunction with removal of the core by dewatering the core hole and filling it with hot mixed asphalt concrete in 50 mm lifts to the pavement surface elevation, compacting each lift with 25 blows using a standard Marshall hammer. Each coring operation and the reinstatement of core hole is to be conducted during a single traffic control and flag person set up.

Failure to meet the time requirements for the core hole repair may result in delayed paving of any subsequent asphalt production.

Mat densities will be tested by the Engineer by core analysis throughout the course of the work and shall conform to the density requirements indicated in Table 2. The asphalt cores will be retained and stored safely by the Engineer.

The percent compaction will be determined by comparing the core bulk densities, in accordance with ASTM D2726 with the average theoretical maximum density of the loose mix samples corresponding with the daily production of these cores, in accordance with ASTM D2041.

The Engineer will provide the Contractor with a copy of the results of acceptance tests within one working day of their availability. For asphaltic base and leveling courses unit price adjustments will be applied utilizing Table 2 to each tonne of asphalt mix for the day (or days if daily production is less than 200 tonne) represented by the segments cored and the percent compaction averaged. For asphaltic surface courses unit price adjustments will be applied utilizing Table 2 for each individual core's percent of maximum theoretical, and the unit price adjustment will be applied to each tonne of asphalt mix for the day divided by the daily segments cored (or days if daily production is less than 200 tonne).

For each asphaltic base, leveling and surface course mixture type for the day, in addition to the requirements noted above, if an individual core's percent of maximum theoretical falls below 92.5 % or above 97.5 % no bonuses will be paid for the paving day for that mixture. Also, irrespective of the paving day, the average of any four consecutive samples of a mixture type (base, leveling or surface) shall have a reject limit of 91.0 % based on the four individual core's percent of maximum theoretical. The rejected material represented by the averaged four cores will be the sum of the four units of material represented by each core defined as the tonnes of the asphalt mixture type for the day divided by the daily segments cored (or days if daily production is less than 200 tonne). Units of rejected material will not be rejected twice or more.

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**Table 2  
Unit Price Adjustment for Density**

<b>% OF MAXIMUM THEORETICAL DENSITY</b>	<b>UNIT PRICE ADJUSTMENT (\$ PER TONNE)</b>	<b>% OF MAXIMUM THEORETICAL DENSITY</b>	<b>UNIT PRICE ADJUSTMENT (\$ PER TONNE)</b>	<b>% OF MAXIMUM THEORETICAL DENSITY</b>	<b>UNIT PRICE ADJUSTMENT (\$ PER TONNE)</b>
>98.5	REJECT	93.2	+ 0.20	91.2	- 3.20
98.5	-5.00	93.1	+ 0.10	91.1	- 3.60
98.4	-4.00	93.0	0.00	91.0	- 4.00
98.3	-3.00	92.9	- 0.10	90.9	- 4.40
98.2	-2.00	92.8	- 0.20	90.8	- 4.80
98.1	-1.00	92.7	- 0.30	90.7	- 5.20
98.0	-0.50	92.6	- 0.40	90.6	- 5.60
97.9	-0.40	92.5	- 0.50	90.5	- 6.00
97.8	-0.30	92.4	- 0.60	90.4	-7.00
97.7	-0.20	92.3	- 0.70	90.3	-8.00
97.6	-0.10	92.2	- 0.80	90.2	-9.00
97.5	0.00	92.1	- 0.90	90.1	-10.00
97.4	+0.10	92.0	- 1.00	90.0	-11.00
97.3	+0.20	91.9	- 1.20	89.9	-12.00
97.2	+0.30	91.8	- 1.40	89.8	-13.00
97.1	+0.40	91.7	- 1.60	89.7	-14.00
≤97.0 thru	+0.50	91.6	- 1.80	89.6	-15.00
to ≥93.5	+ 0.50	91.5	- 2.00	89.5	-16.00
93.4	+ 0.40	91.4	- 2.40	<89.5	REJECT
93.3	+ 0.30	91.3	- 2.80		

### **330.05.09.07 Requirement for Asphaltic Leveling Course**

Asphaltic Leveling Course shall be used to fill surface depressions on old pavement, to restore the surface to the original profile and cross section. Patching and leveling shall not be carried out simultaneously at the same place. The patch shall be placed and fully compacted before leveling operations may proceed over the patch.

### **330.05.09.08 Requirements for Completed Asphaltic Base and Surface Courses**

Each course, after final compaction shall be smooth, true to the established crown and grade, shall have the average thickness specified, and shall at no point vary more than 6 mm from the specified thickness. The surfaces of each base course, and any surface not subjected to smoothness testing under Section 330.07.10, shall be free from deviations exceeding 3 mm as measured with a 3 m straight edge paralleling the centerline of the roadway.

Any low or defective locations shall immediately be remedied by removal of the defective area by cutting and replacing it with fresh hot asphalt. The area should be tacked and allowed to cure prior to the placement of any new asphalt. The new asphalt shall immediately be compacted to conform to the surrounding area and be thoroughly bonded to it.

### **330.05.09.09 Segregation and Other Surface Defects**

The finished surface of any Pavement Course shall have a uniform texture and be free of visible signs of poor workmanship.

Any obvious defects, as determined by the Engineer, will be cause for rejection of the pavement course. Such defects shall include but not necessarily be limited to the following:

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1. SEGREGATED AREAS
2. AREAS OF EXCESS OR INSUFFICIENT ASPHALT CEMENT
3. ROLLER MARKS
4. CRACKING OR TEARING
5. IMPROPER MATCHING OF LONGITUDINAL AND TRANSVERSE JOINTS

6. TIRE MARKS
7. IMPROPERLY CONSTRUCTED PATCHES
8. IMPROPER CROSS SLOPE
9. FUEL SPILLS ON THE MAT.

Segregation is defined here as areas with predominantly coarser texture than that of the surrounding pavement, and will normally be first identified visually.

### **Slight Segregation:**

Area where the matrix is in place between the stones but there is slightly more stone in comparison with the surrounding acceptable mix. Slight segregation will normally be left in place without price adjustment. The severity of segregation can be determined through a number of test methods, as specified by the Engineer.

### **Medium Segregation:**

Area has significantly more stone than the surrounding acceptable mat and usually exhibits some lack of surface matrix. Medium segregation in surface-courses will be subject to a penalty of \$25/m<sup>2</sup> for the area in question, but for base-courses will normally be left in place with no price reduction. However, any areas of medium segregation that deteriorate prior to being overlaid by another pavement course must be repaired at the Contractor's cost.

### **Severe segregation:**

Area appears very stony, with stone against stone and little or no matrix. All areas of severe segregation in any pavement course will require removal and repair across the full lane width.

Defects as determined by the Engineer, which occur in the finished surface of any pavement course during the two year warranty period resulting from poor workmanship, shall be repaired by the Contractor. The Contractor's method of repair shall be approved by the Engineer and performed according to specifications.

## **330.05.10 Pavement Smoothness**

### **330.05.10.01 Pavement Smoothness Measurement**

The smoothness of the finished surface of the top lift of the pavement structure shall be determined after final rolling of the surface to be tested. Normally, the outer wheel paths of all lanes will be tested, in 100 m sections, or lots. Other wheel paths may also be tested in addition to, or as a substitution for, the outer wheel path, as directed by the Engineer.

The profile measurement will normally be taken using a Class 1 inertial laser profiler, which will measure the profile in accordance with the manufacturer's recommendations and ASTM E950 – Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference. The resulting measurements will be compiled to produce a Profile Index (PI). This determination of smoothness will be made by the Department, or its representative.

The Profile Index (PI) for each lane is the cumulative profile reading of the outer wheel path in millimeters per 100 m section, in excess of the 5 mm blanking band.

### **330.05.10.02 Profile Index Limits**

The surface of the profiled pavement shall conform to the following Smoothness requirements:

**Table 5 – Smoothness Requirements**

<b>Roadway Alignment Section</b>	<b>Profile Index (mm / 100 m)</b>
RLU-80 CLASSIFICATION AND ABOVE	15 mm OR LESS
INTERCHANGE RAMPS, TAPERS*, AND HIGHWAYS OF LOWER CLASSIFICATION THAN RLU-80	N/A

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If the Smoothness requirements are not met, the Contractor shall repair the sections, or pay a price adjustment based on the Profile Index. These price adjustments will be applied based on the square meters of the final pavement surface as outlined in Table 6. For price adjustment purposes, the width of the final pavement surface includes the driving lane and adjacent shoulders.

**Table 6  
Profile Index Price Adjustment Schedule**

PROFILE INDEX PI (mm / 100m)	PRICE ADJUSTMENT \$ PER SQUARE METER	PROFILE INDEX PI (mm / 100m)	PRICE ADJUSTMENT \$ PER SQUARE METER
< 4.0	\$0.338	18.1 to 21.0	-\$0.540
4.1 to 5.5 incl.	\$0.270	21.1 to 22.5	-\$0.810
5.6 to 7.0	\$0.203	22.6 to 24.0	-\$1.080
7.1 to 8.5	\$0.135	24.1 to 25.5	-\$1.350
8.6 to 10.0	\$0.068	25.6 to 27.0	-\$1.620
10.1 to 15.0	\$0.00	27.1 to 28.5	-\$1.890
15.1 to 18.0	-\$0.270	28.6 to 30.0	-\$2.160
EACH ADDITIONAL 1.5mm INCREMENT ABOVE 30.0		-(NO OF INCREMENTS X \$0.54 +\$2.160)	

### 330.05.10.03 Surface Deviations (Individual Bumps and Dips)

Individual bumps and dips shall not exceed 8 mm in 7.6 m in the vertical direction. Where individual bumps and dips exceed 8 mm in 7.6 m, they may be corrected or the Contractor may elect to accept a penalty as per Table 7. The 5 mm blanking band is not applied to the bump and dip measurements. Notwithstanding, transverse joints are still subject to Section 330.05.09.05 and any irregularity should be immediately corrected.

**Table 7  
Bump and Dip Penalties**

Bumps / Dips Measured in the Vertical Direction	Penalty	Bumps / Dips Measured in the Vertical Direction	Penalty
8.1 - 9 mm	\$ 200	13.1 - 14 mm	\$1200
9.1 - 10 mm	\$ 400	14.1 - 15 mm	\$1400
10.1 - 11 mm	\$ 600	15.1 - 16 mm	\$1600
11.1 - 12 mm	\$ 800	16.1 - 17 mm	\$1800
12.1 - 13 mm	\$1000	17.1 - 18 mm	\$2000
Each Additional 1 mm Increment Above 18 mm		(No. of Increments x \$500) + \$2000	

### 330.05.10.04 Testing

**Testing and Evaluation:** Testing will be performed as soon as possible after final rolling of the surface.

Profile measurements will terminate 15 metres from the end of each bridge deck, or from a joint between existing pavement and the new pavement. Profiles will be taken at approximately the outer wheel path for every lane of traffic, or as designated by the Engineer. Repeat profiles may be taken only to define the limits of an out-of-tolerance surface variation. Some sections may be omitted from testing, as determined by the Engineer. Tapers will be excluded from testing unless otherwise directed by the Engineer.

The Contractor shall give the Department at least 5 days notice prior to laying the final course of asphalt. A pre-paving meeting shall be convened on-site between the Contractor, the Engineer, and the Manager of Materials (or their representatives) to discuss any concerns either party might have regarding placement of the final course of asphalt. If



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the Contractor believes certain areas to be tested should be excluded from price adjustments, then those concerns should be submitted in writing for discussion at that meeting. Failure to submit those concerns in writing shall mean all areas shall be subject to price adjustments.

**Re-testing to Verify Original Testing Results:** Should the Contractor request retesting of pavement sections due to an excessive PI or excessive bump and dip heights, and the Department approves the re-test, then the Contractor shall bear all costs associated with testing if the original results are confirmed. If the retest results determine an improved PI or improved bump and dip heights over the original test, then testing costs shall be borne equally by the Contractor and the Department, and the average of the two results will be accepted as final. Only one retest, using the same profiler is permitted.

### 330.05.10.05 Remedial Action

Where the Profile Index (PI) and / or the bump and dip heights are greater than the limits specified, then the Contractor may elect to correct the smoothness of the deficient sections by i) rolling, ii) cold milling and replacing, iii) overlaying, or iv) removing and replacing.

**Remedial Action Plan:** Prior to initiating any remedial work, the Contractor shall submit to the Engineer for approval a detailed plan outlining the methods to be used to improve the smoothness. All remedial actions shall be done at the Contractor's expense, and shall comply with the following requirements:

**Rolling:** Additional rolling will only be permitted while asphalt is still workable, i.e., during the same day's paving operations, and at the sole direction of the Engineer. Additional rolling may be used only to correct deviations in transverse joints or excessive bump and dip deviations. Rolling shall not be used solely to reduce the overall PI of a section - rolling is to be used only for correction of individual bumps and dips, not 100 m sections or lots. Rolling must not cause any damage, such as but not limited to, crushing, cracking, or displacing the asphalt concrete. Should the rolling cause damage, the Contractor shall remove and replace the damaged area, at his expense.

**Cold Milling and Replacing:** Any section to be repaired by cold milling and replacing shall be milled the full lane width and a minimum length of 20 meters, to the full thickness of the lift of asphalt to be replaced.

All replacement asphalt concrete shall be of the same material and mix design as originally used on the section undergoing repairs.

Materials removed by cold milling shall become the property of the Contractor.

**Overlaying:** When an additional lift of asphalt concrete is used to improve smoothness, it shall extend the full width of the pavement surface and have a finished compacted thickness sufficient to produce compliance with smoothness limits, and produce a uniform final surface closely matching the existing asphalt pavement. Butt joints will be required at each end of the overlay.

All asphalt concrete used for overlay shall be of the same material and mix design as originally used on the section undergoing repairs.

**Removing and Replacing:** Where the remedial action involves removal and replacement, the lift shall be removed to its full thickness and lane width. All asphalt removed shall become the property of the Contractor.

Asphalt concrete shall be replaced to its original thickness and shall be of the same material and mix design as used originally in the section to be replaced.

**Retesting Following Remedial Action:** Where Remedial Action is conducted, then the Contractor shall bear all costs associated with the verification of smoothness of the remedial work. The test results of the remedial work shall be accepted as final and replace the initial test results for price adjustment purposes.

**Time Limits for Remedial Action:** All remedial work should be completed within 30 days of receipt by the Contractor of testing results, but in no case later than September 30.

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### 330.05.11 ASPHALTIC PATCHING

Asphaltic patching involves patching pot holes in bituminous pavement, patching cuts for culverts or patching transverse cracks with hot mix asphaltic concrete.

Holes to be patched shall have loose material removed and be cleaned of dirt and gravel.

Tack coat shall be applied to all edges to be repaired. Surfaces shall be thoroughly dry before tack coat is applied.

Asphaltic concrete for use in patching shall conform to the requirements of Asphaltic Surface Course or Asphaltic Leveling Course Type I.

Asphaltic concrete shall be placed and leveled in the hole in one lift, so that when compacted, the repaired hole is level with the surrounding surface. The patches shall be compacted in accordance with the requirements of 330.05.09.06 "General Requirements for Compaction".

### 330.05.12 MEASUREMENT FOR PAYMENT

#### 330.05.12.01 Measurement for Payment for Asphaltic Surface, Asphaltic Base Course, Asphaltic Leveling Courses Type I and Type II

Measurement for payment will only be made for those materials accepted for use under this specification and then only when incorporated into the work at the required locations.

Measurement for payment for the particular type of asphaltic course shall be by the weight of that material in tonnes, rounded to one decimal place.

Payment Adjustment Factors, if applicable, shall be as described throughout this specification. The material shall be weighed by means of the truck scales. The Department will supply scale tickets and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker, as being placed in the works at the required locations, shall be included in measurement for payment.

#### 330.05.12.02 Measurement for Payment for Asphaltic Patching

Measurement for payment will only be made for those materials accepted for use under this specification and then only when incorporated into the work at the required locations.

Measurement for payment shall be by the square meter of that material placed, rounded to the whole number.

#### 330.05.12.03 Measurement for Payment for Asphalt Cement

The asphalt cement will be measured in tonnes, rounded to two decimal places. Payment for Asphalt Cement shall be as per the percentage (%) of asphalt cement required in the Design Mix Formula approved by the Materials Engineering Division. However, where Asphalt Cement contents are found to be deficient to the point of being in the penalty zones subsequently described, Asphalt Cement will be paid on actual content only, as determined by ASTM D6307 Method A -Standard Test Method for Asphalt Content of Hot-Mix Asphalt by the Ignition Method. Any moisture content in the hot mix asphalt will be determined and deducted. The method of determination of this moisture content will be in accordance with AASHTO 329 Standard Method of Test for Moisture Content of Hot Mix Asphalt by Oven Method.

Samples of hot mix asphalt shall be taken randomly, throughout each day of production, and tested to ensure conformance with the specifications stated herein. Sampling and testing shall be performed in accordance with ASTM D979 and ASTM D6307, Method A. Additional samples may also be taken and tested in accordance with ASTM D2172, for verification purposes.

In the event of any and all disputes over asphalt content, the asphalt contents as determined by the Engineer, in accordance with the above stated method, shall govern in all cases.

#### Acceptance Criteria

The following acceptance criteria shall apply for all mixes:

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**Table 8  
Asphalt Content Acceptance Criteria**

<b>TYPE OF TEST</b>	<b>ACCEPTABLE ZONE (%)</b>	<b>PENALTY ZONE (%)</b>	<b>REJECTABLE ZONE (%)</b>
INDIVIDUAL SAMPLE	± 0.25	-0.26 TO - 0.50 +0.26 TO +0.50	<-0.50 OR >+0.50

**Payment Adjustment Factor**

If the test results representing the individual sample for asphalt cement content falls into the above-stated “Penalty Zone”, the payments for both Asphalt Cement and Hot Mix Asphalt shall be adjusted by deducting a percentage from the unit prices per Table 9 for the Individual Sample. These adjustments shall apply to the areas of pavement represented by these samples.

If the test results representing the individual sample fall into the above-stated “Rejectable Zone”, then no payment will be made for either the asphalt cement or hot mix asphalt represented by those samples.

The design mix formula may be revised, as required, by the Department throughout the project. If a change in the mix design occurs during the day, then two or more averages will be computed, before and after the change was made.

**Table 9  
AC Content Penalty (Individual Sample)**

<b>Penalty Zone AC Content Déviation %</b>	<b>Unit Price Payment Adjustment Factor %</b>	<b>Penalty Zone AC Content Deviation %</b>	<b>Unit Price Payment Adjustment Factor %</b>	<b>Penalty Zone AC Content Deviation %</b>	<b>Unit Price Payment Adjustment Factor %</b>
0.26	0.5	0.35	5	0.44	14
0.27	1	0.36	6	0.45	15
0.28	1.5	0.37	7	0.46	16
0.29	2	0.38	8	0.47	17
0.30	2.5	0.39	9	0.48	18
0.31	3	0.40	10	0.49	19
0.32	3.5	0.41	11	0.50	20
0.33	4	0.42	12	> 0.50	Reject
0.34	4.5	0.43	13	--	--

**330.05.12.04 Measurement for Payment for Blending Sand**

The blending sand will be measured in tonnes, rounded to the nearest whole number.

Measurement for blending sand shall be determined on the basis of the computed quantity calculated from the percentage of blending sand specified in the mix design and the total tonnage of asphalt mix of that design used by the Department.

**330.05.12.05 Measurement for Payment for the Cutting and Removal of Asphaltic Pavement**

The cutting and removal of pavement in connection with the preparation of joints, as required in Section 330.05.09.05, shall be measured for payment in accordance with Section 510 "Cutting Asphaltic Pavement", and Section 520 "Storage or Disposal of Old Asphaltic Pavement", except where the preparation of joints is required as the result of a break in the paving operations, in which case no measurement for payment will be made for either cutting asphaltic pavement or storage or disposal of old asphaltic pavement.

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### 330.05.13 BASIS OF PAYMENT

#### 330.05.13.01 Basis of Payment for Asphaltic Surface Course, Asphaltic Base Course and Asphaltic Leveling Courses Type I and Type II

Payment at the contract price for asphaltic base course, asphaltic surface course, asphaltic leveling course Type I or asphaltic leveling course, Type II as appropriate, shall be full compensation for:

1. THE SUPPLY OF ALL MATERIALS WITH THE EXCEPTION OF ASPHALT CEMENT AND BLENDING SAND. THE ASPHALT CEMENT AND THE BLENDING SAND SHALL BE PAID FOR SEPARATELY UNDER OTHER CONTRACT ITEMS.
2. THE USE OF THE REQUIRED EQUIPMENT, INCLUDING A PAVER WITH A SKI FOR BASE AND SURFACE COURSE APPLICATION ON THE T.C.H. ON OTHER PROJECTS, WHERE THE CONTRACT ITEM DESCRIPTION, IN THE UNIT PRICE TABLE, INCLUDES THE PHRASE "SPREADER WITH SKI" THEN A SKI ATTACHED TO THE LEAD SPREADER WILL BE INCLUDED AS WELL.
3. THE HANDLING, STORING, CRUSHING, HAULING, STOCKPILING, AND PREPARATION OF ALL MATERIALS WITH THE EXCEPTION OF BLENDING SAND AND ASPHALTIC CEMENT.
4. THE PREPARATION OF ALL JOINTS WITH HOT ASPHALT CEMENT, TOGETHER WITH THE CUTTING AND REMOVAL OF PAVEMENT WHERE A JOINT IS REQUIRED AS THE RESULT OF A BREAK IN THE PAVING OPERATIONS.
5. THE MIXING, PLACING AND COMPACTING OF THE ASPHALTIC MIXTURE, TOGETHER WITH ALL HAULAGE OF THE MIXTURE TO PLACES WITHIN THE CONTRACT.
6. ALL OTHER COSTS ARISING FROM THE REQUIREMENTS OF THE SECTION FOR WHICH PAYMENT IS NOT OTHERWISE SPECIFICALLY PROVIDED, INCLUDING ALL KEYED JOINTS AND THE PAVING REQUIRED FOR TIEINS AT INTERSECTIONS, RAMPS AND DRIVEWAYS.

#### 330.05.13.02 Basis of Payment for Asphaltic Patching

Payment at the contract price for Asphaltic Patching shall be full compensation for:

1. THE SUPPLY OF ALL MATERIALS INCLUDING ASPHALT CEMENT AND BLENDING SAND.
2. THE USE OF THE REQUIRED EQUIPMENT.
3. THE HANDLING, STORING, CRUSHING, HAULING, STOCKPILING AND PREPARATION OF ALL MATERIALS.
4. THE CLEARING OF ALL HOLES TO BE PATCHED, TOGETHER WITH THE REMOVAL OF LOOSE MATERIAL FROM THE HOLES.
5. THE SUPPLY AND APPLICATION OF TACK COAT TO THE EDGES OF THE HOLES.
6. THE MIXING OF THE ASPHALTIC MIXTURE, AND PLACING AND COMPACTING OF THE ASPHALTIC MIXTURE IN THE HOLES.
7. ALL OTHER COSTS ARISING FROM THE REQUIREMENTS OF THE SECTION FOR WHICH PAYMENT IS NOT OTHERWISE SPECIFICALLY PROVIDED.

#### 330.05.13.03 Basis of Payment for Asphalt Cement

Payment at the contract price for Asphalt Cement shall be compensation in full for all labor, materials, and equipment to supply the Asphalt Cement cost shall include purchase, loading, transportation, unloading and storage at the asphalt plant.

#### 330.05.13.04 Basis of Payment for Blending Sand

Payment at the contract price for Blending Sand shall be compensation in full for all labor, materials, equipment-use and all other expenses to: provide a pit, obtain all required permits and approvals, provide and transport samples to the Department's Soils Lab in St. John's, excavate, load and provide all haulage from the source to the asphalt plant, stockpile the sand at the asphalt plant, pay any royalties for the material, clean up and restore the pit as may be required.

#### 330.05.13.05 Basis of Payment for the Cutting and Removal of Asphaltic Pavement

Where cutting and removal of pavement is carried out in order to prepare a joint resulting from a break in the paving operations, then no payment will be made for the cutting and removal of the pavement since such work is considered part of the basis of payment for asphaltic base and surface courses.

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However, where other asphaltic pavement is cut and removed then payment will be in accordance with Section 510 "Cutting Asphaltic Pavement" and Section 520 "Storage or Disposal of Old Asphaltic Pavement."

### **330.05.13.06 Basis of Payment for Asphaltic Mix for Department's Maintenance Division**

The Department's Maintenance Division may, on occasion have need for asphalt in the areas of a project. The Contractor will allow Department trucks along with his own trucks to pick up asphalt from the plant as required. Payment will be made to the Contractor by the tonne weighed over the scales and invoiced to the Department based on the tendered unit price in the Contract except in cases where the Contractor has a Standing Offer Agreement with the Department for supply of asphalt and the Unit Price in the Standing Offer Agreement is less than the Unit Price Table in the highway contract, then the Unit Price in the Standing Offer Agreement will apply.

### **330.05.13.07 Basis of Payment for Rejected Mix**

The Department will pay for only the original mix quantity. The Contractor is fully responsible to bear all costs associated with repair of rejected areas, including all materials, equipment, plant, labour, traffic control and incidentals necessary to complete the work to the satisfaction of Engineer.

If the Department determines the rejected material may remain in the work, and the Contractor elects not to repair the affected area, payment for the rejected mix components will be at 50% of the various contract unit prices.

## **330.06 END PRODUCT SPECIFICATION (EPS) FOR ASPHALT CONCRETE MIX – HOT PLACED**

### **330.06.01 General**

This item consists of supplying crushed aggregates, blending materials, anti-stripping agent, asphalt binder, and the production, loading, hauling, placing and compaction of hot mix asphalt concrete. The limits of placement, application rates and the asphalt concrete mixture type shall be as stated in the contract specifications. Areas constructed will be subjected to various quality assurance testing.

It shall be the Contractor's responsibility to provide an acceptable product as specified. In order to achieve this, the Contractor shall implement and maintain a quality control system that will provide assurance that all components, as well as end result products, submitted to the Department for acceptance, conform to the contract requirements. This is without regard to whether the products are manufactured by the Contractor or purchased from suppliers or subcontractors. The Contractor's Quality Control System proposed for each project shall be provided to the Department in the form of a written Quality Control plan.

Quality assurance tests shall be performed, by the Department, on random samples taken either at the production site or lay down site.

### **330.06.02 Definitions**

#### **330.06.02.01 End Product Specification (EPS)**

An end product specification is a specification under which the Contractor has control of the processes that produce the items of construction. The Department accepts or rejects the end product according to identified bonus / penalty items. The Contractor is entirely responsible for quality control. End product acceptance is the responsibility of the Department based on a program of quality assurance testing.

#### **330.06.02.02 Design Mix Formula (DMF)**

The DMF is defined as the laboratory determination of the precise proportions of asphalt binder, additives and aggregates to be blended together to meet the specified properties for a given asphalt concrete mix.

#### **330.06.02.03 Job Mix Formula (JMF)**

The JMF is the resultant establishment of the single definite percentage for each sieve fraction of aggregate and asphalt binder content that will produce the desired asphalt concrete mix properties under field conditions.

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### **330.06.02.04 Actual Asphalt Binder Content**

This is the percentage of asphalt binder in the asphalt concrete mixture, determined from quality assurance testing in accordance with ASTM D6307.

### **330.06.02.05 Lot**

For each mixture type specified, a Lot is defined as the quantity of asphalt concrete plant production, to a total of 1600 tonnes, where approved changes to the Job Mix Formula have not occurred. For loose samples, each Lot shall be divided into 4 (four) approximately equal segments and one loose sample is randomly selected from each segment. For core samples, each Lot shall be divided into 4 (four) approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

If it is the last time the mix is produced and this criterion cannot be met (i.e. less than 1600 tonnes of mix remain), the following shall apply:

- If the remaining plant production is 400 tonnes or less, the production will be added to the previous Lot. The adjusted Lot shall be divided into 5 (five) approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 (four) approximately equal segments and three adjacent core samples are taken from each segment at a single random location.
- If the remaining plant production is between 400 and 800 tonnes, the production will be added to the previous Lot. The adjusted Lot shall be divided into 6 (six) approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 (four) approximately equal segments and three adjacent core samples are taken from each segment at a single random location.
- If the remaining plant production is greater than 800 tonnes, but less than 1600 tonnes, the production will be designated as a separate Lot. The separate Lot shall be divided into 4 (four) approximately equal segments and one loose sample is randomly selected from each segment. For core samples, the adjusted Lot shall be divided into 4 (four) approximately equal segments and three adjacent core samples are taken from each segment at a single random location.

In all cases above, the lot size shall be equally segmented and random samples selected from each segment.

A separate Lot will be established at the discretion of the Engineer if conditions of construction indicate that it is likely that a portion of the Lot production is significantly different from the remainder of the Lot production.

### **330.06.02.06 Stratified Random Sample**

A stratified random sample is defined as a representative sample taken in an unbiased manner, by dividing a Lot into approximately equal segments. A random sample is taken from each area or segment.

### **330.06.02.07 Sample Mean**

This is the arithmetic mean of the group of test results derived from the randomly selected samples.

### **330.06.02.08 Mean of the Deviations**

This is the sum of the absolute values of the deviations divided by the number of tests in the Lot.

### **330.06.02.09 Thickness**

Thickness is defined as the specified application rate indicated in the contract documents divided by the average bulk relative density obtained from the core samples for a given Lot. Price adjustments for thickness will be applied to new construction only.

### **330.06.02.10 Mix Property**

Mix properties measured for product acceptance and price adjustments are as follows:

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Gradation: Passing 4.75 mm and 75  $\mu$ m sieves, Asphalt Binder Content, Binder Grade, Marshall Air Voids, Thickness, Application Rate, Density and Smoothness.

### **330.06.02.11 Referee Sample**

A referee sample is defined as the portion of the loose or core sample that is set aside by the Department representative's laboratory in the case of an appeal of binder content, gradation, and/or density by the Contractor.

### **330.06.03 Materials**

#### **330.06.03.01 General**

All materials required to produce the asphalt concrete will be supplied by the contractor. Details regarding the property requirements for the asphalt cement, course aggregate, fine aggregate, blending sand, anti-stripping admixtures are presented in section 330.02.

#### **330.06.04 Mix Design Requirements**

##### **330.06.04.01 Establishing a Design Mix Formula (DMF)**

Preparation and submission of the asphalt DMF for the Department's approval is the responsibility of the Contractor. The Contractor shall use professional engineering services and a qualified testing laboratory, to assess the aggregate materials, asphalt binders, blending sands, mineral fillers and anti-stripping agents proposed for use and to carry out the design of the asphalt concrete mix.

##### **330.06.04.02 Requirements for Design Mix Formula**

The asphalt mix design shall follow the Marshall method of the DMF as outlined in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2). The mix design, at the design asphalt binder content, shall meet the requirements presented in section 330.02 for each asphalt concrete mix specified. The Design Air Voids shall be chosen as the lowest value, within the range of 3.5 to 4.0% inclusive, such that all other mix design criteria are met.

##### **330.06.04.03 Submission of Design Mix Formula**

The Contractor's submission shall include the following information/materials:

- The specific gravity and the percentage by mass of each aggregate (including natural sand, lime) to be used in the mix.
- The mix design gradation of the combined aggregate (including natural sand, lime).
- Physical properties of the aggregates specified, in accordance with Section 330.02.
- All Marshall mix design characteristics, including graphs used in arriving at the final mix design, the bulk relative density of the combined aggregates, and the asphalt absorption of the combined aggregates.
- Pit identification consisting of its name, name of owner, public highway from which it is accessed.

##### **330.06.04.04 Evaluation of Design Mix Formula**

The Engineer will require up to ten (10) working days from the time of receipt of the DMF, for evaluation by the Department and/or the Department's representative's laboratory. The Engineer will advise the Contractor of the acceptability. If the DMF does not meet the requirements of Section 330.02, it shall be rejected. The Engineer shall provide a written explanation to the Contractor that details why the DMF failed. The Contractor shall then provide another complete DMF in accordance with 330.06.04.02 Requirements for Design Mix Formula, and re-submit it to the Engineer for evaluation. Each time a DMF is re-submitted, an additional five (5) working days, from the time of receipt of the revised DMF, shall be required for evaluation by the Department and/or the Department's representative's laboratory.

The Engineer will not accept any asphalt concrete mix produced prior to the Contractor receiving written approval of the DMF from the Engineer.

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### **330.06.04.05 Establishing a Job Mix Formula (JMF)**

The Contractor shall establish a JMF for each mix type by placing a specified quantity of trial mix (asphalt concrete) at a location designated by the Engineer. The maximum allotted quantity of asphalt concrete allowed for establishment of the JMF is as follows:

- Base Course: 600 tonnes
- Surface Course: 300 tonnes
- Alternatively, the Contractor may elect to waive their trial mix option and submit their JMF (and supporting documentation) directly to the Engineer for approval.

At the discretion of the Engineer, the Contractor may be permitted to carry over any unused portion of the base course allotment to supplement the surface course allotment.

The asphalt concrete placed in the trial sections will be tested with a minimum of 3 QC tests to determine if it meets the requirements of Section 330.02, however, unit price adjustments and repair/replace/reject criteria will be applied to the Thickness and Density properties. The asphalt concrete shall be assessed for surface defects in accordance with 330.06.07 Surface Defects.

### **330.06.04.06 Approval of Job Mix Formula**

The Contractor shall submit the JMF in writing to the Engineer for approval. The Contractor's submission shall include the following information:

- The percentage by mass of each aggregate (including natural sand, lime) to be used in the mix
- The JMF target asphalt binder content and gradation
- The % Air Voids, Voids in Mineral Aggregate (VMA) and Voids Filled with Asphalt (VFA) from the trial mix.

The Engineer's written approval of the JMF will allow the Contractor to start/continue production. Rejection of the JMF shall require the appropriate action based on the Engineer's assessment.

### **330.06.04.07 Field Adjustments to the Job Mix Formula.**

A field adjustment to the JMF is defined as a change in the target gradation, asphalt binder content and/or proportioning of various aggregate sizes, within specified limits (when compared to the original JMF) as follows, without a redesign of the mix.

- $\pm 0.2\%$  in asphalt content
- $\pm 5.0\%$  in RAP proportion
- $\pm 5.0\%$  passing the 19.0 mm sieve
- $\pm 4.0\%$  passing the 12.7 and 9.5 mm sieves
- $\pm 3.0\%$  passing the 4.75 and 2.00 mm sieves
- $\pm 2.0\%$  passing the 0.425 and 0.150 mm sieves
- $\pm 1.0\%$  passing the 0.075 mm sieve

The Contractor shall request JMF changes in writing, including supporting test results (a minimum of 3 sets of QC results as per 330.06.04.05 Establishing a Job Mix Formula). Upon approval by the Engineer in writing, revisions to the JMF will be applied to subsequent Lots only. In no case will changes to the JMF be accepted during production of a Lot. The Department will limit the number of field adjustments to the originally approved JMF to two.

The Contractor shall submit a revised DMF in accordance with 330.06.04.02 Requirements for Design Mix Formula, for the following changes:

- A change in the source of asphalt cement used in the asphalt concrete mix.
- A change in the source of the aggregate used in the asphalt concrete mix.
- A change in material (different aggregate sizes) from the same source.
- A change in the percentage of the aggregate components from that established in the JMF.
- A change in the asphalt cement content from that established in the JMF
- A change in the source of the anti-strip additive used in the asphalt concrete mix.



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### 330.06.05 Construction Methods

#### 330.06.05.01 General

Equipment shall be designed and operated to produce an end product complying with the requirements of this specification. Equipment used shall be of adequate rated capacity and shall be in good working order.

#### 330.06.05.02 Production

The asphalt mixing plant and its components shall meet the requirements of ASTM D 995 Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

Asphalt concrete exceeding a temperature of 165<sup>0</sup>C at any point of the operation shall be cause for rejection.

#### 330.06.05.03 Transportation

Vehicles shall be equipped with tarpaulins of water repellent material (no open mesh types) of sufficient size to completely cover the truck box and overhang the box on all sides by a minimum of 150 mm. The tarpaulins shall have enough tie-down points so that they can be properly secured, and shall be in good condition and be free of holes and tears. They shall be securely tied down as an effective barrier against rain infiltration and air flow over the HMA mixture.

Tarpaulins are to be used at all times for protection of the load of Hot Mix Asphalt. Tarpaulins shall be rolled back to uncover the hot mix for inspection immediately prior to dumping the load into the paver. Trucks will stop ahead of the paver and allow the paver to smoothly pick up the truck.

Asphalt concrete shall be transported from the paving plant to the work site in trucks that are properly equipped and in good working order.

The use of hydrocarbon fuels or solvents to lubricate the truck bodies or to clean tools or equipment, will not be permitted. A biodegradable release agent shall be supplied by the Contractor to clean or lubricate tools, equipment and truck bodies.

#### 330.06.05.04 Placement

The Contractor shall not place asphalt concrete during rain, or when the surface is frozen, nor when the pavement surface shows signs of free-standing water or when the air temperature at surface is below 7<sup>0</sup>C. A Material Transfer Device/Vehicle shall be used at no extra cost to transfer the asphalt mixture from the transport vehicles to the asphalt spreader.

Asphalt concrete shall be placed upon a prepared surface which is free of any loose or foreign material. The asphalt concrete shall be spread by a mechanical self-powered paver capable of achieving the specified grade, line and crown.

Placement of asphalt concrete shall only be conducted during daylight hours, unless specifically noted otherwise in the contract specifications.

Contact edges of existing mats and contact faces of curbs, gutters, manholes, sidewalks bridge structures, as well as any new mat joint having a temperature less than 60<sup>0</sup>C shall be coated with a thin film of hot liquid asphalt before placing the asphalt concrete all other joint edges shall be coated with asphalt tack coat.

Failed areas in existing surfaces (paved or gravel) shall be repaired, as directed by the Engineer. Areas requiring repair will be identified by the Engineer in consultation with the Contractor. Irregularities in the horizontal alignment and grade along the outside edge of the asphalt concrete shall be corrected by the addition or removal of mix before the edge is rolled. Paving of intersections, extra widths and other variations from standard lane alignment and as defined in the contract, whether by hand spreading or machine laying, shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Engineer.

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Fuel spills from the Contractor's equipment shall be immediately repaired by the Contractor to the satisfaction of the Engineer.

Paving of intersections, ramps and driveway tie-ins are integral with the work. No separate payment or compensation will be provided for this work.

### **330.06.05.05 Joint Construction**

All joints shall be constructed to ensure a dense, well-bonded, continuous seal and to provide a smooth riding surface.

#### **330.06.05.05.01 Transverse Construction Joints**

Transverse joints shall be butt joints constructed at the end of each day's work and at other times when paving is halted for a period of time which results in the asphalt concrete cooling to below 120°C. When paving resumes, temporary tapers or ramps from previously placed asphalt concrete shall be cut back to full mat thickness to expose fresh, straight vertical surfaces. Loose or broken material shall be removed and surfaces tacked, at the Contractor's expense, in accordance with the latest edition of the Standard Specification.

#### **330.06.05.05.02 Longitudinal Construction Joints**

Longitudinal joints in the top lift shall not be constructed within a travel lane except when paving tapers where it can not be avoided, but not in the wheel paths. Joints in preceding lifts shall be offset a minimum of 150 mm to 300 mm for the Trans Canada Highway. Joint offset for all other classes of road shall be a minimum of 150 mm.

Longitudinal joints shall be rolled immediately upon placement of the fresh mixture and before the adjacent strip has completely cooled. The joint shall be set up with the back of a rake or lute at proper height and grade to receive the required compression under rolling. The depth of the newly laid mat shall be adjusted to allow for compaction. The paver shall overlap the existing mat by approximately 25 to 40 mm.

Asphalt mat edges having companion longitudinal joints shall be matched within the maximum allotted time period as determined by the engineer. All longitudinal joints shall be matched by the spreader with ski.

The maximum allotted time period shall be restricted to a lower limit of one hour with an upper limit of two hours. The allotted time limit will be proportioned on the paving lay-down conditions; with the lower time limit applied to least favorable placement conditions and the upper time limit applied to favorable placement conditions. Lay-down conditions considered by the engineer in establishing the time limit will include ground surface temperature, hot mix lay-down temperature, placement capacity, ultraviolet intensity, wind speed and air temperature.

Longitudinal joints shall be matched by the end of each day's operations. Unmatched asphalt longitudinal joints left exposed at the end of the day, or exposed to moisture, shall be cut back to full depth to expose a fresh vertical face, and painted with a continuous thin coating of tack coat or hot asphalt cement to the full fresh vertical face.

#### **330.06.05.05.03 Paving in Echelon**

Where described in the contract specifications, pavers shall be used in echelon to lay the mat full width. Upon completion of each day's paving, the maximum length of exposed joint edge shall be 60 meters.

#### **330.06.05.05.04 Conventional Paving**

Prior to placing the adjacent mat, the exposed edge of each longitudinal joint must be coated with emulsified asphalt (tack coat). Upon completion of each day's paving, the maximum length of exposed joint edge shall be 60 meters.

#### **330.06.05.05.05 Keyed Joints**

When overlaying existing asphalt concrete pavement, keyed joints shall be constructed at both ends of the project, at all intersecting roads, ramps and at all bridge decks in the repaving area. Keyed joints will only be required between the final lift of pavement and the existing pavement, unless otherwise directed by the Engineer.

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When existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a temporary (hot mix asphalt concrete ramp) taper at the joint area to a slope of at least 50 horizontal to 1 vertical (50H:1V). Temporary tapers (ramps) shall be installed immediately following milling of the keyed joint and prior to opening the area to traffic.

### 330.06.06 Compaction

Compaction equipment shall consist of at least one of each of the following:

- vibratory roller (a minimum of one roller must have double drum vibratory capacity)
- pneumatic-tired roller
- finish roller

Along curbs, manholes and similar structures and locations not accessible to full size rollers, the mix shall be compacted with smaller compaction equipment, such as vibrating plate tampers, or by hand tampers.

### 330.06.07 Surface Defects

The finished surface of any pavement course shall have a uniform texture and be free of visible signs of defects. The Engineer will identify any obvious defects and determine remedial requirements, which may include removal and replacement in accordance with 330.06.12.01 Removal and Replacement. Such defects shall include, but not necessarily be limited to, the following:

- |  |                                   |
|--|-----------------------------------|
| 1. SEGREGATED AREAS  | 6. TIRE MARKS                     |
| 2. AREAS OF EXCESS OR INSUFFICIENT ASPHALT CEMENT          | 7. IMPROPERLY CONSTRUCTED PATCHES |
| 3. ROLLER MARKS  | 8. IMPROPER CROSS SLOPE           |
| 4. CRACKING OR TEARING                                     | 9. FUEL SPILLS ON THE MAT.        |
| 5. IMPROPER MATCHING OF LONGITUDINAL AND TRANSVERSE JOINTS |                                   |

Segregation is defined here as areas with predominantly coarser texture than that of the surrounding pavement, and will normally be first identified visually.

#### **Slight Segregation:**

Area where the matrix is in place between the stones but there is slightly more stone in comparison with the surrounding acceptable mix. Slight segregation will normally be left in place without price adjustment. The severity of segregation can be determined through a number of test methods, as specified by the Engineer.

#### **Medium Segregation:**

Area has significantly more stone than the surrounding acceptable mat and usually exhibits some lack of surface matrix. Medium segregation in surface-courses will be subject to a penalty of \$25/m<sup>2</sup> for the area in question, but for base-courses will normally be left in place with no price reduction. However, any areas of medium segregation that deteriorate prior to being overlaid by another pavement course must be repaired at the Contractor's cost.

#### **Severe segregation:**

Area appears very stony, with stone against stone and little or no matrix. All areas of severe segregation in any pavement course will require removal and repair across the full lane width.

Defects as determined by the Engineer, which occur in the finished surface of any pavement course during the two year warranty period resulting from poor workmanship, shall be repaired by the Contractor. The Contractor's method of repair shall be approved by the Engineer and performed according to specifications.

### 330.06.08 Quality Control

The Contractor shall be totally responsible for quality control testing throughout every stage of the work from the crushing and production of aggregates to final product acceptance, to ensure materials and workmanship comply with the requirements of this specification. At no time, will the Engineer issue instructions to the Contractor as to setting of dials, gauges, scales and meters. However, the Engineer may advise the Contractor against the

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continuance of any operations or sequences of operations which will result in non-compliance with specification requirements.

The Contractor shall also be responsible for Quality Control testing of asphalt concrete patching mix used within the limits of the Contract. Asphalt concrete patching mix shall not be considered as part of a Lot, however, QC records and documentation shall be made available in accordance with 330.06.08.02 Sampling and Test Results.

### 330.06.08.01 Quality Control Inspection Testing Plan (ITP)

Following award of Contract, and at least 10 (ten) working days prior to commencement of asphalt concrete aggregate production, the Contractor shall submit, in writing to the Engineer, an ITP covering all phases of the contract performance, including the name of the party retained to prepare the ITP.

The ITP shall include, but not be limited to, identification and description of inspection and required test procedures to be used to fulfill the conditions of the Contract. The ITP shall be sufficiently comprehensive and detailed to assure the Engineer of the Contractor's willingness and ability to control the construction production and processes. Once accepted by the Engineer the plan becomes a part of the Contract and shall be enforced accordingly.

If the Contractor elects to take loose samples from the roadway, the ITP shall describe the sampling procedure in sufficient detail to ensure that a minimum area is affected. The method used to reinstate the sample area must be outlined such that the resulting mix is uniform, non-segregated, and well compacted. Test methods that the ITP must include are listed in Table 10. The frequency of sampling and/or testing is left to the discretion of the contractor.

The Engineer will provide written approval of the ITP within 5 (five) working days of receiving the same. The Contractor may be required to update and resubmit the ITP to the Engineer for approval, as conditions warrant.

**Table 10  
Quality Control Tests**

<b>Aggregate Characteristics/Mix Design</b>	<b>Standard</b>	<b>Minimum Frequency (A)</b>
Sampling	ASTM D 75	
Sieve Analysis	ASTM C 117, C 136	Preliminary aggregate testing
Soundness (MgSO <sub>4</sub> )	ASTM C 88	Preliminary aggregate testing
Los Angeles Abrasion	ASTM C 131	Preliminary aggregate testing
Micro Deval	ASTM D 6928	Preliminary aggregate testing
Freeze Thaw	CSA A23.2-24A	Preliminary aggregate testing
Petrographic Number	CSA A23.2-15A	Preliminary aggregate testing
Flat & Elongated Particles (4:1)	ASTM D 4791	Preliminary aggregate testing
Specific Gravity and Absorption, Coarse Aggregate	ASTM C 127	Preliminary aggregate testing
Specific Gravity and Absorption, Fine Aggregate	ASTM C 128 <sup>(1)</sup>	Preliminary aggregate testing
Fine Aggregate Angularity, Method A	ASTM C 1252	Preliminary aggregate testing
Sand Equivalent	ASTM C 2419	Preliminary aggregate testing
Crushed Particles	ASTM D 5821	Preliminary aggregate testing
Stripping Test	AASHTO T283 (and visual)	One per mix design formula
Absorption	ASTM C 127	Preliminary aggregate testing
<b>Aggregate Production</b>		
Sampling	ASTM D 75	
Sieve Analysis (Crushed)	ASTM C 136 & C 117	Two coarse & fine agg. per lot
Sieve Analysis (Natural Sand)	ASTM C 136 & C 117	One per 300 tonnes
Fractured Particles (Coarse)	ASTM D 5821	One per 1000 tonnes
Flat & Elongated (Coarse)	ASTM D 4791	One per 5000 tonnes
Fine Aggregate Angularity, Method A	ASTM C 1252	One per mix design formula
Sand Equivalent	ASTM D 2419	One per mix design formula
<b>Cold Feed</b>		
Sampling	ASTM D 75	Two per lot
Sieve Analysis (Combined Gradation)	ASTM C 136 & C 117	Two per lot
Aggregate Moisture Content	ASTM D 2216	Two per day
<b>Hot Bin (Batch Plants)</b>		
Sampling		
Sieve Analysis	ASTM C 136 & C 117	As required

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<b>Mix Testing</b> Mix Asphalt Binder Content Extracted Aggregate Sieve Analysis Mix Moisture Content Field Formed Marshall Briquettes Flow & Stability Maximum Theoretical Density Stripping	ASTM D 2172, ASTM D 6307 ASTM D 5444 AASHTO T 329 ASTM D 1559 ASTM D 1559 ASTM D 2041 AASHTO T283 (and visual)	Four tests per lot Four tests per lot Four tests per lot Four tests per lot One per every two lots Four tests per lot One per 4000 tonnes
<b>Other Related Tests</b> Bulk Relative Density Void Calculations, Cores or Formed Specimens (B) Temperatures (plant and road) Sampling of Bituminous Mixes (for Compaction) Density of Bituminous Concrete (by Nuclear Methods) Random Test Site Locations Correction Factors, Nuclear Moisture-Density Smoothness of Pavements	ASTM D 2726 ASTM D 3203  ASTM D 5361 ASTM D 2950  ASTM D 3665 ASTM D 2950 See section 330.06.09.05	Each core or briquette Each core or briquette Five per day per location Four per lot One per hour  Each lot Once per contract or as req'd Top Lift

Notes :

- (A) Conditions may require an increase in the frequency of any of the QC tests; the decision, arrangements and costs for which, are the responsibility of the Contractor.
- (B) If two consecutive air void results fall outside the specified limits, the Contractor shall stop production. Prior to continuing production, the Contractor shall provide the Engineer with written details of what measures have been taken to improve the properties of the mix. The Contractor shall not continue production until such time that the Engineer has issued written approval to do so. Failure on the part of the Contractor to adhere to this requirement, may result in the portion of the Lot affected being ineligible for payment.

### 330.06.08.02      Sampling and Test Results

Where specified, random sampling procedures shall be followed, and where no specific random sampling procedure is specified, the sampling procedure shall be as identified by the Contractor in the ITP. The Contractor shall be responsible for the interpretation of the test results and the determination of any action to be taken to ensure that all materials and work conform to the requirements of the Contract.

The Contractor shall maintain all QC records and documentation. Results of all QC testing carried out in accordance with Table 10 shall be provided to the Engineer within 24 hours of sampling. All QC documentation shall also be made available for inspection by other Department personnel at all times during the course of the Contract.

At the end of the construction season, and no later than January 31 of the following year, the Contractor shall provide the Engineer with a final report detailing all quality control test data. The report shall be provided on CD ROM in Excel format. A copy shall also be provided to the Department's Materials Engineering Division.

### 330.06.09      Quality Assurance

Quality assurance (QA) is the responsibility of the Department. In addition to QA testing used to determine unit price adjustments, the Department may, at its sole discretion, examine, inspect or test any aspect of the Contractor's work as deemed appropriate. Such inspections and testing shall not relieve the Contractor of his responsibilities for quality control.

The Contractor shall supply a field laboratory for Quality Assurance purposes only as per Section 111 of the Department's Specifications Book. The laboratory will be located and setup as approved by the Engineer at the nearest highway depot. The Contractor will make separate arrangements for QC testing.

### 330.06.09.01      Sampling

All QA samples shall be taken and labeled by the Contractor in the presence of the Engineer (or designated representative). Random sample locations (loose samples and core samples) for QA testing shall be generated by the Engineer for each Lot and trial mix. Cores damaged during sampling or handling shall be discarded and

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new samples shall be taken immediately adjacent (within 0.3 meters) to the original sample location. For the trial mix, a minimum of 1 (one) random loose sample shall be taken for QA testing (i.e. for determination of maximum theoretical density).

The Engineer will be responsible for transporting the samples to the Department representative's laboratory.

Neither loose nor core samples will be taken from small areas such as tapers, aprons, bridge approaches, areas of handwork, and asphalt mix used for isolated leveling and repair of failed areas, however, the tonnage contained therein will be included in the Lot.

Random samples will not be taken in areas of obvious surface defects as indicated in 330.06.07 Surface Defects. These areas will be marked and repaired in accordance with 330.06.12.01 Removal and Replacement.

The Engineer may use discretion in relocating random core locations that fall within areas of severe vertical curvature or grade (i.e. at the base or crest of a hill or >10% grade).

### 330.06.09.02 Asphalt Binder Content, Gradation and Air Voids

Loose samples will be taken on the road behind the paver and retrieved prior to compaction per Section 330.06.02.05.

The Engineer will provide the Contractor with approximately 30 minutes advance notice of loose sampling requirements, based on projected tonnage/production rates.

Each sample will be split into 2 (two) equal portions. One portion will be tested and the other will be set aside in the event that a re-test is required.

Performance for asphalt binder content, air voids and gradation will be evaluated for unit price adjustment in accordance to Tables 12, 13 and 14 utilizing the mean of deviations for the lot.

The following acceptance criteria shall apply for all mixes:

**Table 11**

**Asphalt Content Acceptance Criteria**

TYPE OF TEST	ACCEPTABLE ZONE (%)	PENALTY ZONE (%)	REJECTABLE ZONE (%)
Lot Mean of Deviations	± 0.25	-0.26 TO -0.50 +0.26 TO +0.50	<-0.50 OR >+0.50

**Table 12**

**Unit Price Adjustment for Asphalt Binder Content  
For Lot Mean of Deviations**

Penalty Zone AC Content Déviation %	Unit Price Payment Adjustment Factor %	Penalty Zone AC Content Déviation %	Unit Price Payment Adjustment Factor %	Penalty Zone AC Content Déviation %	Unit Price Payment Adjustment Factor %
0.26	0.5	0.35	5	0.44	14
0.27	1	0.36	6	0.45	15
0.28	1.5	0.37	7	0.46	16
0.29	2	0.38	8	0.47	17
0.30	2.5	0.39	9	0.48	18
0.31	3	0.40	10	0.49	19
0.32	3.5	0.41	11	0.50	20
0.33	4	0.42	12	>0.50	Reject
0.34	4.5	0.43	13	--	--

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**Table 13  
Unit Price Adjustment for Marshall Air Voids**

<b>AVERAGE DEVIATION OF AIR VOIDS FROM 4.00%</b>	<b>UNIT PRICE ADJUSTMENT (\$ PER TONNE)</b>
0.00 to 1.00	0.00
1.01 to 1.10	- 0.50
1.11 to 1.20	- 1.00
1.21 to 1.30	- 2.00
1.31 to 1.40	- 4.00
1.41 to 1.50	- 6.00
1.51 to 1.60	- 8.00
1.61 to 1.70	- 10.00
1.71 to 1.80	- 12.00
1.81 to 1.90	- 14.00
1.91 to 2.00	- 16.00
> 2.00	REJECT

**Table 14  
Unit Price Adjustment for Gradation**

<b>SIEVE SIZE (DESIGNATION)</b>	<b>AVERAGE DEVIATION OF THE GRADATION FROM THE JOB MIX FORMULA</b>		<b>UNIT PRICE ADJUSTMENT (\$ PER TONNE)</b>
	<b>19.0mm HMA</b>	<b>12.5mm and 9.5mm HMA</b>	
<b>Passing 4.75mm (#4)</b>	0.00 to 6.00	0.00 to 5.00	0.00
	6.01 to 6.20	5.01 to 5.20	- 0.50
	6.21 to 6.40	5.21 to 5.40	- 1.00
	6.41 to 6.60	5.41 to 5.60	- 1.50
	6.61 to 6.80	5.61 to 5.80	- 2.00
	6.81 to 7.00	5.81 to 6.00	- 2.50
	7.01 to 7.20	6.01 to 6.20	- 3.00
	7.21 to 7.40	6.21 to 6.40	- 3.50
	7.41 to 7.60	6.41 to 6.60	- 4.00
	7.61 to 7.80	6.61 to 6.80	- 4.50
	7.81 to 8.00	6.81 to 7.00	- 5.00
	8.01 to 9.00	7.01 to 8.00	- 10.00
	9.01 to 10.00	8.01 to 9.00	- 15.00
> 10.00	> 9.00	REJECT	
<b>Passing 75µm (#200)</b>	0.00 to 0.60	0.00 to 0.50	0.00
	0.61 to 0.70	0.51 to 0.60	- 1.00
	0.71 to 0.80	0.61 to 0.70	- 2.00
	0.81 to 0.90	0.71 to 0.80	- 3.00
	0.91 to 1.00	0.81 to 0.90	- 5.00
	1.01 to 1.10	0.91 to 1.00	- 7.50
	1.11 to 1.30	1.01 to 1.20	- 12.00
	> 1.30	> 1.20	REJECT

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In addition to the acceptance/rejection requirements for gradation, the following shall apply:

- 1) The Lot will be rejected if the average of the Lot test results from the 4.75mm sieve size falls outside the gradation limits specified in Table 3.
- 2) The Lot payment will be reduced by \$5.00 per tonne if the average of the Lot test results for the 75µm sieve size exceeds, up to the maximum of 1.0%, the upper gradation limit specified in Table 3.
- 3) The Lot will be rejected if the average of the Lot tests results from the 75µm sieve size exceeds, by more than 1.0%, the upper gradation limit specified in Table 3.

### **330.06.09.03 Asphalt Density**

Lots and trial mix areas will be divided into 4 (four) segments of approximately equal quantity. Three core samples will be taken at each location designated by the Engineer. One core sample will be used for QC testing; another for QA and a third sample will be set aside in the event it is required for appeal testing. Cores shall be a nominal 100 mm diameter. Coring locations for each Lot will be selected as follows:

The Engineer shall provide the Contractor with sample locations (station and offset) following placement of all asphalt concrete within a given Lot or trial mix area. Where traffic control conditions warrant, consideration shall be given to providing random core sample locations for a given mat (i.e. before all asphalt concrete for the Lot has been placed).

Cores shall not be taken within 0.15 m of the pavement edge or longitudinal joint, nor closer than 6 m to a transverse joint. Areas not to be cored include; small areas such as tapers, bullnoses, aprons, bridge approaches, bridge decks, areas of handwork, and asphalt mix used for isolated leveling. Cores shall not be taken within 10 m of a loose sample location. The Engineer may use discretion in relocating random core locations that fall within areas of severe vertical curvature or grade (i.e. base or crest of a hill).

Cores shall be obtained in accordance with ASTM D5361 within a minimum of 12 hours and a maximum 24 hours after the placement of the asphalt concrete. The Contractor shall have the option of using dry ice to obtain the cores earlier than 12 hours after placement.

During the coring operation, the Contractor must provide all traffic control in the form of flag persons and signs which conforms to Division 7 Temporary Condition Signs and Devices of the Department and Transportation and Works Specifications Book. Coring will not be permitted until all traffic control devices are erected and flag persons are in position.

Immediately following each coring operation, the Contractor shall reinstate the pavement at the core sample location in conjunction with removal of the core by dewatering the core hole and filling it with hot mixed asphalt concrete in 50 mm lifts to the pavement surface elevation, compacting each lift with 25 blows using a standard Marshall hammer. Each coring operation and the reinstatement of core hole is to be conducted during a single traffic control and flag person set up.

Failure to meet the time requirements for the core hole repair may result in delayed paving of any subsequent asphalt production.

The percent compaction will be determined by comparing the core bulk densities, in accordance with ASTM D2726 with the average theoretical maximum density of the loose mix samples for the Lot, in accordance with ASTM D2041. For asphaltic base and leveling courses unit price adjustments will be applied utilizing Table 15 to each tonne of asphalt mix for the Lot represented by the segments cored and the percent compaction averaged. For asphaltic surface courses unit price adjustments will be applied utilizing Table 15 for each individual core's percent of maximum theoretical, and the unit price adjustment will be applied to each tonne of asphalt mix for the Lot divided by the segments cored for the Lot.

For each asphaltic base, leveling and surface course mixture type per Lot, in addition to the requirements noted above, if an individual core's percent of maximum theoretical falls below 92.5 % or above 97.5 % no bonuses will be paid for the entire Lot for that mixture. Also, irrespective of the Lot, the average of any four consecutive samples of a mixture type (base, leveling or surface) shall have a reject limit of 91.0 % based on the four individual core's percent of maximum theoretical. The rejected material represented by the averaged four cores will be the sum of the four units of material represented by each core defined as the tonnes of the asphalt mixture type for the Lot divided by the



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segments cored for the Lot.

**Table 15  
Unit Price Adjustment for Density**

<b>% OF MAXIMUM THEORETICAL DENSITY</b>	<b>UNIT PRICE ADJUSTMENT (\$ PER TONNE)</b>	<b>% OF MAXIMUM THEORETICAL DENSITY</b>	<b>UNIT PRICE ADJUSTMENT (\$ PER TONNE)</b>	<b>% OF MAXIMUM THEORETICAL DENSITY</b>	<b>UNIT PRICE ADJUSTMENT (\$ PER TONNE)</b>
>98.5	REJECT	93.2	+ 0.20	91.2	- 3.20
98.5	-5.00	93.1	+ 0.10	91.1	- 3.60
98.4	-4.00	93.0	0.00	91.0	- 4.00
98.3	-3.00	92.9	- 0.10	90.9	- 4.40
98.2	-2.00	92.8	- 0.20	90.8	- 4.80
98.1	-1.00	92.7	- 0.30	90.7	- 5.20
98.0	-0.50	92.6	- 0.40	90.6	- 5.60
97.9	-0.40	92.5	- 0.50	90.5	- 6.00
97.8	-0.30	92.4	- 0.60	90.4	-7.00
97.7	-0.20	92.3	- 0.70	90.3	-8.00
97.6	-0.10	92.2	- 0.80	90.2	-9.00
97.5	0.00	92.1	- 0.90	90.1	-10.00
97.4	+0.10	92.0	- 1.00	90.0	-11.00
97.3	+0.20	91.9	- 1.20	89.9	-12.00
97.2	+0.30	91.8	- 1.40	89.8	-13.00
97.1	+0.40	91.7	- 1.60	89.7	-14.00
≤97.0 thru	+0.50	91.6	- 1.80	89.6	-15.00
to ≥93.5	+ 0.50	91.5	- 2.00	89.5	-16.00
93.4	+ 0.40	91.4	- 2.40	<89.5	REJECT
93.3	+ 0.30	91.3	- 2.80		

**330.06.09.04 Thickness (New Construction)**

The asphalt concrete shall be placed in lifts at the prescribed thickness as per the contract specifications and/or as directed by the Engineer. The pavement thickness shall be determined from the cores obtained in 330.06.09.03 Asphalt Density. Price adjustments for thickness will be applied to new construction only.

The maximum thickness for a Lot shall be determined on a Lot by Lot basis. Individual thickness results will be evaluated for Acceptance and Rejection requirements as indicated in Table 16.

**Table 16  
Unit Price Adjustment for Thickness**

<p>For all hot mix asphalt types the penalty for thickness shall be as follows:                      Full payment for at least 3 out of 4 samples meeting the below tolerances                      Repair/Replace/Reject for 2 or more out of 4 samples failing to meet the below tolerances</p> <p>a) Thickness = specified application rate/bulk relative density obtained from core samples                      b) Lift thickness tolerance for base and surface course only</p> <p>Tolerance = 0.20 x specified thickness (base course)                      Tolerance = 0.15 x specified thickness (surface course)</p> <p>c) If the Thickness for the first lift of asphalt concrete is less than the tolerance, and a second lift of asphalt concrete is to be placed under the Contract, the Contractor shall place the second lift of the asphalt concrete to achieve a thickness equivalent to the total combined thickness required. The total first lift thickness shall be verified, for the deficient Lot, by the cores taken from the second lift of the identified deficient Lot.</p>
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### 330.06.09.04.01 Material Application Rate (Rehabilitated Pavements)

On rehabilitated pavements, hot mix asphalt shall be applied to the roadway at the rate or rates specified by the Engineer. Material application rates will be determined by the tonnage delivered to the paver as recorded by weigh tickets generated by automated scales, divided by the area covered by the Lot after allowance has been made for entrances and/or intersections. The Contractor shall provide the material application rates to the Engineer at the completion of each Lot. The appropriate backup information (including calculations) for determining the application rate shall be provided with the application rate, including paving start and end stations, pavement widths, intersection areas, etc.

The pay adjustment for material application rate is shown in the following table. The acceptance limit is the limiting value of the actual material application rate, expressed as a percentage of the specified material application rate for the Lot, below which the Lot is rejected. If the application rate of a Lot is outside the acceptance limit, the Lot is rejected automatically regardless of the values of other acceptance parameters.

**Table 17**  
**Lot Pay Adjustments for Material Application Rate**

Actual Application Rate Expressed as % of Specified Application Rate	Unit Price Adjustment (\$ per tonne) for all material in the Lot	
	Lower Lift or Single Lift	Top Lift of Multiple Lifts
≥ 110	-\$6.00 for all material in the Lot up to 110% and no payment for product in excess of 110.0%	-\$6.00 for all material in the Lot up to 106% and no payment for product in excess of 106.0%
106.0 – 109.9	-\$4.00	-\$4.00
105.0 – 105.9		
104.0 – 104.9	\$0.00	-\$2.00
96.0 – 103.9	+\$0.50	+\$0.50
94.0 – 95.9	-\$1.00	-\$1.00
92.0 – 93.9	-\$2.00	-\$2.00
90.0 – 91.9	-\$3.00	-\$3.00
85.0 – 89.9	-\$5.00	-\$5.00
< 84.9	Rejected, Mill and Fill and/or rejected with no remedial work required at the discretion of the Engineer	Rejected, Mill and Fill, Overlay and/or rejected with no remedial work required at the discretion of the Engineer

### 330.06.09.05 Pavement Smoothness

The smoothness of the finished surface of the top lift of the pavement structure shall be determined after final rolling of the surface to be tested. Normally, the outer wheel paths of all lanes will be tested, in 100 m sections, or lots. Other wheel paths may also be tested in addition to, or as a substitution for, the outer wheel path, as directed by the Engineer.

The profile measurement will normally be taken using a Class 1 inertial laser profiler, which will measure the profile in accordance with the manufacturer's recommendations and ASTM E950 – Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference. The resulting measurements will be compiled to produce a Profile Index (PI). This determination of smoothness will be made by the Department, or its representative.

The Profile Index (PI) for each lane is the cumulative profile reading of the outer wheel path in millimeters per 100 m section, in excess of the 5 mm blanking band.

#### 330.06.09.05.01 Profile Index Limits

The surface of the profiled pavement shall conform to the following Smoothness requirements:

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**Table 18  
Smoothness Requirements**

Roadway Alignment Section	Profile Index (mm / 100 m)
RLU-80 CLASSIFICATION AND ABOVE	15 mm OR LESS
INTERCHANGE RAMPS, TAPERS*, AND HIGHWAYS OF LOWER CLASSIFICATION THAN RLU-80	N/A

If the Smoothness requirements are not met, the Contractor shall repair the sections, or pay a price adjustment based on the Profile Index. These price adjustments will be applied based on the square meters of the final pavement surface as outlined in Table 19. For price adjustment purposes, the width of the final pavement surface includes the driving lane and adjacent shoulders.

**Table 19  
Profile Index Price Adjustment Schedule**

PROFILE INDEX PI ( mm / 100m)	PRICE ADJUSTMENT \$ PER SQUARE METER	PROFILE INDEX PI ( mm / 100m)	PRICE ADJUSTMENT \$ PER SQUARE METER
< 4.0	\$0.338	18.1 to 21.0	-\$0.540
4.1 to 5.5 incl.	\$0.270	21.1 to 22.5	-\$0.810
5.6 to 7.0	\$0.203	22.6 to 24.0	-\$1.080
7.1 to 8.5	\$0.135	24.1 to 25.5	-\$1.350
8.6 to 10.0	\$0.068	25.6 to 27.0	-\$1.620
10.1 to 15.0	\$0.00	27.1 to 28.5	-\$1.890
15.1 to 18.0	-\$0.270	28.6 to 30.0	-\$2.160
EACH ADDITIONAL 1.5mm INCREMENT ABOVE 30.0		-(NO OF INCREMENTS X \$0.54 +\$2.160)	

### 330.06.09.05.02 Surface Deviations (Individual Bumps and Dips)

Individual bumps and dips shall not exceed 8 mm in 7.6 m in the vertical direction. Where individual bumps and dips exceed 8 mm in 7.6 m, they may be corrected or the Contractor may elect to accept a penalty as per Table 20. The 5 mm blanking band is not applied to the bump and dip measurements. Notwithstanding, transverse joints are still subject to Section 330.06.05.05.01 and any irregularity should be immediately corrected.

**Table 20  
Bump and Dip Penalties**

Bumps / Dips Measured in the Vertical Direction	Penalty	Bumps / Dips Measured in the Vertical Direction	Penalty
8.1 - 9 mm	\$ 200	13.1 - 14 mm	\$ 1200
9.1 - 10 mm	\$ 400	14.1 - 15 mm	\$ 1400
10.1 - 11 mm	\$ 600	15.1 - 16 mm	\$ 1600
11.1 - 12 mm	\$ 800	16.1 - 17 mm	\$ 1800
12.1 - 13 mm	\$ 1000	17.1 - 18 mm	\$ 2000
Each Additional 1 mm Increment Above 18 mm		(No. of Increments x \$ 500) + \$ 2000	

### 330.06.09.05.03 Testing

**Testing and Evaluation:** Testing will be performed as soon as possible after final rolling of the surface.

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Profile measurements will terminate 15 metres from the end of each bridge deck, or from a joint between existing pavement and the new pavement. Profiles will be taken at approximately the outer wheel path for every lane of traffic, or as designated by the Engineer. Repeat profiles may be taken only to define the limits of an out-of-tolerance surface variation. Some sections may be omitted from testing, as determined by the Engineer. Tapers will be excluded from testing unless otherwise directed by the Engineer.

The Contractor shall give the Department at least 5 days notice prior to laying the final course of asphalt. A pre-paving meeting shall be convened on-site between the Contractor, the Engineer, and the Manager of Materials (or their representatives) to discuss any concerns either party might have regarding placement of the final course of asphalt. If the Contractor believes certain areas to be tested should be excluded from price adjustments, then those concerns should be submitted in writing for discussion at that meeting. Failure to submit those concerns in writing shall mean all areas shall be subject to price adjustments.

**Re-testing to Verify Original Testing Results:** Should the Contractor request retesting of pavement sections due to an excessive PI or excessive bump and dip heights, and the Department approves the re-test, then the Contractor shall bear all costs associated with testing if the original results are confirmed. If the retest results determine an improved PI or improved bump and dip heights over the original test, then testing costs shall be borne equally by the Contractor and the Department, and the average of the two results will be accepted as final. Only one retest, using the same profiler is permitted.

### **330.06.09.06 Reporting**

The Engineer will provide the Contractor with a copy of the results of QA testing within 1 (one) working day of their availability. Acceptance test results for a given Lot will not be reported to the Contractor until the quality control results for that Lot have been reported to the Engineer. Tests performed by the Engineer will not be considered to be quality control tests. If the Lot results for any one of the QA properties are outside the acceptance limits as listed in Tables 11 to 17, the Lot will be evaluated in accordance with 330.06.11 Analysis of Rejected Lots.

### **330.06.10 Appeals**

The Contractor may appeal the results of QA testing for density, asphalt binder content, gradation and thickness for any rejected or penalized Lot. The Contractor may appeal the results of QA testing for density and thickness for any rejected or penalized trial mix. In the event of an appeal, the Contractor shall serve notice of appeal to the Engineer, in writing, within 48 hours of receipt of the QA test results.

The Contractor may have a representative present during appeal testing. During the period of the testing, the Contractor's representative shall comment on anything concerning the testing which he or she does not consider to be valid and the Engineer shall respond to all comments in order to resolve them.

Prior to leaving the testing laboratory any unresolved comments regarding the testing procedures are to be given to the Engineer in writing. Any comments, with respect to the testing procedures, which are made subsequent to the Contractor's representative leaving the laboratory, will not be considered. The new Sample Result, Mean or Mean of the Deviations, whichever the case may be, so obtained shall be binding on both the Contractor and the Department.

### **330.06.10.01 Appeal of Individual Test Results**

The Contractor may appeal individual results of acceptance testing for the asphalt binder content and gradation properties only. When an individual test result from a Lot is challenged, the validity of the test result in question will be determined in accordance with ASTM E 178, Standard Practice for Dealing with Outlying Observations, using a "t"-test at a 5 (five) percent significance level. If the outlier test procedure shows that the challenged test result is valid, then it will be used in the calculations. If the outlier test procedure shows that the challenged test result is not valid, then the test result will be discarded unless there is an obvious error in the calculations or in transposing of the numbers. If there is no obvious error, the referee sample will be tested by the Engineer. Regardless of the presence of outlying observations in the re-tested sample and remaining original results, the results from the referee sample will be binding on both the Contractor and the Department and will be used in the calculations. The results from the outlier testing will be used for any subsequent appeals. The referee sample shall be tested for the following mix properties: asphalt binder content, gradation, and maximum density, in the event that the results are needed for additional appeals, if required. A new Mean or Mean of the Deviations, for

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the combined test results, will be determined and this value will be used for acceptance and unit price adjustments.

### **330.06.10.02 Appeal of Test Results for the Entire Lot**

The Contractor may appeal the entire Lot QA test results for the density, binder content, gradation and thickness properties for any rejected or penalized Lot only once. Appeal of test results for the entire Lot will only be considered if just cause can be shown by the Contractor that the acceptance test results are not representative of the product placed. If the Contractor's quality control test results indicate greater deviations from the JMF than the quality assurance test results, no appeal will be allowed.

#### **330.06.10.02.01 Appeal of Lot Binder Content and Gradation**

If the individual sample or Lot asphalt binder content and/or Lot gradation, and/or air voids are appealed, the Engineer will submit the referee samples obtained in 330.06.09.02 Asphalt Binder Content, Gradation and Air Voids for testing at the Department representative's laboratory. All original test results of the property appealed will not be considered. Only the new test results from the appeal will be used.

#### **330.06.10.02.02 Appeal of Lot or Trial Mix Density**

If the Lot or Trial Mix density is appealed, the Engineer will submit the appeal core samples obtained in 330.06.09.03 Asphalt Density. Only the new test results from the appeal will be used.

#### **330.06.10.02.03 Appeal of Lot or Trial Mix Thickness**

If the Lot or Trial Mix thickness is appealed, the Contractor will take 7 (seven) more cores at random locations as determined by the Engineer. These cores shall be tested at the Department representative's laboratory. The high and low test results from the original Lot will be discarded and the remaining test results will be combined with the test results for the new samples. For thickness appeals, 7 (seven) of the 9 (nine) test results must meet or exceed the lift thickness tolerance specified in Table 16.

#### **330.06.10.02.04 Payment of Appeal Testing Costs**

If the new test results after the appeal process indicate that a penalty no longer applies, then the testing costs incurred by the Department during the appeal process for that Lot shall be borne by the Department. The Contractor shall be responsible for any other costs that they may incur.

If the new test results after the appeal process verify that a unit price adjustment or rejection remains valid for that Lot, the sampling and testing costs incurred by the Department during the appeal procedure shall be charged to the Contractor.

### **330.06.11 Analysis of Rejected Lots**

Following an appeal of the entire Lot, in accordance with 330.06.10.02 Appeal of Test Results for the Entire Lot, if the new test results continue to indicate rejection, the new test results will be analyzed, at the discretion of the Engineer, to determine whether or not a portion of the Lot is acceptable. An analysis, as determined by the Engineer, will be carried out to determine which segments may be acceptable. If the analysis indicates partial Lot acceptance, only those areas corresponding to the sample segment(s) in which rejected material placement occurred shall be subject to 330.06.12.01 Removal and Replacement. Any and all price adjustments corresponding to the recalculated test results (excluding those in the rejected segment(s)) shall apply.

### **330.06.12 Repairs**

Rejected work shall be repaired, remedied, overlaid, or removed and replaced at the Contractor's expense. The asphalt concrete replacement or overlay shall be the same asphalt concrete mix designation as that which is removed or overlaid. All joints and the underlying asphalt concrete mat shall be tack-coated prior to repair.

The mix tonnage associated with the repair shall be produced in accordance with this specification. The repair tonnage shall be sampled in accordance with 330.06.02.05 Lot. Asphalt concrete comprising repaired areas shall

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be subject to testing in accordance with 330.06.08 (Quality Control) and 330.06.09 (Quality Assurance.) Unit price adjustments calculated in accordance with Tables 12 to 17 and price adjustments from Tables 19 and 20.

The cost of retesting shall be borne by the Contractor. All costs associated with repairs, removal and replacement, or overlays are the responsibility of the Contractor.

### **330.06.12.01 Removal and Replacement**

Rejected Lots or segments of Lots shall be removed by cold milling the full width of the affected mat and full depth of the lift in which the work is being performed.

Material removed shall become the property of the Contractor, to haul and stockpile or otherwise dispose of in an environmentally acceptable manner, at the Contractor's expense.

### **330.06.12.02 Overlaying**

Overlaying as a method of repair will only be considered in areas designated by the Engineer, for Lots or segments of Lots which are subject to rejection based on thickness or smoothness. The asphalt concrete mix used to construct the overlay shall meet the same requirements as the pavement which is overlaid. The overlay shall extend the full width of the underlying pavement surface and have a finished compacted thickness of not less than 40 mm.

A keyed joint shall be constructed at each end of the overlaid section as per 330.06.05.05 Keyed Joints. If an acceptable grade and cross slope cannot be achieved, the Contractor shall repair the area in accordance with 330.06.12.01 Removal and Replacement. If an overlay results in the need for additional shouldering material or adjustments to guide posts and guardrail, this work shall be carried out, at the Contractor's expense, in accordance with the applicable items as per the Standard Specification.

### **330.06.13 Measurement for Payment**

#### **330.06.13.01 Measurement for Payment for Asphaltic Surface Course, Asphaltic Base Course, Asphaltic Levelling Course Type I and II**

The quantity of asphalt concrete to be measured for payment shall be the number of tonnes of mix placed and accepted in accordance with this specification. Unit price adjustments calculated in accordance with Tables 12 to 17 shall apply.

#### **330.06.13.02 Measurement for Payment for Asphalt Cement**

The asphalt cement will be measured in tonnes, rounded to two decimal places. Payment for Asphalt Cement shall be as per the percentage (%) of asphalt cement required in the approved Job Mix Formula. However, where Asphalt Cement contents are found to be deficient to the point of being in the penalty zones subsequently described, Asphalt Cement will be paid on actual content only, as determined by ASTM D6307 Standard Test Method for Asphalt Content of Hot-Mix Asphalt by the Ignition Method. Any moisture content in the hot mix asphalt will be determined and deducted. The method of determination of this moisture content will be in accordance with AASHTO 329 Standard Method of Test for Moisture Content of Hot Mix Asphalt by Oven Method.

Samples of hot mix asphalt shall be taken randomly, in accordance with 330.06.09.02 and tested to ensure conformance with the specifications stated herein. Sampling and testing shall be performed in accordance with ASTM D979 and ASTM D6307, Method A. Additional samples may also be taken and tested in accordance with ASTM D2172, for verification purposes.

If the test results representing the Lot mean of deviations for asphalt cement content falls into the above-stated "Penalty Zone", the payments for both Asphalt Cement and Hot Mix Asphalt shall be adjusted by deducting a percentage from the unit prices per Table 12 for the Lot mean of deviations as appropriate. These adjustments shall apply to the areas of pavement represented by these samples.

If the test results representing the Lot mean of deviations fall into the above-stated "Rejectable Zone", then no payment will be made for either the asphalt cement or hot mix asphalt represented by those samples.

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In the event of any and all disputes over asphalt content, the asphalt contents as determined by the Engineer, in accordance with the above stated method, shall govern in all cases.

### **330.06.14 Basis of Payment**

#### **330.06.14.01 Basis of Payment for Asphaltic Surface, Asphaltic Base Course, Asphaltic Leveling Courses Type I and II, and Patching**

Asphalt concrete will be paid for at the contract unit price per tonne for mix incorporated and accepted in the work, which price shall be full compensation for furnishing and transporting of all materials including aggregates, natural sand, PGAB, heating, handling, mixing, placing and compacting the mix, the supply of all equipment, plant, labour, traffic control and incidentals necessary to complete the work.

All price adjustments determined in accordance with this specification will be calculated and issued on the final progress estimate.

#### **330.06.14.02 Basis of Payment for Asphalt Cement**

Payment at the contract price for Asphalt Cement shall be compensation in full for all labor, materials, and equipment to supply the Asphalt Cement cost shall include purchase, loading, transportation, unloading and storage at the asphalt plant.

#### **330.06.14.03 Basis of Payment for Rejected Mix**

The Department will pay for only the original mix quantity. The Contractor is fully responsible to bear all costs associated with repair of rejected areas, including all materials, equipment, plant, labour, traffic control and incidentals necessary to complete the work to the satisfaction of Engineer.

If the Department determines the rejected material may remain in the work, and the Contractor elects not to repair the affected area, payment for the rejected mix components will be at 50% of the various contract unit prices.

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 340

### CHIP SEAL

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#### 340.07 TEMPERATURE

#### 340.01 SCOPE

This specification covers the requirements for single layer chip seal surface treatment of pavement, together with the requirements for patching and filling cracks in the pavement prior to the chip seal surface treatment operations.

#### 340.02 MATERIALS

##### 340.02.01 Chip Seal Aggregate

The chip seal aggregate must be crushed and shall be of a high quality and be free of soft disintegrated stone, clay, or other deleterious materials. The screening of natural gravel deposits to produce chip seal aggregate shall not be permitted.

The crushed aggregate shall be screened and washed over a 6.35 mm screen. Where the contract item specifies piling of the chip seal aggregate, then the aggregate shall be washed before stockpiling.



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The aggregates shall meet the following requirements:

(i) Gradation Requirements

SIEVE	% PASSING
12.7 mm	100
9.51 mm	85-100
6.35 mm	20-60
4.76 mm	0-20
2.00 mm	0-5
0.075 mm	0-1

(ii) Physical Requirements

TEST	ACCEPTANCE REQUIREMENTS
LOS ANGELES ABRASION, LOSS % MAX.	35
MAGNESIUM SULPHATE SOUNDNESS 5 CYCLES	12
LESS % MAX.	1.75
ABSORPTION % MAX.	20
THIN AND ELONGATED PIECES % MAX.	60
CRUSHED MATERIAL % MIN.	135
PETROGRAPHIC NUMBER MAX.	20
MICRO-DEVAL TEST (% MAX.)	

The use of pits and quarries for the production of chip seal aggregate, together with the requirements for testing and stockpiling shall be carried out in accordance with the requirements of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor".

### 340.02.02 Asphalt Emulsion

Asphalt emulsion shall be RS-2k, or an approved equal, and shall meet the following requirements when delivered to the job site:

	Min.	Max.	TESTS ON RESIDUE	MIN.	MAX.
SAYBOLT VISCOSITY	150	400	PENETRATION AT 25°C, 100 g, 5 s DUCTIBILITY AT 25°C SOLUBILITY IN TRICHLOROETHYLENE	100 60 97.5	250 — —
RESIDUE BY DISTILLATION%	67	—			
SETTLEMENT IN 5 DAYS	—	5			
OIL PORTION OF DISTILLATE	—	3			
PARTICLE CHARGE	POSITIVE	POSITIVE			

### 340.03 EQUIPMENT

The Contractor shall supply all tools, machinery and equipment required in the execution of all phases of the work. Such equipment shall at all times be maintained in first class working condition and shall at all times be operated by skilled and experienced operators.

#### 340.03.01 Pressure Distributor

The approved pressure distributor used for applying asphalt emulsion shall be capable of applying closely regulated quantities. It shall consist of a fully insulated tank permanently and rigidly mounted on a truck or trailer capable of accurately maintaining any speed required for spraying.

The distributor shall be provided with the following minimum equipment:

- (a) Proper hand spray attachments to uniformly apply emulsion to any areas missed by the distributor.
- (b) An efficient and positive means of heating emulsion uniformly to any temperatures up to 150°C, and maintaining the contents constantly at any selected temperature without any local overheating and including a satisfactory method of circulating the contents during the entire heating process.
- (c) An approved thermometer with a minimum range of 10°C-150°C graduated in intervals of not more than 10°C, with subdivisions at every 1°C, so placed as to accurately show the temperature of the distributor contents, and to be accessible to the Engineer.
- (d) An approved Tachometer, driven from a fifth wheel, mounted so that it is readily visible to the driver so that it clearly and accurately registers distances traveled when spraying emulsion, and so that it enables the driver to maintain the constant speed required to ensure the specified rate of application of the emulsion.
- (e) A pump tachometer which registers pump output.
- (f) A pressure gauge indicating the pressure in the spray bar.
- (g) A rear mounted spray bar set parallel to the surface to be sprayed, and capable of adjustment to

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provide any required spraying widths from 2.5 m to 3.5 m. The distributor shall be equipped with a spray bar heating device, circulating a uniform viscosity and pressure of the emulsion at each nozzle, both before and during spraying operations. The circulating system shall also be provided with a strainer to prevent clogging of the bar and nozzles. The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlaps the spray fan from the adjacent nozzle by 50% for double-lap so that a uniformly sprayed surface will result. This adjustment shall be made by the height set when the distributor is one half full, and shall be changed only when so permitted by the Engineer.

- (h) Spray bar nozzles shall be designed and set as to ensure uniform fan shaped sprays. The nozzles shall not be such as to produce such a fine mist that the emulsion will blow away and so not provide an even emulsion coating. All spray nozzles shall be of the same manufacture, size, type and in good condition and shall be provided with valves capable of instant full opening and positive cut-off. All spray nozzles shall be set in the bar so that the nozzle slots make the same horizontal angle (30°) with the longitudinal axis of the bar. Before work commences, and periodically as required during spraying operations, the nozzles on the spray bar shall be removed, and immersed in a solvent for a period of time, sufficient to remove all congealed asphalt and to free the nozzle opening. Each nozzle shall be inspected and approved by the Engineer and reinstalled on the spray bar at the correct angle.
- (i) A strainer shall be provided in the filling line to prevent entry of foreign material into the tank.
- (j) A sampling cock fitted on the spray bar or circulating line, and readily accessible to allow samples of the emulsion to be obtained directly from the distributor.

### 340.03.02 Mechanical Aggregate Spreader

The approved self-propelled aggregate spreader shall be capable of continuously and uniformly spreading closely regulated quantities of aggregate at the application rates selected.

The spreader shall be equipped with a rear mounted hopper designed so that a loaded truck may supply aggregate to this hopper, while being towed by the spreader. The spreader shall be equipped with a front hopper and an approved means of transferring the aggregate to this hopper from the rear. The front hopper shall be equipped with an oversize reject screen and metering gates. The gates shall adjust the spreading width and be capable of individual adjustment to obtain a uniform flow of aggregate across the spreading width. These gates shall also be designed to provide simultaneous movement or closure from the operator's position. The flow of aggregate from the metering gates shall be further controlled by a spread roller, the rotation of which shall automatically commence when the metering gates are opened.

### 340.03.03 Rollers

Steel tired rollers shall have tandem wheels and weigh at least 7 tonnes. Pneumatic-tired rollers shall be self-propelled and have a minimum ballasted weight of 8 tonnes.

### 340.03.04 Mechanical Broom

The mechanical broom shall be of an approved type of power broom suitable for pavement use.

## 340.04 CONSTRUCTION

### 340.04.01 Surface Preparation

Before chip seal operations may begin, the Contractor shall completely clean the pavement of all dirt and other debris. Cleaning shall be by the use of a power broom. Should there be any depressions not completely cleaned with the power broom, then the Contractor shall clean such spots with a hand broom.

### 340.04.02 Patching and Crack Filling

Patching and crack filling shall be carried out to repair pavement pot holes and cracks prior to the carrying out of the chip seal surface treatment operations. The repair work involves localized single or multiple layer chip seal applications as required to fill cracks and pot holes.

All cracks wider than 5 mm shall be treated. Should a single layer application be insufficient to fill the crack, then another application, or applications shall be applied as required until the crack is filled, to the satisfaction of the Engineer.

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All pot holes shall be patched by means of multiple layer emulsion and chip seal aggregate applications to fill the hole level with the surrounding pavement.

The emulsion shall be applied at the proper temperature using hand spray attachments.

The aggregate shall be spread by hand over the emulsion and then compacted. In those cases, where due to the characteristics of the pot hole or crack, the roller cannot apply its weight to the chip seal, then tamping shall be provided by hand operated means. After the completion of each layer of chip seal treatment and compaction, any loose chips shall be removed by hand brooming. All places requiring patching or crack filling shall be treated to the satisfaction of the Engineer.

### **340.04.03 Application of Emulsion**

All required patching and crack filling shall be carried out to the satisfaction of the Engineer, before the regular chip seal emulsion application operations may begin.

The emulsion shall be applied at a temperature in the range 60°C to 75°C.

The emulsion shall be applied at the rate as designed, (approximately 1.9 l per square metre) for single chip seal treatment. For possible second applications the rate will be different. The optimum rate of application is related to aggregate gradation and to the condition of the road surface. For any given area the emulsion shall be applied at the rate designed by the Contractor and approved by the Engineer.

During the application of the emulsion, the distributor shall be operated by a minimum of two men, one of whom shall be stationed on the rear platform, to control the application. The forward speed of the distributor shall not exceed 1.6 metres per second.

### **340.04.04 Application of Aggregate**

The crushing and stockpiling of chip seal aggregates must be 100% complete prior to application of chip seal aggregates to the road surface.

For single chip seal treatment, the aggregate shall be uniformly distributed at the rate of approximately 16.0 kilograms per square metre (approximately 0.01 cubic metre per square metre). For possible second applications the rate may be different. The exact rates of the applications shall be determined by the Engineer.

The aggregate application operation shall be co-ordinated with the emulsion application so that no more than 15 m separates the emulsion application from the aggregate spreading.

Application of aggregate operations for the day, shall be completed at least two hours before sunset.

### **340.04.05 Rolling**

Immediately after the application of the aggregate, pneumatic-tired rolling shall be carried out in such a manner that the entire treated area receives at least one coverage. Final rolling shall consist of one coverage with a steel wheel roller.

The minimum number of rollers required is one pneumatic-tired roller and one steel roller. If this combination of rollers is not sufficient to maintain the completed rate of progress, additional rollers shall be provided.

### **340.04.06 Mechanical Brooming**

The chip seal treated surfaces shall be swept with a power broom. All excess aggregate shall be removed and disposed of by the Contractor, at his own expense. Sweeping shall not be carried out until the treatment has set up to a sufficient degree so that no damage will occur to the chip seal.

On chip seal treated surfaces open to use by public traffic, power brooming shall be carried out within 48 hours of the application of aggregate.

### **340.04.07 Temperature and Weather**

Chip seal operations shall not be carried out when, in the opinion of the Engineer, road conditions, high humidity, imminence of rain, wetness or dampness are not conducive to successful results.

Asphalt emulsion application operations shall not be carried out when the air temperature at the work

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location is less than 15°C.

Chip seal treatment shall not be carried out before June 15th or after September 1st, except by special permission of the Engineer.

### **340.04.08 Protection of Work and Traffic Control**

Where possible, the traffic shall be kept off the treated surface until the chip seal is to the point where it is resistant to damage. Where traffic must go over the surface before it is fully cured, the Contractor shall control traffic speed by means of directing the traffic in convoys. The Contractor shall provide a lead vehicle to ensure that convoys proceed at low speed.

### **340.05 MEASUREMENT FOR PAYMENT**

The chip seal emulsion, the chip seal aggregate and the combined work of patching and crack filling, will be considered separately for payment.

#### **340.05.01 Measurement for Payment for Patching and Crack Filling**

Measurement for payment for patching and crack filling shall be an inspection to see that all the required patching and crack filling over the entire project has been completed. The unit of payment shall be the lump sum contract price to complete all required patching and crack filling within the lengths of the roads to be chip sealed.

#### **340.05.02 Measurement for Payment for Emulsion**

The quantity of asphalt emulsion applied to the road, within the required limits, will be measured in litres, rounded to the nearest whole number.

The quantity of emulsion shall be by means of metering the emulsion as it is being applied from the distribution truck. The metering shall be done by means of gauges located on the distribution truck. The gauges must be checked and approved by Calibration Canada before being used on each job. The Department Engineer shall have the authority to check the accuracy of gauges by weighing the truck and using the emulsions specific gravity to compute the volume of emulsion.

The pay volume of emulsion applied shall be the volume measured by gauges corrected to the basis of 15.6°C by using the temperature volume correction. Coefficients provided in Section 340.07 "Temperature" shall be observed at the time of the gauge reading.

#### **340.05.03 Measurement for Payment for Chip Seal Aggregate by Weight**

Where the unit of measurement for chip seal aggregate is stated in tonnes in the unit price table, then the material shall be weighed on scales.

The scales shall be provided by the Contractor and they shall conform with the requirements of Section 501 "Weighing of Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker as being placed in the works shall be included in measurement for payment.

The weight shall be computed in tonnes, rounded to one decimal place.

#### **340.05.04 Measurement for Payment for Chip Seal Aggregate by Volume**

When the unit of measurement for chip seal aggregate is stated in cubic metres on the unit price table, then the aggregate shall be measured for payment by means of the volume of material.

Where the requirement is for the stockpiling of chip seal aggregate, then the required volume shall be measured for payment in accordance with the requirements of Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by Contractor".

Where the requirement is for the volume of chip seal aggregate used in the treatment, the volume of material taken from the stockpile and placed on the road shall be computed in cubic metres rounded to the nearest whole number. The quantity to be measured shall be the number of cubic metres of material removed from the stockpile, as shown on the cross section sheets between the cross sections taken over the stockpile before material was removed and the cross sections taken after the material was removed. The volume of this excavation being computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

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### 340.06 BASIS OF PAYMENT

#### 340.06.01 Basis of Payment for Patching and Crack Filling

Payment at the lump sum contract price for patching and crack filling shall be full compensation for all the additional work involved in the patching and crack filling operations that is not compensated for in the contract prices for chip seal emulsion and chip seal aggregate.

Quantities of chip seal emulsion and chip seal aggregate used in the patching and crack filling shall be paid for at the appropriate contract prices for chip seal emulsion and chip seal aggregate.

#### 340.06.02 Basis of Payment for Emulsion

Payment at the contract price for emulsion shall be compensation in full for all labour, materials and equipment used to clean the road surface, and to supply, haul, heat and apply the emulsion to the road surface at the specified temperatures and for all other work necessary to complete the application, except where payment is otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the re-treatment of any areas, as required by the Engineer.

#### 340.06.03 Basis of Payment for the Application of Stockpile Supplied Chip Seal Aggregate

Payment at the contract price for application of stockpile supplied chip seal aggregate shall be compensation in full for all labour, materials, equipment-use and any other expenses for; handling the aggregate, providing scales if required, providing all haulage of the aggregate from the stockpiles (the locations of which are stated in the contract documents) to where the aggregate is to be spread, spreading the aggregate, rolling, power brooming, providing and using the lead vehicle for traffic control, and cleaning up the stockpile site as may be required, together with all other operations necessary to complete the work, in accordance with this specification and for which payment is not otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the retreatment of any areas, as required by the Engineer.

#### 340.06.04 Basis of Payment for Supply and Application of Chip Seal Aggregate

Payment at the contract price for the supply and application of chip seal aggregate shall be compensation in full for all labour, materials, and equipment-use and any other expenses for; providing a pit or quarry, obtaining environmental approval, providing and transporting pit or quarry samples to the Department's Soils Laboratory in St. John's, clearing, grubbing and stripping the pit or quarry, processing pit or quarry material to the required gradation and physical requirements, washing the aggregate, providing and maintaining a field laboratory, paying any royalties for the material, constructing and maintaining an access road to the source of material, providing scales if required, handling the aggregate, providing all haulage of the aggregate from the source to where the aggregate is to be spread, spreading the aggregate, rolling, power brooming, providing and using the lead vehicle for traffic control, and cleaning up and providing such other restoration to the pit or quarry and the stockpile site as may be required, together with all other operations necessary to complete the work, in accordance with this specification and for which payment is not otherwise provided.

No compensation other than the contract price shall be made for variations in the rate of application or for the retreatment of any areas, as required by the Engineer.

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## 340.07 TEMPERATURE

### Temperature-volume Correction for Emulsified Asphalts

°C	°F	M*	°C	°F	M*	°C	°F	M*	°C	°F	M*	°C	°F	M*
10.0	50	1.00250	25.0	77	0.99575	40.0	104	0.98900	55.0	131	0.98225	70.0	158	0.97550
10.6	51	1.00225	25.6	78	0.99550	40.6	105	0.98875	55.6	132	0.98200	70.6	159	0.97525
11.1	52	1.00200	26.1	79	0.99525	41.1	106	0.98850	56.1	133	0.98175	71.1	160	0.97500
11.7	53	1.00175	26.7	80	0.99500	41.7	107	0.98825	56.7	134	0.98150	71.7	161	0.97475
12.2	54	1.00150	27.2	81	0.99475	42.2	108	0.98800	57.2	135	0.98125	72.2	162	0.97450
12.8	55	1.00125	27.8	82	0.99450	42.8	109	0.98775	57.8	136	0.98100	72.8	163	0.97425
13.3	56	1.00100	28.3	83	0.99425	43.3	110	0.98750	58.3	137	0.98075	73.3	164	0.97400
13.9	57	1.00075	28.9	84	0.99400	43.9	111	0.98725	58.9	138	0.98050	73.9	165	0.97375
14.4	58	1.00050	29.4	85	0.99375	44.4	112	0.98700	59.4	139	0.98025	74.4	166	0.97350
15.0	59	1.00025	30.0	86	0.99350	45.0	113	0.98675	60.0	140	0.98000	75.0	167	0.97325
15.6	60	1.00000	30.6	87	0.99325	45.6	114	0.98650	60.6	141	0.97975	75.6	168	0.97300
16.1	61	0.99975	31.1	88	0.99300	46.1	115	0.98625	61.1	142	0.97950	76.1	169	0.97275
16.7	62	0.99950	31.7	89	0.99275	46.7	116	0.98600	61.7	143	0.97925	76.7	170	0.97250
17.2	63	0.99925	32.2	90	0.99250	47.2	117	0.98575	62.2	144	0.97900	77.2	171	0.97225
17.8	64	0.99900	32.8	91	0.99225	47.8	118	0.98550	62.8	145	0.97875	77.8	172	0.97200
18.3	65	0.99875	33.3	92	0.99200	48.3	119	0.98525	63.3	146	0.97850	78.3	173	0.97175
18.9	66	0.99850	33.9	93	0.99175	48.9	120	0.98500	63.9	147	0.97825	78.9	174	0.97150
19.4	67	0.99825	34.4	94	0.99150	49.4	121	0.98475	64.4	148	0.97800	79.4	175	0.97125
20.0	68	0.99800	35.0	95	0.99125	50.0	122	0.98450	65.0	149	0.97775	80.0	176	0.97100
20.6	69	0.99775	35.6	96	0.99100	50.6	123	0.98425	65.6	150	0.97750	80.6	177	0.97075
21.1	70	0.99750	36.1	97	0.99075	51.1	124	0.98400	66.1	151	0.97725	81.1	178	0.97050
21.7	71	0.99725	36.7	98	0.99050	51.7	125	0.98375	66.7	152	0.97700	81.7	179	0.97025
22.2	72	0.99700	37.2	99	0.99025	52.2	126	0.98350	67.2	153	0.97675	82.2	180	0.97000
22.8	73	0.99675	37.8	100	0.99000	52.8	127	0.98325	67.8	154	0.97650	82.8	181	0.96975
23.3	74	0.99650	38.3	101	0.98975	53.3	128	0.98300	68.3	155	0.97625	83.3	182	0.96950
23.9	75	0.99625	38.9	102	0.98950	53.9	129	0.98275	68.9	156	0.97600	83.9	183	0.96925
24.4	76	0.99600	39.4	103	0.98925	54.4	130	0.98250	69.4	157	0.97575	84.4	184	0.96900
												85.0	185	0.96875

Legend: C<sup>□</sup> (F<sup>□</sup>) = observed temperature in degrees Celsius ( Fahrenheit)

M = Multiplier for correcting volumes to the basis of 15.6<sup>□</sup>C (60<sup>□</sup>F)

\* Multiplier (M) for C<sup>□</sup> is a close approximation.

# FORM 350



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 350 CRACK SEALING

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#### 350.01 SCOPE

This specification covers the work of sealing pavement cracks with a crack sealant compound. The purpose of crack sealing is to prevent moisture from penetrating the roadway structure, to prevent the intrusion of incompressible material into the cracks and to prevent the spalling of material from the edges of the cracks.

This specification covers two methods of sealing pavement cracks. During the periods of spring and/or fall, a Blow & Go method involving no routing will be conducted. During the summer months, crack sealing work will include a combination of Blow & Go method and a Rout & Seal method whereby cracks are cut using a router and sealed.

#### 350.02 MATERIALS

##### 350.02.01 General

The crack sealing material shall be hot-poured, rubberized joint and crack sealing conforming to ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements or an approved equivalent.

The crack sealing material shall meet Type IV classification of the specification, capable of maintaining an effective seal in climates experiencing very cold temperatures. Crack sealing material having a lower resilience modulus may be acceptable if it can be shown that the product has been used successfully in

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similar climatic conditions. Final approval and acceptance of the crack sealing material will be at the Department's discretion.

Portland cement or agricultural lime will be required to sprinkle over sealed cracks to prevent tacking.

The use of any controlled products must be in accordance with the Workplace Hazardous Materials Information System (WHMIS). Workers should become familiar with Materials Safety Data Sheets for these products.

### **350.02.02 Samples**

The Contractor shall be prepared to submit a 1 kilogram or a 1 liter sample of crack sealing material to the Department of Transportation and Works at least two weeks prior to commencing work.

During the process of placing, the Engineer may require the Contractor to take samples of the crack sealing material directly from the heating kettle.

### **350.03 EQUIPMENT**

All equipment shall be safety approved.

#### **350.01.01 Router**

Routing equipment shall consist of mechanical routers capable of continually creating well-defined right angle routs. The routing equipment shall be sufficiently portable and flexible to accurately follow wandering cracks without tearing, chipping or spalling the crack edges. Equipment must produce a clean, neat square cut with vertical sidewalls.

The router shall be guided so that the crack lies entirely within the routed channel. Vertical sides of the cut shall be perpendicular to the pavement surface. The router must be capable of cutting a groove as shown in FORM 1215 "Crack Sealing Detail". Open "V" shaped grooves are not permitted

Bits used to rout the cracks must be kept sharp and replaced promptly when dull.

#### **350.03.02 Compressor**

Compressed air equipment is required to effectively clean the cracks. The compressor, which may be attached to the hot air lance, shall provide a clean oil-free air jet of a minimum flow of 4m<sup>3</sup>/min, a minimum velocity of 990 m/s and a minimum pressure of 600 kPa.

#### **350.03.03 Hot Air Lance**

A hot air lance is required to dry and pre-heat cracks prior to applying crack sealing material. The hot air lance must be used at all times to warm the crack and remove moisture. It is acceptable to use the compressor and air lance simultaneously. Tiger torches are not permitted.

#### **350.03.04 Heating Kettle**

The heating kettle shall be a double-jacketed melting boiler capable of providing indirect heating and constant agitation of the crack sealing material. The kettle must be equipped with positive thermostatic temperature controls that will prevent overheating of the crack sealing material and heat transfer oil.

A calibrated thermometer capable of +/- 5°C from 100° to 400° C will be located so that the workers may safely and frequently check and record the crack seal material temperature.

A heated sealant applicator wand shall be attached to a heated hose and attached to a heated



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sealant chamber. Temperature controls will be capable of maintaining the temperature of the sealant within manufacturer's tolerances.

### **350.04 TRAFFIC CONTROL**

The Contractor shall be responsible for the maintenance and directing of traffic during crack sealing in accordance with Division 7, Temporary Condition Signs and Devices of the Department's Specification Book.

Treated areas shall be protected from vehicle traffic for either thirty (30) minutes after the crack sealing material has been poured or in accordance with the manufacturer's specifications, whichever is longer.

Where traffic is to be maintained during crack sealing, the surface of the crack sealing material shall be dusted with Portland cement or agricultural lime prior to allowing traffic on the sealed areas.

Each vehicle used by the Contractor for the application of crack sealing material shall be equipped with a clearly visible rotating amber light.

### **350.05 PREPARATION OF UNCUT CRACKS (BLOW AND GO METHOD, NO ROUTING)**

Crack sealing shall be limited to sealing uncut cracks (Blow & Go Method) during the periods of spring (April 01 to June 01) and fall (September 15 to November 30). Pavement surfaces and crack edges must be dry and the air temperature must be above 2°C.

Crack sealing will include cleaning and sealing open cracks greater than 3 mm wide and less than 25 mm wide during the spring and fall seasons.

The cleaning operation shall consist of high compressed air free of oil to rid cracks of debris and/or moisture. The hot air lance will be used to warm the cracks and to remove any remaining moisture. The operation of the compressed air and hot air lance may be conducted in combination or separately. All cracks shall be dry (exhibiting no evidence of moisture) prior to sealing.

The Contractor shall remove all dirt, dust and debris from the pavement and this shall be considered as incidental to the work.

### **350.06 PREPARATION OF CUT CRACKS (ROUT AND SEAL METHOD INCLUDES ROUTING)**

During the summer season, all cracks greater than 3 mm wide and less than 10 mm wide will be routed and cleaned. All cracks greater than 10 mm wide and less than 25 mm wide shall be sealed according to the Blow & Go method. The standard dimension of the cut crack (rout) is 20 mm wide by 20 mm deep or as directed by the Engineer.

The cracks shall be routed taking care to follow the crack precisely. Avoid leaving small islands of pavement, which are or could be broken loose. Two or more cracks shall not be joined by routing through uncracked pavement or routed in areas where a crack does not exist.

Following routing, the pavement surface and the routed crack shall be cleaned with high compressed air free of oil to rid cracks of debris and/or moisture. Ensure that no debris or moisture enters the routed crack before sealing. All routed cracks shall be sealed within four (4) hours of routing.

The hot air lance will be used to warm the cracks and to remove any remaining moisture. All cracks shall be dry (exhibiting no evidence of moisture) prior to sealing.

The routing operation shall be periodically checked for cleanliness using duct tape by pressing one meter of the adhesive surface of the tape into the rout and inspecting it. After proper cleaning, there should be very little, if any residue on the tape.

The Contractor shall remove all dirt, dust and debris from the pavement. This shall be considered as incidental to the work.

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### 350.07 MELTING AND PREPARING HOT CRACK SEALING MATERIAL

The Contractor shall fully comply with the crack sealing material manufacturer's instructions for heating and preparing sealant for application using the specified equipment.

The crack sealing material shall be heated and melted in the melting kettle. The kettle should be charged by adding a few units of crack sealing material at a time. When the compound has reached a fluid condition, additional material can be added until the kettle is full.

The crack sealing material shall be subjected to continuous and positive agitation. The temperature used in the melting the compound will be in accordance with the manufacturer's recommendation. Overheated, burned or under heated material shall not be used. If applied, it shall be removed and replaced at the Contractor's expense, as directed by the Engineer.

When the pouring temperature has been reached, the crack sealing material shall be maintained at this temperature until it is placed in the crack. In no case, shall the material be held at fluid temperatures for more than three (3) hours.

The Contractor shall ensure that crack sealing material packaging or other foreign material does not get into the melting unit.

### 350.08 HOT SEALANT APPLICATION

All cracks shall be thoroughly dried and cleaned of all residual dust and debris with high compressed air followed by the heating of the crack or rout with the hot air lance. The compressor and hot air lance may be used in combination or separately.

The hot air lance should be used at all times and kept moving at a pace that will avoid burning the surrounding pavement. A qualified operator should be used to adjust the cleaning speed, flame size and the distance of the heat lance tip from the road.

All cracks shall be carefully inspected prior to sealing to ensure they are thoroughly dry, clean and free from dust and debris. Adjacent pavement surface must also be clean and dry. The sealant compound shall not be applied with evidence of any dampness on or within the pavement or in the pavement pores.

The crack sealing material shall not be applied when the ambient temperature is below 2°C or according to the sealant manufacturer's instructions.

No sealing shall proceed under unfavorable conditions having regard to the foregoing stipulations, until same have been rectified to the satisfaction of the Engineer.

The crack sealing material shall be applied by the heated sealant applicator wand. The crack sealing material shall be placed within two (2) minutes after heating of the crack with the hot compressed air lance. Care should be taken to avoid spillage of the material on the pavement. Should spillage occur, then the contractor shall clean it up at his own expense.

Pour pots shall not be allowed unless they are used to seal cracks or routs which were previously sealed by the heater kettle and only need a second application to be topped up.

The crack sealing material is placed into the prepared crack or rout, and the material is spread over the crack with a squeegee or with the wand. The crack sealing material centered over the crack or rout shall be shaped with a squeegee or wand as thin as possible into an overband approximately 50 mm wide.

Following the application of the crack sealing material and before the area is open to traffic, all treated areas will be thoroughly checked for areas exhibiting adhesion failure, damage to the sealant, missed cracks, foreign objects in the sealant or other problems. All areas not meeting the acceptable criteria shall be prepared and resealed until satisfactory. To prevent tacking prior to curing, the Contractor shall sprinkle the sealant with Portland cement, neat cement or agricultural

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lime as traffic warrants.

### **350.09 WARRANTY**

The Contractor shall guarantee that subject to normal wear and tear, all work performed under this contract will remain in acceptable condition for a period of twelve (12) months from the date of acceptance of all work by the Engineer.

An acceptable condition would be when 95% of the crack seal performs as required over the 12 month period. If the less than 95% of the crack sealant performs as required, the Contractor will have to repair all failed areas within the contract at the Contractor's expense. All material, haul, traffic control and related work shall be paid by the Contractor.

The Contractor shall, within 14 days after receiving written notice from the Engineer (or an agreed upon date), make good at his expense, in a manner satisfactory to the Engineer, any imperfections due to faulty materials or workmanship discovered in the work.

The Performance Bond will be held and retained by the Department until the twelve-month period has expired. This will be held to ensure that sufficient funds will be available to the Department in the event of non-performance of the crack sealing.

### **350.10 MEASUREMENT FOR PAYMENT**

Measurement for payment for crack sealing will be by means of the required completed and accepted crack seal, measured in metres rounded to one decimal place. The crack sealing of cracks which the Engineer did not require to be treated, will not be included in measurement for payment.

### **350.12 BASIS OF PAYMENT**

Payment at the contract price for crack sealing shall be compensation in full for all labour, materials and equipment-use to : supply samples of sealant to the Department, clean out and/or rout the cracks that the Engineer requires to be treated, clean the routed cracks, dry the cracks, supply and apply sealant to the required depth, clean up all sealant spillage on the pavement, supply and apply cement or lime to the treated cracks to prevent tacking, together with that portion of the cost of providing the required traffic control not covered by the provisions of Section 125 "Wages of Flagperson".

The Contractor is advised that Section 125 "Wages of Flagperson" shall apply.

# FORM 360



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 360

### COLD PLANING

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#### 360.06 MEASUREMENT FOR PAYMENT

#### 360.07 BASIS OF PAYMENT

#### 360.01 SCOPE

This specification covers the requirements for cold-milling existing pavement. The cold planing shall expose sufficient curb and gutter to allow full curb height restoration after eventual resurfacing, and shall extend to a width sufficient to restore an acceptable cross section.

#### 360.02 EQUIPMENT

The cold planing shall be accomplished using a cold-milling machine. The cold-milling machine shall be a self-driven rotating drum type, capable of removing asphalt 100 mm thick and at least 1200 mm wide in a single pass. Cutting depth shall be adjustable from 0 mm to 100 mm over the length of the drum. The machine shall have automatic grade control and be able to load milled material directly into trucks, or be able to windrow the material for subsequent pick-up by other equipment.

#### 360.03 OPERATIONS

The existing pavement shall be removed to the depth specified in the unit price table. Should the pavement not be removed to the required depth in the first pass, then the Contractor shall return again to mill down the pavement to the required depth.

Removal may be required across the full width of the road, one lane width, one lane and shoulder width or in tapered strips along the curb, depending upon the suitability of the resulting cross section. In areas where the cold milling equipment cannot remove the pavement to the depths required, such pavement shall be removed to the required grade using other means acceptable to the Engineer.

Prior to paving operations commencing a transverse butt joint must be constructed. If a transverse vertical cut is milled in the existing pavement at the limit of the work area the contractor shall immediately construct with hot mix asphalt concrete a temporary smooth 1.5 meter long taper. The temporary taper must be removed prior to paving of the milled area.

Lanes shall be completed to the same location at the end of the day's cold milling operation where it is intended to have both lanes milled.

All residue left by the cold planing process shall be removed immediately from the road. Mechanical sweeping shall be performed at the end of each day's operations. Low points in the asphalt as a result of cold planing operations at the end of each day's operation, where water ponding may occur, shall have the shoulder milled for draining rainfall. Any guide rail contaminated as a result of cold planing or

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sweeping operations shall be cleaned to the satisfaction of the Engineer. Any milled material that is lost over the shoulder shall be immediately retrieved and disposed of in an approved manner.

The Contractor shall dispose of residue at an approved waste disposal area provided by the Contractor at his own expense.

The contractor shall continuously maintain the work site free of pot holes and standing water and in a condition providing for a safe and efficient flow of traffic, from the time of removal, until such time as the new asphalt concrete is placed. Hot mix asphalt concrete shall be placed in the pot holes; cold mix or RAP are acceptable only as a temporary repair. Areas cold milled must be paved within 7 days of the cold milling operation. Signage indicating the driving condition of the milled surface shall be posted. (I.e. Construction Signs TC-47 and TC-49) Milled and aged asphalt concrete surfaces shall be treated with bituminous tack coat in accordance with Section 320 prior to the placing of asphalt concrete.

### **360.04 USE OF MILLED MATERIAL FOR SHOULDERING**

For projects where milled material is identified for use as shouldering material, the following conditions apply:

- a. The milled material is to be placed on the shoulder using an approved shouldering machine. Direct placement from the conveyor of the milling machine onto the shoulder will not be permitted.
- b. The material must be compacted immediately after placing.
- c. Milled material shall not be placed on the shoulders within 15 meters of a body of water.
- d. Excess milled material that cannot be used for shoulders will become the property of the contractor.

### **360.05 USE OF MILLED MATERIAL FOR STOCKPILING FOR DEPARTMENT DESIGNATED AREA**

For projects where milled material is identified for use by the Department the material shall be loaded and hauled to a stockpile site as indicated in the contract document or as directed by the Engineer.

If the Contractor removes the specified thickness in more than one layer, then material from each layer must be stockpiled separately, unless otherwise indicated in the contract documents.

Proper stockpiling procedures must be used and care shall be taken not to contaminate or consolidate the reclaimed asphalt concrete stockpile.

If a potential for contamination of the RAP exists due to ground conditions at the stockpile site a layer of clean, fine grained material shall be evenly distributed as a base for the stockpiles. The cost of preparing and providing the layer of clean, fine grained material as a base for the stockpiles shall be included in the unit price bid for cold planing asphalt.

The height of the RAP stockpiles shall be a maximum of 3 meters to limit the consolidation of the stockpile material and no loaders, crawl tractors, trucks or other equipment shall be permitted to travel on the stockpile.

### **360.06 MEASUREMENT FOR PAYMENT**

Measurement for payment shall be on the basis of the required surface area subject to cold planing to the required depth. The area shall be computed in square metres, rounded to one decimal place.

### **360.07 BASIS OF PAYMENT**

Payment at the contract unit price shall be compensation in full for all labour, materials and use of equipment to; carry out the cold planing to the required depth, load and haul away and dispose of the residue at a waste disposal site provided by the Contractor at his own expense, or a site designated by the Engineer, and sweep the planed surface.

# FORM 370



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 370 PULVERIZE EXISTING ASPHALT

### INDEX

#### 370.01 SCOPE

#### 370.02 PROCEDURE

#### 370.03 MEASUREMENT FOR PAYMENT

#### 370.04 BASIS OF PAYMENT

#### 370.01 SCOPE

Pulverizing is a process by which the existing asphalt pavement is crushed in place into small size particles and mixed with part of the existing granular base to total depth equivalent to twice the old asphalt thickness. This is accomplished in one operation with a pulvi-mixer type of equipment.

The pulverized mixture is re-levelled and re-profiled prior to compaction.

#### 370.02 PROCEDURE

The Contractor shall pulverize the existing asphalt pavement (asphalt and granulars) to a total maximum depth of 160mm unless noted otherwise in the unit price table. The pulverized material shall have 100% passing a 40mm sieve and shall be blended uniformly. This process shall be performed using a Caterpillar Reclaimer RR-250 or equivalent.

After the pulverizing operation has been completed the Contractor shall prepare the roadway for Hot Mix Asphalt Paving. This shall include saw cutting the asphalt, rough grading, the addition of new Granular "A" as directed by the Engineer, fine grading and compaction. If the Engineer requires the gradation of the pulverized material to be adjusted, thorough mixing of new Granular "A" with the pulverized material will be required. The profile and cross section shall be restored to the satisfaction of the Engineer.

The grading and compaction shall be in accordance with Section 315 of the Specifications Book.

The Contractor shall be responsible for maintaining the gravel surface in a condition acceptable to the Engineer until the Hot Mix Asphalt Paving is complete. The roadway shall not be left unpaved more than one week after pulverization of the old asphalt and the pulverized or unpaved work area shall not be greater than 4km in road length.

Contractors are reminded that Section 840 of the Specifications Book, "Dust Control", applies.

#### 370.03 MEASUREMENT FOR PAYMENT

Measurement for payment shall be in square meters of actual area of roadway pulverized. The measurement calculations shall be based on actual existing asphalt width determined from field measurements and the length of the actual horizontal distance covered as determined by the Engineer.

#### 370.04 BASIS OF PAYMENT

Payment at the contract price for Pulverization of Existing Asphalt will be considered compensation in full for all plant, labour and material use to: saw cut asphalt at the limits of pulverizing, pulverize the existing asphalt and granulars to a total depth of 160mm or as specified in the Unit Price Table, rough grading, fine grading including blending of new Granular "A" and compaction, and dust control as deemed necessary by the engineer.

## FORM 370

Should the actual depth of pulverization be in excess of 160mm or the thickness noted in the unit price table, the unit price bid per square meter will be prorated as follows:

$$\text{Prorating Factor (PRF)} = 1 + 0.75(A-B)/B$$

$$A = \text{Actual Thickness} \quad B = \text{Bid Thickness} \quad \text{PRF} \geq 1.0$$

Payment for the new Granular "A" will be made according to Section 315, Selected Granular Base Course.

# FORM 400



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## DIVISION 4 SPECIFICATIONS FOR DRAINAGE RELATED ITEMS INDEX

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# FORM 401



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 401 DITCHING FOR STREAMS

### INDEX

#### 401.01 DESCRIPTION

#### 401.02 MEASUREMENT FOR PAYMENT

#### 401.03 BASIS OF PAYMENT

#### 401.01 DESCRIPTION

All stream channel excavations pertaining to the drainage of the highway, whether within the limits of the right of way or not, shall be considered part of the contract. All materials excavated from ditches if suitable for constructing roadway fills shall be incorporated into fill construction in accordance with Section 204 "Grading of Fill". Materials not suitable for roadway fills shall be deposited in flat waste banks where and as directed by the Engineer and shall be levelled and trimmed to slightly proportions and contours to the Engineer's satisfaction.

In swamps, bogs and other wet areas, the Contractor if he so desires, may excavate ditches to the satisfaction of the Engineer by the use of ditching dynamite.

The term "Ditching for Streams" will include all excavations lying beyond the actual ends of footings for culverts and other drainage structures, and will include excavations for stream diversions.

The Contractor shall carry out the work in such a way so as to cause a minimum of disturbance and siltation to the water course and not to impact water quality.

Water courses carrying water shall not be blocked off until alternative water courses are completed and able to carry the water. The new channel shall be excavated in the dry. The channel bottom and side slopes shall be constructed of stable non-erodible material. When the new channel is completed, the old channel shall be closed off with impervious non-erodible material.

Care shall be taken to prevent fish being stranded in closed off diversions. Any fish that are stranded must be captured and transferred to the new stream.

The Contractor shall excavate the ditches to the lines, grades and cross section limits staked by the Engineer.

The Contractor shall minimize the crossing of water courses by heavy equipment. The same crossing place shall be used for such crossings as are unavoidable. At the completion of operations, the crossing place shall be put back to its original condition.

#### 401.02 MEASUREMENT FOR PAYMENT

Measurement will be made in excavation and will be from the cross section sheets showing the original ground lines and the completed and accepted excavation lines as cross sectioned. The volume of this excavation to be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

Excavation below grade, or beyond the cross section limits staked will not be measured for payment.

No allowance will be made for material excavated before original cross sections have been made.

The volume for payment shall be measured in cubic metres, rounded to the nearest whole number.

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### 401.03 BASIS OF PAYMENT

Payment shall be at the Contract Unit Price per cubic metre for either Ditching for Streams, Solid Rock, hauled 1 km or under, or Ditching for Streams, Other Material hauled 1 km or under, as the case may be, and such payment will be compensation in full for all labour and materials required to carry out the operations herein described.

However, should the contract not include quantities for Ditching for Streams, Solid Rock hauled 1 km or under, then all required excavation of solid rock for ditching of streams will be paid for at the contract price for "Ditching Solid Rock hauled 1 km or under".

Should the contract not include quantities for ditching for streams, other material hauled 1 km or under, then all required excavation of other material for ditching of streams will be paid for at the contract price for "Ditching Other Material Hauled 1 km or Under".

However, where the Engineer requires that materials excavated from ditches be hauled in excess of the 1 km freehaul before being placed, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavation Materials".

## FORM 402



GOVERNMENT OF NEWFOUNDLAND AND  
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### SECTION 402

#### PERMANENT RELOCATION OF STREAMS

##### INDEX

##### 402.01 SCOPE

##### 402.02 ENVIRONMENTAL REQUIREMENTS

##### 402.03 CUTTING TREES AND BRUSH FOR RELOCATION

##### 402.04 GRUBBING FOR STREAM RELOCATION

##### 402.05 EXCAVATION OF CHANNEL

##### 402.06 HYDRAULIC RIP-RAP

##### 402.07 RIP-RAP FOR CHANNEL

##### 402.08 SMALL SHOT ROCK FOR CHANNEL BED

##### 402.09 GABIONS FOR CHANNEL

##### 402.10 WASHED GRAVEL FOR CHANNEL BED

##### 402.11 STREAM ROCKS

##### 402.12 PROVISION FOR TREES AND SHRUBS

##### 402.13 SODDING CHANNEL SIDES

##### 402.14 HYDROSEEDING NEAR CHANNEL

##### 402.01 SCOPE

The purpose of this specification is to state the general requirements for the provision of various types of work and features which may be required in connection with the permanent relocation of streams. For a particular stream relocation, some of the features may be required, but it is unlikely that all of the features would be needed at one site.

##### 402.02 ENVIRONMENTAL REQUIREMENTS

Contractors are reminded that Division 8 applies to all work associated with this specification.

##### 402.03 CUTTING TREES AND BRUSH FOR RELOCATION

The proposed stream relocation site shall be cut to the limits as flagged by the Engineer in the field. This work shall be carried out and paid for according to the provisions of Section 202 "Clearing ". Care shall be taken not to cut those particular trees and bushes designated for saving as cover for fish. Such trees and bushes shall be marked for saving by the Engineer.

##### 402.04 GRUBBING FOR STREAM RELOCATION

The Contractor shall only grub within the limits flagged by the Engineer. In order to prevent possible future erosion and siltation, grubbing shall be strictly confined to within those areas that are to be excavated. The limits for grubbing will normally be from the proposed stream bank on one side to the proposed stream bank on the other side. Where possible, a buffer strip (minimum of 15 m) shall be left between the existing stream channel and the new channel.

## FORM 402

The grubbing shall be carried out and paid for in accordance with Section 203 "Grubbing".

### 402.05 EXCAVATION OF CHANNEL

The channel shall be excavated to the lines, cross sections and grades staked by the Engineer. The channel shall be excavated in the dry. Channel side slopes shall not be steeper than two to one. The natural vegetated cover including grasses, low lying shrubs and bushes shall not be disturbed adjacent to the banks so to prevent erosion and siltation. The excavated material shall be removed from the site and used as construction fill. If unsuitable as construction fill, it shall be disposed of at a disposal site approved by the Engineer.

If site conditions permit (minimal impact on vegetation and trees, erosion and water quality), excavated material can be placed in berms not less than 5 m from the new channel. The berms shall be graded and trimmed to slight proportions in preparation for future hydroseeding or sodding.

Particular care shall be taken in excavating the channel so as to incorporate features that will render the channel habitable by fish. The channel alignment shall be irregular like a natural stream channel. The alignment shall have varying cross sections, an uneven profile and frequent meanders so as to create a riffle and pool environment in the completed stream relocation.

Measurement for payment shall be by the number of cubic metres of excavated material as shown between the position of the ground lines as cross sectioned after grubbing operations have been completed, and the completed and accepted excavation lines. Material excavated outside of the required limits will not be included in measurement for payment. The volume of the excavation to be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

During excavation operations whenever the character of material changes from Other Material to Solid Rock, then the Contractor shall strip the area, within the limits, of all overlying material, and notify the Engineer in order that proper measurements for cross sections may be made. No allowance will be made for material excavated before such measurements or cross sections have been made.

For boulders present in Other Material; the three maximum rectilinear dimensions of boulders, actually excavated, will be measured and the volume of each so determined. Volumes of the boulders which are equal to, or greater than, zero decimal five cubic metres will be included for payment as rock.

Payment shall be at the contract price per cubic metre for either Excavation of Channel for Permanent Relocation of Streams, Solid Rock, hauled 1 km or under; or Permanent Relocation of Streams, Other Material, hauled 1 km or under, as the case may be. Such payment shall be compensation in full for all labour, materials and use of equipment to: excavate the material from within the required horizontal alignment, cross sections and profile, then load and transport the material up to the 1 km freehaul limit and place and compact the material in a fill, or in the case of waste material place and trim the material in berms.

Where the Engineer requires that excavated materials be hauled in excess of the 1 km freehaul limit before being placed, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavation Materials".

Should the contract not include quantities for "Excavation of Channel for Permanent Relocation of Streams, Solid Rock", then payment for that quantity shall be at the contract price for "Excavations for Foundations, Solid Rock".

## **FORM 402**

Likewise, should the contract not include quantities for "Excavation of Channel for Permanent Relocation of Streams, Other Material", then payment for that quantity shall be at the contract price for "Excavation for Foundations, Other Material".

### **402.06 HYDRAULIC RIP RAP**

Should the channel bed or sides require Hydraulic Rip Rap treatment, then this work shall be carried out and paid for in accordance with Section 917 "Hydraulic Rip Rap".

### **402.07 RIP-RAP FOR CHANNEL**

Should the channel bed or sides require rip rap treatment, then this work shall be carried out and paid for in accordance with Section 610 "Rip Rap Treatment".

### **402.08 SMALL SHOT ROCK FOR CHANNEL BED**

Should small shot rock be required to line the channel bed, then the small shot rock shall be placed on the excavated channel bed in a layer no thicker than one piece of shot rock thick. Care shall be taken not to place any appreciable depth of shot rock, so as to help avoid the stream becoming a "French Drain" during periods of low flow.

The small shot rock shall be well shattered with no pieces larger than 100 mm, and be placed as designated by the Engineer.

Measurement for payment shall be on the basis of the number of cubic metres, rounded to one decimal place, of the small shot rock placed within the limits required by the Engineer. The volume shall be calculated from the computed surface area multiplied by a nominal thickness of 0.1 metres.

Payment at the contract price for small shot rock for channel bed, shall be compensation in full for all labour, materials and use of equipment to supply and place the small shot rock, as specified.

### **402.09 GABIONS FOR CHANNEL**

Should gabions be required for the channel, then the gabion work shall be carried out and paid for in accordance with Section 601 "Supply and Installation of Gabions".

### **402.10 WASHED GRAVEL FOR CHANNEL BED**

Should washed gravel be required in the channel bed, the washed gravel shall consist of aggregate all of which passes the 20mm sieve, but none passes the 1.25mm sieve. The gravel shall be washed.

The washed gravel shall be placed after the Hydraulic Rip Rap, Rip Rap, Stream Rock or Small Shot Rock has been placed in the channel bed. The Contractor shall place the washed gravel in the spaces between the rocks. Care shall be taken not to completely cover the rock. Should the underlying rock be completely obscured by the washed gravel, then the excess washed gravel shall be removed so as to expose the tops of the rocks.

Measurement for payment shall be on the basis of the area of washed gravel treated channel bed, measured in square metres rounded to the nearest whole number.

Payment at the contract price for washed gravel for channel bed shall be compensation in full for all labour, materials and use of equipment to supply and place the washed gravel described.

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### 402.11 STREAM ROCKS

Stream rocks are sometimes used in streams to assist fish passage by providing places of slower current behind the rocks, so that fish can rest while migrating upstream.

Should stream rocks be required, they shall be placed individually, or in clusters, as directed by the Engineer. The stream rocks shall be placed prior to the placement of small shot rock and washed gravel.

Stream rocks shall vary from 300 mm diameter to a larger boulder.

Measurement for payment shall be by the number of individual stream rocks placed as required.

Payment at the contract price for Stream Rocks shall be compensation in full for all labour, materials, and use of equipment to supply the stream rocks and place them as required.

### 402.12 PROVISION OF TREES AND SHRUBS

The planting of trees and shrubs may sometimes be required in order to provide cover for fish. Trees and shrubs shall be of the species and sizes specified.

Transplanting shall not take place during the growing season (June-September). However, should the trees or shrubs be growing in flower pots, then these may be transplanted at any time if care is taken not to disturb the roots when removing the pot.

The most satisfactory transplanting results are often obtained using native trees or shrubs of height less than 1.2 m.

The trees and shrubs shall be planted at the locations designated by the Engineer.

Trees and shrubs of height 1.2 m or less, shall be planted in at least 0.5 m<sup>3</sup> of topsoil. The Contractor shall excavate a hole of the required size to take the topsoil. The excavated material shall be disposed of. The hole shall be half filled with lightly tamped topsoil. A hand full of bone meal shall be sprinkled over the topsoil near the roots. The tree or shrub shall be planted and the topsoil lightly tamped.

The planted tree or shrub shall be maintained by the Contractor including frequent watering as required by the Engineer. The Contractor shall provide a one year warranty for all plantings.

Measurement for payment shall be by the number of individual trees of the specified species and size planted.

Payment at the contract price for a tree or shrub of the specified size shall be compensation in full for all labour, materials, and use of equipment to: excavate the required hole for the tree or shrub roots, dispose of the excavated material, supply and place topsoil, supply and place bone meal, and supply and plant the required tree or shrub.

### 402.13 SODDING CHANNEL SIDES

Should all or part of the channel sides and adjacent sides require sodding, then this work shall be carried out and paid for in accordance with Section 633 "Sodding".

## **FORM 402**

### **402.14 HYDROSEEDING NEAR CHANNEL**

Should hydroseeding be required at or near the stream relocation, then the work shall be carried out and paid for in accordance with the provisions of Section 632 "Hydroseeding" and Section 635 "Lime for Hydroseeding". Should soil for hydroseeding be required also, then it shall be provided and paid for in accordance with Section 634 "Soil for Hydroseeding".

# FORM 403



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 403 EXCAVATION FOR FOUNDATIONS

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- 403.05.01 Measurement for Payment for Excavation for Foundation for Culverts Installed in All Places Other than Across Existing Roads
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#### 403.06 BASIS OF PAYMENT

#### 403.01 SCOPE

This work shall include labour, equipment and materials required to carry out excavation such as that required to obtain a foundation for such structures as bin-wall, culverts, footings, and gabions, and shall include hauling up to 1 km, handling and incorporation of all suitable materials into fill construction in accordance with Section 204 "Grading of Fill", and shall include the hauling up to 1 km, and handling of the unsuitable materials and the trimming of such unsuitable materials along embankment slopes or elsewhere, all as directed by the Engineer.

The work shall also include excavation required prior to disposal or salvage of culvert or pipe.



The work shall not include the excavation of those materials which the Contractor had previously placed, of his own choice as a temporary measure, and is required to excavate to facilitate the placing of, for example, select granulars. Any such excavation of materials which were placed as a temporary measure by choice of the Contractor, shall be at the Contractor's expense.

Where the quantity of excavation exceeds that required in the backfilling operation or to construct the fills as directed by the Engineer, the surplus shall be used to widen the fills or otherwise disposed of as directed by the Engineer.

#### **403.02 ENVIRONMENTAL REQUIREMENTS**

The Contractor shall be aware of Division 8. Where unwatering is required, it shall be carried out as specified in Section 180.

#### **403.03 EXCAVATION FOR FOUNDATION**

The Contractor shall excavate along the lines, to the width and to the grade required by the Engineer.

##### **403.03.01                   Excavation for Foundation for Culverts Installed in All Places Other than Across Existing Roads**

In the particular case of excavation for foundation for culverts installed in all places except across existing roads, the Contractor will normally be required to excavate for a width equal to the nominal diameter of the pipe, or the nominal span of the arch in the case of pipe arches, plus a distance of 300 mm on each side of the culvert, unless required otherwise by the Engineer. The depth of the excavation shall be as shown on Form 1236 "Typical Culvert Bedding and Backfill Details", Form 1231 "Typical Structural Plate Round Pipe Bedding and Backfill Details", or Form 1232 "Typical Structural Plate Pipe Arch Bedding and Backfill Details", as appropriate, or as directed by the Engineer.

Excavation in addition to that required by the Engineer, will be considered incidental to the works.

##### **403.03.02                   Excavation for Foundation for Culverts Installed Across an Existing Road in a Low Fill**

In the particular case of excavation for foundation for culverts installed across an existing road where the excavation is 1.25 m deep, or less, the Contractor will be required to excavate for a width equal to the nominal diameter of the pipe, plus 0.3 m on each side.

The depth of excavation shall be as shown on Form 1236 "Typical Culvert Bedding and Backfill Details", or as directed by the Engineer.

Excavation in addition to that required by the Engineer, will be considered incidental to the works.

##### **403.03.03                   Excavation for Foundation for Culverts Installed Across an Existing Road in a High Fill**

In the particular case of excavation for foundation for culverts installed across an existing road where the excavation is deeper than 1.25 m, the Contractor will be required to excavate for a width at the bottom of the trench, equal to the nominal diameter of the pipe, plus 0.3 m on each side. However, at the top of the trench, the width shall be equal to the bottom width plus two times the depth of the trench.

For culverts where the depth of excavation is greater than 5.0m, calculated nominal excavation volumes will include the provision of a bench of nominal width 4.0m. The bench is intended to assist in the operation of removing the old culvert and installing the new one. The location of the bench will be such that their will be 5.0m from the bottom of the culvert to the bench or as determined in the field by the engineer.

The depth of excavation shall be as shown on Form 1236 "Typical Culvert Bedding and Backfill Details", Form 1231 "Typical Structural Plate Round Pipe Bedding and Backfill Details", or Form 1232 "Typical Structural Plate Pipe Arch Bedding and Backfill Details", or Form 1226 "Benching Detail" as appropriate, or as directed by the Engineer.

Excavation in addition to that required by the Engineer, will be considered incidental to the works.

#### **403.03.04 Excavation for Foundation for Gabions**

In the case of excavation for foundations for gabions, the Contractor will normally be required to excavate an area slightly larger than the nominal base area, to a depth as required by the Engineer.

#### **403.03.05 Excavation for Foundation for Footings**

In the case of excavation for concrete footings for structural plate arches, the excavation pay lines shall be the length of the footing plus 300 mm on each end times the width of the footing plus 300 mm on each side times the depth between original ground line and foundation elevation or as directed by the Engineer. All excavation in addition to the above will be considered incidental to the works.

When a footing is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation. In soft or wet conditions, the final removal of material to foundation level shall not be made until the Contractor is ready to proceed with the construction of the footing. When material at the founding elevation is Other Material and has been over excavated, the elevation shall be re-established by replacing with suitable material and compacting it to the bearing capacity of the original material as approved by the Engineer. When the founding material is Solid Rock and has been over excavated, the foundation elevation shall be re-established to the original elevation with mass concrete. First, all loose and compressible material shall be removed from the excavation to the satisfaction of the Engineer. Next, concrete shall be placed to the foundation elevation and shall fill the entire volume of the over excavation. Concrete shall be of a quality compatible with that used in the footing. No compensation will be provided for the cost of remedial measures required by the Engineer as a result of over excavation by the Contractor.

#### **403.03.06 Excavation for Foundation for Bin-Type Retaining Wall**

In the case of excavation for bin-type retaining wall, the excavation lines shall be the length of the structure plus one metre on each end times the width of the structure plus one metre on each side times the actual depth from original ground to the base elevation or 200 mm below the base elevation where an unyielding or rock foundation exists. When the foundation is soft or has non-uniform bearing capacity, the lines for the excavation shall be as directed by the Engineer.

All excavation in addition to the above will be considered incidental to the works.

#### **403.03.07 Excavation for Foundation for Welded Wire Retaining Wall**

In the case of excavation for welded wire retaining wall, the excavation lines shall be the length of the structure plus 0.3 m on each end times the width of the structure plus 0.3 m on each side times the actual depth from original ground to the base elevation or 200 mm below the base elevation where an unyielding or rock foundation exists. When the foundation is soft or has non-uniform bearing capacity, the lines for the excavation shall be as directed by the Engineer.

All excavation in addition to the above will be considered incidental to the works.

#### **403.03.08 Backfill Material**

Materials excavated as excavation for foundations will be used for backfill if the material is deemed suitable by the Engineer.

If there should be insufficient backfill material available from the excavations, then the Engineer will direct that material from a cut or from a borrow area will be used to complete the backfilling.

Frozen materials shall not be acceptable as backfill material.

**March 2011**

#### **403.04 CLASSIFICATION**

Excavated materials will be classified as either "Solid Rock" or "Other Material" in accordance with Section 205 "Classification of Excavated Materials".

#### **403.05 MEASUREMENT FOR PAYMENT**

Volumes of all classes of excavation described in 403.04 "Classification" will be measured in excavation and computed in cubic metres rounded to the nearest whole number.

During excavation operations whenever the character of material changes from one type to another, as classified in Section 205, then the Contractor shall strip the area, within the limits, of all overlying material, and notify the Engineer in order that proper measurements or cross sections may be made. No allowance will be made for material excavated before such measurements or cross sections have been made.

For boulders present in Other Material; the three maximum rectilinear dimensions of boulders, actually excavated, will be measured and the volume of each so determined. Volumes of the boulders which are equal to, or greater than, zero decimal five cubic metres will be included for payment as Excavation for Foundation Solid Rock.

Where excavation for foundation is carried out during existing pipe removal operations, the cross-sectional area of the pipe to be removed shall be determined, and deducted for excavation end areas used in volume of excavation determinations.

##### **403.05.01 Measurement for Payment for Excavation for Foundation for Culverts Installed in All Places Other than Across Existing Roads**

Measurement for payment for Excavation for Foundation for culverts installed in all places other than across existing roads shall be by means of the nominal volume of excavation.

The quantity to be measured shall be the number of cubic metres of excavated material as shown between the position of the ground lines as cross sectioned after grubbing operations have been completed (or when excavation for foundation is to be carried out in a cut, after grading of cut or excavation of muskeg or bog operations have been completed as the case may be), and the completed and accepted excavation lines. Material excavated outside of the required limits will not be included in measurement for payment. Nominal volume of excavation shall be computed by an adaption of the Average End Area method of volume computation, in which end areas are calculated as the product of the required depth of excavation, times the nominal width of excavation.

The nominal width of excavation shall be taken as either: 1.0 m, or the nominal diameter of the culvert plus 0.6 m, whichever is greater.

##### **403.05.02 Measurement for Payment for Excavation for Foundation for Culverts Installed Across an Existing Road in a Low Fill**

Measurement for payment for Excavation for Foundation for culverts installed across an existing road where the excavation is 1.25 m deep, or less, shall be by means of the nominal volume of excavation.

Nominal volume of excavation shall be computed by an adaption of the Average End Area method of volume computation, in which end areas are calculated as the product of the required depth of excavation, times the nominal width of excavation.

The nominal width of excavation shall be taken as either: 1.0 m, or the nominal diameter of the culvert plus 0.6 m, whichever is greater.

### **403.05.03 Measurement for Payment for Excavation for Foundation for Culverts Installed Across an Existing Road in a High Fill**

Measurement for payment for Excavation for Foundation for culverts installed across an existing road where the excavation is 1.25 m deep, or less, shall be by means of the nominal volume of excavation.

Nominal volume of excavation shall be computed by an adaption of the Average End Area method of volume computation, in which the end areas used in the calculations are nominal end areas. For each culvert, the volume shall be calculated using the excavation nominal end area: at the inlet, at the edge of the road shoulder, at the road center line, at the edge of the other shoulder, and at the outlet. These individual nominal end areas shall each be calculated in accordance with the typical cross section shown on Form 1226, "Typical Culvert Excavation Pay Limit Cross Section for Fills Deeper than 5.0m".

### **403.05.04 Measurement for Payment for Excavation for Foundation for Items Other than Culverts**

Measurements shall be of the actual amount of material moved from within the limits required by the Engineer.

The quantity to be measured shall be the number of cubic metres of excavated material as shown between the position of the ground lines as cross sectioned after grubbing operations have been completed (or when excavation for foundation is to be carried out in a cut, after grading of cut or excavation of muskeg or bog operations have been completed as the case may be), and the completed and accepted excavation lines. Material excavated outside of the required limits will not be included in measurement for payment. The volume of the excavation to be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

### **403.06 BASIS OF PAYMENT**

Payment shall be at the Contract Unit Price per cubic metre for Excavation For Foundation, Solid Rock or Other Material, as the case may be, hauled 1 km or under and the backfilling of the same in accordance with the plans or as directed by the Engineer. Such payment shall be full compensation for all work herein described together with the labour, materials, and equipment-use required for excavating, handling, hauling up to 1 km, placing, and compacting in a fill as described in Section 204 "Grading of Fill" or stockpiling and reuse of the materials excavated as excavation for foundations for backfill of the excavation if the material is deemed suitable by the Engineer or disposing over slopes or otherwise directed by the Engineer.

Where the Engineer requires that Excavation for Foundation material be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavation".

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## SECTION 404

### TRENCHING, AND EXCAVATION FOR CATCH BASINS AND STORM SEWERS

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#### 404.01 SCOPE

This specification covers the requirements for excavation for catch basins, and trenching for sanitary sewers, storm sewers, and sub-drains together with the requirements for backfilling and compacting material in trenches after the removal of pipe or after the placing of pipe and bedding. Also included is the hauling up to 1 km, of surplus or unsuitable excavation and trenching materials, the handling, and incorporation of suitable surplus excavation and trenching materials into fill construction in accordance with Section 204 "Grading of Fill" and the handling of unsuitable materials, the placing, and trimming of such unsuitable materials along embankment slopes or elsewhere, all as directed by the Engineer.

The requirements for placing bedding for storm sewers, sub-drains, and catch basins are covered separately under Section 410 "Select Bedding for Storm Sewers, Sub-Drains, and Catch Basins".

#### 404.02 CLASSIFICATION OF EXCAVATION AND TRENCHING MATERIALS

Materials excavated under this heading will be classified as either "Solid Rock" or "Other Material", in accordance with Section 205 "Classification of Excavated Materials".

#### 404.03 EXCAVATION AND TRENCHING

The use of mechanical excavation and trenching equipment will be permitted except where, in the opinion of the Engineer, their use will cause damage to structures below ground. The Contractor shall proceed with caution in the excavation and trenching work so that the exact location of all buried pipes, services,

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cables, and underground structures, both known and unknown may be determined, and he shall be responsible for the repair of such pipes, services, cables, and structures when broken or otherwise damaged.

All excavation and trenching material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provision made for street drainage, and natural water courses shall not be obstructed.

Should the Contractor excavate deeper than required, then excavation shall be refilled to the required excavation grade with approved material and compacted to at least 95% of Standard Proctor Density (ASTM D698-78), all at the Contractor's expense.

### **404.03.01 Excavation for Catch Basins**

Excavations for catch basins shall be carried out at those locations and to the grades as staked by the Engineer. The size of the excavation shall be such as to facilitate the installation of the required catch basin structure in accordance with the requirements of Section 470 "Construction and Adjustment for Manholes, Catch Basins, and Ditch Inlets".

Where the material at excavation grade proves unstable then the excavation bottom shall be sub-excavated to such depth and replaced with such material and compacted as the Engineer may direct.

Should the excavation require blasting, the mouth of any pipe, any portion of pipe not backfilled and any catch basins shall be adequately protected. No blasting shall be performed within 6m of a pipe or catch basin previously placed.

### **404.03.02 Trenching for Sanitary Sewers, Storm Sewers and Sub-Drains**

The trench shall be excavated true to the line staked by the Engineer.

The trench shall be excavated so as to facilitate the installation of the pipe in accordance with Form 1235 "Typical Storm Sewer Bedding and Backfill Details".

In Other Material ground, when trenching for a corrugated steel pipe sewer, the excavation shall be to the proposed invert elevations and be graded so as to provide a uniformly firm bed for the pipe. However, when trenching for a plastic pipe in Other Material ground, the excavation shall be to a depth of 150mm below the proposed invert elevations so as to make room for select bedding under the pipe.

In Solid Rock, regardless of whether corrugated steel or plastic pipe is to be used, the excavation shall be to a depth of 150mm below the proposed invert elevations so as to make room for select bedding under the pipe.

The width of the trench shall be such so as to facilitate the installation of the pipes and the placing of bedding in accordance with Section 420 "Supply and Installation of Pipe for Storm Sewers and Perforated Pipe for Sub-Drainage", and Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins" respectively.

The trench shall be excavated beginning at the lower end and proceeding towards the upper end.

Not more than 50m of trench shall be opened at any place in advance of the completed pipe line unless permission of the Engineer is obtained and for such distances as then specified.

Batter boards shall be set for line and grade for all trench grades of one percent or less. For grades greater than one percent, the Contractor will be permitted to use other means of establishing line and grade, subject to the prior approval of the Engineer. However, if the quality of the work is not maintained, the Engineer may direct that batter boards be set for all grades.

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Where the material at excavation grade proves unstable then the excavation bottom shall be sub-excavated to such depth and replaced with such material and compacted as the Engineer may direct.

Should the excavation or trench require blasting, the mouth of any pipe, any portion of pipe not backfilled and any catch basins shall be adequately protected. No blasting shall be performed within 6m of a pipe or catch basin previously placed.

### **404.04 SHEATHING AND SHORING**

Protection of the works and all work done under this section shall comply with the relevant requirements of "The Occupational Health and Safety Act, including all Amendments", Province of Newfoundland and Labrador.

Where, due to the nature of the work, the Contractor sheathes, shores, or braces the excavation and/or trenches then such sheathing, shoring, or bracing shall be supplied, installed, maintained, removed or left in place as part of the work, all at the Contractor's expense.

All works behind the sheathing shall be filled with native backfill or other material, as the Engineer directs, and compacted as the sheathing is placed.

The Contractor has the option of removing the sheathing before backfilling, or leaving it in place, provided, however, no sheathing shall be left in place within one metre of subgrade.

In trench work, sheathing shall not be removed until any required bedding has been placed and compacted.

### **404.05 PROVISION FOR TRAFFIC AND PEDESTRIANS**

The Contractor shall provide, place, and maintain such barricades, construction signs, torches, red lanterns, and guards as are required to protect persons from injury and to avoid property damage during the progress of the work.

The Contractor shall at all times provide access to adjacent properties during the work. Such required bridging shall be provided, placed, and maintained by the Contractor.

Should the Contractor have to divert traffic over channelling, curbs and sidewalks, etc., he must protect the same from damage and any such damage must be made good.

In the event of a stoppage of work, excavations shall not be left open for a period exceeding two weeks. The Contractor shall refill such excavations and shall provide the required protection for pipe and manholes already installed, on instructions of the Engineer.

Re-excavation shall be at the Contractor's expense, unless the stoppage was beyond his control.

### **404.06 BACKFILL MATERIAL**

Materials excavated from trenches, and as excavation for catch basins will be used for trench backfill if the material is deemed suitable by the Engineer.

If there should be insufficient backfill material available from the excavations, then the Engineer will direct that material from a cut or from a borrow area will be used to complete the trench backfilling.

Frozen materials shall not be acceptable as backfill material.

### **404.07 BACKFILLING AND COMPACTION**

No backfill material shall be placed until any required pipes and bedding have been placed to the satisfaction of the Engineer.

Backfill material shall be carefully placed in the trench so as not to cause damage or movement to any pipes in the trench.

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Backfill and cover material shall be placed in layers not exceeding 200mm in thickness loose measurement. Each layer shall then be compacted to the required compaction before a further layer is placed.

Backfill consisting of Other Material or Other Material Borrow shall be compacted to a minimum of 95% of the Standard Proctor Density (ASTM D698-78).

In rock backfill material where Standard Proctor tests can not be carried out, compaction shall be continued until a compaction is achieved that is equivalent to that obtained in fill when there is no visible movement of fill under a vibrating vibratory compactor with vibratory roller of length not less than one decimal five metres.

The Contractor shall remove all surplus or unsuitable trench and catch basin excavation material.

Surplus excavation materials that are suitable shall be incorporated into fill construction, as directed by the Engineer and in accordance with the requirements of Section 204 "Grading of Fill".

Unsuitable excavation material, or surplus excavation material for which no use can be found, shall be placed and trimmed along embankment slopes or in waste areas, as directed by the Engineer.

The Contractor shall be liable for any damages arising from default or neglect in backfilling operations.

### 404.08 MEASUREMENT FOR PAYMENT

Measurement for payment will be by means of nominal volume of trench excavation, plus nominal volume of catch basin excavation, being made up of either excavated *Solid* Rock or excavated Other Material, as classified in Section 404.02 "Classification of Excavation and Trenching Materials".

The nominal volume of excavation shall be measured in cubic metres rounded to the nearest whole number.

During excavation operations whenever the character of the material changes from Other Material to Solid Rock, then the Contractor shall excavate the overlying Other Material, and notify the Engineer in order that proper measurements of depth may be made. No allowance will be made for material excavated before such measurements have been made.

For boulders present in Other Material; the three maximum rectilinear dimensions of boulders, actually excavated, will be measured and the volume of each so determined. Volumes of the boulders which are equal to, or greater than, zero decimal five cubic metres will be included for payment as Solid Rock trenching and/or excavation as the case may be.

Excavation lower than the required grade or beyond the width pay limit, or as a result of side slips caused by whatever reason, shall not be included in measurement for payment.

#### 404.08.01 Measurement for Payment in Excavation for Catch Basins

Nominal volume of catch basin excavation shall be defined as the volume given by the product of: width given by outside width of the catch basin plus 0.6m, times breadth given by outside breadth of the catch basin plus 0.6m, times the depth of the excavation measured vertically from the ground surface (after "Excavation of Cut" operations have been completed) to the accepted excavation grade.

#### 404.08.02 Measurement for Payment in Trenching for Sanitary Sewers, Storm Sewers and Sub-Drains.

Nominal volume of sewer and sub-drain trench excavation material shall be computed by an adaption of the Average End Area method of computation, in which end areas are taken to be the product of; the depth of the excavation measured vertically in metres from the ground surface

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(after "Excavation of Cut" operations have been completed) to the accepted excavation grade, times the nominal width of excavation.

The nominal width of excavation shall be taken to be 1.0 m, or the nominal pipe diameter in metres plus 0.6 m, whichever is greater.

Lengths used in the average end area method of volume computation shall not include those distances of width of catch basin plus 0.6 m, included as part of the calculation of nominal volume of catch basin excavation.

Where perforated pipe is to be placed in the same trench as a storm sewer, then the width of excavation to be used in the nominal volume of trench excavation computation shall be only the storm sewer nominal diameter in metres plus 0.6 m.

### 404.09 BASIS OF PAYMENT

#### 404.09.01 Basis of Payment in Excavation for Catch Basins

Payment shall be at the contract price in Excavation for Catch Basins (a) Solid Rock or (b) Other Material, as the case may be, hauled 1 km or under. Such payment shall be full compensation for all work herein described together with the labour, materials, and equipment use required for excavation, handling, unwatering, sheathing and shoring; provision for accommodation of traffic and pedestrians; placing and compacting backfill; for the hauling up to the 1km freehaul limit, placing, compaction, and trimming of excess excavated materials placed within and the removal and disposal of excess excavated material placed outside the contract limits; and for all repair work required under Section 404.03 "Excavation and Trenching" and Section 404.05 "Provision for Traffic and Pedestrians".

The Contractor shall be deemed to have allowed in his prices for excavation by hand when the proximity of other structures or other considerations render this necessary.

Should additional backfill materials be required to complete backfilling, then, these materials shall be paid for in accordance with Section 206 "Grading of Cuts" or Section 207 "Borrow", as the case may be, but the additional requirements for backfilling as stipulated in this specification shall be considered compensated for in the contract price in Excavation for Catch Basins.

Where the Engineer requires that excavation or borrow materials be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Materials".

#### 404.09.02 Basis of Payment in Trenching

Payment shall be at the contract price in Trenching (a) Solid Rock or (b) Other Material, as the case may be, hauled 1 km or under. The basis of payment for trenching shall include trenching for sanitary sewers, storm sewers, and sub-drains without specification to the particular kind.

Such payment shall be full compensation for all work herein described together with the labour, materials, and equipment use required for trenching, handling, unwatering, sheathing and shoring; provision for accommodation of traffic and pedestrians; placing and compacting backfill; for the hauling up to 1 km freehaul limit; placing, compaction, and trimming of excess excavated materials placed within and the removal and disposal of excess excavated material placed outside the contract limits; and for all repair work required under Section 404.03 "Excavation and Trenching" and Section 404.05 "Provision for Traffic and Pedestrians".

The Contractor shall be deemed to have allowed in his prices for excavation by hand when the proximity of other structures or other considerations render this necessary.

Should additional backfill materials be required to complete backfilling, then, these materials shall be paid for in accordance with Section 206 "Grading of Cuts" or Section 207 "Borrow", as the case may be, but the additional requirements for backfilling as stipulated in this specification shall be considered compensated for in the contract price in Trenching.

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Where the Engineer requires excavation or borrow materials be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Materials".

### **404.09.03 Basis of Payment in Trenching and Excavation for Catch Basins**

Payment shall be at the contract price in Trenching and Excavation for Catch Basins (a) Solid Rock or (b) Other Material, as the case may be, hauled 1 km or under. The basis of payment in trenching and excavation for catch basins shall include both trenching and excavation for catch basins without specification to the particular kind.

Such payment shall be full compensation for all work herein described together with the labour, materials, and equipment use required for both trenching and excavation, handling, unwatering, sheathing and shoring; provision for accommodation of traffic and pedestrians; placing and compacting backfill; for the hauling up to the 1km freehaul limit, placing, compaction, and trimming of excess excavated materials placed within and the removal and disposal of excess excavated material placed outside the contract limits; and for all repair work required under Section 404.03 "Excavation and Trenching" and Section 404.05 "Provision for Traffic and Pedestrians".

The Contractor shall be deemed to have allowed in his prices for excavation by hand when the proximity of other structures or other considerations render this necessary.

Should additional backfill materials be required to complete backfilling, then, these materials shall be paid for in accordance with Section 206 "Grading of Cuts" or Section 207 "Borrow", as the case may be, but the additional requirements for backfilling as stipulated in this specification shall be considered compensated for in the contract price in Trenching and Excavation for Catch Basins and Storm Sewers.

Where the Engineer requires that excavation or borrow materials be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Materials".

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## SECTION 405

### TEMPORARY DIVERSION OF STREAMS

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#### 405.01 SCOPE

This specification covers the requirements for the temporary diversion of streams. Temporary stream diversions are often needed for example, where it is required that a culvert be installed in the dry.

#### 405.02 ENVIRONMENTAL REQUIREMENTS

Contractors are reminded that the requirements of Division 8 apply to all work associated with this specification.

#### 405.03 CUTTING TREES AND BRUSH FOR TEMPORARY DIVERSION

The proposed temporary diversion site shall be cut to the limits designated by the Engineer. This work shall be carried out and paid for in accordance with the provisions of Section 202 "Clearing".

#### 405.04 GRUBBING FOR TEMPORARY DIVERSION

The Contractor shall only grub within the limits designated by the Engineer.

In order to minimize siltation into the temporary stream diversion, grubbing shall initially be confined to within the limits of from one proposed stream bank to the other, leaving wide ungrubbed strips adjacent to each bank. After the temporary diversion has been abandoned the balance of the required grubbing may be carried out.

The grubbing shall be carried out and paid for in accordance with Section 203 "Grubbing".

#### 405.05 PREPARATION OF CHANNEL FOR STREAM DIVERSION

The channel shall be excavated to the lines, cross sections and grades designated by the Engineer. The channel shall be excavated in the dry. The Contractor shall carry out the work in such a way so as to cause a minimum of disturbance and siltation to the water course. The channel shall be lined with polyethylene sheeting of suitable strength.

In order to minimize siltation, excavated material shall not be placed adjacent to the banks.

The stream shall not be diverted until the channel has been prepared to the satisfaction of the Engineer.

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When the diversion is made, the old channel shall be closed off with sand bags, or such other non-silting, non erodible and impervious material which is satisfactory to the Engineer.

Care shall be taken to prevent fish being stranded in closed off diversions.

The Contractor shall minimize the crossing of water courses by heavy equipment. The same crossing place shall be used for such crossings as are unavoidable. At the completion of operations, the crossing place shall be put back to its original condition.

### **405.06 CLEAN UP REDUNDANT CHANNEL**

After the stream has been diverted to the new culvert or water course, and the temporary diversion is no longer required, then that portion of the temporary diversion that will not be covered by fill, shall be graded and trimmed to slightly proportions and stabilized as directed by the Engineer including sodding and/or hydroseeding of previously undisturbed areas.

### **405.07 MEASUREMENT FOR PAYMENT**

Measurement for payment shall be by the number of cubic metres of excavated material as shown between the position of the ground lines as cross sectioned after grubbing operations have been completed, and the completed and accepted excavation lines. Material excavated outside of the required limits will not be included in measurement for payment. The volume of the excavation to be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

During excavation operations whenever the character of material changes from Other Material to Solid Rock, then the Contractor shall strip the area, within the limits, of all overlying material, and notify the Engineer in order that proper measurements for cross sections may be made. No allowance will be made for material excavated before such measurements or cross sections have been made.

For boulders present in Other Material; the three maximum rectilinear dimensions of boulders, actually excavated, will be measured and the volume of each so determined. Volumes of the boulders which are equal to, or greater than, zero decimal five cubic metres will be included for payment as rock.

### **405.08 BASIS OF PAYMENT**

Payment shall be at the contract price per cubic metre for either Excavation for Temporary Diversion of Streams, Solid Rock, hauled 1 km or under; or Temporary Diversion of Streams, Other Material, hauled 1 km or under, as the case may be. Such payment shall be compensation in full for all labour, materials and use of equipment to: excavate the material from within the required horizontal alignment, cross section and profile, load and transport the material up to the 1 km freehaul limit and place and compact the material in a fill, supply and place such sand bags or other items necessary to divert the water to the temporary diversion, divert the stream to the diversion, divert the stream to the new culvert or water course after the permanent features have been put in place, and to grade and trim the temporary diversion channel to slightly proportions after it is no longer required including and sodding or hydroseeding of previously undisturbed areas.

Where the Engineer requires that excavated materials be hauled in excess of the 1 km freehaul limit before being placed, additional payment for overhaul will be made in accordance with Section 215 "Overhaul of Excavation Materials".

Should the contract not include quantities for "Excavation for Temporary Diversion of Streams, Solid Rock", then payment for that quantity shall be at the contract price for "Ditching Solid Rock".

Likewise, should the contract not include quantities for "Excavation for Temporary Diversion of Streams, Other Material", then payment for that quantity shall be at the contract price for "Ditching Other Material".

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## SECTION 410

### SELECT BEDDING FOR STORM SEWERS, SUB-DRAINS AND CATCH BASINS

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##### 410.05.02 Measurement for Payment for Catch Basin Bedding

#### 410.06 BASIS OF PAYMENT

#### 410.01 SCOPE

This work shall include labour, materials, and equipment use required to provide, place and compact select bedding for storm sewers, sub-drains, and the sides of catch basins.

#### 410.02 MATERIALS

Select bedding material shall be crushed stone or pit run gravel and shall have the gradation of Class "B" as set forth in Section 315 "Selected Granular Base Course".

#### 410.03 PLACING OF BEDDING

Prior to any placing of bedding, material from cave-ins, accumulations of water and muck and all other objectionable matters shall be removed, damaged sections repaired or removed and replaced, and any other repair or attention required for a workmanlike job shall be performed.

No placing of select bedding shall be carried out until the works to be covered by bedding have been inspected and passed for backfilling by the Engineer.

Chutes or other proper means shall be used to prevent segregation of materials or displacement of structures or pipes. Improper dumping of select bedding material will not be permitted.

Select bedding material for pipes and catch basins shall be placed in layers not exceeding 200mm in thickness loose measurement. Each layer shall then be compacted to the density specified before a further layer is placed.

Select bedding for storm sewers and sub-drains shall be placed as shown in Form 1235 "Typical Storm Sewer Bedding and Backfill Details".

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### **410.03.01 Placing of Under Bedding in Trenches**

In the case of rock bottomed trenches, select bedding shall be placed in the bottom of the trench to provide under bedding for the pipe.

In the case of Other Material bottomed trenches, no select bedding is required for corrugated steel pipe. However, if plastic pipes are to be used then select bedding shall be placed in the bottom of the Other Material bottomed trench to provide under bedding for the plastic pipe.

Under bedding shall be shaped to conform to the under side of the pipe and be graded to conform to the required grade for the pipe.

### **410.03.02 Placing of Bedding in Each Side and Over Pipe**

When placing select bedding over pipes, bedding operations shall be kept back at least 3m from the advanced end of the pipe line, except for the completion of any section or at the termination of a day's work. Uncovered pipe, left overnight, shall be backfilled as soon as possible to the end of the pipe without covering it. The trench shall be filled with select bedding material to a height of at least 300mm above the top of the pipe, or when more than one pipe is laid in the trench, to a height of at least 300mm above the top of the highest pipe.

Select bedding material placed around a pipe shall be maintained at equal levels on each side of the pipe at all times, so that the intended alignment of the pipe be achieved.

### **410.03.03 Placing of Bedding for Catch Basins**

The excavation surrounding the exterior of the catch basin shall be filled with compacted select bedding material up to subgrade elevation. Care shall be exercised in compacting the material to assure that the structure is not disturbed.

## **410.04 COMPACTION**

Each layer of select bedding material shall be compacted to at least 95% of Standard Proctor Density (ASTM D698-78).

## **410.05 MEASUREMENT FOR PAYMENT**

### **410.05.01 Measurement for Payment for Pipe Bedding**

Measurement for payment for select bedding when used to cover storm sewers and sub-drains, will be by means of the net nominal volume of select bedding, measured in cubic metres rounded to the nearest whole number.

Net nominal volume of select bedding for storm sewers and sub-drains being defined as the gross nominal volume of select bedding material, less the nominal volume of the pipe, or pipes, treated with select bedding.

In trenches where under bedding is not required, such as Other Material bottomed trench in which a corrugated steel pipe is to be placed, then gross nominal volume of select bedding shall be defined as the volume of a rectangular prism calculated as the product of: width equal to the nominal diameter of the pipe in metres plus 0.6m, depth equal to the pipe nominal diameter in metres plus 0.3m, and the length in metres of pipe treated with select bedding.

In trenches where under bedding is not required and where a perforated pipe is placed in a trench alongside of a storm sewer, then the gross nominal volume of select bedding shall be calculated as the product of: width equal to only the storm sewer nominal diameter in metres plus 0.6m, depth equal to the storm sewer nominal diameter in metres plus 0.3m, and the length in metres of the storm sewer pipe treated with select bedding.

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In trenches where under bedding is required, such as a trench with a rock bottom or any kind of trench in which a plastic pipe is to be placed, then gross nominal volume of select bedding shall be defined as the volume of a rectangular prism calculated as the product of: width equal to the nominal diameter of the pipe in metres plus 0.6m, depth equal to the pipe nominal diameter in metres plus 0.45m, and the length in metres of pipe treated with select bedding.

In trenches where under bedding is required and where a perforated pipe is placed in a trench alongside of a storm sewer, then the gross nominal volume of select bedding shall be calculated as the product of: width equal to only the storm sewer nominal diameter in metres plus 0.6m, depth equal to the storm sewer nominal diameter in metres plus 0.45m, and the length in metres of the storm sewer pipe treated with select bedding.

Nominal volume of each treated pipe being defined as the volume calculated from the manufacturer's nominal pipe diameter and the length of pipe treated with select bedding material.

### **410.05.02 Measurement for Payment for Catch Basin Bedding**

Measurement for payment for select bedding when used for providing bedding for the sides of catch basins will be by means of the nominal volume of select bedding, measured in cubic metres rounded to the nearest whole number.

Nominal volume of select bedding for catch basins shall be defined as the product of catch basin outside perimeter measured in metres plus 1.25 metres, times the measured height in metres between underside of catch basin and subgrade elevation, times a nominal thickness of 0.3 metres.

### **410.06 BASIS OF PAYMENT**

Payment shall be at the contract unit price per cubic metre for select bedding for storm sewers, sub-drains and catch basins.

Such payment shall be full compensation for all work herein described together with the labour, materials, and equipment use required to: supply, haul, place and compact the select bedding material, together with any unwatering that may be required to carry out the work.

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Department of Transportation and Works  
Highway Design Division

## SECTION 411

### SELECT BACKFILL FOR LONG SPAN STRUCTURAL PLATE STRUCTURES

#### INDEX

#### 411.01 DESCRIPTION

#### 411.01 DESCRIPTION

This specification covers the requirements for the provision of select backfill for use with those long span structural plate structures for which the Contractor is responsible for the design.

The select backfill for long span structural plate structures shall meet the gradation and other requirements specified by the long span structural plate structure design Engineer.

The long span structural plate structure design Engineer's shop drawings for the long span structure, which must be submitted to the Department for approval, shall also indicate the select backfill envelope and gradation chart, and compaction requirements.

The Department will conduct all compaction testing and sieve analysis on the select backfill to ensure compliance with the designers requirements.

The supply, transport, placement and compaction of select backfill, meeting the designers requirements shall be compensated for as part of the basis of payment for the design, supply and installation of the long span structural plate structure.



**SECTION 420**

**SUPPLY AND INSTALLATION OF PIPE FOR STORM SEWERS AND PERFORATED PIPE FOR SUB-DRAINAGE**

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**420.05.02 Basis of Payment for Pipe Restocking**

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**420.01 SCOPE**

This specification covers the requirements for the supply and installation of factory fabricated pipes for storm sewers and perforated sub-drains.

The requirements for storm sewer or sub-drain trench excavation and backfilling, and the requirements for storm sewer or sub-drain bedding are covered separately under Section 404 "Trenching and Excavation for Catch Basins and Storm Sewers", and Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins" respectively.

**420.02 MATERIALS**

Pipe shall consist of aluminized steel pipe type 2. However, contractors are advised that consideration will be given to proposals to substitute with corrugated polyethylene pipe for diameters of up to and including 600 mm. The pipe shall be of the type and size specified in the Unit Price Table.

The Contractor shall supply concrete to form plugs for the upstream ends of sub-drains. The concrete shall have a minimum compressive strength of 28 days of 20 MPa.

The Contractor shall supply the pipe, couplers, wyes, tees, adaptors, bends, nuts and bolts.

**420.02.01 Aluminized Steel Pipe Materials**

Aluminized corrugated steel pipe, couplers, wyes, tees, bends, adapters, nuts and bolts shall conform to the requirements of the most recent revisions of the following specifications: AASHTO M274 and M36, ASTM A819 and A760 and CSA G401.

The pipe shall have a wall thickness of at least that specified in the Unit Price Table. However, should the wall thickness not be specified, then the wall thickness shall be at least the corresponding thickness given in the following table for pipe of the size and type required.

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PIPE DIAMETER	WALL THICKNESS
100 mm to 500 mm	1.6 mm for Any Corrugation
600 mm to 1200 mm	2.0 mm for Any Corrugation
1400 mm to 1800 mm	2.0 mm for 125 mm X 25 mm Corrugation or 3.5 mm 68 X 13 mm Corrugation
2000 mm to 2400 mm	2.8 mm for 125 mm x 25 mm Corrugation or 4.2 mm for 68 x 13 mm Corrugation

### 420.02.02 Plastic Pipe Materials

Couplers, wyes, tees, adaptors, bends, nuts, bolts and plastic pipe, consisting of corrugated polyethylene pipe, shall be of a type, size and strength acceptable to the Engineer.

### 420.03 PIPE INSTALLATION

All pipe shall be handled with care, so as not to damage the pipes or their protective coatings. Each pipe shall be inspected for defects before being lowered into the trench. Any pipe that is defective or unsound, in the opinion of the Engineer, shall not be incorporated in the work.

The pipe shall be installed in accordance with the requirement given in Form 1235 "Typical Storm Sewer Bedding and Backfill Details".

No pipe laying shall commence until a bed has been prepared to the alignment and grades as required by the Engineer, and until the trench has been inspected and approved by the Engineer.

The Contractor shall provide such unwatering as is required.

No pipe shall be laid or joined when the trench bottom is frozen or under water or when, in the Engineer's opinion, the trench conditions or the weather are unsuitable for such work.

All pipe shall be laid to the line and grades staked by the Engineer.

Pipe to be laid at a location shall be that size and type of pipe that the Engineer required to be laid at that location.

Riveted corrugated steel pipe shall be laid with the inside circumferential laps pointing in the direction of the flow. The longitudinal laps shall be located in the upper half of the pipe.

Helical aluminized corrugated steel pipe shall be installed so that the helix angle is constant for the total length of the installation and each pipe section shall be installed next to the previous section such that the lock-seam forms a continuous helix.

Adaptors, bends, wyes or tees shall be installed where required by the Engineer.

Pipes shall be cut whenever necessary to permit the installation of adaptors, bends, wyes, tees, or catch basins at the places staked by the Engineer.

At catch basins, the pipe shall be cut so that pipe ends will not project more than 300 mm in from the walls of the catch basin.

Pipe cuts shall be made neatly at right angles to the axis of the pipe.

Where aluminized corrugated steel pipe is cut, drilled, or welded, the pipe shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld spatter, etc., and wiped clean. The cleaned surface shall receive at least one application of metal conditioner to de-oxidize, degrease, and phosphatize the metal surface to be treated if the surface is oily. Pre-mixed, ready-to-apply, liquid zinc compound shall be applied to the prepared clean dry metal surface. The cold-galvanizing compound must be of a type that imparts cathodic action against corrosion.

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The cold-galvanizing compound should have a minimum 50 mm overlap of the surrounding undamaged galvanized metal.

Both metal conditioner and cold-galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings (organic) and meet or exceed Canadian Government Specification 1-GP-181A. All materials must be applied in accordance with the manufacturer's instructions.

Aluminized corrugated steel pipe sections shall be joined together by means of aluminized steel couplers. The couplers shall be installed to lap approximately equal portions of the pipe being connected and such that the corrugations or projections of the coupler properly engage the pipe corrugations. As the coupler is being tightened, it shall be tapped with a mallet to take up the slack. On asphalt coated pipe, the contacting surfaces of the coupler and pipe shall be lubricated with fuel oil, or a similar solvent, prior to tightening the coupler.

The interior of pipes shall be carefully cleaned of all dirt, cement or superfluous material of every description as the work progresses.

At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means approved by the Engineer. If water is in the trench when work recommences, then the plug shall remain in place until the trench is pumped completely dry.

The alignment of sewer pipes between catch basins shall be tested as each portion is laid. The Engineer may order a strong light to be supplied by the Contractor, which will be shone through the pipe from catch basin to catch basin. If less than half of the full diameter of the end of the pipe at the light source is visible from the far end, then the Engineer may order the pipes realigned at the Contractor's expense.

Perforated steel pipe shall be laid with the perforations downwards and symmetrical about the vertical axis.

The upstream ends of perforated pipe shall be sealed by means of a concrete plug. When the pipe is in position the wet concrete shall be placed in the open end of the pipe. The concrete shall fill the end of the pipe to a length equal to the diameter of the pipe.

### **420.04 MEASUREMENT FOR PAYMENT**

Measurement for payment for supply and installation of pipe for storm sewers and perforated pipe for sub-drains, consisting of pipe of a particular size and type shall be the actual in place end to end length, measured in metres to one decimal place, along the centre line of the completed new pipe line made up of material of that size and type.

Pipe length, couplers, adaptors, wyes, tees or bends not actually incorporated into a storm sewer or sub-drain will not be included in measurement for payment.

### **420.05 BASIS OF PAYMENT**

#### **420.05.01 Basis of Payment for Supply and Installation of Pipe for Storm Sewers and Perforated Pipe for Sub-Drainage**

Payment at the contract price for the type and size of storm sewer or perforated pipe sub-drain specified shall be compensation in full for all labour, materials and equipment use to: supply the pipe, couplers, wyes, tees, bends, adaptors, nuts and bolts, transport the materials to the project, store the materials at the project, transport the materials to the site, cut the pipe, clean cut ends, supply and apply metal conditioner and cold-galvanizing compound to cut ends of galvanized pipe, install storm sewer or sub-drain as required, provide concrete plugs for sub-drains, and provide any unwatering that is required.

#### **420.05.02 Basis of Payment for Pipe Restocking**

Contractors are advised that should less than the contract estimated quantity of pipe of a particular size and type be required, then the Contractor will be compensated for restocking this excess pipe at the rate of 15% of the contract unit price for the Supply and Installation of Pipe Culvert of this size and type.

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However, should there be no contract price for the Supply and Installation of Pipe Culvert of this size and type, then the compensation for restocking this excess pipe shall be at the rate of 15% of the contract unit price for; the Supply and Installation of Pipe for Storm Sewers of this size, or the supply and installation pipe for sub-drainage of this size, as appropriate.

Restocking shall include such things as handling, all transportation and any other expenses associated with removing the excess pipe from the project site, and returning it to the supplier or to the Contractor's permanent storage areas.

### **420.05.03 Basis of Payment for Pipe Purchase**

Contractors are advised that should less than the contract estimated quantity of pipe of a particular size and type be required, the Department reserves the right to purchase the excess. Compensation for purchase will be at the invoiced price for that pipe from the pipe supplier plus 10%.

## SUPPLY AND INSTALLATION OF PIPE CULVERTS

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#### 421.02 MATERIALS

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##### 421.07.01 Basis of Payment for Supply and Installation of Pipe Culverts

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##### 421.07.03 Basis of Payment for Pipe Purchase

#### 421.01 SCOPE

This specification covers the requirements for the supply, installation and backfilling of factory fabricated pipe culverts, including the extension of existing culverts. Pipe culverts may be round or arched pipe.

Should end-treatments such as concrete headwalls, gabions or rip rap be required, then the requirements for these will be covered separately in other items and specifications.

#### 421.02 MATERIALS

Pipe shall consist of aluminized steel pipe type 2. However, contractors are advised that consideration will be given to proposals to substitute with corrugated polyethylene pipe for diameters of up to and including 600 mm. The pipe shall be of the type and size specified in the Unit Price Table.

##### 421.02.01 Aluminized Steel Pipe Materials

Aluminized corrugated steel pipe, couplers, wyes, tees, bends, adapters, nuts and bolts shall conform to the requirements of the most recent revisions of the following specifications: AASHTO M274 and M36, ASTM A819 and A760 and CSA G401.

The pipe shall have a wall thickness of at least that specified in the Unit Price Table. However, should the wall thickness not be specified, then the wall thickness shall be at least the corresponding thickness given in the following table for pipe of the size and type required.

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PIPE DIAMETER	WALL THICKNESS
100 mm to 500 mm	1.6 mm for Any Corrugation
600 mm to 1200 mm	2.0 mm for Any Corrugation
1400 mm to 1800 mm	2.0 mm for 125 mm X 25 mm Corrugation or 3.5 mm 68 X 13 mm Corrugation
2000 mm to 2400 mm	2.8 mm for 125 mm X 25 mm Corrugation or 4.2 mm for 68 X 13 mm Corrugation

The Contractor shall supply the pipe, couplers, nuts and bolts. Should strutting be required during backfill operations, then the Contractor shall provide the necessary timber.

Fill material to be placed within 300mm of the top, bottom and the sides of corrugated pipe shall consist of clean well graded Other Material, or small sized shot rock. The maximum dimension of any stone in the Other Material, or in the shot rock, shall not exceed 150mm.

### **421.02.02 Plastic Pipe Materials**

Couplers and plastic pipe, consisting of corrugated polyethylene pipe, shall be of a type, size and strength acceptable to the Engineer. The Contractor shall provide the plastic pipe and couplers.

Contractors are advised that should plastic pipe be used, then the pipe shall be installed in a Select Backfill Material consisting of well graded Other Material having no more than 10% passing the 0.075mm sieve with a maximum particle size not exceeding 75mm.

### **421.03 ENVIRONMENTAL PERMITS AND AUTHORIZATIONS**

Authorization from the Fish Habitat Management Branch, Fisheries and Oceans Canada, is required for work in or near any watercourse or water body deemed to be viable fish habitat.

Where required by Fisheries and Oceans, a downstream pool shall be provided at the culvert outlet.

The Contractor shall provide such unwatering as is required. The unwatering shall be carried out in accordance with the requirements of Section 180 "Unwatering Incidental to Work".

The Contractor shall be aware of Division 8.

Where the stream is deemed to be viable fish habitat, then in order to assist fish passage during minimum flow periods, the culvert shall be installed such that the bottom of the culvert is at least 300mm below natural stream bed.

In multiple culvert installations, then to assist fish passage, only one culvert need be installed with the invert at least 300mm below natural stream bed.

### **421.04 PIPE INSTALLATION**

Culvert pipes shall be laid to the alignment, length and grade staked by the Engineer.

Driveway culverts will typically be: a minimum length of 7 m if rip-rap end treatment is used, and a minimum length of 8 m if no rip-rap is used.

The culvert shall be installed in accordance with the requirements given in Form 1236 "Typical Culvert Bedding and Backfill Details".

Should excavation be required to install the pipe at the required grade, then excavation shall be carried out and paid for in accordance with Section 403 "Excavation for Foundations".

Where unsuitable material is encountered at the proposed pipe invert grade, then the unsuitable material shall be excavated and replaced.

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The replaced material shall be compacted to not less than 95% of Standard Proctor Density (ASTM D698-78).

The bed shall be shaped to conform to the bottom of the pipe and shall afford a uniformly firm bed throughout its entire length.

When extending an existing culvert, the Contractor shall brush off all soil sticking to that part of the existing pipe that will be lapped.

When laying pipe, should the required culvert length be unobtainable from a combination of pipe lengths available on the site, then the Contractor shall cut a piece of pipe to obtain the required length of culvert. The cut or short section shall be placed on the down stream end.

Pipe cuts shall be made neatly at right angles to the axis of the pipe.

Riveted or annular corrugated steel pipe and plastic pipe shall be laid with the inside circumferential laps pointing in the direction of the flow. The longitudinal laps shall be located in the upper half of the pipe.

Helical corrugated plastic and steel pipe shall be installed so that the helix angle is constant for the total length of the installation and each pipe section shall be installed next to the previous section such that the lock seam forms a continuous helix.

Should concrete headwall be installed under another item, then backfilling against the headwalls shall not commence until the concrete has been cured to the specified design strength at 28 days. Should the Contractor wish to commence backfilling before 28 days after pouring, then the Contractor will be required to prove that the 28 days specified design strength has been obtained before permission to commence backfilling will be granted.

The material shall be carefully placed so that the intended shape of the pipe is maintained and no damage or movement of the culvert occurs.

The backfill material shall be placed simultaneously on both sides of the pipe in layers not exceeding 200mm in thickness. Each layer shall be thoroughly tamped to a compaction not less than 95% of Standard Proctor Density before a further layer is placed.

Backfilling shall be continued until all parts of the pipe culvert have not less than 300mm of backfill cover.

Any pipe which is not in the alignment and to the grade required by the Engineer after laying shall be taken up and relaid at the Contractor's expense.

### **421.04.01 Aluminized Corrugated Steel Pipe Installation**

Where excavation for foundation is required before an aluminized corrugated steel pipe may be placed in Other Material ground, then the excavation shall be to the proposed invert elevations and graded so as to provide a uniformly firm bed throughout the length of the culvert.

However, in solid rock, the excavation shall be carried out to a depth of 150mm below the proposed invert elevations so that fill material may be placed to provide a bed for the culvert. The fill material shall be placed and graded so as to provide a uniformly bed throughout the length of the culvert.

Where an aluminized corrugated steel pipe is cut, drilled or welded, the pipe shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld splatter, and wiped clean. The clean surface shall receive at least one application of metal conditioner to de-oxidize, de-grease and phosphatize the metal surface to be treated if the surface is oily. Pre-mixed, ready-to-apply, liquid-zinc compound shall be applied to the prepared clean dry metal surface. The cold galvanizing compound must be of a type that imparts cathodic action against corrosion. The cold galvanizing compound should have a minimum 50mm overlap of the surrounding undamaged aluminized metal.

When applying metal conditioner and cold galvanizing compound near a watercourse or water body, the Contractor shall ensure that the application is carried out carefully so as to prevent leakage or spillage.

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Both metal conditioner and cold galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings (organic) and meet or exceed Canadian Government Specifications 1-GP-181A. All materials must be applied in accordance with the manufacturer's instructions.

Corrugated pipe sections shall be jointed together by means of couplers. The couplers shall be installed to lap approximately equal portions of the pipe being connected and such that the corrugations or projections of the coupler properly engage the pipe corrugations. As the coupler is being tightened, it shall be tapped with a mallet to take up the slack. On asphalt coated pipe, the contacting surfaces of the coupler and pipe shall be lubricated with fuel oil, or a similar solvent, prior to tightening the coupler.

Strutting will be required for corrugated steel pipe culverts of diameter or span greater than 1500mm in order to ensure that the original shape of the culvert is retained after completion of backfilling operations.

Strutting shall be placed as directed by the Engineer. Struts shall be placed such that they bear onto longitudinally placed members. Under no circumstances shall struts be placed so that they bear directly onto the walls of the pipe.

Struts shall be left in place until ordered removed by the Engineer at the completion of backfilling operations.

For aluminized corrugated steel pipe of diameter 2400mm or less, the minimum required cover to subgrade is 300mm. For aluminized corrugated steel pipe of diameter between 2400mm and 3600mm, the minimum required cover is 500mm.

### **421.04.02 Plastic Pipe Installation**

Plastic pipe shall be laid on a bed of 150mm of Select Backfill Material.

Where excavation for foundation is required, the excavation shall be to 150mm below the proposed invert elevations so that Select Backfill Material may be placed to provide a bed for the culvert.

The Select Backfill Material shall be placed and shaped to conform to the underside of the culvert, and graded so as to provide a uniformly firm bed throughout the length of the culvert.

The cover shall not be less than the manufacturer's recommended minimum cover.

### **421.05 PROTECTION FROM TRAFFIC**

Prior to allowing the movement of construction equipment or any vehicular traffic over the structure, the depth of cover over the culvert shall be at least equal to that stipulated under Section 421.04 "Pipe Installation". Cover for off highway construction equipment will be in addition to that specified above.

### **421.06 MEASUREMENT FOR PAYMENT**

Measurement for payment for a culvert shall be the length of the culvert within the limits staked by the Engineer, measured in metres, to one decimal place, along the bottom of the new culvert. Should any part of the culvert extend beyond the limits as staked by the Engineer, then that part beyond the limits shall not be included in measurement for payment.

### **421.07 BASIS OF PAYMENT**

#### **421.07.01 Basis of Payment for Supply and Installation of Pipe Culverts**

Payment at the contract price for the type and size of pipe culvert specified shall be compensation in full for all labour, materials and equipment use to: supply the pipe, couplers,



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nuts and bolts, transport the materials to the project, store the materials at the project, transport the materials to the site, cut the pipe if required, clean the cut end, supply and apply metal conditioner and cold galvanizing compound to all cuts and welds, assemble the culvert, place and compact bedding and backfill as required, supply and place any required strutting, remove the strutting and provide all required unwatering of the culvert site during installation.

Select Backfill for use with plastic pipe shall be paid for in accordance with Section 206 "Grading of Cuts", or 207 "Borrow", or Section 310 "Use of Pits, Quarries and Stockpiles for Production of Materials Supplied by the Contractor" as the case may be, but the additional requirements for these materials as stipulated in this specification shall be considered compensated for in the contract price for supply and installation of pipe culverts.

Backfill for use near aluminized corrugated steel pipes will be obtained from materials excavated to place the pipes. Should the engineer determine that the excavated material be unsuitable for backfill, or should additional backfill materials be required, the backfill materials shall be paid for in accordance with Section 206, Grading of Cuts or Section 207, Borrow, as the case may be, but the additional requirements for backfilling, as stipulated in this specification shall be considered compensated for in the contract price for supply and installation of pipe culverts.

### **421.07.02 Basis of Payment for Pipe Restocking**

Contractors are advised that should less than the contract estimated quantity of pipe of a particular size and type be required, then the Contractor will be compensated for restocking this excess pipe at the rate of 15% of the Contract Unit Price for the supply and installation of pipe culvert of this size and type. Restocking shall include such things as handling, all transportation and any other expenses associated with removing the excess pipe from the project site, and returning it to the supplier or to the Contractor's permanent storage area.

### **421.07.03 Basis of Payment for Purchase of Pipe**

Contractors are advised that should less than the contract estimated quantity of pipe of a particular size and type be required, the Department reserves the right to purchase the excess. Compensation for purchase will be at the invoiced price for that pipe from the pipe supplier plus 10%.

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### SADDLE BRANCH SUPPLY AND INSTALLATION

#### INDEX

#### 422.01 SCOPE

#### 422.02 MATERIALS

#### 422.03 INSTALLATION

#### 422.04 MEASUREMENT FOR PAYMENT

#### 422.05 BASIS OF PAYMENT

#### 422.01 SCOPE

This specification covers the requirements for the supply and installation of a saddle branch to connect a smaller pipe to a corrugated steel pipe culvert or storm sewer. The work involves: cutting into the C.S.P., the supply and installation of the saddle branch to the C.S.P., and the joining of the smaller pipe to the saddle branch.

Excavation and backfilling required in making the connection will be covered separately under Section 404 "Trenching, and Excavation For Catch Basins", and bedding will be covered under Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

#### 422.02 MATERIALS

The saddle branch shall consist of 1.6 mm aluminized corrugated steel, manufactured to a size and shape suitable for connecting the smaller pipe to the corrugated steel pipe.

See Section 1219 "Typical Saddle Branch".

After fabrication, the saddle branch and saddle branch welds shall be either factory galvanized or treated as follows. Where corrugated steel pipe is cut, drilled, or welded, the pipe shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld splatter, etc. and wiped clean. The cleaned surface shall receive at least one application of metal conditioner to de-oxidize, de-grease, and phosphatize the metal surface to be treated if the surface is oily. Pre-mixed, ready-to-apply, liquid-zinc compound should be applied to the prepared clean dry metal surface. The cold-galvanizing compound must be of a type that imparts cathodic action against corrosion. The cold-galvanizing compound should have a minimum 50 mm overlap of the surrounding undamaged aluminized metal.

Both metal conditioner and cold-galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings (organic) and meet or exceed Canadian Government Specification 1-GP-181A. All materials must be applied in accordance with the manufacturer's instructions.

Should the corrugated steel pipe, to which the saddle is to be attached, be asphalt treated, then the aluminized saddle branch shall be asphalt treated too.

Nuts, bolts and washers shall be of galvanized steel.

Materials including saddle branch, nuts, bolts, washers, metal conditioner, cold-galvanizing compound and asphalt shall be supplied by the Contractor.

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### 422.03 INSTALLATION

Excavation required at the required point of connection shall be carried out in accordance with Section 404 "Trenching and Excavation For Catch Basins". The Contractor shall brush off all soil or dirt sticking to that part of the C.S.P. where the connection is to be made.

The Contractor shall cut a neat hole of suitable size in the C.S.P. at the location where the connection is to be made. Holes shall be drilled in the C.S.P. at required locations in preparation for connecting the saddle branch.

The Contractor shall treat both the cut edge and drilled holes as outlined above.

After the cold-galvanizing compound is thoroughly dry, the saddle branch shall be securely bolted to the wall of the C.S.P. and the pipe secured to the other end of the saddle branch.

### 422.04 MEASUREMENT FOR PAYMENT

Measurement for payment for saddle branch supply and installation, shall be by the number of saddle branches of a particular size and type installed.

### 422.05 BASIS OF PAYMENT

Payment at the contract price for each saddle branch of the type and size specified shall be compensation for all labour, materials, and equipment use to: clean pipes to be connected, cut a hole into the wall of the corrugated steel pipe, drill the bolt holes, surface preparation, the supply and application of metal conditioner, cold-galvanizing compound, and asphalt, the supply of the saddle branch, nuts, bolts and washers, the connection of the saddle branch of the C.S.P. and the connection of the pipe to be saddle branched, together with such unwatering as may be required to carry out the work.

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### SECTION 423

#### SUPPLY AND INSTALLATION OF STRUCTURAL PLATE PIPE

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##### 423.02 ENVIRONMENTAL PERMITS AND AUTHORIZATIONS

##### 423.03 MATERIALS

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##### 423.05 EXTENSIONS TO EXISTING STRUCTURAL PLATE

##### 423.06 BEDDING

##### 423.07 ASSEMBLY

##### 423.08 BACKFILLING

##### 423.09 PROTECTION FROM TRAFFIC

##### 423.10 MEASUREMENT FOR PAYMENT

##### 423.11 BASIS OF PAYMENT

##### 423.01 SCOPE

This specification covers the requirements for the supply and installation of structural plate round pipe and structural plate pipe-arch as new construction, or, where specified, to extend an existing structural plate pipe.

Should head wall treatment be required, it will be covered separately under another item.

##### 423.02 ENVIRONMENTAL PERMITS AND AUTHORIZATIONS

Authorization from the Fish Habitat Management Branch, Fisheries and Oceans Canada, is required for work in or near any watercourse or water body deemed to be viable fish habitat.

Where required by Fisheries and Oceans, a downstream pool shall be provided at the culvert outlet.

Culvert pipes are to be installed such that the bottom of the culvert is at least 300 mm below the natural streambed. This will allow the deposition of stream gravels in the culvert providing a natural appearing streambed and will assist fish passage during minimum flow periods.

For stream crossings requiring multiple culvert installations, only the culvert designed to carry minimum flows shall be installed to maintain fish passage (i.e. countersunk a minimum of 300 mm). The other culverts shall normally be installed along the streambed or at an elevation determined by the Engineer.

Where unwatering is required, the contractor shall carry out this work in accordance with Section 180 - "Unwatering Incidental to Work". The Contractor shall be aware of the requirements of Division 8.

##### 423.03 MATERIALS

The structural plate round pipe or structural plate pipe-arch shall be of the size, thickness, and type specified in the contract documents.

The Contractor shall supply the plates, nuts, bolts, washers, ribs if required, and all necessary hardware

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to the job site. All materials for steel pipes shall be of galvanized steel and conform to CSA Standard CAN 3-G401-M81, or the latest edition thereof. For aluminum pipes all materials shall be aluminum and conform to ASTM Standard B746, or latest edition thereof except that the bolts may be galvanized steel meeting the CSA Standard CAN3-G401-M81 or latest edition thereof.

### 423.04 EXCAVATION

The Contractor shall excavate a foundation within the limits and to the grade as staked by the Engineer. This excavation shall be carried out and paid for in accordance with Section 403 "Excavation For Foundations".

The foundation shall be excavated to a depth of 300 mm below the proposed grade of the invert and to a width equal to the width of the proposed structural plate pipe or pipe-arch plus 600 mm, or as directed by the Engineer.

### 423.05 EXTENSIONS TO EXISTING STRUCTURAL PLATE

When specified, the work will involve extending an existing structural plate pipe. Where the pipe has a beveled end on the end to be extended, then the Contractor shall remove the plates comprising the beveled end before adding the extension. The plates comprising the dismantled beveled end shall be disposed of by the Contractor at his own expense.

Where in order to secure the extension to the existing pipe, cuts need to be made, or bolt holes need to be drilled in the existing pipe, then the Contractor shall make such cuts or holes as are necessary. Cuts and holes shall be made in such a manner so as to leave neat edges.

In the case of extensions or modifications to existing pipe all cutting and drilling shall be approved by the supplier and the Engineer. Cuts (if essential) shall be made with saws and holes (if essential) shall be drilled. Following such alteration, the Contractor shall clean, pre-treat if necessary and coat all damaged sections with cold-galvanizing compound as outlined. The cold-galvanizing compound shall be allowed to thoroughly dry before adding the extension.

Where corrugated steel pipe is cut, drilled, or welded the pipe shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld splatter, and wiped clean. The clean surface shall receive at least one application of metal conditioner to de-oxidize, de-grease, and phosphatize the metal surface to be treated if the surface is oily. Pre-mixed, ready-to-apply, liquid-zinc compound should be applied to the prepared clean dry metal surface. The cold-galvanizing compound must be of a type that imparts cathodic action against corrosion. The cold-galvanizing compound should have a minimum 50 mm overlap of the surrounding undamaged galvanized metal.

When applying a metal conditioner and a cold galvanizing compound near a watercourse or water body, the Contractor shall ensure that the application is carried out carefully as to prevent leakage or spillage.

Both metal conditioner and cold galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings (organic) and meet or exceed Canadian Government Specifications 1-GP-181A. All materials must be applied in accordance with the manufacturer's instructions.

### 423.06 BEDDING

The Contractor shall prepare a bed to the alignment, shape of underside of the structural plate and grade, as required by the Engineer.

See Sections 1231 "Typical Structural Plate Round Pipe Bedding and Backfill Details", and 1232, "Typical Structural Plate Pipe Arch Bedding and Backfill Details".

Select bedding material shall be used to prepare the bed. Select bedding material shall consist of

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well graded other material, or other material borrow, having no more than 10% passing the 0.075 mm sieve and with a particle size not exceeding 75 mm.

The bedding directly below structural plate pipe shall be lightly compacted to the required grade and shaped with a thin layer of loose select bedding in direct contact with the invert plates. All remaining bedding shall be compacted to at least 95% of Standard Proctor Dry Density (ASTM D698-78).

### 423.07 ASSEMBLY

The Contractor shall load the plates, nuts, bolts, washers, ribs if required, and all necessary hardware at the point of supply and transport them to the installation site.

The cutting of plate(s) or the drilling of holes in new structural plate pipe construction will not be permitted. Any defective plate(s) must be reported to the supplier and corrective action taken by the supplier or the manufacturer.

The Contractor shall assemble the structure using procedures as recommended by the supplier and in accordance with the instructions of the Engineer.

The Contractor shall brush off all soil sticking to the outside of those parts of plates that are to be lapped when joined.

On bituminous coated plates, the contacting surfaces of the plates shall be lubricated with fuel oil, or similar solvent, prior to tightening the bolts. When applying fuel oil, or a similar solvent, near a watercourse or water body, the contractor shall ensure that the application is carried out carefully as to prevent leakage or spillage.

Structural plate pipes may be assembled at the proposed location or at the side of the location. If the assembled structure has to be moved to its final position it shall be moved in such a manner that no damage or distortion is caused to the structure or the bedding.

The structural plate pipe shall be placed to the required alignment, and grade and be within the required limits, as specified by the Engineer.

After complete assembly all bolts shall be re-tightened with a torque wrench to not less than 200 N-m for plates of thickness up to and including 3.2 mm thick, and not less than 340 N-m for plate thicker than 3.2 mm or to the manufactures specifications.

### 423.08 BACKFILLING

Should concrete headwalls be installed under another item, then backfilling shall not commence until the concrete headwalls have been cured to the specified design strength at 28 days. Should the Contractor wish to commence backfilling before 28 days after pouring, then the Contractor will be required to provide that the 28 day specified design strength has been obtained before permission to commence backfilling will be granted.

Select backfill material shall be used in backfilling and it shall consist of well graded other material or other material borrow having no more than 10% passing the 0.075 mm sieve and with particle size not exceeding 75 mm.

The backfill material shall be carefully placed so that the intended shape of the structure is maintained and no damage or movement occurs.

The backfill material shall be placed simultaneously on both sides of the structure in layers not exceeding 200 mm in thickness. The backfill material shall be spread with a light dozer running parallel to, not at right angles to the structure.

Select backfill material shall extend along the sides of the structure at least one span width away from the steel surfaces.

Backfilling with select backfill material shall be continued until all parts of the pipe have not less than 1 m

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of backfill cover, or not less than the manufacturer's recommended minimum cover, whichever is less.

Each layer of select backfill material shall be compacted to at least 95% of Standard Proctor Density (ASTM D698-78), before a further layer is placed on top.

Compaction shall be provided by means of a hand held mechanical type compactor. Normal highway fill type compaction equipment shall not be used in close proximity to the structure.

Backfilling equipment and mechanical tampers shall not operate closer than 300 mm from the free ends. Compaction within this area shall be achieved by means of hand operated timber rams.

Particular care shall be taken to ensure that 95% of Proctor compaction is achieved in the haunches of the structure.

The diameter, span, and rise of the structural plate pipe shall not vary from the original dimensions by more than five percent during backfilling operations.

Any structural plate pipe which is not in the alignment or within the limits required by the Engineer, or which displays distortions greater than those stated above, shall be excavated and re-installed according to these specifications, at the Contractor's expense.

### **423.09 PROTECTION FROM TRAFFIC**

Prior to allowing the movement of construction equipment or any vehicular traffic over the structure, the depth of cover over the structural plate pipe shall not be less than the manufacturer's recommended minimum cover for the particular loading condition.

### **423.10 MEASUREMENT FOR PAYMENT**

Measurement for payment for a structural plate pipe shall be the actual length of the new pipe measured in metres, to one decimal place, along the bottom of the pipe.

### **423.11 BASIS OF PAYMENT**

Payment at the contract price for the size, thickness, and type of structural plate pipe specified shall be full compensation for all labour, materials, and equipment-use required to: supply all plates, nuts, bolts, washers, ribs if required, together with all necessary hardware, load and haul the same from the supply point to the installation site, provide for temporary storage and all rehandling necessary, assemble the structure, locate to alignment, grade, and tolerance specified by the Engineer, place and compact select bedding and select backfill as specified herein, together with all labour, materials and equipment-use necessary to provide any required unwatering.

Where the work involves extending an existing structural plate pipe, then the basis of payment shall, in addition to the aforesaid, also include all labour, materials and equipment-use for: removing and disposing of the existing beveled end or ends (if any), cutting plates (if needed), drilling holes (if needed), and treating, supplying and applying cold-galvanizing compound to any cuts or drilled holes.

Select bedding material and select backfill material shall be paid for in accordance with Section 206 "Grading of Cuts" or Section 207 "Borrow" or Section 310 "Use of Pits, Quarries, and Stockpiles for Production of Materials Supplied by the Contractor" as the case may be, but the additional requirements for bedding and backfilling as stipulated in this specification shall be considered compensated for in the contract price for structural plate pipe.

All excavation required for a new pipe or to expose the end of an existing pipe where an extension is required shall be paid for in accordance with Section 403 "Excavation for Foundations" (a) Solid Rock or (b) Other Material, as the case may be.

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Department of Transportation and Works  
Highway Design Division

### SECTION 424

#### SUPPLY AND INSTALLATION OF STRUCTURAL PLATE ARCH

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##### 424.08 BASIS OF PAYMENT

##### 424.01 SCOPE

This specification covers the requirements for the supply, installation, and backfilling of a structural plate arch to extend an existing structural plate arch or new construction.

The provision of footings for the arch is covered under Section 450 "Concrete Footings for Structural Plate Arches".

Should concrete headwalls be required, then they will be covered separately under another item and specification.

##### 424.02 ENVIRONMENTAL PERMITS AND AUTHORIZATIONS

Authorization from the Fish Habitat Management Branch, Fisheries and Oceans Canada's required for work in or near any watercourse or water body deemed to be viable fish habitat.

Where required by Fisheries and Oceans, a downstream pool shall be provided at the culvert outlet.

Where unwatering is required, the Contractor shall carry out this work in accordance with Section 180 "Unwatering Incidental to Work".

The Contractor shall be aware of the requirements of Division 8.

##### 424.03 MATERIALS

The structural plate arch shall be of the span, rise, thickness, and type as specified in the contract.

The Contractor will supply the plates, unbalanced channel, nuts, bolts, washers, ribs if required, and all necessary hardware including the bolts necessary to fasten the structural plate arch to the unbalanced channel. For steel pipes all materials shall be of galvanized steel and conform to CSA Standard CAN3-G401-M81, or latest edition thereof. For aluminum pipes all materials shall conform to ASTM Standard B746 except that the bolts can be galvanized steel meeting the CSA Standard CAN3-G401-M81, or latest edition thereof.



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### 424.04 ASSEMBLY

The Contractor shall load the plates, unbalanced channel, nuts, bolts, washers, ribs if required, and all necessary hardware at the point of supply and transport them to the installation site.

The Contractor shall allow the concrete footings to cure for at least three days before commencing the assembly of the structural plate and the bolting of the plates to the channel embedded in the footing.

The Contractor shall assemble the structure using procedures as recommended by the supplier and in accordance with the instructions of the Engineer.

When extending an existing arch, the Contractor shall brush off all soil sticking to the outside of those parts of plates that are to be lapped when joined.

The cutting of plate(s) or the drilling of holes in new structural plate arch construction will not be permitted. Any defective plates must be reported to the supplier and corrective action taken by the supplier or manufacturer.

When the Contractor is extending an existing structural plate arch all cutting and drilling shall be approved by the supplier and the Engineer. Cuts (if essential) shall be made with saws and holes (if essential) shall be drilled. Following such alteration, the Contractor shall clean, pre-treat if necessary and coat all damaged sections with cold-galvanizing compound as outlined.

Where corrugated steel pipe is cut, drilled or welded the pipe shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld splatter, and wiped clean. The clean surface shall receive at least one application of metal conditioner to de-oxidize, de-grease, and phosphatize the metal surface to be treated if the surface is oily. Pre-mixed, ready-to-apply, liquid-zinc compound should be applied to the prepared, clean dry metal surface. The cold-galvanizing compound must be of a type that imparts cathodic action against corrosion. The cold-galvanizing compound should have a minimum 50 mm overlap of the surrounding undamaged galvanized metal.

When applying metal conditioner and a cold-galvanizing compound near a watercourse or water body, the Contractor shall ensure that the application is carried out carefully as to prevent leakage or spillage.

Both metal conditioner and cold-galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings (organic) and meet or exceed Canadian Government Specifications 1-GP-181A. All materials must be applied in accordance with the manufacturer's instructions.

On bituminous coated plates, the contacting surfaces of the plates shall be lubricated with fuel oil, or similar solvent, prior to tightening the bolts. When applying fuel oil, or similar solvent near a watercourse or water body, the Contractor shall ensure that the application is carried out carefully as to prevent leakage or spillage.

After complete assembly all bolts shall be re-tightened with a torque wrench to a minimum of 200 N-m for plates of thickness up to and including 3.2 mm, and to a minimum of 340 N-m for plates thicker than 3.2 mm or to the manufactures specifications.

### 424.05 BACKFILLING

Backfilling shall not commence until footings and any concrete headwalls and wingwalls have cured to at least 70% of the specified design strength at 28 days or cured for seven days, whichever comes first.

Select backfill material shall be used in backfilling, and shall consist of well graded other material or other material borrow having no more than 10% passing the 0.075 mm sieve and with particle size not exceeding 75 mm.

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The backfill material shall be carefully placed so that the intended shape of the structure is maintained and no damage occurs.

The backfill materials shall be placed in layers simultaneously on both sides and over the structure, such that each layer conforms to the shape of the structure. Layers shall not exceed 200 mm in thickness.

When backfilling arches without head walls, or with head walls not sufficiently strong to maintain the shape of the arch, the first fill shall be placed midway between the ends of the arch. This fill shall be kept in as narrow a strip as possible until the top of the arch is reached. The remainder of the backfill shall be placed from the top of the arch, starting at the centre and working both ways to the ends.

When backfilling arches with head walls heavy enough to maintain the shape of the arch, backfill shall be placed against one head wall until the top of the arch is reached. Then backfill shall be placed towards the opposite head wall.

The backfill shall be spread with a light dozer running parallel to, not at right angles to the structure.

Select backfill material shall extend along the sides of the structure at least one span width away from the steel surfaces.

Backfilling with select backfill material shall be continued until all parts of the arch have not less than 1 m of backfill cover, or not less than the manufacturer's recommended minimum cover, whichever is less.

Each layer of select backfill material shall be compacted to at least 95% of Standard Proctor Density (ASTM D698-78) before a further layer is placed on top.

Compaction shall be provided by means of a hand held mechanical type compactor. Normal highway fill type compaction equipment shall not be used in close proximity to the structure.

Backfilling equipment and mechanical tampers shall not operate closer than 300 mm from the free ends. Compaction within this areas shall be achieved by means of hand operated timber rams.

The span and rise of the arch shall not vary from the original dimensions by more than five percent during backfilling operations. Any arch which displays distortions greater than those stated above, shall be excavated and re-installed according to these specifications, at the Contractor's expense.

### **424.06 PROTECTION FROM TRAFFIC**

Prior to allowing the movement of construction equipment or any vehicular traffic over the arch the depth of cover over the arch shall not be less than the manufacturer's recommended minimum cover for the particular loading condition.

### **424.07 MEASUREMENT FOR PAYMENT**

Measurement for payment for the supply and installation of Structural Plate Arch shall be the actual length of the new structural plate part of the arch measured in metres, to one decimal place, along the bottom of one side of the new structural plate.

### **424.08 BASIS OF PAYMENT**

Payment at the contract price for the size, thickness, and type of structural plate arch specified shall be full compensation for all labour, materials, and equipment use required to: supply all plates, unbalanced channel, nuts, bolts, washers, ribs if required together with all necessary hardware, load and haul the same from the supply point to the installation site, provide for temporary storage, and all necessary rehandling, assemble the structure, and bolt to unbalanced channel, locate to alignment, grade and tolerance specified by the Engineer, place and compact select backfill as specified herein, together with all labour, materials, and equipment use necessary to provide any required unwatering.

Where the work involves extending an existing structural plate arch the tendered price shall include full compensation for cleaning, pre-treating if necessary, including the supply and application of cold-galvanizing compound to all cuts, holes and damaged galvanizing.

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Select backfill material shall be paid for in accordance with Section 206 "Grading of Cuts", Section 207 "Borrow" or Section 310" Use of Pits Quarries or Stockpiles for Production of Materials Supplied by the Contractor, as the case may be, but the additional requirements for backfilling as stipulated in this specification shall be considered compensated for in the contract price for the supply and installation of Structural Plate Arch.

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### SECTION 425 TIMBER CULVERT EXTENSION

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#### 425.09 BASIS OF PAYMENT

#### 425.01 SCOPE

This specification covers the requirements for extending existing timber culverts by amounts and to grades as shown on the drawings and as required by the Engineer.

#### 425.02 MATERIALS

Timber for extending timber culverts shall be treated timber of sizes as shown on the drawings.

Spikes and drift bolts together with nuts and washers shall be of the dimensions shown on the drawings.

Wood preservative shall be required. Wood preservative for use in treating field cuts shall be of the same type and chemical composition as that used in the timber for the extension.

The Contractor shall supply the above listed materials.

#### 425.03 EXCAVATION

The Contractor shall excavate a foundation for the proposed extension within the limits and to the grade as staked by the Engineer. This excavation shall be carried out and paid for in accordance with Section 403 "Excavation for Foundations".

Excavation will normally be to a depth of 600 mm below the proposed invert elevation, to a width equal to the outside width of the culvert plus 600 mm on each side, and to a length equal to the required length of the extension plus 600 mm. Where aprons are required the excavation shall be deepened by an amount equal to the depth of the required apron below the invert.

The sides of the existing end pieces shall normally be excavated to a width 600 mm from the face, to a depth 100 mm below the bottom of the nailing strip and as far as the start of the existing sheathing.

#### 425.04 BEDDING

The Contractor shall prepare a bed for the nailing strips comprising selected bedding material.

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Selected bedding material shall consist of well graded other material, or other material borrow, having no more than 10% passing the 0.075 mm sieve and with a particle size not exceeding 75 mm.

The bed shall be placed to a compacted grade such that the positioned nailing strips will be at their required grade. The bed shall be placed so that the nailing strips bear completely on firm material leaving no voids under the nailing strip.

The bed shall be compacted to at least 95% of Standard Proctor Density (ASTM D698-78).

After the nailing strips have been placed to the required lines, and to the required grades, then selected bedding material shall be placed

between the strips to a compacted grade level with the tops of the nailing strips, so that when placed, the bottom cover will bear completely on firm material. The bedding material between the nailing strips shall be compacted to at least 95% of Proctor Density (ASTM D698-78).

### 425.05 ASSEMBLY

The extension shall be carried out in accordance with the drawings and the instructions of the Engineer. The extension shall have the same cross section dimensions as the existing timber culvert.

All field cut ends and field bore holes shall be treated with wood preservative before drive bolts are placed. The field treatment shall be carried out in accordance with Section 590 "Wood Preservation".

Before sheathing is applied to the sides of the culvert; the Contractor shall brush off all soil sticking to the sides of the exposed end sections.

### 425.06 BACKFILLING

Selected backfill material shall be used in backfilling, and it shall consist of well graded other material or other material borrow having no more than 10% passing the 0.075 mm sieve and with particle size not exceeding 75 mm.

The backfill shall be carefully placed so that no damage occurs to the structure.

The selected backfill material shall be placed simultaneously on both sides of the structure in layers not exceeding 200 mm in thickness. The backfill material shall be spread with a light dozer running parallel to, not at right angles to the structure.

Selected backfill shall extend along the sides of the structure at least one span width from each side.

Backfilling with selected backfill shall be extended to subgrade or until all parts of the structure have at least 1 m of cover, whichever is less.

Each layer of selected backfill material shall be compacted to at least 95% of Standard Proctor Density (ASTM D698-78), before a further layer is placed on top.

Compaction shall be provided by means of a hand held mechanical type compactor. Normal highway fill type compaction equipment shall not be used in close proximity to the structure.

### 425.07 PROTECTION FROM TRAFFIC

Prior to allowing the movement of construction equipment or any vehicular traffic over the structure the depth of cover shall be such that no damage will occur to the structure.

### 425.08 MEASUREMENT FOR PAYMENT

Measurement for payment shall be the volume measured in cubic metres, to two decimal places, of the timber actually incorporated into the extension of the culvert. Wasted ends, or timber added in excess of that required by the Engineer will not be measured for payment.

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Volume of timber being assessed as the sum of the individual pieces of timber calculated as the product of measured length, times measured width, times measured depth.

### **425.09 BASIS OF PAYMENT**

Payment at the contract price for timber culvert extension shall be compensation in full for all materials, labour, and use of equipment to: supply all treated lumber, hardware and wood preservative, cut pieces as required, treat cut ends and holes with preservative, construct the extension, and place and compact bedding and backfill as specified, together with the provision of such unwatering as may be required.

Select bedding material and select backfill material shall be paid for in accordance with Section 206 "Grading of Cuts", or Section 207 "Borrow" or Section 310 "Use of Pits, Quarries or stockpiles for Production of Materials Supplied by the Contractor", as the case may be, but the additional requirements for bedding and backfilling as stipulated in this specification shall be considered compensated for in the contract price for timber culvert extension.

## FORM 426



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 426

#### DESIGN, SUPPLY AND INSTALLATION OF LONG SPAN STRUCTURAL PLATE ARCH

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##### 426.08 BASIS FOR PAYMENT

##### 426.01 SCOPE

This specification covers the requirements for the design, supply, and installation for a structural plate long span arch, box culvert or other type of large metal pipe structure. The provision of footings for the arch is covered under Section 450 "Concrete Footings for Structural Plate Arches". Should headwalls be required, then they may be covered separately under another item and specification. The provision of backfill for the arch is covered under Section 411 "Select Backfill for Long Span Structural Plate Structures". The design life for the structural plate long span arch/pipe must be a minimum of 75 years.

##### 426.02 DESIGN

The Contractor shall be responsible for the design of the long span structural plate arch. The long span structure shall be of the stated length, span and rise, although minor variations from the stated span and rise will be considered.

The design shall be carried out in accordance with generally accepted standards of practice to meet CL-625 loading requirements, in accordance with the Canadian Highway Bridge Design Code.

The design shall be prepared by a Professional Engineer who shall submit shop drawings and installation procedures to the Department at least two weeks prior to start of construction. Shop drawings shall bear the stamp and signature of a Professional Engineer licensed to practice in the Province of Newfoundland and Labrador.

The shop drawings shall specify the intended plate corrugation profile, together with the plate thickness. The design calculations for plate thickness shall be included with the shop drawings.

Where the structure is intended as an underpass, provision shall be made to prevent water from the fill seeping through joints in the plates, and then leaking on to the road below. This may be accomplished by designing the plate overlap so that the water sheds to the fill side of the structure, rather than seeping through the joints.

Alternatively, such other means to prevent water seepage that are acceptable to the Engineer may be used.

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### 426.03 ENVIRONMENTAL PERMITS AND AUTHORIZATIONS

Authorization from the Fish Habitat Management Branch, Fisheries and Oceans Canada's required for work in or near any watercourse or water body deemed to be viable fish habitat.

Where unwatering is required, the Contractor shall carry out this work in accordance with Section 180 "Unwatering Incidental to Work".

The Contractor shall be aware of the requirements of Division 8.

### 426.04 MATERIALS

The long span structural plate arch shall be of the length, span, rise, corrugation profile and plate thickness, as approved by the Department.

The Contractor will supply the plates, unbalanced channel, nuts, bolts, washers, ribs if required, and all necessary hardware including the bolts necessary to fasten the structural plate arch to the unbalanced channel. All materials shall be of galvanized steel and conform to CSA Standard CAN3-G401-M81, or latest edition thereof.

### 426.05 ASSEMBLY AND BACKFILLING

The Contractor shall allow the concrete footings to cure for at least three days before commencing the assembly of the structural plate and the bolting of the plates to the channel embedded in the footing.

The cutting of plates or the drilling of holes in new structural plate arch construction will not be permitted. Any defective plates must be reported to the supplier and corrective action taken by the supplier or manufacturer.

The Contractor shall assemble and install the structure in accordance with the designer's drawings, using procedures specified by the industry representative and in accordance with the instructions of the Engineer. Prior to starting the work, the Contractor shall provide a copy of assembly and installation drawings and procedures to the Engineer on site.

Backfilling shall not commence until footings and any concrete headwalls and wingwalls have cured to at least 70% of the specified design strength at 28 days or cured for seven days, whichever comes first. This requirement may be increased by the Professional Engineer who stamps the design drawings.

Assembly and installation of the culvert shall be monitored by a qualified representative of the steel culvert industry, hereafter referred to as the industry representative. The industry representative will be responsible for approval of backfill materials; approval of procedures for placing and compacting backfill materials; supervising culvert assembly and installation; and generally ensuring that the culvert is installed in accordance with the requirements of the culvert designer and the culvert manufacturer. If the structure is intended to be an underpass, then the Contractor shall install such provisions as are required to make the structure watertight.

The industry representative shall monitor the Contractor's operations on a full time basis during backfill operations. The Department will carry out compaction tests on the backfill material under the direction of the industry representative.

Backfill material shall be carefully placed and compacted so that the correct shape of the structure is maintained. Deflections from the specified dimensions shall be within the tolerances permitted by the culvert designer.



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### 426.06 PROTECTION FROM TRAFFIC

Prior to allowing the movement of construction equipment or any vehicular traffic over the arch the depth of cover over the arch shall not be less than the manufacturer's recommended minimum cover for the particular loading condition.

### 426.07 MEASUREMENT FOR PAYMENT

Measurement for payment for the long span structural plate arch shall be the actual length of the installed plate arch, measured along the bottom of one side. The measurement shall be computed in metres, rounded to one decimal place.

### 426.08 BASIS OF PAYMENT

Payment at the contract price for the design, supply, and installation of the long span structural plate arch shall be compensation in full for all materials, labour, and use of equipment to: design, supply, transport, assemble, and install the plate arch, provide any required unwatering, and place and compact the backfill, together with the provision of supervision by a qualified representative from the long span structural plate structure industry.

Included in the materials which shall be supplied by the Contractor are all plates, unbalanced channels, nuts, bolts, and washers, together with any thrust beams, distribution slabs, ribs and gaskets, select backfill and such other items which may be included in the design.

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Department of Transportation and Works  
Highway Design Division

## SCREEN END TREATMENT FOR CORRUGATED STEEL PIPE

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#### 430.01 SCOPE

This specification covers the requirements for the supply and installation of a screen to the end of a corrugated steel pipe culvert or to the inlet of a corrugated steel pipe storm sewer.

#### 430.02 MATERIALS

Screens shall consist of 3.8 mm steel mesh welded to a standard pipe coupling of such size as to fit the size of pipe for which the screen is required. A drawing of a typical screen is shown in Section 1225, "End Treatment Screens for Corrugated Steel Pipe".

Coupler, nuts and bolts shall be of galvanized steel.

After fabrication, the screen shall be rust proofed with cold galvanizing compound.

When corrugated steel pipe is cut, drilled, or welded the pipe shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld splatter, etc., and wiped clean. The cleaned surface shall receive at least one application of metal conditioner to de-oxidize, de-grease, and phosphatize the metal surface to be treated if the surface is oily. Premixed, ready-to-apply, liquid-zinc compound should be applied to the prepared clean dry metal surface. The cold-galvanizing compound must be of a type that imparts cathodic action against corrosion. The cold-galvanizing compound should have a minimum 50 mm overlap of the surrounding undamaged galvanized metal.

Both metal conditioner and cold-galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings (organic) and meet or exceed Canadian Government Specifications 1-GP-181A. All materials must be applied in accordance with the manufacturer's instructions.

Should asphalt treatment be specified, then the fabricated screen shall be asphalt treated.

Materials including steel mesh, pipe coupling, cold galvanizing compound, nuts, and bolts together with asphalt, if required, shall be supplied by the Contractor.

#### 430.03 FABRICATION AND INSTALLATION

The screen shall be fabricated to such size that it will fit over, and be capable of being secured to, the CSP for which it is required. The screen shall be constructed as shown in the drawings and then rust proofed as outlined above.

After the rust proof treatment is thoroughly dry, the screen shall be treated with asphalt if asphalt treatment is specified.

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After all treatments are thoroughly dry, the screen shall be securely bolted to the end of the corrugated steel pipe.

### **430.04 MEASUREMENT FOR PAYMENT**

Measurement for payment for screen and treatment for corrugated steel pipe shall be by the number of screen end treatments of a particular size and type made.

Screen end treatment sizes are specified in the unit price table in terms of the size of the pipes to which they will be connected.

### **430.05 BASIS OF PAYMENT**

Payment at the contract price for each screen end treatment of the type and size specified shall be compensation for all labour, materials, and equipment use to supply the steel mesh and pipe coupling, to fabricate and rust proof the screen as outlined above, to treat with asphalt if so specified, to supply nuts and bolts, and to secure the screen to the corrugated steel pipe, together with such unwatering provisions as may be necessary to carry out the work.

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Department of Transportation and Works  
Highway Design Division

## SECTION 450

### CONCRETE FOOTINGS FOR STRUCTURAL PLATE ARCHES

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#### 450.01 SCOPE

This specification covers the Department's requirement for the construction of concrete footings for structural plate arches, and long span structural plate arches. The footings incorporating a galvanized channel, reinforcing steel, and dowels if required, shall be as shown on the drawings, or as directed by the Engineer.

Dowels where required, shall be a separate contract item.

#### 450.02 MATERIALS

##### 450.02.01 Galvanized Channel

The Contractor will supply the galvanized channel sections. Galvanized channel is supplied and paid for under Section 424 of the Specifications Book, "Supply and Installation of Structural Plate Arch".

##### 450.02.02 Concrete

Concrete for use in constructing the footings shall be supplied by the Contractor and shall meet the specifications for "Substructure" concrete with a compressive strength at 28 days of 40MPa as per Section 904 "Concrete Structures". The cement used shall be a blended Portland, fly ash, silica fume cement, Type GUbF/SF. Contractors are advised that the minimum proportion by mass of the total cementing materials for silica fume shall be 6% and a maximum of 8%. Contractors are advised that the maximum proportion by mass of the total cementing materials for fly ash is 25%.

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### 450.02.03 Joints

Joint materials shall be supplied by the Contractor. Material for forming isolation joints shall be 12 mm thick bituminous fibre material.

Material for forming control joints shall be 12 mm thick bituminous fibre material for the set-in-place type, or a bituminous filler material for the saw-cut type.

### 450.02.04 Reinforcing Steel

Reinforcing steel shall be of the sizes shown in the drawings.

Reinforcing steel shall conform with the requirements of Section 905 "Concrete Reinforcement".

### 450.03 EXCAVATION

The Contractor shall excavate a foundation within the limits and to the grades as staked by the Engineer.

The excavation shall be carried out and paid for in accordance with Section 403 "Excavation For Foundations".

### 450.04 FORMWORK

Before placing formwork, the Contractor shall have drilled the required holes removed any dirt and debris that may be in the holes with compressed air or other acceptable means, inserted the required dowels, free of oil, grease, excessive rust and scale, and grouted them securely in place where the contract documents indicate that dowels are required. Holes to be drilled into the rock for the insertion of dowels shall have a maximum size of 1½-2 times the dowel diameter.

Formwork shall be supplied by the Contractor, and shall conform to the requirements of Section 907 "Formwork and Falsework".

### 450.05 PLACING OF REINFORCING STEEL

Reinforcing steel shall be placed in accordance with the requirements of Section 905 "Concrete Reinforcement".

### 450.06 PLACING CONCRETE AND CHANNEL

The Contractor shall load the channel sections at the point of supply and transport them to the installation site.

The lugs on the channels shall be bent down and twisted into the correct position.

The channel sections shall be cut to lengths such that when placed the channel will not be continuous through any of the joints.

The channels shall be placed in the footings to the lines and grades as staked by the Engineer and such that there will be a small gap between pieces of channel at all joints, at both the set-in-place type and at any future saw-cut control joints.

Concrete shall be placed in accordance with the requirements of Section 904 "Concrete Structures".

As soon as the concrete has been placed and consolidated, it shall be struck off true to grade on each side of the imbedded channel.

The surface shall then be floated with a wooden float until the mortar flushes to the top, and the entire surface, on each side of the channel, presents a tight and compact appearance.

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### 450.07 JOINTS

The configuration and spacing of joints shall be as shown on the drawings, or as required by the Engineer.

Isolation joints shall extend the full width and depth of the footing. The 12 mm thick bituminous fibre panels comprising the joint shall be set in the forms before the concrete is poured.

Control joints shall extend over at least one quarter the least dimension, and be of length equal to the full length of the dimension perpendicular to the least dimension.

Control joints may be formed using a 12 mm thick bituminous fibre panel cut to size and placed in the forms before the concrete is poured. Alternatively, control joints may be formed by saw-cutting the hardened concrete with a sufficient time of placing to prevent uncontrolled cracking. Saw-cut control joints shall be of thickness between 3 and 5 mm. Saw-cut joints shall be thoroughly cleansed of all dust and particles of foreign matter and then completely filled with a bituminous filler material.

### 450.08 CURING THE CONCRETE

Concrete shall be cured in conformity with the requirements of Section 904 "Concrete Structures".

### 450.09 TRIMMING

After the removal of the forms and after the initial curing of the concrete, the Contractor shall backfill adjacent material into any foundation trenches which may occur at the ends and at the stream sides of the footings. The ground next to the ends and the stream sides of the footings shall be made trim to sightly proportions.

### 450.10 MEASUREMENT FOR PAYMENT

Measurement for payment for Concrete Footings for Structural Plate Arches shall be calculated from the dimensions of the footings as laid out according to the instructions of the Engineer and such measurements will be computed to obtain the volume in cubic metres, rounded to two decimal places.

### 450.11 BASIS OF PAYMENT

Payment at the contract price for Concrete Footings for Structural Plate Arches shall be full compensation for all labour, materials, and equipment use: to supply and place formwork, to supply reinforcing steel, to protect and clean the reinforcing steel as required, to bend, cut and weld the reinforcing steel, to place the reinforcing steel in the work, to support the reinforcing steel during the placing, to supply and place concrete, to construct joints, to provide and place joint filler, to cut and place channel sections, to cure the concrete, to remove the forms and to trim the adjacent ground; together with labour, materials, and equipment use to provide such unwatering provisions that may be necessary in order to carry out the work according to these specifications.

It should be clearly understood, that the supply of the reinforcing steel is included in the basis of payment for Concrete Footings For Structural Plate Arches.

Dowels where required, shall be compensated for in a separate contract item.

### 450.12 CONCRETE ACCEPTANCE AND REDUCED PAYMENT CRITERIA ON CONCRETE FOOTINGS AND HEADWALLS FOR STRUCTURAL PLATE ARCHES

Concrete footings and headwalls, as defined by the contract item and the required specified strength at 28 days, must have an average tested strength at 28 days equal to or greater than that specified for payment at the bid price.

Concrete of a lower strength will have section 904.11.03 Concrete Acceptance and Reduced Payment Criteria on Concrete Located in New Structures of the specifications apply for adjustment of the unit price applicable or judgement of the acceptability of the concrete placed for this item.

## FORM 460



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 460 CONCRETE PLUGS FOR STORM SEWERS

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#### 460.01 SCOPE

#### 460.02 MATERIALS

#### 460.03 CONSTRUCTION

#### 460.04 MEASUREMENT FOR PAYMENT

#### 460.05 BASIS FOR PAYMENT

#### 460.01 SCOPE

This specification concerns the supply and placing of cast-in-place concrete plugs to block ends of storm sewers.

#### 460.02 MATERIALS

Plugs shall consist of concrete having a strength not less than 20 MPa at 28 days.

#### 460.03 CONSTRUCTION

The end of the storm sewer to be sealed with a plug shall be thoroughly cleaned of all dirt and accumulations of debris.

The concrete shall be placed in the end of the sewer to completely block the opening with a thickness of concrete blocking the end not less than 200 mm at its narrowest point.

#### 460.04 MEASUREMENT FOR PAYMENT

Measurement for payment for concrete plugs, shall be by the number of concrete plugs installed.

#### 460.05 BASIS OF PAYMENT

Payment at the contract unit price per plug shall be compensation in full for all labour, materials and equipment use to supply and place a concrete plug in a storm sewer, including any necessary cutting of pipe regardless of size and dewatering.

# FORM 461



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 461

### CONCRETE COLLAR AT CONCRETE CULVERT EXTENSION

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#### 461.01 SCOPE

#### 461.02 MATERIALS

#### 461.03 CONSTRUCTION

#### 461.04 MEASUREMENT FOR PAYMENT

#### 461.05 BASIS FOR PAYMENT

#### 461.01 SCOPE

This specification deals with the provision of a cast in place concrete collar to secure an extension to an existing concrete culvert when using pipe other than concrete pipe as the extension.

#### 461.02 MATERIALS

The collar shall consist of concrete having a strength of not less than 25MPa at 28 days, a maximum particle size of 20mm, and a maximum slump of 60mm.

Backfill for use within 300mm of the completed sides and top of the concrete collar, shall consist of a select backfill material consisting of a well graded other material having no more than 10% passing the 0.075mm sieve with a maximum particle size not exceeding 75mm.

#### 461.03 CONSTRUCTION

See Form 1220 "Typical Concrete Collar at Concrete Culvert Extension", for details of the required collar.

The Contractor shall provide such unwatering as is necessary in order that the collar be constructed as required.

Under the end of the concrete pipe to be extended, the ground shall be excavated in order to facilitate the placing of the concrete collar. The excavation shall extend 150mm back from the end, 150mm in front of the end, and in other material ground shall be to a depth of 300mm below the underside of the culvert. If the pipe is resting on solid rock, then any loose rock shall be removed down to 300mm below the underside, or to solid rock, whichever is less.

Surfaces of the new and existing pipe, to which concrete will be in contact, shall be thoroughly cleaned of all dirt and grease.

Where possible, the extension pipe shall be placed in the end of the concrete pipe so that approximately 100mm of the extension pipe lies within the end of the concrete pipe.

Formwork shall be placed so as to provide at least the minimum dimensions for the collar as shown on Form 1220 "Typical Concrete Collar at Concrete Culvert Extension". Formwork shall be supplied by the Contractor and shall conform to the requirements of Section 907 "Formwork and Falsework".

Concrete shall be placed and cured in accordance with the requirements of Section 904 "Concrete Structures".

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## **FORM 461**

Select Backfill material shall be placed simultaneously on all sides of the collar in layers not exceeding 200mm in thickness. Each layer shall be thoroughly compacted to a compaction of not less than 95% of standard proctor density before a further layer is placed.

Backfilling, with select backfill, shall be continued until the collar has not less than 300mm of select backfill cover.

### **461.04 MEASUREMENT FOR PAYMENT**

Measurement for payment will be based on the number of required concrete collars placed, regardless of the sizes of the various collars.

### **461.05 BASIS FOR PAYMENT**

Payment at the contract unit price for each concrete collar shall be compensation in full for all labour, materials and use of equipment to: clean the pipe surfaces which will be in contact with the collar, supply and place formwork, supply and place concrete, remove the formwork, cure the concrete, and to provide such unwatering as is required.

Select backfill material shall be paid for in accordance with Section 206 "Grading of Cuts", Section 207 "Borrow" or Section 310 "Use of Pits, Quarries or Stockpiles for Production of Materials Supplied by the Contractor as the case may be, but the additional requirements for the placing and compaction of the select backfill, as stipulated in this specification, shall be considered compensated for the contract price for concrete collar at concrete culvert extension.

The excavation required in order to place the collar around the culvert shall be paid for in accordance with Section 403 "Excavation for Foundations.

# FORM 470



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 470

### CONSTRUCTION AND ADJUSTMENT OF MANHOLES, CATCH BASINS AND DITCH INLETS

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470.02.06 Manhole and Catch Basin Steps

470.02.07 Weep Hole Pipes

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## 470.09 BASIS OF PAYMENT

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### 470.09.03 Basis of Payment for Supply of Frames, Grates, Covers and Gratings

### 470.09.04 Basis of Payment for Breaking into Manholes, Catch Basins and Ditch Inlets

## 470.01 SCOPE

This specification covers the requirements for constructing, rebuilding, adjusting and breaking into manholes, catch basins and ditch inlets.

## 470.02 MATERIALS

### 470.02.01 Concrete

Concrete shall have the following specific requirements:

CLASS OF CONCRETE	25MPa AT 28 DAYS
AGGREGATE	20mm MAXIMUM SIZE
AIR CONTENT	5% TO 8%
SLUMP	20mm TO 80mm

All concrete shall conform with the requirements of Section 904 "Concrete Structures".

### 470.02.02 Mortar

Mortar shall have the following proportions by weight:

1 PART PORTLAND CEMENT	2 PARTS CLEAN SHARP SAND
------------------------	--------------------------

Mortar shall be thoroughly mixed in a mechanical mixer of approved type or by hand on an impervious stage with only sufficient water to make the mixture plastic. Only clean water shall be used in mortar.

Mortar shall be applied in a fresh condition before any setting has commenced.

### 470.02.03 Grout

Grout shall have the following proportions by volume:

1 PART PORTLAND CEMENT	3 PARTS CLEAN SHARP SAND
------------------------	--------------------------

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Grout shall be thoroughly mixed to a consistency such that the grout will just flow evenly; too liquid a mixture will not be acceptable.

Grout shall be used in a fresh condition and any grout which has commenced to set shall not be worked up again but shall be removed from the works.

### **470.02.04 Bricks**

Bricks shall be construction grade bricks.

### **470.02.05 Reinforcing Steel**

Reinforcing steel shall conform to CSA CAN-A23.1-M77 "Concrete Materials and Methods of Concrete Construction". Yield point shall be not less than 400 MPa and size and type of bars shall be as stated on the drawings.

### **470.02.06 Manhole and Catch Basin Steps**

Manhole and catch basin steps shall be ladder rungs of the approximate dimensions as shown on the drawings for catch basins.

The materials of the ladder rungs shall be galvanized steel or an aluminum alloy.

Galvanized steel ladder rungs shall conform to the requirements of CSA Standard G30.12M or G30.16N, and shall be hot dip galvanized according to CSA Standard G164 to provide a zinc coating of not less than 0.6 kg per square metre. The carbon content of the steel shall not exceed 0.25%.

Aluminum alloy rungs shall conform to the requirements of CSA Standard HA5.

### **470.02.07 Weep Hole Pipes**

Weep hole pipes shall be of the diameters as shown on the drawings and shall consist of galvanized steel, aluminum, clay or plastic pipe.

### **470.02.08 Precast Reinforced Concrete Manhole, Catch Basin and Ditch Inlet Components and Precast Concrete Adjustment Units**

Precast units shall conform to design approved by the Engineer. Materials used in the units shall conform to the requirements of this specification.

### **470.02.09 Pipe Seals**

Pipe seals used in connecting pipes to manholes, catch basins and ditch inlets shall be of types approved by the Engineer.

### **470.02.10 Manhole and Catch Basin Frames, Grates, Covers and Lift Rings**

All frames, grates and covers shall conform to the size and configuration indicated on the drawings for the particular type specified on the contract unit price table.

Castings shall conform to the requirements of Class No. 30C as specified in ASTM A48-74.

Castings shall be sound, free from pouring faults, sponginess, cracks, blow holes and other defects. Bearing surfaces shall be machined if necessary so that the grates and covers sit firmly on the frames without rocking.

Castings shall be thoroughly cleaned and coated with a commercial quality asphaltic paint of a type suitable as a protective coating for iron castings.

Lift rings shall be of a type approved by the Engineer.

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### 470.02.11 Ditch Inlet Grating and Hardware

Ditch inlet grating, I-beam, anchor bolts, nuts and washers shall be as shown in the appropriate drawing for the required size of ditch inlet manhole, and Section 1260 "Typical Ditch Inlet Grating Detail".

The Contractor shall construct each grating so that it is of the required dimensions to fit the ditch inlet for which it is required. The inlet grates shall be composed of materials conforming with Metal Grating Institute #RF-37-5, or approved equal. The end bearing bar shall be welded to the angle bar along both legs with a 5 mm fillet weld.

When fabrication of the grating is complete, the grating and the I-beam shall be shop painted with asphalt having a softening point not lower than 70oC. Alternatively a tar base black paint shall be used.

Anchor bolts, together with accompanying nuts and washers shall be galvanized.

### 470.03 OPTIONS

The Contractor may choose between poured in place or approved precast construction.

Should the Contractor wish to use precast units, then he shall submit plans and specifications to the Engineer for a review of their suitability for use in the type of structure required. Only precast units which conform to designs approved by the Engineer shall be used.

### 470.04 CONSTRUCTION OF MANHOLES, CATCH BASINS AND DITCH INLETS

Manholes, catch basins or ditch inlets of the type specified shall be excavated for and constructed to conform to the requirements of the contract drawings, or the approved precast structure, and shall be located at the points and elevations as staked by the Engineer.

#### 470.04.01 Excavation

The Contractor shall carry out, and be paid for excavations in accordance with the requirements of Section 404 "Trenching and Excavation for Catch Basin".

#### 470.04.02 Poured in Place Construction

The Contractor shall form and pour the specified unit plumb and true to alignment and grade as set by the Engineer.

Formwork shall be supplied by the Contractor and shall conform to the requirements of Section 907 "Formwork and Falsework".

Concrete shall be placed in accordance with the requirements of Section 904 "Concrete Structures".

The Contractor shall incorporate all built-in hardware as is shown on the appropriate drawings for the particular type of structure being built.

Once forms have been stripped the Contractor shall remove all inside wall protuberances.

Concrete shall be cured in conformity with the requirements of Section 904 "Concrete Structures".

#### 470.04.03 Precast Construction

The precast unit shall be placed plumb and true to alignment and grade as set by the Engineer.

Precast bases shall be set to the grade as staked, shall be level, and shall have uniform overall contact with the underlying ground.

Any adjustment of the unit for plumb, alignment, and grade shall be carried out by lifting the unit free of the excavation, levelling the base, and replacing the unit to proper alignment and grade. Should the adjustment

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involve placing material under the base, then the placed materials shall be compacted to at least 95% of the Standard Proctor Density.

### **470.04.04 Pipe Connections**

When constructing cast-in place units, pipes may be built-in, or holes may be kept in the walls at the required grades and locations so that the pipes can be placed later.

For precast units, the Contractor shall cut holes into the side of the structure at required locations.

Pipes shall not extend out from interior walls more than 0.3 m unless specifically directed by the Engineer.

These pipes that are placed in a prepared or cut hole in the wall shall be securely sealed into place using grout or pipe seals. Grout shall be well and truly worked into all holes and spaces between the pipe and wall so as to completely fill the spaces and form a strong watertight bond. Seals shall be installed according to the manufacturer's directions.

### **470.04.05 Installation of Manhole and Catch Basin Frames, Grates and Covers**

The manholes and catch basins shall be constructed or installed so that the surface on which the mortar bed is to be placed is at least 20 mm but not more than 150 mm below the bottom of the frame and grate or frame and cover assembly.

Before application of mortar to the manhole or catch basin, the Contractor shall thoroughly clean the surface to which mortar is to be applied.

Frames for grates or covers on manholes and catch basins shall be set in a full mortar bed.

Bricks or precast concrete adjustment units may be used to set the frame and grate or frame and cover at the required position and elevation. Bricks shall be laid in double width using a Flemish bond. The inside and outside surfaces of the brick shall be plastered with a 10 mm thick mortar coat.

The frames and grates or frames and covers shall be set to the lines and grades as staked by the Engineer.

### **470.04.06 Installation of Grating for Ditch Inlet**

Gratings for ditch inlets shall be installed and securely fastened down with a washer and nut as indicated in the contract drawings.

### **470.04.07 Backfilling**

Backfilling shall be carried out using select bedding material which shall be placed and paid for according to the requirements of Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

The placing of select bedding materials shall not commence until the structure has cured to the specified design strength at 28 days. Should the Contractor wish to commence the placing of material before 28 days after pouring, then the Contractor will be required to prove that the 28 day specified design strength has been obtained before permission to commence backfilling will be granted.

## **470.05 ADJUSTMENT AND REBUILDING OF MANHOLES, CATCH BASINS AND DITCH INLETS**

### **470.05.01 Scope**

The work to be carried out shall include change of elevation of either a manhole, catch basin or ditch inlet, regardless of type or size.

Adjustment of manholes, catch basins or ditch inlets will apply where the top of the structure is to be raised or lowered 1.0 m or less.

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Rebuilding of manholes, catch basins or ditch inlets will apply to where the top of the structure is to be lowered or is to be raised more than 1.0 m.

### 470.05.02 Excavation

Where bituminous pavement must be removed to adjust or rebuild a structure the pavement shall be cut and excavated.

When concrete curb and gutter or concrete sidewalk must be removed to adjust or rebuild a structure, the curb and gutter or sidewalk shall be cut and excavated. This work of cutting and excavating shall be carried out and paid for in accordance with Section 511 "Cutting Concrete Slabs and Curb and Gutter" and Section 521 "Demolition and Removal of Sidewalks, Curb and Gutter, Manholes, Catch Basins, Ditch Inlets, Fences, Guide Rails and Guide Posts".

The Contractor shall excavate such granular base course materials together with catch basin backfill materials that it is necessary to excavate in order to carry out the adjustment or rebuilding. These materials shall be piled in a manner that will not endanger the work or obstruct traffic or pedestrians, but will permit the materials future use as backfill for the completed structure.

Prior to adjustment or rebuilding, the existing frame and grate or cover shall be carefully removed and salvaged in order that it may be re-used.

### 470.05.03 General Adjustment and Rebuilding Work

All existing mortar and brickwork shall be removed from the top of the existing structures prior to adjustment or rebuilding with precast adjustment units.

Where the work involves adjusting or rebuilding a ditch inlet, then the Contractor shall supply and place such new anchor bolts, nuts and washers as are required to carry out the work.

Where the work involves poured in place concrete or placing pre-cast units, then the work shall conform to the requirements of Section 470.04.02 "Poured in Place Construction" or Section 470.04.03 "Precast Construction" as the case may be.

Once a manhole, catch basin, or ditch inlet has been adjusted or rebuilt the salvaged or a new frame and grate or frame and cover, as required, shall be set to the correct elevation on the adjusted or rebuilt structure. This shall be done in accordance with the requirements of Section 470.04.05 "Installation of Manhole and Catch Basin Frames, Grates and Covers" or Section 470.04.06 "Installation of Grating for Ditch Inlet" as the case may be.

All construction debris resulting from adjustment or rebuilding of the structures shall be kept separate from excavated backfill materials.

#### 470.05.03.01 Adjustment

When manhole or catch basin covers are to be raised only to accommodate re-surfacing of the adjacent pavement, the Contractor may use manhole cover lift rings to raise the cover a sufficient height to accommodate the thickness of re-surfacing material.

Bricks may be used to raise structures up to 0.3 m. Precast concrete adjustment units may be used to raise structures up to 1.0 m. Where bricks are used, they shall be plastered inside and outside with a 10 mm thick mortar coat.

Where structures have already been extended using bricks and they are further adjusted upward with bricks, the total height of adjustment shall not exceed 0.3 m.

Where structures have already been extended using concrete adjustment units and they require further upward adjustment, the total height of adjustment shall not exceed 1.0 m.

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Where the top of units are to be raised, including structures with a domed upper section, concrete adjustment units, manhole cover lift rings or bricks shall be removed or added as required to adjust the structure to the proper elevation.

### **470.05.03.02 Rebuilding**

To lower the top of cast-in-place structures with a domed upper section the concrete in the structure shall be removed for the entire depth of the doming plus as much of the straight wall section as is necessary. The upper section of the structure shall then be rebuilt with a standard dome.

To lower the top of straight walled cast-in-place structures, the upper section of concrete shall be removed.

To raise the top of cast-in-place structures with a domed upper section, the concrete in the structure shall be removed for the entire depth of the doming. The upper section, including straight walls and dome shall then be rebuilt.

To raise the top of straight walled cast-in-place structures, the existing walls shall be extended upward in concrete.

Where poured-in place units are to be raised with poured-in-place concrete, the top surface of all existing walls shall be roughened before the walls are extended upwards.

Where the top of a precast structure is to be lowered or raised, the cone section shall be removed and riser sections of suitable height shall be removed, substituted for, or added to the existing riser sections. The cone section shall then be replaced.

### **470.05.04 Backfilling**

Backfilling shall be carried out using excavated granular base course materials and excavated catch basin backfill materials. The backfill shall be placed and compacted in accordance with the requirements for placing and compacting bedding material as given in Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

Backfilling shall be placed up to subgrade elevation.

Where poured-in-place construction has been used to carry out the adjustment or rebuilding, then the placing of backfilling material shall not commence until the structure has cured to the specified design strength at 28 days. Should the Contractor wish to commence the placing of material before 28 days after pouring, then the Contractor will be required to prove that the 28 day specified design strength has been obtained before permission to commence backfilling will be granted.

## **470.06 BREAKING INTO MANHOLES, CATCH BASINS AND DITCH INLETS**

### **470.06.01 Scope**

This specification concerns the connection of a storm sewer or sub-drain to a catch basin, manhole or ditch inlet, which was not built as part of this contract.

### **470.06.02 Excavation**

Excavation shall be carried out and paid for as part of the excavation for the storm sewer or sub-drain in accordance with Section 404 "Trenching, and Excavation for Catch Basins and Storm Sewers".

### **470.06.03 Construction**

The Contractor shall cut a hole into the side of the structure at the location and grade as staked by the Engineer. The pipe shall be securely and neatly grouted in place at the required grade. The grout shall be well and truly worked into all holes and spaces between the pipe and wall so as to completely fill the spaces and form a strong watertight bond.



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### 470.06.04 Backfilling

The grout shall be allowed to cure for at least 7 days before any backfill may be placed next to the connection.

Backfilling shall consist of the placing of select bedding and backfill for the pipe. Backfill shall be placed, compacted and paid for in accordance with Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins" and Section 404 "Trenching and Excavation for Catch Basins and Storm Sewers" respectively.

### 470.07 CLEAN-OUT

During the progress of the work and until the completion and final acceptance, manholes, catch basins and ditch inlets shall be kept clean and free of all foreign material.

The Contractor shall dispose of debris and surplus materials at his own expense.

### 470.08 MEASUREMENT FOR PAYMENT

Dependent on the items specified, measurement will be made by one of the following methods:

#### 470.08.01 Measurement for Payment for Construction of Manholes, Catch Basins and Ditch Inlets

Measurements will be based on the number of each type of required manhole, catch basin, or ditch inlet placed at the required locations and grades.

#### 470.08.02 Measurement for Payment for Adjustment and Rebuilding of Manholes, Catch Basins and Ditch Inlets

The alteration to each structure will be measured in metres, rounded to one decimal place. Measurement for payment will be made by taking the difference in elevation of the top of grate or cover at the centre prior to and after the adjustment with the following exceptions:

- (a) When rebuilding domed structures, the actual measured adjustment will be increased by the height of the dome portion.
- (b) Where the measured adjustment is less than 0.3 m, the measurement for payment will be taken to be 0.3 m.

#### 470.08.03 Measurement for Payment for Supply of Frames, Grates, Covers and Gratings

Measurement for payment for the supply of frame and grate, frame and cover or grating will be based on the number of each type of frame and cover, frame and grate or grating supplied for incorporation into the adjustment or rebuilding of manholes, catch basins and ditch inlets.

#### 470.08.04 Measurement for Payment for Breaking into Manholes, Catch Basins and Ditch Inlets

Measurement will be based on the number of connections made at the required locations of the grades.

### 470.09 BASIS OF PAYMENT

#### 470.09.01 Basis of Payment for the Construction of Manholes, Catch Basins and Ditch Inlets

Payment of the contract price for each of the required type of manhole, catch basin, or ditch inlet placed shall be full compensation for all labour, materials and equipment-use to supply all materials (including required grating, frame and cover, frame and grate, or frames and grates, as the case may be) required to construct the structure as shown on the drawings, construct and cure a cast-in-place unit or install a precast unit, carry out such required preparation and compaction of a bed as may be necessary for the base of a precast unit, install such reinforcement steel, anchor bolts, I-beams, ladder rungs, pipe for weeping holes and such other required hardware, install pipes in the walls, install the required type of grating, frame and cover, frame and grate or frames and grates, place anchor bolts or full mortar bed as appropriate, place and parge bricks or place precast concrete adjustment units as required, provide any required unwatering and shearing and

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shoring, and to carry out any necessary work to complete the structure in accordance with the contract requirements.

Excavation required prior to manhole, catch basin, or ditch inlet construction shall be paid for in accordance with Section 404 "Trenching and Excavation for Catch Basins and Storm Sewers".

Backfilling of new manholes, catch basins, or ditch inlets shall be paid for in accordance with Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

### **470.09.02 Basis of Payment for the Adjustment and Rebuilding of Manholes, Catch Basins and Ditch Inlets**

Payment at the contract price per metre for adjustment and rebuilding of manholes, catch basins and ditch inlets shall be full compensation for all labour, materials and equipment-use to supply all materials (except frame and grate, frame and cover or grating) required to carry out the alteration regardless of size or type, cut, remove and dispose of existing asphalt, carry out all necessary excavation after pavement, sidewalk and curb and gutter have been removed, remove and dispose of concrete and bricks in the structure, salvage the grating, frame and cover, frame and covers or frames and grates, place and cure cast-in-place concrete, place precast concrete adjustment units, place and parge bricks, place such additional ladder rungs as may be required, place any required manhole rings, place anchor bolts or full mortar bed as appropriate, re-install salvaged frame and cover, frame and grate, frames and grates or grating or install new frame and cover as required, provide any required unwatering and shearing and shoring, place and compact backfill, and supply, place and compact Granular "A", Granular "B" and asphalt including liquid and blending sand, together with all other items of work necessary for the satisfactory completion of the work, except for the cutting and removal, curb and gutter and sidewalk which will be paid for under separate contract items.

### **470.09.03 Basis of Payment for Supply of Frames and Covers, Frames and Grates and Gratings**

Payment at the contract price for each type and set of frame and grate, frame and cover and grating supplied shall be full compensation for all labour, materials and equipment-use to supply and deliver the required type of frame and grate, frame and cover, or grating to the location where the hardware is to be incorporated into the manhole, catch basin, or ditch inlet adjustment or rebuilding.

### **470.09.04 Basis of Payment for Breaking into Manholes, Catch Basins and Ditch Inlets**

Payment at the contract price for each connection made shall be full compensation for all labour, materials and equipment-use to provide openings in existing structures and grout in the pipe to be connected, regardless of the size of the pipe.

Excavation and backfilling shall be paid for in accordance with Section 404 "Trenching and Excavation of Catch Basins and Storm Sewers" and bedding shall be paid for in accordance with Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 475 ADJUSTMENT OF WATER VALVE BOX

#### INDEX

#### 475.01 SCOPE

#### 475.02 DESCRIPTION

#### 475.03 MEASUREMENT FOR PAYMENT

#### 475.04 BASIS OF PAYMENT

#### 475.01 SCOPE

This specification covers the requirements for the work of adjusting the level of water valve boxes to match proposed grade changes. This work is typically required prior to paving, or pavement recapping operations, so that the level of the valve box cover will match the level of the proposed recapped finish grade.

#### 475.02 DESCRIPTION

The Contractor shall carry out such excavation as is necessary so that the valve box is exposed sufficiently so that it may be adjusted to the required grade.

Where the valve box is set in pavement, the Contractor shall cut the existing pavement to a square or rectangular shape around the valve box. Each cut line shall be at least 200mm from the edge of the valve box. Cuts shall be finished straight with vertical edges.

During excavation operations, all contaminated select granulars, dirt and debris shall be removed and disposed of.

The valve box shall be adjusted so that the cover is at the grade required by the Engineer. Should the valve box, or any other parts, become damaged during the operations, then the Contractor shall replace the damaged parts with new parts.

The bottom of the excavation shall be compacted, using hand operated compaction equipment if necessary.

The hole shall be backfilled with Other Material, fresh Class"B", and fresh Class"A", in layers as appropriate. Each layer shall be compacted before the next layer is placed. Layers shall not be thicker than 150mm.

The bottom of the excavation, and each layer of select granulars shall be compacted to 100% of the maximum Standard Proctor Density(ASTM D698-78).

In pavement recapping operations, the top of the compacted Class"A" shall be brought level with the bottom of the existing pavement, then the area around the valve box shall be patched with hot mix asphaltic pavement to the full depth of the existing pavement. The asphaltic pavement shall meet the

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requirements for either asphaltic base, or asphaltic surface course as stipulated in Section 330"Hot Mix Asphaltic Concrete".

Immediately prior to patching, the vertical faces of the existing pavement shall be treated with a continuous thin coating of hot asphalt cement.

The hot mix asphaltic concrete shall be placed in layers not thicker than 50mm, and compacted, before the next layer is placed. Compaction of the hot mix asphaltic pavement shall conform with the requirements for compaction given in Section 330"Hot Mix Asphaltic Concrete", sub-section 330.07.06.

### **475.03 MEASUREMENT FOR PAYMENT**

Measurement for payment for Adjustment of Water Valve Box shall be on the basis of the number of water valve boxes adjusted to the required grades.

### **475.04 BASIS OF PAYMENT**

Payment at the contract price for Adjustment of Water Valve Box shall be compensation in full for all materials, labour, and use of equipment:

to supply all materials including Selected Granular Base Course Class"A" and Class"B", asphalt cement, and asphaltic concrete, to cut existing pavement, to excavate existing pavement and granular materials from around the valve box, to adjust the valve box to the required grade, to place and compact Other Material, Class"B", and Class"A", to treat the cut edge of existing pavement with asphalt cement, to place and compact hot asphaltic concrete around the adjusted valve box, and to dispose of all waste materials.

The Contractor shall be deemed to have allowed in his prices for hand work, should hand work be necessary in places.

The basis of payment for Adjustment of Water Valve Box also includes compensation in full for all materials, labour, and use of equipment to supply and replace any valve boxes and parts which are damaged during the adjustment of water valve box operation.

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## SECTION 480

### INSTALLATION OF CONCRETE CURB AND GUTTER

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#### 480.10 MEASUREMENT FOR PAYMENT

#### 480.11 BASIS OF PAYMENT

#### 480.01 SCOPE

This specification covers the requirements for the construction of various types of concrete curb and gutter on a prepared bed of granular base course. Curb and gutter of the type as stipulated in the Unit Price Table will include the provision of drop curbs, paraplegic ramps, and tapered ends together with the incorporation of catch basins and manhole gratings as staked by the Engineer.

#### 480.02 MATERIALS

Concrete for use in constructing curb and gutter shall conform to the following specific requirements:

CLASS OF CONCRETE	35MPa AT 28 DAYS
AGGREGATE	20mm MAXIMUM SIZE
AIR CONTENT	6% ± 1%
SLUMP	60mm ± 20mm

All concrete shall conform with Section 904 "Concrete Structures".

Material for forming isolation joints shall be 12 mm thick bituminous fibre material.

Material for forming control joints shall be 12 mm thick bituminous fibre material for the set-in-place type, or a bituminous filler material for the groove or saw-cut type.

All materials including formwork, shall be supplied by the Contractor.

#### 480.03 PREPARATION WORK

Should excavation be required prior to placing the bed for the curb and gutter, then such work shall be carried out and paid for in accordance with Section 206 "Grading of Cuts" or Section 403 "Excavation for Foundations".

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When fill is required prior to placing the bed for the curb and gutter, then this work shall be carried out in accordance with Section 204 "Grading of Fill".

After the site has been graded, as described above, a bed shall be laid composed of granular base course Class "B", or Class "A" should the Engineer so require. The bed shall be laid to the lines and grades as staked by the Engineer.

The compacted depth of the bed should not be less than 100 mm. The bed shall be compacted to not less than 95% of the Standard Proctor Density (ASTM D698-78).

### **480.04 FORMWORK**

Formwork shall conform to the requirements of Section 907 "Formwork and Falsework".

Forms shall be set to provide curb and gutter of the required type, to the grades and lines as staked by the Engineer.

Curb and gutter shall be of Types "C", "D", "G", or "H" as shown in the drawing in Section 1275 "Concrete Curbs, Types C, D, G & H" or of other types shown on the drawings.

At those places where a drop curb or a tapered end is required, the forms shall be set so as to obtain a finished concrete surface as shown in the drawings in Section 1276 "Typical Drop Curb With Sidewalk Layout" or Section 1277 "Typical Curb and Gutter Tapered End Treatment", Section 1278, "Paraplegic Ramps" as the case may be.

### **480.05 PLACING THE CONCRETE**

Concrete shall be placed in accordance with the requirements of Section 904 "Concrete Structures".

The curb and gutter shall be laid so as to incorporate catch basin, and manhole frames and grates which lie on the line of the curb and gutter.

The concrete on the upper surfaces shall be floated to a smooth uniform finish of the required cross section, free of open textured aggregate and local projections. No deviation of greater than 3 mm in a 3 m straight edge shall be tolerated.

Care shall be taken to avoid over finishing or working more mortar to the surface than is actually required.

Back edges shall be rounded by use of a 6 mm radius edging tool.

Neat cement shall not be used as a drier to facilitate finishing.

Any honeycombed areas occurring along the formed surfaces shall be filled with mortar composed of one part Portland Cement and two parts sand.

The provisions of this specification may be modified by the Engineer at the Contractor's request to suit construction by extrusion methods if the Contractor can demonstrate to the Engineer's satisfaction that by such methods a quality will be achieved at least equal to that produced by standard methods. Notwithstanding approval of such modifications, the Engineer may, at any time, require the Contractor to revert to standard methods if, in his opinion, the required results are not being obtained.

### **480.06 JOINTS**

When concrete curb and gutter is constructed immediately adjacent to another structure such as concrete pavement, concrete sidewalk, catch basin frame or gutter outlets, then the Contractor shall construct a full depth isolation joint between the structure and the curb and gutter. Isolation joints shall also be constructed at points of curvature for short radius curves.

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Isolation joints shall consist of a 12 mm thick bituminous fibre panel cut to such size so as to provide a full depth joint extending for the full width. The bituminous fibre panels shall be set vertical in the forms before the concrete is poured.

Panels shall be pre-cut to the shape of the joint so as to provide a 6 mm recess on the exposed surfaces. The Contractor has the option of either providing a 6 mm deep, 12 mm wide cap strip, to be removed after the concrete has hardened and not edging the joints, or carefully removing all concrete immediately above the filler material to form a 6 mm deep, 12 mm wide recess then finishing both edges of each joint to 6 mm radius with a suitable short edging tool.

When concrete curb and gutter is constructed adjacent to asphalt pavement, control joints shall be spaced at intervals not exceeding 6 metres. However, when concrete curb and gutter is constructed adjacent to concrete pavement, control joints shall coincide with joints in the pavement. Control joints may be formed using a 12 mm thick bituminous fibre panel cut to such size so as to provide a joint extending not less than one quarter the depth of the curb and gutter for the full width. The bituminous fibre panel control joints shall be set vertical in the forms before the concrete is poured.

Panels shall be pre-cut to the shape of the joint so as to provide a 6 mm recess on the exposed surfaces. The methods of obtaining these 6 mm recesses shall be as previously stipulated for isolation joints.

Alternatively control joints may be formed by the use of a "guillotine" knife in fresh concrete or saw cutting the hardened concrete within a sufficient time of placing to prevent uncontrolled cracking. Groove or saw-cut control joints shall be of thickness between 3 and 5 mm, depth not less than one quarter the depth of the curb and gutter and width the full width of the curb and gutter. When the concrete is dry, the control joints shall be completely filled with a bituminous filler material. Immediately prior to the filling, the joint shall be thoroughly cleansed of all dust, and particles of foreign matter.

Construction joints shall be built at convenient stopping places in the placement of the concrete. They may be either butt type or isolation joints and they shall be the full depth and width of the curb and gutter. They shall be built at the end of each day's construction or when there is a delay in the supply of concrete and cold joints might develop.

### **480.07 CURING THE CONCRETE**

Concrete shall be cured in accordance with the requirements of Section 904 "Concrete Structures". Consideration will be given to the use of white pigmented curing compound applied according to the manufacturer's recommendations.

### **480.08 TRIMMING**

Trimming of adjacent materials shall be carried out behind the curb and gutter which is to remain in isolation without abutting a sidewalk.

After the removal of the forms and after the initial curing of the concrete, the Contractor shall grade and tamp adjacent granular materials against the rear of the curb and gutter to form shoulders to the sidewalk. These shoulders shall be made trim to slightly proportions.

### **480.09 PROTECTION OF CURB AND GUTTER FROM TRAFFIC AND PEDESTRIANS**

The Contractor shall by barricades, security, or other means, protect all curb and gutter from harm by traffic or pedestrians, until the Engineer authorizes the curb and gutter open to those who wish to cross over the curb and gutter.

The Contractor shall at all times prior to the opening to traffic provide suitable bridging or other means of access to adjacent properties.

### **480.10 MEASUREMENT FOR PAYMENT**

Measurement for payment for the installation of curb and gutter of a particular type of curb and gutter shall be the length in metres, rounded to one decimal place, as measured along the exposed face of the

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curb of the type in question. Such measurements will include the space occupied by gutter outlets and frames and grates.

Curb and gutter installed outside of the lines and grades as staked by the Engineer will not be measured for payment.

### **480.11 BASIS OF PAYMENT**

Payment at the contract price for curb and gutter for the type in question shall be full compensation for labour, materials and equipment-use to supply and place formwork and concrete, to provide tapered ends and drop curbs as required, to incorporate any catch basin frames into the curb and gutter, to construct joints, to provide and place joint filler, to cure the concrete, to protect the curb and gutter from traffic, to remove the forms, to shoulder the back of the curb with adjacent material, and to tamp the shoulders behind the curb.

Granular base course for providing the bed shall be paid for in accordance with the contract unit price for Granular "B" or Granular "A", as appropriate, but any additional labour required to place this bed as specified shall be considered compensated for in the contract price for curb and gutter.

### **480.12 Concrete Acceptance and Reduced Payment Criteria on Concrete Located in Curbs and Gutter**

Concrete on a project for a specified Type of curb and gutter, and also as defined by its specified strength at 28 days, must have an average tested strength at 28 days equal to or greater than that specified for payment at the bid price.

Concrete for a certain Type of Curb and Gutter having an average strength of less than that specified will be accepted into the job at a reduced payment, provided the difference between specified strength and tested strength is no greater than 5MPa. If the average of tests in a particular predefined portion of curb and gutter is less than that specified by more than 5MPa then that concrete shall be rejected.

When concrete is rejected, those provisions outlined in CSA-A23.1-94 shall be followed to determine whether or not the concrete may remain in the work. Such work will be done at the Contractors cost. Notwithstanding the above, should the concrete remain in the work it will be subject to a reduction, as outlined below, for having a strength less than that specified.

Concrete of a specific Type of Curb and Gutter and otherwise acceptable but having an average strength deficiency as tested of less than 5 MPa compared with that specified, will be accepted but the bid price for all concrete in the predefined portion will be reduced according to the following procedure:

For concrete work where the Unit Price Table states the unit to be linear metres the adjusted price shall be calculated as follows:

$$\begin{aligned} & \$(\text{Adjusted Concrete Price}) = (\text{Tested Strength} / \text{Specified Strength}) \times \\ & \$(\text{Bid Concrete Unit Price}) \end{aligned}$$

Division of the curb and gutter into predefined portions will be done by the Engineer as the concrete placement is carried out. A predefined portion shall generally be established as that concrete placed within one operation.

There will be no bonus payment under the contract when the average strength is in excess of the specified strength.



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## SECTION 481

### ROCK EMBEDDED CONCRETE GUTTER

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#### 481.01 SCOPE

This specification covers the requirements for the construction of rock embedded concrete gutter on a prepared bed of granular base course.

The width, length and cross section of the gutter shall be as shown on the drawings.

#### 481.02 MATERIALS

##### 481.02.01 Concrete

Concrete for use in constructing the rock embedded gutter shall conform to the following specific requirements:

CLASS OF CONCRETE	35MPa AT 28 DAYS
AGGREGATE	20mm MAXIMUM SIZE
AIR CONTENT	6% ± 1%
SLUMP	60mm ± 20mm

Where gutter is to be placed on slopes it may be necessary for the concrete to have a slump of 20 mm in order for the wet concrete to stay in the forms while the concrete is setting.

All concrete shall conform with Section 904 "Concrete Structures".

##### 481.02.02 Rock

Stones for embedding in the gutter shall consist of slab shaped clean, hard durable rock, free of cracks. Rock subject to marked deterioration by water or weather will not be accepted.

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The thickness of the individual stones shall not be less than 70 mm or greater than 130 mm and the maximum dimension shall not exceed 250 mm.

### 481.02.03 Joints

Material for forming isolation joints shall be 12 mm thick bituminous fibre material of depth equal to the depth of the gutter.

Material for forming control joints shall be 12 mm thick bituminous fibre material for the set-in-place type, or a bituminous filler material for the groove or saw-cut type.

All materials including formwork shall be supplied by the Contractor.

### 481.03 PREPARATION WORK

Should excavation be required prior to placing the bed for the gutter, then such work shall be carried out and paid for in accordance with Section 403 "Excavation for Foundations".

When fill is required prior to placing the bed for the gutter, then this work shall be carried out in accordance with Section 204 "Grading of Fill".

After the site has been graded, as described above, a bed shall be laid composed of Selected Granular Base Course Granular "B", or Granular "A" should the Engineer so require. The bed shall be laid to the lines and grades as staked by the Engineer.

The compacted depth of the bed should not be less than 100 mm. The bed shall be compacted to not less than 95% of the Standard Proctor Density (ASTM D698-78).

### 481.04 FORMWORK

Formwork shall conform to the requirements of Section 907 "Formwork and Falsework".

Forms shall be set to provide a gutter of the required cross section, to the grades and lines as staked by the Engineer.

### 481.05 PLACING THE CONCRETE AND ROCKS

Concrete shall be placed in accordance with the requirements of Section 904 "Concrete Structures".

As soon as the concrete has been placed and consolidated, it shall be struck off true to grade and required cross section by an oscillating movement of a template.

The surface shall then be floated with a wooden float until the mortar flushes to the top, and the entire surface presents a tight and compact appearance and the divisions between each block shall be marked, rounded and tooled with proper finishing tools in the neatest possible manner and to the approval of the Engineer. The jointing tool shall have a radius of 12 mm.

Immediately following finishing, the stones shall be moistened in water and placed in the concrete. The stones shall be placed in the concrete at a spacing as stipulated on the drawings, and with the thickness dimension into the concrete leaving about 20 mm of stone exposed above the concrete. When the stones are pushed into the concrete, any resulting depression in the surface of the concrete next to the sides of the stones shall be filled and trimmed by means of hand work with a trowel, or other suitable tool.

Should the Contractor choose to use the groove or saw-cut type of control joint, as opposed to the bituminous fibre type, then at those places where control joints are to be made, care shall be taken to ensure that no stones are placed in the path of a joint.

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The Contractor shall take care in placing the stones in the concrete to ensure that the exposed parts of the stones are not smeared with concrete. Should stones become smeared during placing, they shall be immediately removed, thoroughly washed and then placed back in the concrete before it sets.

### 481.06 JOINTS

When the rock embedded concrete gutter is to be constructed abutting another structure such as concrete pavement, concrete sidewalk, concrete retaining wall, or catch basin frame, then the Contractor shall construct a full length isolation joint, of depth equal to the depth of the gutter. When abutting asphaltic pavement no joint is necessary.

Isolation joints shall consist of a 12 mm thick bituminous fibre panel cut to such size so as to provide a full depth joint extending for the full width. The bituminous fibre panels shall be set vertical in the forms before the concrete is poured.

Panels shall be pre-cut to the shape of the joint so as to provide a 6 mm recess on the exposed surface. The Contractor has the option of either providing a 6 mm deep, 12 mm wide cap strip, to be removed after the concrete has hardened and not edging the joints, or carefully removing all concrete immediately above the filler material to form a 6 mm deep, 12 mm wide recess then finishing both edges of each joint to 6 mm radius with a suitable short edging tool.

Control joints shall be placed at intervals of not greater than 6 m.

Control joints may be formed using a 12 mm thick bituminous fibre panel cut to such size so as to provide a joint extending not less than one quarter the depth of the gutter for the full width. The bituminous fibre panel control joints shall be set vertical in the forms before the concrete is poured.

Panels shall be pre-cut to the shape of the joint so as to provide a 6 mm recess on the exposed surface. The methods of obtaining these 6 mm recesses shall be as previously stipulated for isolation joints.

Alternatively control joints may be formed by the use of a "guillotine" knife in fresh concrete or saw cutting the hardened concrete with a sufficient time of placing to prevent uncontrolled cracking. Groove or saw-cut control joints shall be of thickness between 3 and 5 mm, depth not less than one quarter the depth of the gutter, and width the full width of the gutter. When the concrete is dry the control joints shall be completely filled with a bituminous filler material. Immediately prior to the filling, the joint shall be thoroughly cleansed of all dust, and particles of foreign matter.

Construction joints shall be built at convenient stopping places in the placement of the concrete. They may be either butt type or isolation joints and they shall be the full depth and width of the gutter. They shall be built at the end of each day's construction or when there is a delay in the supply of concrete and cold joints might develop.

### 481.07 CURING THE CONCRETE

Concrete shall be cured in conformity with the requirements of Section 904 "Concrete Structures". Consideration will be given to the use of white pigmented curing compounds applied in accordance with the manufacturer's recommendations.

### 481.08 TRIMMING

After the removal of the forms and after the initial curing of the concrete, the Contractor shall grade and tamp adjacent other material against the exposed edges of the gutter to form stable shoulders for the gutter. These shoulders shall be made trim to sightly proportions.

### 481.09 MEASUREMENT FOR PAYMENT

Measurement for payment will be by the length and width as laid according to the instructions of the Engineer and such measurements will be computed into square metres, rounded to one decimal place.

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### **481.10 BASIS OF PAYMENT**

Payment at the contract price for rock embedded concrete gutter shall be compensation for labour, materials and equipment-use to supply and place form work, reinforcing steel, concrete and stones, to construct joints, to provide and place joint filler, to cure the concrete, to remove the forms, to shoulder the exposed edges of the gutter with adjacent other material, and to tamp the other material shoulders of the gutter. Granular base course for providing the bed shall be paid for in accordance with the contract unit price for Selected Granular Base Course Granular "B", or Granular "A" as appropriate, but any additional labour required to place this bed as specified shall be considered compensated for in the contract price for rock embedded concrete gutter.

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## SECTION 485 INSTALLATION OF ASPHALT CURB

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This specification covers the requirements for the installation of asphalt curb on top of existing pavement. See Form 1274 "Asphalt Curb".

#### 485.02 MATERIALS

Material for use in constructing the asphalt curb shall comprise hot asphaltic mix conforming to the requirements for surface course, as set forth in Section 330 "Hot Mix Asphaltic Concrete".

Emulsion to prepare the paved shoulder for the curb and to be used in finishing the asphalt curb, shall comprise undiluted SS-1h emulsion conforming to ASTM D977-85, or RS-1k emulsion conforming to ASTM D977-85.

#### 485.03 EQUIPMENT

The asphalt paver shall be supplied with a template capable of being attached to the paver so that the required cross section is provided.

The hand operated roller for compacting shall weigh not less than 135 kg.

The equipment shall meet the approval of the Engineer, before it may be used in the work.

#### 485.04 CONSTRUCTION

If there is no existing paved shoulder on which to construct the asphalt curb, then paving operations to provide a paved shoulder shall be completed, before installing the asphalt curb.

The surface of the existing asphalt on which the asphalt curb is to be placed shall be cleaned, and all dirt, and all loose and broken materials shall be removed.

Should the pavement, where asphalt curb is to be placed, be older than one year, then treatment with emulsion will be required. The treatment shall extend for the full length of the proposed curb, and shall be of a width extending 150 mm, from the proposed back of the curb, towards the proposed front.

Where SS-1h emulsion is used, the SS-1h shall be applied undiluted, at the rate of  $0.5 \text{ l/m}^2$ . Where RS-1k emulsion is used, the RS-1k shall be applied at the rate of  $0.15 \text{ l/m}^2$ .

The emulsion shall be allowed to dry until it reaches the required state of tackiness before the curb is placed.

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Asphaltic mix shall not be placed unless the surface is dry and the air temperature is at least 7°C.

The asphalt curb shall be constructed using the approved asphalt paver and template. The asphaltic mix shall be placed to the dimensions after compaction, as shown on Form 1274 "Asphalt Curb". The asphaltic curb shall be constructed to the lines required by the Engineer.

The asphalt curb shall be compacted using the hand operated roller. However, in areas that cannot be reached by the roller, the compaction shall be carried out with hot hand tampers.

The surface of the asphalt curb after compaction shall be of uniform texture, smooth and true to the required lines and cross section. The finished surface shall be free from depressions exceeding 3 mm as measured from the bottom edge of a 3 m straight edge placed anywhere along the surface of the curb and parallel to the edge.

After the compacted asphalt curb has cooled to ambient temperature, the Contractor shall spray the exposed surfaces of the curb with emulsion to a distance 1500 mm beyond the front edge. The emulsion shall be applied before the surface becomes contaminated by any material which would prevent bond. Where SS-1h emulsion is used, undiluted SS-1h shall be applied at the rate of 0.5 l/m<sup>2</sup>. Where RS-1k emulsion is used the rate of application shall be 0.15 l/m<sup>2</sup>.

### 485.05 MEASUREMENT FOR PAYMENT

Measurement for payment for the installation of asphalt curb, shall be the length in metres, rounded to one decimal place, as measured along the roadside face of the curb.

Curb installed outside of the lines required by the Engineer will not be measured for payment.

### 485.06 BASIS OF PAYMENT

Payment at the contract price for installation of asphalt, curb shall be compensation in full for all materials, labour, and use of equipment: to supply all materials including surface course asphaltic mix and emulsion, to clean the surface on which the curb is to be placed, to apply emulsion to the underlying shoulder, to construct the curb to the required lines and section, to compact the curb, and to finish the curb with emulsion.

The Contractor shall be deemed to have allowed in his prices for hand work, should hand work be necessary in places.

Should pavement be required to widen existing pavement to construct a base for the curb, then such pavement shall be compensated for separately, in accordance with the provisions of Section 330 "Hot Mix Asphaltic Concrete".

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 486 INSTALLATION OF ASPHALT GUTTER

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This specification covers the requirements for the installation of asphalt gutter. See Form 1273 "Asphalt Gutter".

#### 486.02 MATERIALS

Material for use in constructing the asphalt gutter shall comprise hot asphaltic mix conforming to the requirements for surface course, as set forth in Section 330 "Hot Mix Asphaltic Concrete".

Emulsion to finish the surface of the gutter shall comprise: undiluted SS-1h conforming to ASTM D977-85, or RS-1k emulsion conforming to ASTM D977-85.

#### 486.03 EQUIPMENT

The hand operated roller for compacting shall weigh not less than 135 kg.

#### 486.04 CONSTRUCTION

The gutter shall have the section as shown in Form 1273 "Asphalt Gutter", or as required by the Engineer. The gutter shall be constructed to the lines required by the Engineer.

Should Selected Granular Base Course Class "A", not be present where it is required to place asphalt gutter, then Excavation for Foundations operations shall be carried out to facilitate the placing of Class "A". The Class "A" shall be placed to the required lines and contoured to the required section. Hand work may be required to obtain the required section and smooth lines.

The Class "A" shall be compacted using the hand operated roller. However, in areas that cannot be reached by the roller, the compaction shall be carried out with hand tampers.

Asphalt shall not be placed until the Class "A" has been contoured to the required smooth lines and section, and compacted.

The asphaltic mix shall be placed to the required smooth lines, thickness and width with the use of a mold to attain the required gutter shape. The asphalt gutter shall be constructed using the approved asphalt paver and template. The asphaltic mix shall be placed to the dimensions after compaction, as shown on Form 1273 "Asphalt Gutter". The asphaltic gutter shall be constructed to the lines required by the Engineer.

Asphaltic mix shall not be placed unless the surface is dry and the air temperature is at least 7°C.

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The asphalt gutter shall be compacted using the hand operated roller. However, in areas that cannot be reached by the roller, the compaction shall be carried out with hot hand tampers.

The surface of the asphalt gutter after compaction shall be of uniform texture, smooth and true to the required lines and section. The finished surface shall be free from depressions exceeding 3 mm as measured from the bottom edge of a 3 m straight edge placed anywhere along the surface of the gutter parallel to the edge. After the compacted asphalt gutter has cooled to ambient temperature, the Contractor shall spray the exposed surface with emulsion. The emulsion shall be applied before the surface becomes contaminated by any material which would prevent bond. Where SS-1h emulsion is used, undiluted SS-1h shall be applied at the rate of 0.5  $\ell/m^2$ . Where RS-1k emulsion is used the rate of application shall be 0.15  $\ell/m^2$ .

### **486.05 MEASUREMENT FOR PAYMENT**

Measurement for payment will be by the length and width as constructed according to the instructions of the Engineer, and such measurements will be computed into square metres, rounded to one decimal place.

### **486.06 BASIS OF PAYMENT**

Payment at the contract price for installation of asphalt gutter shall be compensation in full for all labour, materials and use of equipment: to carry out such hand work as is required to place and contour the underlying Class "A" to the required smooth lines and section, to compact the Class "A", to construct the gutter to the required lines and section, to compact the gutter, to supply emulsion for finishing, and to finish the curb with emulsion.

The Contractor shall be deemed to have allowed in his prices for hand work, should hand work be necessary to complete the work as required.

However, payment for the actual supply of the surface course hot mix, and the Selected Granular Base Course Granular "A" , shall be in accordance with the provisions of Section 330 "Hot Mix Asphaltic Concrete", and Section 315 "Selected Granular Base Course" respectively.



# FORM 500



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## DIVISION 5 SPECIFICATIONS FOR MISCELLANEOUS ITEMS

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# FORM 501



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 501 WEIGHING MATERIALS IN TRUCKS

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#### 501.01 SCOPE

This specification covers the Department's requirements for weighing materials in trucks for those instances where payment is based on the weight of the material.

#### 501.02 GENERAL

Where the contract includes items that require measurement for payment by weighing, the Contractor, as part of the work to be carried out under these items, shall provide, install, and maintain as necessary, truck weigh scales meeting the requirements of the Government of Canada Weights and Measures Act and Regulations, and also the requirements of this specification. On completion of the work, the Contractor shall remove temporary scales and scale ramps and clean up and trim the site on which the scale was located.

#### 501.03 LOCATION

Scales for weighing hot mix asphaltic concrete shall be located at a site convenient to the asphalt plant. Scales for weighing other materials shall be installed at locations selected by the Contractor subject to the approval of the Engineer.

When, for the above locations, in the opinion of the Engineer, there is a waste or loss of material between the point of origin and the materials intended destination on the contract, the hauling operation may be terminated by the Engineer until the Contractor has, at his own expense, provided on a site approved by the Engineer, a scale which is close enough to the intended destination to preclude the possibility of waste or loss.

#### 501.04 WEIGH SCALES

The scales shall be of such capacity to accurately weigh any single loaded truck arriving on the site. The contractor is advised that split weighing will not be permitted under any circumstances. The vehicle being weighed must be fully supported by the scale platform. Split or axle weighing is a method to be used only for highway weight restriction control.

The scale shall be equipped with a portable scale house complete with furniture and adequate provision for heat and light.

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## **FORM 501**

Scale house and furniture shall be of a standard not less than that shown on the Department's Portable Scale House plan which is shown in Section 1202 for Beam type Scales and Section 1204 for Electronic Scales. Should the Contractor wish to supply a scale house or furniture other than that shown on the plan then prior written approval by the department will be required before substitution may be made.

Scales may not be used for weighing materials on the contract unless the scale house heater and lights are in working order.

The Contractor shall periodically clean the scale house and maintain all lights and heating in good working condition at all times when the scales are in use. The lights shall provide adequate lighting for general office work and the heater must be able to maintain the temperature in the scale house at 20°C.

In order to minimize the effect of impact loads on the scale adjustment and to reduce the effect of vehicle braking and kickback on the scale platform and scale adjustments, the approach ramp shall be constructed on a straight and level grade at the same elevation as the scale platform, for a distance at least equal to the length of the scale platform. Vehicles shall enter and leave the platform at a speed not exceeding 8 km/h.

The scale platform and mechanism shall at all times be maintained clean and free from encumbrances such as gravel, asphalt, snow, and ice.

Scale houses must be equipped with suitable washroom facilities that meet the OHS Act and Regulations under Sections 13 and 14 of the Regulations. These facilities must be located within 100m of the scale house.

These facilities must be provided for use of the Department of Transportation and Works employees only for the duration of the project while scales are being used. Other accommodations must be provided for contractors/subcontractors personnel.

The sanitary provisions shall be in accordance with the various Provincial Government and Municipal Government Regulations.

If portable toilets are used they must be a minimum of 2m (height) x 1m x 1m and must be approved by the Government Service Center. The contractor shall transport the waste from these units, using a collection company (whenever possible) licensed by the Government Service Center.

Toilet facilities must also be approved by the Resident Engineer. These facilities must be cleaned twice weekly and in the case of a portable toilet, emptied of sewage as well. Contractor must also supply toiletries for the facility. Also, adequate and suitable provisions for washing (hot and cold water, soap, towels OR ample supply of hand sanitizer liquid) must be included with the facility. The door to the facility must contain a lock and key and shall be provided to the Resident Engineer.

All associated costs to provide and maintain the sanitary provisions as outlined above shall be considered incidental to the cost of weighing materials in trucks.

### **501.05 TESTING AND CERTIFICATION**

The Contractor shall engage an independent company to test and certify the weigh scales in accordance with the current acts and regulations of Measurement Canada.

All scales shall be tested by the proper authority at the Contractor's expense after each set-up and prior to use on every contract. After certification, the Contractor must provide, to the Engineer, a certificate of compliance from the scale testing company before the scales may be used.

## **FORM 501**

When considered necessary by the Engineer, the Contractor shall have the scales re-tested and re-certified.

The re-testing shall be at the Contractor's own expense.

### **501.06 DETERMINING TRUCK TARES**

When scales are being used on the contract, the tares of the hauling vehicles will be determined randomly at least once daily, and more frequently if required by the Engineer. Vehicles which are being weighed for the tare shall contain the normal hauling complement of driver and accessories such as spare tires and tools.

### **501.07 WEIGHING COSTS**

The Contractor shall supply a scale operator to take measurements for weights. However, Department representatives may also operate the scales and take measurements for weights whenever the Engineer sees fit during weighing operations.

Should the Contractor use a scale with electronic controls and readings, the Department may forgo the requirement for the Contractor to provide a scale operator.

All costs of providing, installing, maintaining, and finally removing weigh scales complete with scales and furniture, together with all costs of testing and certification in accordance with this specification shall be borne by the Contractor as part of the work to be carried out at the contract price for items which are measured by weighing.

The Department shall not be liable for claims caused by delays in testing or certification of the scales.

### **501.08 USE OF WEIGH SCALES BY ENFORCEMENT OFFICERS**

Weigh scales, during weigh scale operating hours, shall be at the disposal of Police Officers and Highway Enforcement Officers of the Department of Government Services and Lands for the purposes of checking the various weights of vehicles hauling materials for use on this contract or on any departmental or private work the Contractor may undertake.

# FORM 510



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 510 CUTTING ASPHALTIC PAVEMENT

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#### 510.03 BASIS OF PAYMENT

#### 510.01 DESCRIPTION

This work shall include labour, materials, and equipment-use to cut asphaltic pavement along lines set by the Engineer.

Cuts shall be made using an approved pavement cutter. The cuts shall be made straight and vertical and be made in such a manner that will allow neat tie-ins with new pavement.

#### 510.02 MEASUREMENT FOR PAYMENT

Measurement for payment shall be the length of the required cuts, regardless of the actual thickness of the asphalt. The length shall be measured in metres rounded to one decimal place.

#### 510.03 BASIS OF PAYMENT

Payment shall be at the Contract Unit Price per metre for cutting of asphaltic pavement. Such payment shall be full compensation for labour, materials, and equipment-use to carry out the operations herein described.

## FORM 511



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

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##### 511.04 BASIS OF PAYMENT

##### 511.01 SCOPE

This specification concerns the cutting of concrete curb and gutter and concrete slab where part of a continuous length of concrete slab and/or curb and gutter has to be removed.

##### 511.02 DESCRIPTION

The Contractor shall make cuts along the lines as marked by the Engineer.

The cuts shall be made straight and vertical and be made in such a manner that will allow neat butt joints with future new concrete.

##### 511.03 MEASUREMENT FOR PAYMENT

Measurement for payment shall be the total length of the required cuts measured in metres to one decimal place.

##### 511.04 BASIS OF PAYMENT

Payment shall be at the Contract Unit Price per metre for cutting concrete slab and curb and gutter and such payment shall be full compensation for all labour, materials, and equipment-use to carry out the operations herein described.

## FORM 520



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 520

#### STORAGE OR DISPOSAL OF OLD ASPHALTIC PAVEMENT

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##### 520.06.02 Basis of Payment for Disposal of Old Asphaltic Pavement

##### 520.01 SCOPE

This specification covers the requirements for the excavation of asphaltic pavement, together with either the storage of the debris, or the disposal of the debris.

##### 520.02 EXCAVATION

The Contractor shall excavate the asphaltic pavement from within the limits staked by the Engineer.

Care shall be taken in excavating the pavement so as not to contaminate the underlying granular base course. In the case when the asphaltic pavement debris is to be stored, care shall also be taken not to excavate underlying granular materials with the pavement.

Pavement debris shall be broken into pieces of greatest dimension not more than one metre in length.

##### 520.03 STORAGE

Where the contract item designates that old asphaltic pavement is to be stored, the Engineer shall select a site where all the excavated asphaltic pavement is to be stockpiled. The site shall comply with requirements of Section 830 Marshaling Yards and Temporary Work Camps.

The stockpile shall be made on a flat well drained area on firm ground so that the asphaltic debris will not become contaminated with deleterious materials when it is moved at some future date prior to recycling.

Should the Engineer require that grading work be carried out to prepare the stockpile site, then such grading shall be carried out and paid for in accordance with Section 206 "Grading of Cuts" and Section 204 "Grading of Fill".

After any required grading operations have been completed, the stockpile site shall be treated with an even mat of Granular "A" 100 mm thick. The Granular "A" mat shall be supplied and paid for in accordance with the contract price for Granular "A".

Old asphaltic pavement that is to be stored shall be handled, transported, and stockpiled at all times in such a manner that will avoid contamination by any deleterious material.

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The pavement debris shall be hauled to the stockpile site and spot-dumped and levelled and then succeeding loads shall be dumped and levelled on top of the others to form a neat, unified, elevated stockpile.

### 520.04 DISPOSAL

On those jobs where the contract item states that the old asphaltic pavement is to be disposed of, then the old asphaltic pavement debris for disposal shall become the property of the Contractor.

If the Contractor wishes, the Contractor will be permitted to use Recycled Asphalt Pavement (RAP) in levelling course asphalt. The amount of Recycled Asphalt in the mixture of RAP plus Virgin Aggregate will be limited to a maximum of 10%.

In addition, the Contractor will be permitted to use RAP in Granular B. The Recycled Asphalt in the mixture of Virgin Granulars plus RAP will be limited to a maximum of 30% under the asphalt and 50% in the granular shoulders.

The Department reserves the right to accept or reject any particular source of RAP, irrespective of its quality.

As approved by the Engineer, the Contractor shall be permitted to use old asphalt pavement in shouldering operations and as a surface stabilizer on gravel roads. The latest Department procedure for these operations shall be strictly adhered to by the Contractor in these operations.

The Contractor shall be aware of Division 8.

### 520.05 MEASUREMENT FOR PAYMENT

Measurement for payment will be by means of the volume of pavement excavated from within the required limits, calculated as the product of the exposed surface area of the excavated pavement before removal, times the centreline thickness of the asphalt. Should individual areas of asphalt removal exceed 100m in length, then the thickness used for volume calculation will be the average of the thickness of the asphalt measured at 100m intervals.

The volume of the excavated pavement shall be calculated in cubic metres rounded to two decimal places.

### 520.06 BASIS OF PAYMENT

#### 520.06.01 Basis of Payment for Storage of Old Asphaltic Pavement

Payment at the contract price for storage of old asphaltic pavement hauled 1km or under, shall be payment in full for all labour, materials, and use of equipment to: excavate the old pavement, break-up the pavement, transport the debris up to 1km, and place the debris in a stockpile.

However, where the Engineer requires that excavated material be hauled in excess of the 1 km freehaul before being *stored*, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Material", at the appropriate rate for overhaul on excavation other material.

In the case of storage of old asphaltic pavement, the grading of the stockpile floor and the supply and placing of the Granular "A" mat for the stockpile shall be paid for in accordance with Section 206 "Grading of Cuts" and Section 315 "Selected Granular Base" for Granular "A", respectively.

#### 520.06.02 Basis of Payment for Disposal of Old Asphaltic Pavement

Payment at the contract price for disposal of old asphaltic pavement, shall be payment in full for all labour, materials, and use of equipment to excavate the old pavement, and provide all transportation and any other costs to remove the debris from the site.



# FORM 521



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 521

### DEMOLITION AND REMOVAL OF SIDEWALKS, CURB AND GUTTER, MANHOLES, CATCH BASINS, DITCH INLETS, FENCES, GUIDE RAILS, AND GUIDE POSTS

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521.08.07 Measurement for Payment for Removal of Guide Posts

#### 521.09 BASIS OF PAYMENT

#### 521.01 SCOPE

This specification covers the requirements for demolishing, salvaging, and removing wholly or in part, sidewalks, curb and gutter, manholes, catch basins, ditch inlets, fences, guide rail, and guide posts, together with the backfilling, compaction, and trimming of the resultant trenches, holes, and pits.

#### 521.02 CUTTING

Where a section of sidewalk, or curb and gutter is to be removed either as part of the removal of sidewalk, or curb and gutter, or as a necessary prerequisite prior to the removal of a manhole or catch basin, then the Contractor shall first cut the curb and gutter or sidewalk along lines staked by the Engineer. Cuts shall be carried out and paid for in accordance with Section 511 "Cutting Concrete Slab, and Curb and Gutter".

Where bituminous pavement must be removed prior to removing a manhole or catch basin, the pavement shall be cut and excavated. The work of cutting and excavating the pavement shall be carried out and

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paid for in accordance with Section 510 "Cutting Asphaltic Pavement", and Section 520 "Storage or Disposal of Old Asphaltic Pavement".

### **521.03 DEMOLITION**

Demolition shall be carried out in such a manner and with such equipment so as not to disturb adjacent pavement, utilities, or other works to be left in place and with such care as to leave undamaged, materials designated to be salvaged. The removal of all accompanying posts shall be included in the work of removal of guide rails and fences.

### **521.04 SALVAGE**

Where manholes, catch basins, and ditch inlets are to be demolished, castings, and rivetted gratings shall be carefully removed and stored at a safe storage place on the job prior to their collection by Department forces, or re-installation elsewhere on the job.

Where fences are to be dismantled, the materials including posts and gates shall be neatly piled at the edge of the right of way, or the fences and gates shall become the property of the Contractor and removed from the right of way whichever the Engineer shall direct.

Where guide rail and guide posts are to be removed, the Contractor shall exercise care in removing rails and excavating posts so that they are not damaged and remain suitable for re-use. The guide rail sections, angle pieces, end pieces, nuts, bolts, and washers together with all posts shall be transported to and stored at the nearest Department Depot.

Should any material, designated for salvage, be damaged or lost by the Contractor, then the Contractor shall be charged with the cost of replacement with equivalent new material. Damaged material shall become the property of the Contractor and shall be disposed of.

### **521.05 DISPOSAL OF DEBRIS**

Waste materials shall be removed and disposed of in an approved waste disposal area provided by the Contractor at his own expense.

The Contractor shall be aware of Section 140.04 "Waste Material Disposal".

### **521.06 EXCAVATION**

Where bituminous pavement must be removed prior to carrying out excavation, then such excavation of pavement shall be carried out and paid for in accordance with Section 520 "Storage or Disposal of Old Asphaltic Pavement".

Where sidewalk and/or curb and gutter must be removed prior to excavation of the structure in question, then such removal shall be carried out and additional payment made for the removal, in accordance with this specification.

Excavation required for the removal of the structure shall be performed in such a manner as to leave undisturbed, adjacent structures or other work to be left in place and to save where necessary, for purposes of backfill, the acceptable excavated materials.

### **521.07 BACKFILLING, COMPACTION, AND TRIMMING**

Where concrete is placed in the excavation under another specification, such as concrete plugs in the ends of pipes after a catch basin has been removed, then backfilling shall not take place until the concrete has reached at least the specified strength at 28 days.

The Contractor shall backfill to the required grade using the excavated materials if suitable. Should the excavated material be unsuitable, or should there be insufficient suitable backfill

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material from the excavation, then the Engineer will direct that material from a cut or from a borrow areas will be used to complete the backfilling.

Backfill shall be placed in layers not exceeding 200 mm in thickness loose measurement. Each layer shall then be compacted to the required compaction before a further layer is placed.

Backfill consisting of other material or other material borrow shall be compacted to not less than 95% of the Standard Proctor density (ASTM D698-78).

In rock backfill material where Standard Proctor tests cannot be carried out, compaction shall be continued until a compaction is achieved that is equivalent to that obtained in a fill when there is no visible movement of fill under a vibrating vibratory compactor with vibratory roller of length not less than one decimal five metres.

The backfilled hole or trench shall be levelled and trimmed to provide slightly contours and adequate drainage.

### **521.08 MEASUREMENT FOR PAYMENT**

#### **521.08.01 Measurement for Payment for Removal of Concrete Sidewalk**

Quantities for the removal of concrete sidewalk shall be measured in square metres rounded to one decimal place.

Measurements shall be made before removal and shall be the superficial area calculated as the product of the width of sidewalk times its length.

#### **521.08.02 Measurement for Payment for Removal of Concrete Sidewalk and Abutting Curb and Gutter**

Quantities for the removal of concrete sidewalk and abutting curb and gutter shall be measured in square metres rounded to one decimal place.

Measurements shall be made before removal and shall be the superficial area calculated as the product of the width between the outer edge of the gutter and the outer edge of the sidewalk, times the length of the sidewalk.

#### **521.08.03 Measurement for Payment for Removal of Curb and Gutter**

Measurement for payment shall be the length in metres, rounded to one decimal place, as measured along the exposed face of the curb before excavation.

#### **521.08.04 Measurement for Payment for Removal of Manholes, Catch Basins, and Ditch Inlets**

Measurement for payment will be based on the number of manholes, catch basins, and ditch inlets removed. No distinction being drawn between the type of manhole, catch basin, or ditch inlet.

#### **521.08.05 Measurement for Payment for Removal of Fences**

Measurement for payment for the removal of a fence of a particular type shall be the length in metres, rounded to one decimal place, of the assembled fence together with all accompanying gates.

#### **521.08.06 Measurement for Payment for Removal of Guide Rail**

Measurement for payment for the removal of guide rail shall be the length in metres, rounded to one decimal place, of the assembled guide rail measured end to end along the face of the railing from the extreme tip of one end piece to the extreme tip of the other piece at the opposite end.

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### 521.08.07 Measurement for Payment for Removal of Guide Posts

Measurement for payment will be based on the number of guide posts removed.

### 521.09 BASIS OF PAYMENT

Payment at the contract prices for the tender items covered by this specification shall be full compensation for all labour, materials, and equipment-use to: carry out any necessary other material excavation, dewatering, and necessary cutting of pipe, demolish the structure, salvage where required, haul away and dispose of debris, backfill, compact, and trim the excavation.

Where additional backfill materials are required to complete backfilling, then, these materials shall be paid for in accordance with Section 206 "Grading of Cuts" or Section 207 "Borrow", as the case may be, but the additional requirements for backfilling, compaction, and trimming as stipulated in this specification shall be considered compensated for in the contract price for this specification.

Should the additional backfill materials be hauled in excess of 1 km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavated Materials".

When it is necessary to cut and remove a section of pavement, sidewalk, or curb and gutter, or similar item in order to remove a manhole or catch basin, then payment will be made for each item cut and removed in accordance with the appropriate specification.

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 522

#### DISPOSAL OR SALVAGE OF CULVERT OR PIPE

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##### 522.05.02 Basis of Payment for Salvage of Pipe

##### 522.01 SCOPE

This specification covers the requirements for the excavation and removal of culvert, sanitary sewer, storm sewer, or other pipe followed with the backfilling and compaction of the excavated material together with either; the salvage, or the disposal of the pipe, as specified in the Contract item.

Excavation above and around the pipe shall be compensated for under Section 403 "Excavation for Foundations", but any additional hand work excavation required to remove the pipe shall be considered part of Section 522 "Disposal or Salvage of Culvert or Pipe".

##### 522.02 EXCAVATION AND DISPOSAL OR SALVAGE

After Excavation for Foundations operations have been carried out to expose the pipe the Contractor shall dispose of, or salvage the pipe, as designated, within the limits as required by the Engineer.

The excavation of material abutting the top and sides of the pipe shall be performed in such a manner as to leave undisturbed, adjacent structure or other work to be left in place, and so that no damage occurs to pipe designated to be salvaged.

All excavated material shall be piled in a manner that will not endanger the work, and that will avoid obstructing sidewalks, driveways, and gutters.

Where pipe is designated to be salvaged, the Contractor shall carefully disassemble the couplers and joints and carefully remove the pipe from the trench in such a way as not to cause damage to the pipe. The salvaged pipe together with couplers shall be stored at a safe place on the job prior to reinstallation or transported to the nearest Department Depot.

Should any pipe lengths, designated for salvage, be damaged or lost by the Contractor, then the Contractor shall not receive payment for pipe salvage for the damaged lengths. Damaged material shall become the property of the Contractor and shall be disposed of.

Where pipe is designated for disposal, the Contractor shall remove and dispose of the pipe and couplers.

Pipe for disposal shall be removed and disposed of in an approved waste disposal area provided by the Contractor at his own expense.

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The Contractor shall be aware of Section 825 "Waste Management".

### **522.03 BACKFILLING AND COMPACTION**

Where concrete is placed in the excavation under another specification, such as concrete plugs in the ends of pipes left in place, then backfilling shall not take place until the concrete has reached at least the specified strength at 28 days.

Material excavated as part of the removal or salvage operations shall be used as backfill in the trench.

Backfill shall be placed in layers not exceeding 200 mm in thickness loose measurement. Each layer shall then be compacted to not less than 95% of the Standard Proctor density (ASTM D698-78) before a further layer is placed.

### **522.04 MEASUREMENT FOR PAYMENT**

#### **522.04.01 Measurement for Payment for Disposal of Pipe**

Measurement for payment for disposal of pipe of a particular diameter and material type shall be the length in metres, to one decimal place, of that length of pipe required to be disposed of as measured along the centerline of the pipe before excavation.

#### **522.04.02 Measurement for Payment for Salvage of Pipe**

Measurement for payment for the salvage of pipe of a particular diameter and material type shall be the length in metres, to one decimal place, of the pipe of that size and type, when measured after being removed from the ground.

Pipes that are damaged to the extent that they will be unsuitable for re-use, will not be included in measurement for payment for pipe salvage.

### **522.05 BASIS OF PAYMENT**

#### **522.05.01 Basis of Payment for Disposal of Pipe**

Payment at the contract price for the disposal of pipe of a particular material and size shall be compensation in full for all materials, labour, and use of equipment to: provide any hand work excavation necessary to complete the pipe disposal operation, remove the pipe and couplers, provide any dewatering necessary to carry out the work, provide an approved waste disposal site, transport pipes and couplers to the waste disposal site, dispose of the pipes and couplers, and backfill and compact the excavated material.

Excavation above and around the pipe shall be compensated for under Section 403 "Excavation for Foundations", but any additional hand work excavation required to remove the pipe shall be considered compensated for as part of payment for Section 522 "Disposal or Salvage of Culvert or Pipe".

#### **522.05.02 Basis of Payment for Salvage of Pipe**

Payment at the contract price for the salvage of pipe of a particular material and size shall be compensation in full for all materials, labour, and use of equipment to: provide any hand work excavation necessary to complete the pipe salvage operation, remove and salvage the pipe and couplers, provide any dewatering necessary to carry out the work, transport pipes and couplers to the storage site, store the salvaged pipes and couplers, and backfill and compact the excavated material including the temporary stockpiling of the excavated material for reuse in the backfilling process. In the case of driveway culverts excavation and backfill of the driveway culvert will be included in the price of disposal or salvage and reinstallation of culvert or pipe.

## **FORM 522**

Excavation above and around the pipe, in roadways, shall be compensated for under Section 403 "Excavation for Foundations", but any additional hand work excavation required to salvage the pipe shall be compensated for as part of payment for Section 522 "Disposal or Salvage of Culvert or Pipe".

Any damaged pipe will be replaced at the contractor's expense, where it is deemed the pipe was salvageable.

## FORM 523



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 523

#### SALVAGE AND REINSTALLATION OF CULVERT OR PIPE

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##### 523.02 EXCAVATION AND SALVAGE

##### 523.03 BACKFILLING AND COMPACTION AND REINSTALLATION

##### 523.04 MEASUREMENT FOR PAYMENT

##### 523.04.01 Measurement for Payment for Salvage and Reinstallation of Pipe

##### 523.05 BASIS OF PAYMENT

##### 523.05.01 Basis of Payment for Salvage and Reinstallation of Pipe

##### 523.01 SCOPE

This specification covers the requirements for the excavation and removal of culvert, sanitary sewer, storm sewer, or other pipe followed with the backfilling and compaction of the excavated material together with the salvage, and the reinstallation of the pipe, as specified in the Contract item.

Excavation above and around the pipe shall be compensated for under Section 403 "Excavation for Foundations", but any additional hand work excavation required to remove and reinstall the pipe shall be considered part of Section 523 "Salvage and Reinstallation of the Culvert or Pipe".

##### 523.02 EXCAVATION AND SALVAGE

After Excavation for Foundations operations have been carried out to expose the pipe the Contractor shall salvage the pipe, as designated, within the limits as required by the Engineer.

The excavation of material abutting the top and sides of the pipe shall be performed in such a manner as to leave undisturbed, adjacent structure or other work to be left in place, and so that no damage occurs to pipe designated to be salvaged.

All excavated material shall be piled in a manner that will not endanger the work, and that will avoid obstructing sidewalks, driveways, and gutters.

The Contractor shall carefully disassemble the pipe at the couplers and joints and carefully remove the pipe from the trench in such a way as not to cause damage to the pipe. The salvaged pipe together with couplers shall be stored at a safe place on the job prior to reinstallation.

Should any pipe lengths, designated for salvage, be damaged or lost by the Contractor, then the Contractor shall not receive payment for pipe salvage for the damaged lengths. Damaged material shall become the property of the Contractor and shall be disposed of by the Contractor at his own expense.

The Contractor shall be aware of Section 825 "Waste Management".

##### 523.03 BACKFILLING AND COMPACTION AND REINSTALLATION

Where concrete is placed in the excavation under another specification, such as concrete plugs in the ends of pipes left in place, then backfilling shall not take place until the concrete has reached at least the specified strength at 28 days.



## **FORM 523**

Material excavated as part of the removal or salvage operations shall be used as backfill in the trench, which shall include any necessary stockpiling of the excavated material.

Backfill shall be placed in layers not exceeding 200 mm in thickness loose measurement. Each layer shall then be compacted to not less than 95% of the Standard Proctor density (ASTM D698-78) before a further layer is placed.

Reinstallation of the pipe or culvert shall be carried out as per Section 421.04 Pipe Installation.

### **523.04 MEASUREMENT FOR PAYMENT**

#### **523.04.01 Measurement for Payment for Salvage and Reinstallation of Pipe**

Measurement for payment for the salvage of pipe of a particular diameter and material type shall be the length in metres, to one decimal place, of the pipe of that size and type, when measured after being removed from the ground and reinstalled at the designated reinstallation location.

Pipes that are damaged to the extent that they will be unsuitable for re-use, will not be included in measurement for payment for pipe salvage and reinstallation.

### **523.05 BASIS OF PAYMENT**

#### **523.05.01 Basis of Payment for Salvage and Reinstallation of Pipe**

Payment at the contract price for the salvage of pipe of a particular material and size shall be compensation in full for all materials, labour, and use of equipment to: provide any hand work excavation necessary to complete the pipe salvage operation, remove and salvage the pipe and couplers, provide any dewatering necessary to carry out the work, transport pipes and couplers to the storage site, store the salvaged pipes and couplers, and backfill and compact the excavated material and reinstall the salvaged pipe at the same or new location for the pipe. including the temporary stockpiling of the excavated material for reuse in the backfilling process. (In the case of driveway culverts excavation and backfill of the driveway culvert will be included in the price of salvage and reinstallation of culvert or pipe.) Any damaged pipe will be replaced at the contractor's expense, where it is deemed the pipe was salvageable.

Excavation above and around the pipe, in roadways, shall be compensated for under Section 403 "Excavation for Foundations", but any additional hand work excavation required to salvage the pipe shall be compensated for as part of payment for Section 523 "Salvage and Reinstallation of Culvert or Pipe".

## FORM 525



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 525

#### CUTTING PREVIOUSLY INSTALLED CORRUGATED STEEL PIPE

##### INDEX

##### 525.01 SCOPE

##### 525.02 MATERIALS

##### 525.03 OPERATIONS

##### 525.04 MEASUREMENT FOR PAYMENT

##### 525.05 BASIS OF PAYMENT

##### 525.01 SCOPE

This specification deals with the work of cutting a previously installed corrugated steel pipe which was placed as part of another contract. This section does not apply to cutting new corrugated steel pipe culverts, perforated pipe or storm sewers which are to be installed in this contract. Cutting new corrugated steel pipe is not a pay item, but is included in payment as part of Section 421 "Supply and Installation of Pipe Culverts" and Section 420 "Supply and Installation of Pipe for Storm Sewers and Perforated Pipe for Sub-Drains".

##### 525.02 MATERIALS

Metal conditioner and cold galvanizing compound shall meet Canadian Government Specifications 1-GP-181A. The cold galvanizing compound shall be of a type that imparts cathodic actions against corrosion.

##### 525.03 OPERATIONS

At the point designated by the Engineer, the Contractor shall sever the pipe by making a neat cut perpendicular to the axis of the pipe. All soil and dirt sticking to the pipe near the cut shall be thoroughly brushed off using a wire brush.

The clean surface shall receive at least one application of metal conditioner to de-oxidize, de-grease, and phosphatise the metal surface. Pre-mixed ready-to-apply, liquid zinc compound shall be applied to the prepared clean dry metal surface. The cold galvanizing compound shall be applied with an overlap of at least 50mm over the surrounding undamaged galvanized metal.

These compounds are toxic to fish and other aquatic life. Extreme care shall be taken to ensure that this material does not enter streams or ponds.

##### 525.04 MEASUREMENT FOR PAYMENT

Measurement for payment for cutting a previously installed corrugated steel pipe of the size indicated shall be by the number of complete severing cuts made to pipe of that size.

##### 525.05 BASIS FOR PAYMENT

Payment at the contract price for Cutting Previously Installed Corrugated Steel Pipe of the size stipulated shall be compensation in full for all labour, materials, and use of equipment to: sever the pipe at the point designated, clean the cut, and supply and apply metal conditioner and cold galvanized compound to the cut.

# FORM 530



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 530

### SUPPLY AND INSTALLATION OF TRAFFIC LIGHT CONDUIT

#### INDEX

#### 530.01 SCOPE

#### 530.02 MATERIALS

#### 530.03 PROCEDURE

#### 530.04 MEASUREMENT FOR PAYMENT

#### 530.05 BASIS OF PAYMENT

#### 530.01 SCOPE

This specification covers the requirements for the supply and installation of electrical conduit for the installation of traffic signal systems.

#### 530.02 MATERIALS

Conduit will be rigid polyvinyl chloride (PVC) conduit suitable for electrical applications. The use of telephone duct will not be permitted. Concrete for encasement of the PVC conduit will be 35 MPa and meet the requirements for sub structure concrete set forth in Section 904 "Concrete Structures".

#### 530.03 PROCEDURE

All electrical conduit must be installed by a registered electrical contractor. The electrical contractor must obtain a permit from the Department of Government Services and Lands or the local municipality as the case may be, prior to commencing work on the conduit. All inspections that are required are to be arranged with the proper authority by the electrical contractor. Copies of the permit and inspection certificates must be provided to the Engineer.

Conduit shall be laid in continuous lengths as far as possible not less than 1 m below finished grade in a trench. Where joints are necessary, they shall be made with couplings as approved by the Engineer. Conduits shall be placed in the trench on a uniform grade and compacted bed, free of sharp stones. No sharp bends will be permitted. Where two or more conduits are to be laid in a trench, they shall be laid side by side and spaced as shown in the contract drawings.

All conduit ends shall be terminated in junction boxes, pole bases or traffic signal controller foundation. All rigid PVC connections must be made with solvent cement.

The conduit is to be encased in 35MPa concrete with a minimum cover thickness of 75mm around each conduit in the installation. At least 3 hours shall occur before the trench is backfilled to allow the concrete to stiffen.

Immediately after the concrete has been poured, the Contractor, by using a suitable size testing mandrel, or by other means acceptable to the Engineer, shall prove the complete system to ensure the conduits are clean and free of obstructions.

Except by permission from the engineer, the trenches shall be backfilled prior to completion of the days work and shall not be left open over night.

Except for such material as may be specified for bedding purposes or conduit protection, and unless otherwise directed by the Engineer, material used for backfilling trenches shall correspond in quality and

## **FORM 530**

depth with the material in the faces of the trenches. Each material shall be compacted to 100% of maximum dry density.

The Contractor shall place 6mm twisted nylon fish lines into the conduits for the future easy installation of cables. The ends of the fish line are to be secured to the satisfaction of the Engineer.

All facilities and surface features affected by excavation shall be restored by the Contractor to their original condition or to a condition satisfactory to the Engineer.

### **530.04 MEASUREMENT FOR PAYMENT**

Measurement will be made in metres, rounded to the nearest 0.1 metre, horizontally along the longitudinal axis of the trench and shall be from centre to centre of junction boxes, poles and traffic signal controller foundations for each type of conduit installation.

### **530.05 BASIS OF PAYMENT**

Payment at the contract price shall be full compensation for all labour, equipment and material required to supply and install conduit, including: cutting, removal and disposal of asphalt, excavation of trench, supply and installation of conduit, couplings, elbows, and end caps; supply and installation of fish lines, supply and installation of concrete form work, supply and place concrete, backfilling and compaction of trench, removal of surplus material and repairing of trench area, including reinstatement of the disturbed area to its original condition.

# FORM 535



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 535

### SUPPLY AND INSTALLATION OF TRAFFIC SIGNAL FOUNDATIONS

#### INDEX

#### 535.01 SCOPE

#### 535.02 GENERAL

#### 535.03 MEASUREMENT FOR PAYMENT

#### 535.04 BASIS OF PAYMENT

#### 535.01 SCOPE

This specification covers the requirements for the supply and installation of concrete foundations for traffic signal poles, both post top and cantilever styles.

#### 535.02 GENERAL

Concrete shall conform to the requirements of Section 904 "Concrete Structures" for sub-structures.

The forms shall be held to the established lines and grades, and upper edges shall conform to the grade established by the Engineer.

All forms shall be thoroughly wetted, oiled or coated with soft soap or whitewash before depositing any concrete against them. All mortar and dirt shall be removed from forms that have been previously used.

As soon as the concrete has been placed and consolidated, it shall be struck off and screened to the established grade. The surface shall be immediately floated with a wood or metal float to remove ridges and fill the voids remaining on the surface following screening. The concrete shall not receive any floating or working when bleed water or free water, is present on the surface. The surface shall not be permanently worked or subsequently overworked to cause excessive fines and water to be forced to the surface.

The method and materials used to cure and protect the concrete shall be in accordance with the provisions of Section 904 "Concrete Structures".

The anchorage assembly shall be accurately orientated in order that future pole brackets and signal heads will be right angles to the roadway being served. The template shall be firmly positioned and fixed in a level position before concrete is placed. The template shall remain in place until the pole is to be erected.

Steel reinforcing bolts and ties shall be as shown on Forms 1286 or 1287 as the case may be.

Conduit sleeves shall be firmly fixed to formwork or steel reinforcing prior to the pouring of concrete.

All sleeve openings not to be utilized on this contract shall be plugged using approved PVC plugs.

All components shall be accurately placed, secured and supported in a manner approved by the Engineer so that there can be no shifting or deflection of the components due to the placing of concrete and such other loads as may be superimposed during construction.

All rigid PVC connections shall be made with solvent cement.

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Immediately after concrete has been poured, the contractor, by using a suitable size testing mandrel, or by other means acceptable to the Engineer, shall prove the complete system to ensure that conduits are clean and free of obstructions.

The ends of the ducts shall be capped with plastic plugs after a 6m twisted nylon fish line has been pulled in each duct and a 1.5m length brought out at each end past the plastic plugs and left coiled for future use.

All exposed studs and appropriate nuts shall be thoroughly cleaned and smeared with a suitable antiseizer lubricating component to prevent the nuts from freezing to the studs

One nut shall be turned down on each anchor stud.

### **535.03 MEASUREMENT FOR PAYMENT**

Measurement for payment for Traffic Signal Foundations shall be by the number of Traffic Signal Foundations of each type installed.

### **535.04 BASIS OF PAYMENT**

Payment at the contract price for Traffic Signal Foundations will be compensation in full for all plant labour and material use to supply and install a traffic signal foundation including: excavation and supply and installation of formwork, reinforcing, concrete, anchor bolts, conduits, elbows and fish lines.

# FORM 537



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 537

### SUPPLY AND INSTALLATION OF TRAFFIC POLES

#### INDEX

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##### 537.02.01 General

##### 537.02.02 Traffic Pole

##### 537.02.03 Street Lights

#### 537.03 CONSTRUCTION

##### 537.03.01 Bases and Foundations

#### 537.04 MEASUREMENT FOR PAYMENT

#### 537.05 BASIS OF PAYMENT

#### 537.01 SCOPE

The work covered by this specification shall cover the supply and installation of traffic and light poles, anchor bolts, mounting arms and associated hardware.

#### 537.02 MATERIALS

##### 537.02.01 General

Steel poles shall be designed to meet CSA-S6-06 Canadian Highway Bridge Design Code Standards. Aluminum poles shall be designed to meet CSA-S157-05 Strength in Aluminum Design Standards. They shall be able to withstand wind loads of 160km/h and a wind gust factor of 1.3 and have a design life of 60 years.

The design shall be prepared by a Professional Engineer who shall submit shop drawings and installation procedures to the Department at least two weeks prior to start of construction. Shop drawings are required to detail the EPA and reactions to be transferred to the foundation from the base of the pole to the foundation and shall bear the stamp and signature of a Professional Engineer licensed to practice in the Province of Newfoundland and Labrador.

##### 537.02.01 Traffic Pole

Unless otherwise specified traffic poles: shall be hot dipped galvanized steel having offsets and mounting heights as specified on the contract drawings.

##### 537.02.02 Traffic Lights

Traffic lights shall be as specified on the contract drawings and documents.

#### 537.03 CONSTRUCTION

##### 537.03.01 Bases and Foundations

The Contractor shall supply under separate pay items concrete bases and foundations for the installations of poles, however, the supplying and placing of anchor bolts for these bases and foundations shall be considered included in the price bid for supplying and installing poles.

## **FORM 537**

Where poles are of the direct bury type then excavation to the required grade and backfilling shall be included in the price bid for supply and installation of poles.

### **537.04 MEASUREMENT OF PAYMENT**

Measurement for payment for Poles shall be by the number of Poles supplied and installed.

### **537.05 BASIS OF PAYMENT**

Payment shall be at the unit price or lump sum price for each pole or item supplied and installed complete with anchor bolts, nuts, washers, template, leveling grout, shop drawings and incidentals.



# FORM 540



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 540

### CAST-IN-PLACE CONCRETE MEDIAN BARRIER

#### INDEX

#### 540.01 SCOPE

#### 540.02 MATERIALS

##### 540.02.01 Concrete

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##### 540.03.01 Concrete Mix Design

##### 540.03.02 Concrete Placement

##### 540.03.03 Finishing

##### 540.03.04 Curing

##### 540.03.05 Contraction Joints

##### 540.03.06 Construction Joints

#### 540.04 MEASUREMENT FOR PAYMENT

#### 540.05 BASIS OF PAYMENT

#### 540.01 SCOPE

This item consists of the construction of concrete median barrier using the slipforming method, in accordance with the plans and specifications.

#### 540.02 MATERIALS

##### 540.02.01 Concrete

Concrete shall meet the requirements outlined in Section 904 of the Specifications Book, Concrete Structures.

The concrete shall have a 28 day compressive strength of 35 MPa, with a minimum cement content of 380 kg per cubic metre. The maximum size of coarse aggregate shall be 20 mm. The entrained air content shall be 6.5% (plus 1% or minus 0.5%). The slump of the concrete used shall be less than 40mm.

#### 540.03 CONSTRUCTION

##### 540.03.01 Concrete Mix Design

The Contractor shall submit to the Engineer for approval a proposed mix design 14 days prior to its use.

##### 540.03.02 Concrete Placement

The concrete for the median barrier shall be placed by the use of an approved slipform paver. The slip form shall be cleaned and oiled with an approved form oil prior to each use. The vibration technique used will be such as to ensure the concrete in place shall be void of air pockets.

Manpower shall be scheduled and truck mixers sequenced so as to provide for uniform placing of the concrete with a minimum of interruption.

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## FORM 540

Precautions shall be taken to prevent any damage to the pavement by the slipform paver, truck mixers or other equipment. Damaged surfaces shall be repaired by the Contractor at his expense.

The surfaces of the median barrier shall not vary by more than 5mm when measured with a 3m straight edge.

Concrete spilled on the highway shall be removed and the highway cleaned to the satisfaction of the Engineer.

### **540.03.03 Finishing**

Hand finishing shall be kept to a minimum. Repair of air holes less than 15mm in diameter will not be required. Care shall be taken in any hand finishing that may be required to maintain the correct alignment and grade.

A textured broom or brush finish shall be applied to the finished surface. Hand finishing shall be done with a magnesium or wood float but shall be kept to a minimum.

### **540.03.04 Curing**

White membrane curing compound, if used, shall be applied immediately after finishing. Curing shall consist of two spray applications of the compound with the second application applied in a direction perpendicular to the first.

### **540.03.05 Contraction Joints**

Contraction joints shall be saw cut with an approved power saw, as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling and before shrinkage cracking takes place. Uncontrolled shrinkage cracks that occur shall be subject to the approval of the Engineer. If not acceptable, a section of concrete of not less than 1m surrounding the crack shall be removed and replaced.

Contraction joints shall be sawed to a minimum depth of 50mm and shall be spaced uniformly at a distance of not exceeding 6m, unless otherwise specified on the plans or specifications.

Contraction joints shall be cut neatly in a vertical plane.

### **540.03.06 Construction Joints**

Vertical construction joints at the ends of slipformed barrier segments shall include a vertical key in the joint surface as shown on the plans or approved by the Engineer.

## **540.04 MEASUREMENT FOR PAYMENT**

The quantity to be measured for payment shall be the number of linear metres of concrete median barrier constructed in accordance with the plans and specifications, measured to the nearest tenth of a metre.

## **540.05 BASIS OF PAYMENT**

Payment at the contract price per lineal metre of concrete barrier median shall be compensation in full for all plant, labour, materials and equipment use to, supply and place concrete with an approved slipform paver to the line and grade established by the Engineer, cure the concrete, and finish the concrete.

# FORM 541



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 541 PRECAST CONCRETE TRAFFIC BARRIER

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#### 541.03 CONSTRUCTION

##### 541.03.01 Welded Wire Mesh

##### 541.03.02 Forms

##### 541.03.03 Curing

##### 541.03.04 Finishing

##### 541.03.05 Tolerances

##### 541.03.06 Handling

##### 541.03.07 Installation

#### 541.04 MEASUREMENT FOR PAYMENT

#### 541.05 BASIS OF PAYMENT

#### 541.01 SCOPE

This item consists of the supply and installation of precast concrete median barrier elements in accordance with the plans and specifications.

#### 541.02 MATERIALS

##### 541.02.01 Concrete

Concrete shall meet the requirements outlined in Section 904 of the Specifications Book. Concrete Structures and shall have a 28 day compressive strength of 30 MPA, with a minimum cement content of 400 kg/m<sup>3</sup>. The maximum size of coarse aggregate shall be 19mm. The entrained air content shall be 6.5% (plus 1% or minus 0.5%). The concrete slump shall be 75mm (plus 12.5mm or minus 50mm).

##### 541.02.02 Welded Steel Wire Fabric

The welded wire fabric shall conform to "Specifications for Welded Steel Wire Fabric for Concrete Reinforcement" (A.S.T.M. A-185).

#### 541.03 CONSTRUCTION

##### 541.03.01 Welded Wire Mesh

The reinforcing steel may be tack welded to the welded wire mesh. The bar cover tolerance for the reinforcing steel shall be plus 12.5mm and minus 6mm.

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## FORM 541

Supporting chairs for welded steel wire fabric shall be heavy plastic tipped, approved by the Engineer. The bar cover tolerance of the wire mesh shall be plus 1.5mm and minus 6mm.

### 541.03.02 Forms

Only steel side forms and steel bottom forms shall be used. Forms shall be clean and of a configuration to ensure compliance with the tolerances outlined in this particular specification. Forms previously used shall be thoroughly cleaned of all mortar and foreign material before being re-used. Inside formwork shall be, coated with a commercial quality form varnish or other equivalent coating before concrete is placed which will permit the ready release of the forms and will not discolour the concrete.

The Engineer shall be informed of the time and location of the concrete pour for the precast barrier elements.

### 541.03.03 Curing

Exposed sharp edges shall be chamfered with triangular fillets, 12.5mm by 12.5mm, to prevent mortar runs and to preserve smooth straight lines. Triangular fillets or chamfer strips shall be made of steel, plastic or milled from clear, straight grain lumber planed on the side exposed to concrete.

Curing shall be carried out naturally or artificially accelerated by the use of heat. When curing naturally, the methods outlined under "Curing" in Section 904.05 of the Specifications Book shall be followed.

Forms may be removed and no further curing required when the concrete has obtained 80% of its specified 28 day strength. When curing is artificially accelerated, the following methods shall be used for precast barrier elements.

Immediately after the concrete in each element is placed, the element shall be covered with an approved enclosure. During the initial curing period, which is from 4 to 5 hours after completion of casting, the temperature within the enclosure shall be maintained at approximately 20° C, with a maximum moisture content in the air. The element shall be kept wet by the application of sufficient water at the same temperature as the air within the enclosure. Condensate from steam will be an acceptable source of water.

During the next stage of curing, the temperature within the enclosure shall be raised to a minimum of 40°C and a maximum of 70° C at a rate not exceeding 15°C per hour. This temperature, combined with maximum moisture content in the air, shall be maintained until the required concrete strength is reached. Throughout the curing time, the element shall be kept wet by applying water of the same temperature as the air within the enclosure. Condensate from steam will be an acceptable source of water.

After the required strength has been reached the temperature shall be lowered at a rate of 15°C per hour until the element is at air temperature. The elements shall not be exposed to temperatures below freezing until they have undergone two days of drying in warm temperatures following the above curing. After drying, such elements shall be cooled at not more than 5°C per hour until the outside air temperature is reached.

When forms are removed during the curing period, particular care shall be taken to maintain the required temperature. Steam jets shall be directed so that the steam does not strike directly on the forms or concrete surfaces.

### 541.03.04 Finishing

In general the bottom surface (top surface when pouring) of the precast section shall be a smooth wood float finish.

## **FORM 541**

The permanently exposed surfaces shall be true, smooth and free from honeycomb. Small surface voids due to entrapped air shall be filled with an approved cement mixture. All ridges occurring at junctions of form panels and all bottom edges shall be ground smooth.

The Engineer's permission must be received before patching any defects other than minor surface imperfections.

### **541.03.05 Tolerances**

The barrier element surfaces shall be true line and dimensions within the following tolerances.

Overall Depth of Elements =  $\pm 5$  mm

Width of Elements =  $\pm 3$  mm

Exposed Element End Deviation from Square (Measured where Element is 762mm in width) Horizontal = 6mm

Exposed Element End Deviation from Square Vertical = 6mm

### **541.03.06 Handling**

Elements shall not be shipped until the concrete in the elements has reached the specified 28 day strength.

Elements shall be stored and transported in the final upright position only and shall be supported on a dry firm base as required by the Engineer.

Elements shall not be placed on other elements unless otherwise approved by the Engineer.

Elements damaged by improper handling, storage or transportation by the Contractor will not be acceptable to the Department of Works, Services and Transportation until acceptable repairs have been made by the Contractor.

### **541.03.07 Installation**

Barrier sections shall be installed at locations as directed by the Engineer. The barrier shall become the property of the Department.

## **541.04 MEASUREMENT FOR PAYMENT**

The quantities to be measured for payment shall be the number of linear metres, rounded to the nearest 0.1 metre, of traffic barrier acceptably built, delivered to the job site and installed according to the plans and specifications.

## **541.05 BASIS FOR PAYMENT**

Payment at the contract price per linear metre of barrier shall be full compensation for all plant, labour, equipment and materials used to construct formwork, supply and place reinforcing steel and wire mesh, supply, place and compact the concrete, cure the concrete, remove formwork, load, transport and unload the barrier at the work site and place the barrier at the line and grade established by the Engineer.

# FORM 570



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 570

### INSTALLATION OF CONCRETE SIDEWALK

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#### 570.02 MATERIALS

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#### 570.04 FORMWORK

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#### 570.07 CURING THE CONCRETE

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#### 570.09 PROTECTION OF SIDEWALK FROM TRAFFIC AND PEDESTRIANS

#### 570.10 MEASUREMENT FOR PAYMENT

#### 570.11 BASIS OF PAYMENT

#### 570.01 SCOPE

This specification covers the requirements for the construction of concrete sidewalk on a prepared bed of Granular Base Course.

#### 570.02 MATERIALS

Concrete to use in constructing the sidewalk shall conform to the following specific requirements:

CLASS OF CONCRETE	35MPa AT 28 DAYS
AGGREGATE	20mm MAXIMUM SIZE
AIR CONTENT	6% ± 1%
SLUMP	60mm ± 20mm

All concrete shall conform with the requirements of Section 904 "Concrete Structures".

Material for forming isolation joints shall be 12 mm thick bituminous fibre material of depth equal to the depth of the sidewalk.

Material for forming control joints shall be 12 mm thick bituminous fibre material for the set-in- place type, or a bituminous filler material for the groove or saw-cut type.

All materials including formwork, shall be supplied by the Contractor.

#### 570.03 PREPARATION WORK

Should excavation be required prior to placing the bed for the sidewalk, then such work shall be carried out and paid for in accordance with Section 206 "Grading of Cuts".

When fill is required prior to placing the bed for the sidewalk, then this work shall be carried out in accordance with Section 204 "Grading of Fill".

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After the site has been graded, as described above, a bed shall be laid composed of Selected Granular Base Course Granular "B". The bed shall be laid to the lines and grades as staked by the Engineer.

At those places where a sidewalk is to be placed behind a drop curb, then the bed shall be graded in such a way that will allow the finished sidewalk to have a configuration as shown in the drawing in Section 1276 "Typical Drop Curb with Sidewalk Layout".

The compacted depth of the bed should not be less than 100 mm. The bed shall be compacted to not less than 95% of the Standard Proctor Density) ASTM D698-78).

### 570.04 FORMWORK

After the bed has been prepared, suitable forms shall be placed to conform to the lines and grades furnished by the Engineer.

Formwork shall conform to the requirements of Section 907 "Formwork and Falsework".

The forms shall be placed as to provide for a slope of 2% towards the curb, or for such other slopes as may be set by the Engineer.

At those places where a sidewalk is to be placed behind a drop curb, then the forms shall be set so as to obtain a finished concrete surface and joints as shown in the drawing in Section 1276 "Typical Drop Curb with Sidewalk Layout", Section 1278 "Paraplegic Ramps".

### 570.05 PLACING THE CONCRETE

Sidewalk may be placed in isolation or it may be placed adjacent to a curb.

The thickness of the sidewalk slab shall be not less than 125 mm. The width shall be as staked by the Engineer.

Concrete shall be placed in accordance with the requirements of Section 904 "Concrete Structures".

As soon as the concrete has been placed and consolidated, it shall be struck off true to grade and cross-section, by an oscillating movement of a straight-edge or template inclining towards the curbing with an inclination of 2% or such other slope as may be determined by the Engineer.

The surface shall then be floated with a wooden flat until the mortar flushes to the top, and the entire surface presents a tight and compact appearance. No deviation of greater than 3 mm in a 3 m straight edge shall be tolerated. The divisions between each block shall be marked, rounded, and tooled with proper finishing tools in the neatest possible manner, and to the approval of the Engineer. The jointing tool shall have a radius of 12 mm. Under no circumstances will it be permitted to grout any portion the sidewalk which does not in the opinion of the Engineer present a satisfactory surface. Such portion or portions must be entirely removed and replaced by the Contractor, to the satisfaction of the Engineer, without extra remuneration.

### 570.06 JOINTS

When the sidewalk is to be placed adjacent to another structure, such as a curb, then the Contractor shall place a full length isolation joint between the back of the structure and the sidewalk. Isolation joints shall be placed at all places where a change in slope on the sidewalk occurs such as adjacent to drop curbs and tapered curbs. See drawing in Section 1276 "Typical Drop Curb with Sidewalk Layout" for an illustration of the location of isolation joints behind a curb and also at places where a change in slope of the sidewalk occurs.

Isolation joints shall also be placed around all water services, lamp posts, hydrants, and utility poles which occur within the limits of the sidewalk. The joint material shall be set so as not to protrude above the surface of the sidewalk.

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Control joints shall be constructed adjacent to all transverse control or isolation joints in the curb and gutter. In addition control joints shall be placed at intervals not more than 2 m apart. They shall have a depth of not less than one quarter the thickness of the sidewalk, and extend the full width of the sidewalk. The cast-in -place control joint shall consist of 12 mm wide bituminous filler material of length equal to the width of the sidewalk. Alternative control joints may be cut using a saw or made with a tool before the concrete is completely set. The cuts or groove shall be between 3 mm and 5 mm wide. This groove or saw-cut type of control joint shall be completely filled with a bituminous filler material when the concrete is dry. Immediately prior to the filling, the groove or saw-cut shall be thoroughly cleansed of all dust and particles of foreign matter.

Construction joints shall be built at convenient stopping places in the placement of the concrete. They may be either a butt type joints, or an isolation type joint. They shall be built at the end of each day's construction or when there is a delay in the supply of concrete and cold joints may develop.

### **570.07 CURING THE CONCRETE**

Concrete shall be cured in accordance with the requirements of Section 904 "Concrete Structures".

### **570.08 TRIMMING**

After the removal of the forms and after the initial curing of the concrete, the Contractor shall grade and tamp adjacent other material against the exposed edges of the sidewalk to form shoulders to the sidewalk. These shoulders shall be made trim to slightly proportions.

### **570.09 PROTECTION OF SIDEWALK FROM TRAFFIC AND PEDESTRIANS**

The Contractor shall use barricades, watchmen, or other means, to protect all sidewalk surfaces from harm by traffic or pedestrians, until the Engineer authorizes the sidewalk to be opened to public use.

The Contractor shall at all times prior to the opening to traffic provide suitable bridging as other means of access to adjacent properties.

### **570.10 MEASUREMENT FOR PAYMENT**

This item will be measured by the length and width as laid according to the instructions of the Engineer and such measurements will be computed into square metres, rounded to one decimal place.

### **570.11 BASIS OF PAYMENT**

Payment at the contract price for installation of concrete sidewalk shall be compensation for labour, materials, and equipment-use to supply and place formwork and concrete, to construct joints, to provide and place joint filler, to cure the concrete, to protect the sidewalk from traffic, to provide suitable bridging, to remove the forms, to shoulder the exposed edges of the sidewalk with adjacent other material, and to tamp the O.M. shoulders of the sidewalk.

Selected Granular Base Course Granular "B", for providing the bed shall be paid for in accordance to the Contract Unit Price for Selected Granular Base Course Granular "B", but any additional labour required to place this bed as specified shall be considered compensated for in the contract price for concrete sidewalk.

### **570.12 Concrete Acceptance and Reduced Payment Criteria on Concrete Located in Concrete Sidewalk**

Concrete on a project for sidewalk, and also as defined by its specified strength at 28 days, must have an average tested strength at 28 days equal to or greater than that specified for payment at the bid price.

Concrete for concrete sidewalk having an average strength of less than that specified will be accepted into the job at a reduced payment, provided the difference between specified strength and tested strength



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is no greater than 5MPa. If the average of tests in a particular predefined portion of concrete sidewalk is less than that specified by more than 5MPa then that concrete shall be rejected.

When concrete is rejected, those provisions outlined in CSA-A23.1-94 shall be followed to determine whether or not the concrete may remain in the work. Such work will be done at the Contractors cost. Notwithstanding the above, should the concrete remain in the work it will be subject to a reduction, as outlined below, for having a strength less than that specified.

Concrete for concrete sidewalk otherwise acceptable but having an average strength deficiency as tested of less than 5 MPa compared with that specified, will be accepted but the bid price for all concrete in the predefined portion will be reduced according to the following procedure:

For concrete work where the Unit Price Table states the unit to be square metres the adjusted price shall be calculated as follows:

$$\$(\text{Adjusted Concrete Price}) = (\text{Tested Strength} / \text{Specified Strength}) \times \$(\text{Bid Concrete Unit Price})$$

Division of the sidewalk into predefined portions will be done by the Engineer as the concrete placement is carried out. A predefined portion shall generally be established as that concrete placed within one operation.

There will be no bonus payment under the contract when the average strength is in excess of the specified strength.

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### SECTION 575 ASPHALT SIDEWALK

#### INDEX

#### 575.01 DESCRIPTION

#### 575.02 MEASUREMENT FOR PAYMENT

#### 575.03 BASIS OF PAYMENT

#### 575.01 DESCRIPTION

This specification covers the requirements for the provision of asphalt sidewalk.

The sidewalk shall be constructed as shown in Form 1272. The Granular "A" shall meet the requirements set forth in Section 315 "Select Granular Base Course" and the Asphalt shall meet the requirements for surface course set forth in Section 330 "Hot Mix Asphaltic Pavement".

#### 575.02 MEASUREMENT FOR PAYMENT

This item will be measured by the length and width, as laid according to the instructions of the engineer, and such measurements will be used to determine the number of square meters, rounded to one decimal place, of asphalt sidewalk incorporated into the work.

#### 575.03 BASIS OF PAYMENT

Payment at the contract price for Asphalt Sidewalk shall be compensation in full for all equipment and labour to install the asphalt sidewalk.

Granular "A" placed beneath the asphalt sidewalk will be paid for in accordance to the contract price for Granular "A" and the Hot Mix Asphaltic Surface Course used for the sidewalk shall be paid in accordance with the contract price for Hot Mix Asphaltic Surface Course, but all additional labour and equipment use required to place and compact the Granular "A" and Hot Mix Asphaltic Surface Course shall be considered compensated for in the contract price for Asphalt Sidewalk.

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## SECTION 580 SIGN AND SIGNPOST INSTALLATIONS

### INDEX

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#### 580.04 ASSEMBLY

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- 580.05.03 Additional Installation Instructions for the Sign Board

#### 580.06 MEASUREMENT FOR PAYMENT

#### 580.07 BASIS OF PAYMENT

#### 580.01 SCOPE

This specification covers the requirements for the supply and installation of various types of signposts and the actual placing of highway signs on those signposts.

#### 580.02 CLASSIFICATION OF SIGNPOST INSTALLATIONS

There are **nine** basic types of signpost installations, namely; Type A, Type B, Type C, Type D, Type E, Type F, Type G, Type H and Type I.

Type A and Type B signpost installations are of various dimensions, but all are intended to support signs which require only one wooden vertical member for support. for Type A and Type B signpost installations,

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the number following the letter denotes the required height of the sign to be placed on the post, measured in millimetres. See section 1290, "Sign Post Installation Details Type A", and Section 1291, "Sign Post Installation Details Type B", for an illustration.

Type C and Type D signpost installations are of various dimensions, but all are intended to support signs which require two wooden vertical members for support. Type C installations are intended for signs of width less than or equal to 2440 mm and a height of less than or equal to 1220 mm. Type D installations are intended for signs wider than 2440 mm but less than 4880 mm and/or higher than 1220 mm.

For Type C and Type D signpost installations the upper number following the letter denotes the required height of the sign board in millimetres, and the lower number denotes the length of the sign board in millimetres. See Section 1292 "Sign Board Installation Details Type C", and Section 1293, "Sign Post Installation Details Type D", for an illustration.

Type E signpost installations will be of various dimensions and are intended to support signs less than or equal to 2440 mm in height and between 4880 mm and 6096 mm in length which require three wooden vertical members for support. For Type E signpost installations, the upper number following the letter denotes the height of the signboard in millimetres and the lower number denotes the length of the signboard in millimetres. See section 1294 "Sign Post Installation Details Type E", for an illustration.

Type F signpost installations are intended to support signs between 2440 mm and 3050 mm in height and less than or equal to 4880 mm in length which require two vertical structural steel members for support. For Type F signpost installations, the upper number following the letter denotes the height of the sign panel in millimetres and the lower number denotes the length of the sign panel in millimetres. See section 1295 "Sign Post Installation Details Type F", for an illustration.

Type G signpost installations are intended to support signs greater than 2440 mm in height and less than or equal to 6100 mm in length which require three vertical structural steel members for support. For Type G signpost installations, the upper number following the letter denotes the sign panel height in millimetres and the lower number denotes the sign panel length in millimetres. See section 1296 "Sign Post Installation Details Type G", for an illustration.

Type H signpost installations will be of various dimensions and are intended to support signs less than or equal to 2440 mm in height and between 6706 mm and 7925 mm in length which require four wooden vertical members for support. For Type H signpost installations, the upper number following the letter denotes the height of the signboard in millimetres and the lower number denotes the length of the signboard in millimetres. See section 1294a "Sign Post Installation Details Type H", for an illustration.

Type I signpost installations are intended to support signs greater than 2440 mm in height and between 6700 mm and 7925 mm in length which require four vertical structural steel members for support. For Type I signpost installations, the upper number following the letter denotes the sign panel height in millimetres and the lower number denotes the sign panel length in millimetres. See section 1296a "Sign Post Installation Details Type "I", for an illustration.

### 580.03 MATERIALS

The Contractor shall supply all materials required to complete sign and signpost installations in accordance with these specifications.

All posts, footings, and braces for Types A to E and H shall be pressure treated eastern hemlock, western hemlock, or BC fir and be of the size specified for each post type.

Nails shall be galvanized with a length of 100 mm.

Lag bolts shall be galvanized with a length of 80 mm and a diameter of 10 mm and with Hex or Square Head only (carriage type head is not to be used on signs).

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Washers shall be galvanized flat washers to fit 10 mm diameter lag bolts.

Posts for Type F, Type G and Type I shall be W250x49 structural steel members, grade 350W in accordance with CSA G40-21, latest edition. All welding is to conform to CSA W59 and companies are to be certified to W47.1, latest edition. All fabrication of structural steel shall be done in accordance with Section 910 "Structural Steel". No splicing of the vertical member will be permitted. The sign post shall be painted in accordance with Section 921 "Blast Cleaning and Painting of Structural Steel". The complete penetration groove weld between the vertical member and the base plate shall be designed by a qualified welding engineer to handle a factored moment of 135 kN-M (ultimate limit states), 103.85kN-M (fatigue limit states) a factored horizontal shear force of 32.5 kN (Ultimate limit states), 25.0 kN (fatigue limit states). The fatigue category shall be "B" for 2,000,000 cycles. Shop drawings bearing the seal of a registered professional engineer, licensed to practice in the Province of Newfoundland, shall be submitted for approval.

Brackets for attaching the aluminum panels to the steel post shall be manufactured from 8mm steel plate to the dimensions shown on Forms 1295, 1296 and 1296a. The brackets are to be painted in accordance with Section 921 "Blast Cleaning and Painting of Structural Steel".

A 6mm thick x 245mm wide neoprene gasket shall be placed between the steel post and aluminum sign panels. The gasket is to extend the full height of the aluminum panels.

### **580.03.01 Additional Material Requirements For Type A Installations**

Vertical members shall be 114 mm x 114 mm pressure treated lumber of length not less than that as calculated for the appropriate sign drawings as explained by Section 580.02 "Classification of Signpost Installations", and as illustrated on Section 1290 "Sign Post Installation Details Type A".

Footings for each post shall consist of six pieces of 38 mm x 89 mm pressure treated lumber of length not less than 450 mm.

### **580.03.02 Additional Material Requirements For Type B Installations**

Vertical members shall be 140 mm x 140 mm pressure treated lumber of length not less than that as calculated for the appropriate sign indicated by the contract drawings, as explained by Section 580.02 "Classification of Signpost Installation" and as illustrated on Section 1291 "Sign post Installation Details Type B".

Footings for each post shall consist of six pieces of 38 mm x 89 mm pressure treated lumber of length not less than 450 mm.

### **580.03.03 Additional Material Requirements For Type C Installations**

Vertical members shall be 140 mm x 140 mm pressure treated lumber. Footings for each installation shall consist of two pieces of 38 mm x 89 mm pressure treated lumber. The length of vertical members and footings shall not be less than that as calculated for the appropriate sign board indicated by the contract drawings, as explained by Section 580.02 "Classification of Signpost Installations" and as illustrated on Section 1292 "Sign Post Installation Details Type C", and Section 1299 "Sub-Grade Widening for Types C, D, and E Signpost Installations".

Cross bracing shall consist of two pieces of 38 mm x 89 mm pressure treated lumber of sufficient length to provide cross bracing for the installation of the required size.

### **580.03.04 Additional Material Requirements For Type D Installations**

Vertical members shall be 184 mm x 184 mm pressure treated lumber. Footings for each installation shall consist of two pieces of 38 mm x 89 mm pressure treated lumber. Cross members for each installation shall consist of two pieces of 89 mm x 89 mm pressure treated lumber.

The length of vertical members, footings, and cross members shall not be less than that as calculated for the appropriate sign board indicated by the contract drawings, as explained by Section 580.02 "Classification of Signpost Installations" and as illustrated on Section 1293 "Sign Post Installation Details

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Type D", and Section 1299 "Sub-Grade Widening For Types C, D and E Signpost Installations".

Cross bracing shall consist of two pieces of 38 mm x 89 mm pressure treated lumber of sufficient length to provide cross bracing of the installation of the required size.

Nuts, bolts, and washers for connecting cross members shall be galvanized. The bolt shall be of length 150 mm and be of diameter not less than 15 mm or greater than 25 mm.

### **580.03.05 Additional Material Requirements For Type E Installations**

Vertical members shall be 184 mm x 184 mm pressure treated lumber. Footings for each installation shall consist of two pieces of 38 mm x 89 mm pressure treated lumber. Cross members for each installation shall consist of three pieces of 89 mm x 89 mm pressure treated lumber.

The length of vertical members, footings, and cross members shall not be less than that as calculated for the appropriate sign board indicated by the contract drawings, as explained by Section 580.02 "Classification of Signpost Installations" and as illustrated in Section 1294 "Sign Post Installation Details Type "E", and Section 1299 "Sub-Grade Widening for Types C, D and E Signpost Installations".

Cross bracing shall consist of four pieces of 38 mm x 89 mm pressure treated lumber of sufficient length to provide cross bracing of the installation of the required size.

Nuts, bolts, and washers for connecting cross members shall be galvanized. The bolt shall be of length 300 mm and be of diameter not less than 12 mm or greater than 25 mm.

### **580.03.06 Additional Material Requirements For Type F, Type G And Type I Installations**

Vertical members shall be W250x49 Structural Steel sections as specified by drawings 1295,1296 and 1296a. Footings for each installation shall consist of reinforced concrete complete with anchor bolts as shown on the contract drawings. Neoprene gaskets shall be used to isolate the aluminum panels from the vertical members.

The length of vertical members shall not be less than that as calculated for the appropriate sign board indicated by the contract drawings, as explained by Section 580.02 "Classification of Signpost Installations" and as illustrated in Section 1295 "Sign Post Installation Details Type F", Section 1296 "Signpost Installation Details Type G", Section 1296a "Signpost Installation Details Type "I" and Section 1299a "Sub-Grade Widening For Types F, G, H and I Signpost Installations".

### **580.03.07 Additional Material Requirements For Type H Installations**

Vertical members shall be 184 mm x 184 mm pressure treated lumber. Footings for each installation shall consist of two pieces of 38 mm x 89 mm pressure treated lumber. Cross members for each installation shall consist of six pieces of 89 mm x 89 mm pressure treated lumber.

The length of vertical members, footings, and cross members shall not be less than that as calculated for the appropriate sign board indicated by the contract drawings, as explained by Section 580.02 "Classification of Signpost Installations" and as illustrated in Section 1294-2 "Sign Post Installation Details Type "H", and Section 1299a "Sub-Grade Widening for Types F, G, H and I Signpost Installations".

Cross bracing shall consist of six pieces of 38 mm x 89 mm pressure treated lumber of sufficient length to provide cross bracing of the installation of the required size.

Nuts, bolts, and washers for connecting cross members shall be galvanized. The bolt shall be of length 150 mm and be of diameter not less than 15 mm or greater than 25 mm.

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### 580.03.08 Materials Used For The Installation Of Signs

Signs will be made by the Department of Works, Services and Transportation and must be picked up by the Contractor.

Signs will be made available to the Contractor at the nearest main Depot, (i.e. White Hills Depot, Clarendville Depot, Grand Falls Depot, Deer Lake Depot, or Goose Bay Depot).

Signs will be placed on wooden signposts with 80 mm x 10 mm lag bolts and washers in accordance with Section 1290 "Sign Post Installation Details Type A", Section 1291 "Sign Post Installation Details Type B", Section 1292 "Sign Post Installation Details Type C", Section 1293 "Sign Post Installation Details Type D", and Section 1294 "Sign Post Installation Details Type E".

Signs will be placed on steel posts with 6mm x 100mm brackets. Bolts are to be stainless steel. See Section 1295 "Sign Post Installation Details Type F", Section 1296 "Sign Post Installation Details Type G", and Section 1296a "Sign Post Installation Details Type I".

### 580.04 ASSEMBLY

Should any piece of lumber become split or cracked during nailing or installing the sign, then the Contractor shall replace the damaged piece with sound lumber at his own expense. For aluminum installations, posts or panels which become damaged in any manner shall be replaced by the Contractor at his own expense.

#### 580.04.01 Assembly Of Type A And Type B

The footings shall be secured to the vertical member at the spacing shown on Section 1290 "Sign Post Installation Details Type A", and Section 1291 "Sign Post Installation Details Type B".

Each footing shall be nailed near its centre to the vertical member, by means of two nails as shown on Section 1290 "Sign Post Installation Details Type A", and Section 1291 "Sign Post Installation Details Type B".

#### 580.04.02 Assembly Of Type C

The footings, cross bracing, and vertical members shall be assembled and secured at the spacing shown on the drawing, Section 1292 "Sign Post Installation Details Type C and Section 1299 "Sub-grade Widening for Types C, D, and E Signpost Installations".

Each piece of footing and cross bracing shall be secured to the vertical members with four nails, that is, with two nails at each joint.

#### 580.04.03 Assembly Of Type D

The footings, cross bracing, cross members and vertical members shall be assembled and secured at the spacing shown on the drawings, Section 1293 "Sign Post Installation Details Type D" and Section 1299 "Sub-grade Widening for Types C, D, and E Signpost Installations".

Each joint shall be secured with a nut, bolt, and washer. The head of the bolt shall be placed at the front of the installation. The head shall be counter sunk so that the top of the bolt is flush with the front of the installation.

Each piece of footing and cross bracing shall be secured to the vertical members with four nails, that is, with two nails at each joint.

#### 580.04.04 Assembly Of Type E

The footings, cross bracing, cross members and vertical members shall be assembled and secured at the spacing shown on the drawings, Section 1294 "Sign Post Installation Details Type E", and Section 1299 "Sub-grade Widening for Types C, D, & E Sign Post Installations".

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Each joint shall be secured with a nut, bolt, and washer. The head of the bolt shall be placed at the front of the installation. The head shall be counter sunk so that the top of the bolt is flush with the front of the installation.

Each piece of footing and cross bracing shall be secured to the vertical members with four nails, that is, with two nails at each joint.

### **580.04.05 Assembly of Type F, Type G and Type I**

The footings shall be constructed of reinforced concrete as shown on Form 1295, 1296 or 1296a as the case may be and Section 1299a "Sub-grade Widening for Types F, G, H & I Sign Post Installations".

All concrete is to be 35MPa and shall conform to the requirements of Section 904 "Concrete Structures" for substructures. However, the slump must be 60mm  $\pm$  20mm. Reinforcing steel shall be hard grade, YP400MPa. The top of the footing is to be steel float finished dead level.

The foundation backfill material shall be compacted to 95% of the maximum standard dry density (ASTM D698-78).

Prior to placing the post, bottom nuts are to be placed and levelled. The post is then to be set and the top nuts tightened. Ensure that the post is true and plumb. Hand pack non-shrink grout under base plate and trowel exposed edges to a smooth level.

### **580.04.06 Assembly Of Type H**

The footings, cross bracing, cross members and vertical members shall be assembled and secured at the spacing shown on the drawings, Section 1294 "Sign Post Installation Details Type "H", and Section 1299a "Sub-grade Widening for Types F, G, H and I Sign Post Installations".

Each joint shall be secured with a nut, bolt, and washer. The head of the bolt shall be placed at the front of the installation. The head shall be counter sunk so that the top of the bolt is flush with the front of the installation.

Each piece of footing and cross bracing shall be secured to the vertical members with four nails, that is, with two nails at each joint.

## **580.05 INSTALLATION**

The Engineer will stake the locations where signpost installations are to be installed and designate the sign number of the signpost installation that is required for each location.

The Contractor shall place signpost installations at these locations only of the required type and size for the sign as noted on the drawings.

The Contractor shall excavate holes for the footings, such that when installed the installation is at least the required minimum depth in the ground.

Signpost installations shall be placed with the vertical axis plumb, and with at least the required minimum depth in the ground. The vertical post edge nearest the road shall be 2500 mm from the edge of the shoulder, as illustrated in drawings, Section 1298 "Sub-grade Widening for Type A and Type B Sign Post Installations" and Section 1299 "Sub-grade Widening for Types C, D, and E Sign Post Installations". The vertical post edge nearest the road shall be 3500 mm from the edge of the shoulder, as illustrated in drawings, Section 1299a "Sub-grade Widening for Types F, G, H and I Sign Post Installations".

Footings shall be backfilled with selected fill which meets with the Engineer's approval. Backfill material shall not contain stones larger than 150 mm in any one dimension.



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Backfill material shall be placed in layers of thickness not greater than 150 mm. Each layer shall be thoroughly compacted before the successive layer is placed. Dry granular backfill shall be moistened before tamping.

Backfill material around the signpost installations shall be brought up level with the surrounding ground and surplus excavated material together with surplus backfill material shall be disposed of on the sides of fills, or as directed by the Engineer.

The Contractor shall be responsible for placing each sign on the correct posts, and at the location as set by the Engineer, taking care to ensure that each sign is placed undamaged, horizontally levelled, and attached to the posts and cross members with 80 mm x 10 mm galvanized lag bolts and galvanized washers. Nails cannot be substituted for this job.

Sign board size, sign post type, and the location of each will be specified on drawings as set by the Engineer.

### 580.05.01 Additional Installation Requirements For Type A and Type B

Type A and Type B sign post installations shall be placed so that at least 1250 mm of the vertical member is in the ground. They shall be installed so that the face of the post that is to take the sign is perpendicular to the direction of traffic, or as directed by the Engineer.

### 580.05.02 Additional Installation Requirements For Type C, Type D, Type E, Type F, Type G, Type H And Type I

Type C and Type D sign post installations shall be placed so that both vertical members are at least 1500 mm in the ground.

Type E installation shall be placed so that the three vertical members are at least 2500 mm in the ground.

Type F, Type G, Type H and Type I installations shall be placed as shown on the contract drawings.

Special care should be taken with the placing of the above sign post installations so as to minimize specular glare.

On straight stretches of roadway, Type C, Type D, Type E, Type F, Type G, Type H and Type I sign post installations shall be set with the horizontal axis at an angle of 93 degrees with the traffic lane which the proposed sign will serve, or as directed by the Engineer.

On the horizontal curves, these installations shall be set with the horizontal axis at an angle of 93 degrees with a straight line brackets between the sign and the point at which the sign is to be read, or as directed by the Engineer.

### 580.05.03 Additional Installation Instructions For The Sign Board

On Type A and Type B sign posts, the sign board will be mounted flush with the top of the sign post.

On Type C and Type D signposts, the sign board will be mounted with the top of the sign board, 100 mm above the signpost.

On Type A and Type B signposts, the top and bottom lag bolts must be placed 100 mm from the top and bottom edges of the sign board, **EXCEPT** for those pre-drilled sign boards that are normally supplied to the Contractor. See also Section 1290 "Sign Post Installation Details Type A", and Section 1291 "Sign Post Installation Details Type B".

On Type C, Type D, Type E and Type H signposts, lag bolts must be placed 250 mm down from the top edge of the sign board and follow down the sign board at a maximum spacing of 600 mm apart with the lowest lag bolt placed approximately 100 mm above the bottom edge of the sign board (for each post).

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See also Section 1292 "Sign Post Installation Details Type C", Section 1293 "Sign Post Installation Details Type D", Section 1294 "Sign Post Installation Details Type E", and Section 1294-2 "Sign Post Installation Details Type H".

On Type C, Type D, Type E, and Type H signposts, lag bolts must be placed 300 mm from each outside edge of the sign board and spaced a maximum of 600 mm apart (for each cross member). See also Section 1292 "Sign Post Installation Details Type C", Section 1293 "Sign Post Installation Details Type D", Section 1294 "Sign Post Installation Details Type E", and Section 1294 "Sign Post Installation Details Type H".

The Contractor is advised that care must be taken when installing the sign board to see that all lag bolts are seated into the frame and without the washer indenting the signs reflective sheeting. Care must be taken to see that damage to the sign while installing it to the post is minimal.

For Type F, Type G and Type I signposts, all aluminum sign panels must be bolted together with 3/8" x 1" stainless steel stitch bolts and washers (supplied by Department) at a maximum spacing of 600 mm. The entire aluminum sign must be attached to the steel posts with brackets at a spacing not exceeding 900 mm with a bracket band at the extreme top and bottom panels of the sign. See Section 1295 "Sign Post Installation Details Type F", Section 1296 "Sign Post Installation Details Type G" and Section 1296a "Sign Post Installation Details Type I".

For signs with tabs in the upper corners, the Contractor is to supply and install 2 pieces of aluminum T-Bar, 75mm x 100mm x 6mm thick x 1600mm long with 10-9.5mm x 25mm stainless steel bolts with 15 x 25 x 5 rectangular heads and nuts to brace the tabs to the back of the sign.

### **580.06 MEASUREMENT FOR PAYMENT**

Measurement for payment will be by means of the number of each type of signpost installation placed at the required locations.

### **580.07 BASIS OF PAYMENT**

Payment at the contract price for sign and signpost installation of a particular type shall be compensation in full for all labour, handling, materials, and equipment-use to: supply all materials, handling of signs from Department Depots, assemble the installation, excavate a hole for the footings, install the signposts, backfill the hole, compact the backfill, install the sign board and dispose of all surplus materials, all in accordance with this specification. Concrete footings, reinforcing, anchor bolts, neoprene gaskets, base plates, posts, brackets, and hardware to install the signs for Type F, Type G and Type I installations are also included in the contract price for these items.

Should excavation of solid rock be required to complete the installation of a signpost, payment for the rock excavation will be made according to Section 403, Excavation for Foundations, Solid Rock.

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## SECTION 582

### DISPOSAL OR SALVAGE OF SIGNS AND SIGNPOSTS

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#### 582.05 BASIS OF PAYMENT

##### 582.05.01 Basis of Payment for Disposal of Signs and Signposts

##### 582.05.02 Basis of Payment for Salvage of Signs and Signposts

#### 582.01 SCOPE

This specification covers the requirements for the excavation and removal of signs and signposts followed with the backfilling and compaction of the excavated material together with either; the salvage, or the disposal of the sign and signposts, as specified in the Contract item.

Excavation above and around the sign and signposts including any hand work excavation required to remove the sign and signposts shall be considered part of Section 582 "Disposal or Salvage of Sign and Signposts".

#### 582.02 EXCAVATION AND DISPOSAL OR SALVAGE

After excavation operations have been carried out to expose the signpost foundation the Contractor shall dispose of, or salvage the sign and signposts, as designated, within the limits as required by the Engineer.

The excavation of material abutting the top and sides of the signposts shall be performed in such a manner as to leave undisturbed, adjacent structure or other work to be left in place, and so that no damage occurs to the sign and signpost designated to be salvaged.

All excavated material shall be piled in a manner that will not endanger the work, and that will avoid obstructing sidewalks, driveways, and gutters.

Where a sign and signpost is designated to be salvaged, the Contractor shall carefully disassemble the sign and signpost and carefully remove the sign and signpost from the trench in such a way as not to cause damage to the sign and signpost. The salvaged sign and signpost shall be stored at a safe place on the job prior to reinstallation or transported to the nearest Department Depot.

Should any sign and signpost, designated for salvage, be damaged or lost by the Contractor, then the Contractor shall not receive payment for sign and signpost salvage for the damaged sign and signpost. Damaged material shall become the property of the Contractor and shall be disposed of.

Where a sign and signpost is designated for disposal, the Contractor shall remove and dispose of the sign and signpost .

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Signs and signposts for disposal shall be removed and disposed of in an approved waste disposal area provided by the Contractor at his own expense.

The Contractor shall be aware of Section 825 "Waste Management".

### **582.03 BACKFILLING AND COMPACTION**

Where concrete is placed in the excavation under another specification, such as concrete for signpost foundations, then backfilling shall not take place until the concrete has cured to at least 70% of the specified design strength at 28 days or cured for at least 7 days, whichever comes first.

Material excavated as part of the removal or salvage operations shall be used as backfill in the trench.

Backfill shall be placed in layers not exceeding 200 mm in thickness loose measurement. Each layer shall then be compacted to not less than 95% of the Standard Proctor density (ASTM D698-78) before a further layer is placed.

### **582.04 MEASUREMENT FOR PAYMENT**

#### **582.04.01 Measurement for Payment for Disposal of Sign and Signpost**

Measurement for payment for disposal of a sign and signpost of a particular type shall be in units of each sign and signpost type required to be disposed of as measured per location.

#### **582.04.02 Measurement for Payment for Salvage of Sign and Signpost**

Measurement for payment for the salvage of a sign and signpost of a particular type shall be in units of each sign and signpost type required to be salvaged, when measured after being removed from the ground.

Sign and signposts that are damaged to the extent that they will be unsuitable for re-use, will not be included in measurement for payment for sign and signpost salvage.

### **582.05 BASIS OF PAYMENT**

#### **582.05.01 Basis of Payment for Disposal of Sign and Signpost**

Payment at the contract price for the disposal of sign and signpost of a particular type shall be compensation in full for all materials, labour, and use of equipment to: provide any hand work excavation necessary to complete the sign and signpost disposal operation, remove the sign and signpost, provide any dewatering necessary to carry out the work, provide an approved waste disposal site, transport the sign and signpost to the waste disposal site, dispose of the sign and signpost, and backfill and compact the excavated material.

Excavation above and around the sign and signpost shall be compensated for under this item including any additional hand work excavation required to remove the sign and signpost which shall be considered compensated for as part of payment for Section 582 "Disposal or Salvage of Sign and Signpost".

#### **582.05.02 Basis of Payment for Salvage of Sign and Signpost**

Payment at the contract price for the salvage of sign and signpost of a particular type shall be compensation in full for all materials, labour, and use of equipment to: provide any hand work excavation necessary to complete the sign and signpost salvage operation, remove and salvage the sign and signpost, provide any dewatering necessary to carry out the work, transport sign and signpost to any temporary storage site, store the salvaged sign and signpost, and backfill and compact the excavated material including the temporary stockpiling of the excavated material for

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reuse in the backfilling process, and transporting the sign and signpost to the nearest Department Depot.

Any additional hand work or excavation required to salvage the sign and signpost shall be compensated for as part of payment for Section 582 "Disposal or Salvage of sign and signpost".

Any damaged sign and signpost will be replaced at the contractor's expense, where it is deemed the sign and signpost was salvageable.

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## SECTION 583

### SALVAGE AND REINSTALLATION OF SIGN AND SIGNPOST

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##### 583.04.01 Measurement for Payment for Salvage and Reinstallation of Sign and Signposts

#### 583.05 BASIS OF PAYMENT

##### 583.05.01 Basis of Payment for Salvage and Reinstallation of Sign and Signpost

#### 583.01 SCOPE

This specification covers the requirements for the excavation and removal of a sign and associated signpost followed with the backfilling and compaction of the excavated material together with the salvage, and the reinstallation of the sign and signpost, as specified in the Contract item.

Excavation above and around the sign and signpost shall be compensated for under this item including any additional hand work excavation required to remove and reinstall the sign and signpost shall be considered part of Section 583 "Salvage and Reinstallation of the Sign and Signpost".

#### 583.02 EXCAVATION AND SALVAGE

After Excavation for Foundations operations have been carried out to expose the sign and signpost the Contractor shall salvage the sign and signpost, as designated, within the limits as required by the Engineer.

The excavation of material abutting the sides of the sign and signpost foundation shall be performed in such a manner as to leave undisturbed, adjacent structure or other work to be left in place, and so that no damage occurs to the sign and signpost designated to be salvaged.

All excavated material shall be piled in a manner that will not endanger the work, and that will avoid obstructing sidewalks, driveways, and gutters.

The Contractor shall carefully disassemble the sign and signpost as required and carefully remove the sign and signpost from the trench in such a way as not to cause damage to the sign and signpost. The salvaged sign and signpost shall be stored at a safe place on the job prior to reinstallation.

Should any sign and signpost, designated for salvage and reinstallation, be damaged or lost by the Contractor, then the Contractor shall not receive payment for sign and signpost salvage for the damaged sign and signpost type. Damaged material shall become the property of the Contractor and shall be disposed of by the Contractor at his own expense.

The Contractor shall be aware of Section 825 "Waste Management".

#### 583.03 BACKFILLING AND COMPACTION AND REINSTALLATION

Where concrete is placed in the excavation under another specification, such as concrete for signposts foundations, then backfilling shall not take place until the concrete has cured to at least 70% of the specified design strength at 28 days or cured for at 7 days, whichever comes first.

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Material excavated as part of the removal or salvage operations shall be used as backfill in the trench, which shall include any necessary stockpiling of the excavated material.

Backfill shall be placed in layers not exceeding 200 mm in thickness loose measurement. Each layer shall then be compacted to not less than 95% of the Standard Proctor density (ASTM D698-78) before a further layer is placed.

Reinstallation of the sign and signpost shall be carried out as per Section 580 Sign and Signpost Installation.

### **583.04 MEASUREMENT FOR PAYMENT**

#### **583.04.01 Measurement for Payment for Salvage and Reinstallation of Sign and Signpost**

Measurement for payment for the salvage of sign and signpost of a particular type shall be per each sign and signpost type, when measured after being removed from the ground and reinstalled at the designated reinstallation location.

Signs and signposts that are damaged to the extent that they will be unsuitable for re-use, will not be included in measurement for payment for sign and signpost salvage and reinstallation.

### **583.05 BASIS OF PAYMENT**

#### **583.05.01 Basis of Payment for Salvage and Reinstallation of Sign and Signpost**

Payment at the contract price for the salvage of sign and signpost of a particular type shall be compensation in full for all materials, labour, and use of equipment to: provide any hand work and excavation necessary to complete the sign and signpost salvage operation, remove and salvage the sign and signpost, provide any dewatering necessary to carry out the work, transport the sign and signpost to the storage site, store the salvaged sign and signpost, and backfill and compact the excavated material and reinstall the salvaged sign and signpost at the same or new location for the sign and signpost including the temporary stockpiling of the excavated material for reuse in the backfilling process. Any damaged sign and signpost will be replaced at the contractor's expense, where it is deemed the sign and signpost was salvageable.

Excavation around the sign and signpost shall be considered compensated for under Section 583 including any additional hand work excavation required to salvage the sign and signpost which shall be considered compensated for as part of payment for Section 583 "Salvage and Reinstallation of Sign and Signpost".

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## SECTION 590 WOOD PRESERVATION

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##### 590.05.05 Requirements for Application of Field Treatment

#### 590.06 SPECIFIC REQUIREMENTS FOR FIELD TREATMENT OF PILES

##### 580.06.01 General

##### 580.06.02 Alternative Procedures

#### 590.07 METHOD OF PAYMENT

#### 590.01 SCOPE

This specification covers the requirements for the preservation treatment of any wood or wood products as may be required in the construction of Departmental projects.

The specification covers the particular requirements for the pressure impregnation of woods with chemical preservatives and other compounds and the specific requirements for the handling, storage, and placement of treated materials.

#### 590.02 GENERAL

All preservation treatments, unless otherwise specified, shall be applied through the use of approved pressure impregnation processes by licensed operators as issued by the appropriate governing authorities.

All operations associated with treatment (before, during, and after treatment) shall be carried out in complete accordance with the Canadian Standards Association (CSA), Standard 080-M89, Wood Preservation, and with the American Wood Preservers Association (AWPA) Standards. These standards are complimentary and as such, the CSA standard or the AWPA standard may be considered incomplete if read separately.

#### 590.03 MATERIALS

All materials to be pressure treated with chemical preservatives shall be sound, of good quality, and of satisfactory species and grade as required in the plans and Supplementary General Conditions.



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All species shall be treated with specified chemical preservatives to the required tolerances or the minimum acceptable tolerances as outlined in the CSA Standard "080-M89 Wood Preservation" and the "AWPA Standards".

These standards cannot give complete instructions for all conditions and all uses. The net retentions required shall be governed by the severity of the service conditions and by a number of other considerations, such as, service life desired, cost of replacement, climate, ground contact, exposure to weather, exposure to insect attack, size of material and depth of sapwood. The specified net retentions therefore, may be greater than indicated in the applicable standards and the supplementary specifications shall take precedence.

### 590.04 PREPARATION AND HANDLING

All materials to be pressure treated with chemical preservatives shall be prepared in a manner as required by the particular treatment process to be undertaken and shall be in accordance with appropriate sections of the CSA and AWPA Standards.

All pressure preserved materials shall be transported, stored, stacked, and handled or otherwise used in a manner that will avoid damage or field fabrication causing alteration of the original pressure preserved surface.

In particular, the use of cant hooks, peavies, pickaroons, and end hooks shall not be permitted on the side surface of treated materials. The handling of pressure preserved piles, poles, ties, lumber or timber with such pointed tools shall be confined to end grain only.

Any pressure treated materials damaged through improper handling or misuse by the Contractor, shall be repaired or replaced at cost to the Contractor under the direction of the Engineer.

Insofar as practicable, all adzing, boring, chamfering, framing, graining, incising, surfacing, or trimming shall be undertaken prior to treatment.

### 590.05 FIELD TREATMENT

#### 590.05.01 Material Requirements

Any unavoidable damage or necessary field fabrication shall be field treated in an approved manner with appropriate preservatives.

Preservatives for field treatment shall be at the same type and chemical composition as those used in their original treatment and shall be obtained from the supplier of the pressure preserved material or other licensed authority and shall be applied in the following manner.

#### 590.05.02 Requirements for Field Application of Creosote and Creosote Mixtures

Creosote for field treatment of material originally treated with creosote or any creosote solution, shall meet the requirements of Commodity Standards P1 and P7 of CSA Standard -080, with the temperature of the solution while being applied, maintained at 65°C to 95°C. Where particularly heavy coatings are required, a suitable plastic compound shall be prepared by mixing 10 to 20 percent of creosote with 80 to 90 percent of pitch.

#### 590.05.03 Requirements of Field Application of Oil-Borne Preservatives

Pentachlorophenol used for field treatment of material originally treated with this preservative shall consist of a solution prepared with solvent conforming to Commodity Standard P9 of CSA Standard 080. The toxicant concentration shall be a minimum of 5 percent of the solution weight. The Contractor shall prepare material for field treatment and field treatment with these preservatives shall be as directed by the manufacturers of the preservative or as directed by the Engineer.

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### 590.05.04 Requirement of Field Application of Water-Borne Preservatives

The concentration of water-borne preservatives shall be 3 to 5 times greater than the concentration of the original treating solution.

### 590.05.05 Requirements for Application of Field Treatment

All cuts, holes, and injuries, including all abrasions and unused nail and spike holes and other damage to the surface of treated material shall be field protected by liberal brushing, spraying, dipping, soaking, or coating of preservatives.

Any procedures for field application of preservative shall be as the manufacturers recommend and as certified by the Engineer.

Any cuts, damages, and other like damages shall be cleaned of all deleterious substances and thoroughly saturated with two coats of field preservative.

All holes, including horizontal holes bored in pressure preserved material shall be poured full of appropriate preservative. The use of pressure equipment in the application of preservatives to boreholes is recommended.

All bolt holes having a diameter equal to or greater than the diameter of the bolt shall be treated with preservative. Bolt holes having a diameter of 15 mm less than the bolt diameter shall not require application.

All unused bore holes and spike holes shall be poured full of preservatives and plugged with tight-fitting treated plugs.

Where the on-site application of wood preservative is necessary, the Contractor shall where practical, apply the wood preservative at a location at least 15 m from the nearest watercourse of waterbody. The application shall in all cases be carried out carefully, so as to prevent spillage or leakage.

The Contractor shall be aware of Section 140.03.03 "Spill Reporting and the Required Procedures".

## 590.06 SPECIFIC REQUIREMENTS FOR FIELD TREATMENT OF PILES

### 590.06.01 General Requirements

Immediately after making final cut-off, the cut area should be given two applications of preservative followed by a heavy application of coal-tar pitch, or other sealer. Piles shall be cut square, except in the case of piles to be capped with masonry.

Piles which will have the cut-off surface exposed in the structure shall be further protected by the application of two thickness of tar saturated fabric which cover the cut-off and overlap the side of the pile at least 50 mm. The overlap should be folded down along the side and glued in place with the sealer used. The fabric should then be coated with one coat of sealer.

In addition, under no circumstances shall treated piles be chopped or sawn to permit installation of sway bracing or other framing members. To avoid the necessity of cutting, piles shall, as far as possible, be selected of uniform size for each bent. Treated filler blocks shall be used when necessary to fill spaces between piles or caps and sway bracing.

### 590.06.02 Alternative Procedures

The Engineer may, if it is determined to be necessary (based upon insect or decay hazards or other economic or environmental considerations) require the Contractor to provide additional protection or implement special procedures as the case may be.

The application of preservative to pile cut-off may be undertaken using procedures as follows:

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### a. **Steel Ring**

A 2.6 mm sheet metal ring 100 mm in height and of a diameter slightly less than that of the pile at the point of cut-off should be driven into the pile so that the untreated center of the cut-off is enclosed by the ring. The ring should be driven into the wood until it forms an oil tight seal. The space enclosed by the ring should be filled to a depth of at least 50 mm above with preservatives chosen for field treatment. Treatment should continue until the flow of preservative liquid into the end grain of the pile ceases. The ring can be removed for reuse.

### b. **Jacket Ring**

A strip of roofing felt or thin metal tightly bonded to the pile at the cut-off point to form a cup extending 100 mm from the end of the pile may be used in place of a more rigid ring as above. The penetration procedure and reuse of the material are as indicated above.

### **590.07 METHOD OF PAYMENT**

No separate payment shall be made for the preservative treatment of any wood or wood products to be incorporated into department projects.

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## DIVISION 6 SPECIFICATIONS FOR PROTECTION INDEX

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## SECTION 601

### SUPPLY AND INSTALLATION OF GABIONS

#### INDEX

#### 601.01 SCOPE

#### 601.02 MATERIALS

#### 601.03 INSTALLATION

#### 601.04 MEASUREMENT FOR PAYMENT

#### 601.05 BASIS OF PAYMENT

#### 601.01 SCOPE

This specification covers the requirements for the supply and installation of various sizes of gabions.

#### 601.02 MATERIALS

Gabion baskets shall be of various sizes and consist of vinyl coated wire mesh as specified in the unit price table.

Tie-wire to secure the baskets shall be vinyl coated.

Stones used in the construction of gabions shall be clean, hard and durable, and shall be either boulder, broken rock, quarry stone, broken concrete or gravel screenings. The least dimension of any stone shall not be less than one and one-half the mesh size. The greatest dimension shall not exceed 300 mm.

Stones shall be of such dimensions that no less than two layers of overlapping stone are required to fill the gabion. The Contractor shall supply the stones to fill the gabion.

The Contractor shall supply gabion baskets, tie wire, and wooden or metal pegs to anchor the gabion baskets, should anchoring be necessary during construction.

The drawing showing various types and sizes of gabions is shown in Section 1210 "Gabions".

#### 601.03 INSTALLATION

The Contractor shall load the gabion baskets and tie-wire at the point of supply and transport them to the installation site.

Gabions shall be installed to neat lines, to the lines and grades as staked by the Engineer.

Should excavation be required to install the gabions at the required grade then excavation shall be carried out in accordance with Section 403 "Excavation for Foundations". The foundation shall be excavated to an even finish and to the required grade.

The Contractor shall assemble gabions according to the manufacturer's recommendations.

The Contractor shall unfold each gabion to the open position. The four corner edges shall be wired to secure the gabion shape. The edges of the diaphragms shall be wired to the gabion walls in the correct position.

Each assembled gabion shall be securely wired to the adjacent gabions along the top and the vertical edges prior to placing of stone.

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All wiring of gabions shall be carried out using the tie-wire provided, and using the following method of connection by looping. The tie-wire shall be looped around the edges to be joined. Loops shall be separated by a distance not greater than 100 mm. Single loops shall alternate with double loops. A single loop is one which wraps around the edges being joined once. A double loop is one which wraps around the edges being joined twice.

To achieve better alignment and finish, the Contractor shall stretch gabions before filling.

Stone on exposed areas shall be carefully hand-picked to minimize voids and also to present an attractive and pleasing appearance.

Gabions shall be filled, keeping voids to a minimum, to a depth of 300 mm in each cell after which connecting wires shall be placed one in each direction, with these wires looped around two meshes at each end.

For gabions of height greater than 600 mm, then the operation shall be repeated and a further 200 mm of rock shall be placed, and then two more connecting wires shall be installed in each cell.

When filling of each gabion has been completed, the top shall be folded shut and wired to the ends, sides and diaphragms.

When placing gabions on top of each other, fill placing and compaction operations as specified in Section 204 "Grading of Fill" shall be carried out behind each row of completed gabions before a successive row may be placed.

Empty gabions placed on top of a completed row of gabions shall be wired to the filled gabions at the front and at the back of a row, before filling commences.

Gabions adjacent to culverts shall be cut and fit to match the culvert to present an attractive and pleasing appearance.

### **601.04 MEASUREMENT FOR PAYMENT**

Measurement for payment for gabions will be based on the number of each size of required gabion placed to the required alignment.

### **601.05 BASIS OF PAYMENT**

Payment at the contract price for the size of gabion specified shall be compensation in full for all labour, materials and equipment-use required to supply the gabion baskets and tie-wire, assemble and place the gabion baskets, tie together the gabion baskets, place connecting wires, complete necessary cutting and fitting together with the supply and placing of stones and also the supply and placing of anchors, if anchor pegs should be needed.

# FORM 610



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## SECTION 610 RIP RAP TREATMENT

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(b) Rip Rap - Hand Laid With Sod

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#### 610.05 PLACING

(a) Rip Rap - Hand Laid Dry Wall

(b) Rip Rap - Hand Laid With Sod

(c) Rip Rap - Grouted

(d) Rip Rap - Random

#### 610.06 MEASUREMENT FOR PAYMENT

610.06.01 Measurement for Payment by Volume

610.06.02 Measurement for Payment by Weight

#### 610.07 BASIS OF PAYMENT

#### 610.01 TYPES OF RIP RAP TREATMENT

(a) Rip Rap - Hand Laid Dry Wall

(b) Rip Rap - Hand Laid With Sod

(c) Rip Rap - Grouted

(d) Rip Rap - Random

#### 610.02 SCOPE

This specification covers the requirements for the various types of rip rap treatment listed above. The work consists of constructing a protective covering of approved stone, with or without mortar or sod as required on an earth bed; at the ends of culverts, on the sides of slopes or in the beds of channels or at other places as directed by the Engineer. The work also includes such fine grading and tamping of slopes to be rip rapped and backfilling and tamping of foundation trenches, as may be required.

#### 610.03 MATERIALS

Rip rap shall consist of clean, hard, durable rock, having a density not less than 2.6 t/m<sup>3</sup>. The rock material, if subjected to the Los Angeles Abrasion Test (ASTM C131-81), shall have a loss not greater than 35%. When tested for soundness, five cycles of magnesium sulphate, ASTM C88-76, the rock material shall have a loss not greater than 15%.

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## **610.03.01 Rock**

Stones for use in rip rap shall consist of clean, hard, durable rock, free of cracks. Rock subject to marked deterioration by water or weather will not be accepted. Only those stones approved by the Engineer shall be used.

The largest rocks procurable shall be supplied and in no case shall any fragment measure less than 0.0035 cubic metres in volume. In hand laid dry wall rip rap, spalls shall be supplied to fill open joints. Field stones or boulders may be used when approved by the Engineer.

## **610.03.02 Sod**

Sod shall consist of a dense well rooted growth of permanent and desirable grasses. When sod is lifted it shall be covered with grass recently mowed to a length not more than 75 mm. Sod shall be in widths not less than 300 mm nor more than 450 mm, in thickness not less than the depth of the fibrous roots and in no case less than 25 mm.

All sod shall be taken from good loamy soil. It shall be well permeated with roots; be uniform in texture and free from weeds; be in a good healthy condition with no sign of decay, and contain sufficient moisture to maintain its vitality during transportation and placing.

## **610.03.03 Grout**

Grout shall consist of a cement mortar composed of one part Portland Cement and three parts fine aggregate.

## **610.04 EXCAVATION**

Should the Engineer require that excavation be carried out to prepare a foundation for the rip rap, then the work shall be carried out in accordance with Section 403 "Excavation for Foundation".

### **(a) Rip Rap - Hand Laid Dry Wall**

On slopes to be rip rapped the slopes shall be fine graded to a uniform surface. Depressions shall be filled and thoroughly compacted.

### **(b) Rip Rap - Hand Laid With Sod**

Same as for (a) above.

### **(c) Rip Rap - Grouted**

Same as for (a) above.

### **(d) Rip Rap - Random**

Where directed by the Engineer, excavation for foundation shall be performed to provide a shelf or ledge to retain the rock so dumped as permitted under the paragraph "Placing Random Rip Rap".

## **610.05 PLACING**

Rip rap shall be placed to the grades and within the lines staked by the Engineer.

### **(a) Rip Rap - Hand Laid Dry Wall**

Unless laid to form a flat apron, the rip rap shall commence in a trench below the toe of the slope. Stones shall be placed by derrick or by hand. Stones shall be set normal to the slope, and placed so that the largest dimension is perpendicular to the face of the wall, unless such dimension is



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greater than the specified thickness of the wall.

The required thickness of rip rap is dependent on the proposed height and slope of the rip rap and on the expected force of the stream flow.

The Contractor shall construct the rip rap to the thickness required by the Engineer.

The largest stones shall be placed in the bottom courses and for use as headers through subsequent courses. No shaping of stones will be required; but the Contractor shall build to reasonable semblance of courses with stones laid closely and voids chinked with spalls.

Stones shall be placed in the wall in such a way that the rear of each stone shall be embedded into the slope of the embankment.

On the completion of laying of rip rap operations any open foundation trenches bordering the rip rap shall be backfilled and tamped.

### **(b) Rip Rap - Hand Laid With Sod**

The placing of stones and the backfilling and tamping of trenches shall be as required under (a) above.

However, as the placing of stones proceeds sod shall be placed so that sod separates the stones from each other, both horizontally and vertically. The sod shall be placed so that there are no voids between stones.

Sod shall not be placed upside down.

The sodding shall be trimmed so that the exposed edges of the sods are flush with the exposed face of the rip rap.

### **(c) Rip Rap - Grouted**

The placing of stones shall be as required under (a) above. Before applying mortar the surfaces of the stones shall be amply wetted. The spaces between the stones shall be filled with mortar, starting from the bottom and working to the top. The mortar shall be worked with suitable tools to completely fill all voids except that the outer faces of the stones shall be exposed. Excess mortar shall be removed with a stiff brush. Grouted rip rap shall be cured in accordance with the requirements for curing concrete sidewalk as set forth in Section 570 "Installation of Concrete Sidewalk".

After the mortar has set any foundation trenches bordering the rip rap shall be backfilled and tamped.

### **(d) Rip Rap - Random**

Rock material may be placed by dumping it into position over the surface to be rip rapped.

The Engineer will indicate whether the larger stones should be placed near the bottom of the slope, or near the top of the treated area to protect against scour. The Contractor shall make a reasonable endeavour to dump the larger stones where required. Placing shall be done in such a manner that the surface of the finished rip rap shall have a uniform appearance.

## **610.06 MEASUREMENT FOR PAYMENT**

Measurement for Payment for rip rap will only include measurement of materials which meet the specifications for the type of rip rap treatment in question. Materials placed outside of the limits as staked by the Engineer will not be included in measurement for payment.

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### 610.06.01 Measurement for Payment by Volume

For rip rap for which the contract unit price is stated in terms of the price per cubic metre, then such rip rap shall be measured for payment in terms of the net nominal volume of the rip rap structure comprising rip rap of the type in question. This net nominal volume shall be computed in cubic metres rounded to one decimal place.

The net nominal volume of the rip rap structure shall be calculated as the product of: the net surface area of the rip rap structure, times the mean thickness of the rip rap structure.

The net surface area of the rip rap structure shall be defined as the net area given by mean length of the rip rap structure, times the mean width of the rip rap structure; less the area of such objects as culvert ends around which the rip rap is placed.

### 610.06.02 Measurement for Payment by Weight

For rip rap for which the contract unit price is stated in terms of the price per tonne, then only the stones to be used in the rip rap treatment shall be weighed on scales. The weight shall be computed in tonnes rounded to one decimal place.

The scales shall be provided by the Contractor and they shall conform with the requirements of Section 501 "Weighing of Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only loads certified by the Department Road Checker as being placed in the works shall be included in measurement for payment.

### 610.07 BASIS OF PAYMENT

Payment at the Contract Unit Price per cubic metre, or per tonne, for the type of rip rap specified shall be compensation for all labour, materials and equipment-use to supply stones and sod or mortar as required, haul the materials to the site, provide such necessary dewatering as may be required, trim and tamp ground that is to receive rip rap treatment, construct the required rip rap treatment according to these specifications, cure mortar if used, backfill and tamp any open foundation trenches, together with the provision for weighing (if appropriate).

Excavation for foundation shall be paid for in accordance with Section 403 "Excavation for Foundations", but the additional requirements for the fine grading and the tamping of depressions in slopes to be rip rapped, together with the backfilling and tamping of any foundation trenches, shall be considered compensated for in the contract price for rip rap treatment.

The occasional manual handling of rocks or stones which may occur during placing Random Rip Rap, shall in no manner be construed as transforming the classification of Random Rip Rap to that of Hand Laid Dry Wall Rip Rap.

# FORM 615



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 615 ARMOUR STONE

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#### 615.03 PLACING

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#### 615.05 BASIS FOR PAYMENT

#### 615.01 SCOPE

This specification covers the requirements for the supply of armour stone of various minimum sizes and minimum weights, together with the preparation of a foundation seat for the base of the armour stone treatment and the placing of the armour stones to a thickness not less than that stated on the Unit Price Table for the type of armour stone under construction.

#### 615.02 MATERIALS

Armour stone shall consist of clean, hard, durable rock having a density not less than 2.6 t/m<sup>3</sup>. The rock material if subjected to the Los Angeles Abrasion Test (ASTM C131-81) shall have a loss not greater than 35%. When tested for soundness, five cycles of magnesium sulphate, ASTM C88-76, the rock material shall have a loss not greater than 15%.

Armour stones shall be of an angular shape, and be of a uniform gradation. The least dimension of any stone shall not be less than one quarter of the greatest dimension.

Individual armour stones shall be of a weight, or of a volume that is not less than that specified in the contract item in the Unit Price Table.

Armour stones shall be supplied by the Contractor.

#### 615.03 PLACING

Armour stones shall be placed within the limits required by the Engineer.

The Contractor shall prepare a foundation for the armour stone by excavating a seat in the existing ground.

Excavation shall be by means of a backhoe, or a clam as required, to carry out the excavation for the seat at the required location and to sufficient depth to provide a proper footing for the armour stone.

Stones shall be placed by a crane, or similar equipment, starting at the bottom of the slope and working upwards.

No pushing or dumping of the stones by bulldozers or other equipment will be allowed.

## FORM 615

The Contractor shall choose the stones and place them in such a way that the whole structure will be bound and consolidated to as great an extent as the nature of the rock will allow. Placing shall be done in such a manner that the surface of the armour stone treated slope shall have a uniform appearance. The thickness of the treated slope shall not be less than that specified in the contract item on the Unit Price Table.

Care shall be taken by the Contractor to ensure that no stones are placed outside of the lines as staked by the Engineer.

If any armour stones are placed outside of the area to be treated or are washed out of place during construction, then they shall be removed or replaced by the Contractor at his own expense.

### **615.04 MEASUREMENT FOR PAYMENT**

Stones placed outside of the limits required by the Engineer will not be included in measurement for payment.

#### **615.04.01 Measurement for Payment by Volume**

For armour stone for which the contract unit price is stated in terms of the price per cubic metre, then such armour stone shall be measured for payment in terms of the net nominal volume of the armour stone treated slope comprising armour stone of the size in question. This net nominal volume shall be computed in cubic metres rounded to one decimal place.

The net nominal volume of the armour stone treated slope shall be calculated as the product of: the net surface area of the armour stone treated slope, times the nominal thickness of the armour stone treated slope, as specified in the contract item.

The net surface area of the armour stone treated slope shall be defined as the net area given by the mean length of the armour stone treated slope, times the mean width of the armour stone treated slope, measured along the face of the slope; less the area of objects around which the armour stone is placed.

#### **615.04.02 Measurement for Payment by Weight**

For armour stone for which the contract unit price is stated in terms of the price per tonne, then such armour stone shall be measured for payment by weighing the stones which are to comprise the treated slope. The weight shall be computed in tonnes rounded to one decimal place. The armour stone shall be weighed on scales provided by the Contractor. The scales shall conform to the requirements of Section 501 "Weighing Materials in Trucks". The Department will supply scale tickets, and the Department Scale Checker will issue the tickets. Only armour stones certified by the Department rock Checker as being placed within the limits, as staked by the Engineer, will be included in measurement for payment.

### **615.05 BASIS OF PAYMENT**

Payment at the contract unit price per cubic metre, or per tonne, for the size of armour stone specified, shall be compensation in full for all labour, materials, and equipment-use: to supply the required armour stones, to excavate a foundation seat for the bottom armour stones, to provide all haulage to transport the armour stones from the source to the place where the stones are to be placed, and to place the armour stones, together with the provision for weighing (if applicable).

## FORM 620



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and works  
Highway Design Division

### SECTION 620 BIN-TYPE RETAINING WALL

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#### **620.01 SCOPE**

This specification covers the requirements for the supply and installation of a bin-type retaining wall comprising bins of the design types and dimensions, and made up components of the dimensions and thickness as shown on the drawings.

#### **620.02 MATERIALS**

The materials for constructing the bin-wall shall conform to the types, dimensions and thicknesses as shown on the plans.

All elements including but not limited to the base or grade plate, horizontal stringers and spacers, vertical connectors, stiffeners, corner angles, nuts, bolts and washers shall be galvanized steel. Materials used in the fabrication of bin-type retaining walls shall conform to the applicable requirements of ASTM Designation A526 and Z600, with respect to base metal analysis and the weight of zinc coating.

All required bin-wall elements together with nuts, bolts and washers shall be supplied by the Contractor.

Bedding and backfill material shall consist of well graded, pervious, granular, other material having no more than 10% passing the number of 100 or 0.152 mm sieve and with a maximum particle size not exceeding 75 mm. However, should any part of the bedding or backfill be subjected to frequent inundation or expectation of the same, then the material used in those parts of the structure shall not have particles smaller than 3 mm.

The other material, other material borrow, or excavation for foundation other material used for bedding and backfill shall be measured and paid for according to the appropriate contract price for that item.

#### **620.03 EXCAVATION FOR FOUNDATION**

Excavation for Foundation for the bin-wall shall be carried out and paid for in accordance with the provisions of Section 403 "Excavation for Foundations", however, the following additional requirements shall also apply.

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Excavation shall be carried out to the lines and grades as staked by the Engineer.

The use of mechanical excavation equipment will be permitted, except where, in the opinion of the Engineer, their use will cause damage to structures below ground, in which case excavation by hand shall be used.

The Contractor shall proceed with caution in the excavation work so that the exact location of all buried pipes, service cables and underground structures, both known and unknown may be determined and he shall be responsible for the repair of such pipes, services, cables and structures when broken or otherwise damaged.

Where such underground structures and pipes, etc. need to be removed in order for the bin-wall to be placed, then the removal shall be carried out according to the appropriate specification for that work and paid for according to the appropriate contract item on the Unit Price Table. Should there not be a contract item for the removal of the particular type of structure encountered, then such required removal will be paid for in accordance with the provisions of Section 150 "Force Account".

Should blasting be required to carry out the excavation, the Contractor shall ensure that any existing structures and any already assembled bin-walls are adequately protected. Any damage occurring during the carrying out of the works shall be put right by the Contractor at his own expense.

Excavation near the various grades shall be carried out by hand to ensure that no over-excavation occurs and that base plates may be placed at the correct grades and locations on undisturbed ground over their entire length.

However, where rock, or other unyielding foundation, occurs at base elevation the excavation shall be deepened to 200 mm below base elevation to allow room for the addition of bedding.

Should the Contractor excavate deeper than required, then the excavation shall be refilled to the required unyielding foundation excavation grade with approved material and compacted to at least 95% of Standard Proctor Density (ASTM D698-78) all at the Contractor's expense.

The excavation at the sides and back of the bin-wall shall be of such width as to facilitate the use of hand operated compaction equipment when backfilling between the sides of the bin-wall and the sides of the excavation. This width will normally be 1 m wide, or of such width as the Engineer may direct.

Where because of unstable soil conditions the excavation cannot be carried out to a trench steep batter, the Contractor shall not excavate a more gentle slope. In these conditions, the excavation shall be carried out in a series of steps with surfaces vertical and horizontal.

Excavation material conforming to the requirements of bedding material and backfill as stated in 620.02 materials shall be used as either bedding or backfill for the bin-walls. Such material may be placed straight away into partly erected bins or stockpiled for later placing.

Excavation material not suitable for use with bin-walls but nevertheless suitable for fill construction shall be incorporated in full construction in accordance with Section 204 "Grading of Fill".

Excavation material which is unsuitable for fill construction shall be placed and trimmed along fill slopes or elsewhere, as directed by the Engineer.

### **620.04 SHEATHING AND SHORING**

Protection of the works and all work done under this section shall comply with the relevant requirements of "The Occupation Health and Safety Act, including all Amendments", Province of Newfoundland and Labrador.

## FORM 620

Where, due to the nature of the work, the Contractor sheathes, shores, or braces the excavation, then such sheathing, shoring or bracing shall be supplied, installed, maintained and removed before backfill is placed, all at the Contractor's expense.

All works behind the sheathing shall be filled with native backfill or other material, as the Engineer directs, and compacted as the sheathing is placed.

### **620.05 PROVISIONS FOR TRAFFIC AND PEDESTRIANS**

The Contractor shall make provisions for the accommodation and protection of traffic and pedestrians and the owners and occupants of adjacent houses and premises, during the carrying out of the works. Such required temporary stairs, bridgeways, guards and fences shall be provided by the Contractor at his own expense.

The Contractor shall provide, place and maintain until the work is completed such barricades, construction signs, torches, red lanterns and guards as are required to protect persons from injury and to avoid property damage.

Excavated material when stockpiled shall be piled so as to avoid obstructing sidewalks, driveways or the road.

### **620.06 PROVISION OF UNDERDRAIN**

Where the Engineer requires that perforated pipe be placed to provide an underdrain for the bin-wall, then such work shall be carried out and paid for under separate contract items.

Should additional excavation be required to position the underdrain, after excavation for foundation operations for the bin-wall have been completed, then such excavation shall be carried out and paid for in accordance with Section 404 "Trenching and Excavation for Catch Basins".

The perforated pipe shall be installed and paid for in accordance with Section 420 "Installation of Corrugated Steel Pipe for Storm Sewers and Perforated Steel Pipe for Sub-Drainage".

Select bedding for the perforated pipe shall be supplied, placed and paid for in accordance with Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

### **620.07 PREPARATION OF BED**

Where rock or unyielding soils have been excavated to a compacted grade of not more than 200 mm below the proposed base elevations then bedding material, comprising material conforming to the requirements of 620.02 materials, shall be used to provide a bed for the base plates.

The Contractor shall place and lightly compact the bedding so as to provide the required grades for the base plates, as staked by the Engineer.

The Contractor shall exercise care in the preparation of the bed to ensure a smooth trim bed, only lightly compacted, so that the entire wall may adjust to small differential settlements and avoid the concentration of loads on any individual members of the wall.

### **620.08 ASSEMBLY OF BIN-WALL**

The manufacturer or supplier shall provide shop drawings to both the contractor and Department (minimum two sets each) which outline all steps necessary for the proper assembly of the bin-wall.

The bin-wall shall be installed to the lines, grades and batter as staked by the Engineer.

The assembly of the bin-wall shall comply with the manufacturer's specifications for bin-wall assembly.

Drilling, punching or drifting to correct defects in manufacture, settlement or improper backfill and bedding shall not be permitted. Any parts having holes improperly punched shall be promptly replaced by the manufacturer.

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The Contractor shall ensure that components of the various dimensions and gauge thicknesses are installed at the appropriate locations in the structure, as shown on the plans.

Bin-wall members shall be handled carefully and any which are damaged shall be removed and new members substituted at the Contractor's expense.

All the required nuts and bolts shall be firmly secured in place before acceptance.

The bin-wall shall be so assembled so that when installation is complete the structure presents a neat and uniform appearance.

The Contractor shall co-ordinate the installation of the bin-wall with any work of relocating or installing any other structures which may occur at the same location as the bin-wall.

### **620.09 BACKFILLING AND COMPACTION**

Other material consisting of suitable Excavation for Foundation other material, other material, or other material borrow conforming to the requirements of 620.02 materials shall be used to provide backfill for both inside and around the outside edges of the bins.

Backfill shall be placed in layers of loose thickness not greater than 200 mm and then compacted.

Each layer of backfill shall be compacted to at least 95% of Standard Proctor Density (ASTM D698-78) before a further layer is placed on top.

Compaction in areas more than 300 mm away from stringers and spacers shall be provided by means of a hand held mechanical type compactor.

The corrugations of the stringers and spacers including vertical connectors and corner angles, shall be filled with backfill material conforming to Section 620.02. The maximum thickness of each lift shall be 100 mm. Mechanical tampers shall not operate closer than 300 mm from the stringers and spacers. Compaction within this area shall be achieved by means of hand operated timber rams.

The Contractor shall exercise care in placing backfill to avoid segregation.

Filling the bins shall follow closely the assembly of the structure to avoid storm damage or displacement of the bins by earth movement.

Backfilling should proceed keeping the level of fill in the bins above the level of fill behind the retaining wall. But if restricted working conditions render this impractical, then the fill may be placed behind the wall concurrently with backfilling the bin wall. However, the backfill shall not be placed behind the wall before the backfill is placed in the bin.

Backfilling operations shall proceed to an elevation 300 mm above the top of the bin wall, or to such lower grade as may be staked by the Engineer. Should fill be required above this limit for backfilling, then such fill shall be in accordance with Section 204 "Grading of Fill".

The Contractor shall be liable for any damage arising from default or neglect in backfilling operations.

### **620.10 MEASUREMENT FOR PAYMENT**

Measurement for payment for bin-type retaining wall of a particular design type, shall be the sum given by the addition of the individual bin front nominal areas for all the bins placed of that particular design type. This measurement shall be computed in square metres rounded to two decimal places.



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Bin front nominal area being defined as the product given by a nominal width of bin of 3.05 m times the slope height of the bin measured from the bottom of the bottom stringer to the top of the top stringer.

### **620.11 BASIS OF PAYMENT**

Payment at the contract price for bin type retaining wall, of a particular design type and thickness, shall be full compensation for all materials, labour and equipment-use to supply and install the bin-wall of that design type to the requirements as stated in this specification, including the provisions of shop drawings.

Excavation for foundation for the bin-wall shall be carried out and paid for in accordance with Section 403 "Excavation for Foundation". However, the additional hand work and care required to carry out the excavation in accordance with this specification shall be considered compensated for in the contract price for the bin-type retaining wall.

The preparation of a bed, backfilling and compaction shall be paid for in accordance with Section 403 "Excavation for Foundation", Section 206 "Grading of Cuts" or Section 207 "Borrow", as the case may be, but the additional requirements for placing and compaction in accordance with this specification shall be considered compensated for in the contract price for bin-type retaining wall.

**SECTION 625**

**DESIGN, SUPPLY AND INSTALLATION OF WELDED WIRE WALL**

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**625.06 BASIS OF PAYMENT**

**625.01 SCOPE**

This work shall consist of Welded Wire Retaining Wall constructed in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans or established by the Engineer. The wall shall be a Hilfiker Retaining Wall or an approved equal. The design life for the wall must be a minimum of 75 years.

**625.02 MATERIALS**

**625.02.01 Wire Reinforcement and Cap Mesh**

Wire mesh for facing shall be formed by a 90-degree bend of the soil wire reinforcement mesh and shall have a pre-bent tie to connect to the soil reinforcing mesh above. The reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A-82 and shall be welded into the finished mesh fabric in accordance with ASTM-A185. Fabric for the Welded Wire Retaining Wall shall be hot dip galvanized (2.0oz/SF, ASTM A-123) (605 g/m<sup>2</sup>). Any damage done to the mesh galvanization prior to installation shall be repaired in an acceptable manner and provide a galvanized coating comparable to that provided by ASTM A-123.

**625.02.02 Backing Materials**

Where required, as shown on the plans, steel backing mat shall be W5 vertical x W2.5 horizontal (min.) (.258" [6.4mm] x .178" [4.5mm] nom. Dia.) welded wire fabric meeting ASTM A-185 and galvanized in accordance with either a), b) or c) in paragraph 2.1.

Where required, as shown on the plans, geotextile filter cloth shall be utilized to retain the soil as approved by the Engineer.

**625.03 Select Granular Backfill Materials**

As shown on the plans, select granular backfill materials for the Welded Wire Retaining Wall structure shall be reasonably free from organic and otherwise deleterious materials and shall conform to the following gradation limits as determined by ASTM D-422:

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Sieve Size	Percent Passing
152.4 mm	100
76.1 mm	100 - 75
75 µm (0.075 mm)	0 - 25

\*If the percent passing the 75 µm sieve is greater than 15 percent, the backfill must conform to all of the following additional requirements.

- The Plasticity Index (P.I.), as determined by ASTM D-4318, shall not exceed 6.
- The fraction finer than 15 µm (0.015 mm), as determined by ASTM D-422 (AASHTO T-88) shall not exceed 15 percent.
- The material shall exhibit an angle of internal friction of not less than 34 degrees, as determined by the standard direct shear test (ASTM D-3080-72) (AASHTO T-236), utilizing a sample of the material compacted to 90% percent of ASTM D-1557-92, at optimum moisture content.

In addition, backfill materials shall also meet the following corrosion requirements:

Resistivity	≥ 3000 ohm-cm (Min)	(CA-DOT 643)
pH	5.0 to 10.0	(CA-DOT 643)
Chlorides	<200 mg/kg (ppm)	(CA-DOT 422)
Sulfates	< 1000 mg/kg (ppm)	(CA-DOT 417)

Backfill not conforming to this specification shall not be used without written consent of the Engineer.

The frequency of sampling of Select Granular Backfill necessary to assure gradation shall be directed by the Engineer.

### 625.04 Construction Requirements

#### 625.04.01 Wall Excavation

Wall excavation shall be in accordance with the requirements of general specifications and in reasonably close conformity with the limits and construction stages shown on the plans.

#### 625.04.02 Foundation Preparation

The foundation for the structure shall be graded level for a width equal to or exceeding the length of the reinforcement mat or as shown on the plans. Prior to wall construction, the foundation, if not in rock, shall be compacted, as directed by the Engineer.

Any foundation soils found to be unsuitable shall be removed and replaced, as directed by the Engineer.

#### 625.04.03 Welded Wire Retaining Wall Erection

Wire mesh reinforcement mats, and applicable facing materials, shall be placed in successive horizontal lifts in the sequence shown on the plans as backfill placement proceeds. Vertical tolerance (plumbness) and horizontal alignment tolerance shall not exceed 38mm when measured at the junction of the wire facing and soil reinforcement along a 3m straight edge.

The overall vertical tolerance of the wall (top and bottom) after construction of the cast-in-placed concrete facing shall not exceed 13mm per 3m of wall height.

## FORM 625

### 625.04.04 Backfill Placement

Backfill placement shall closely follow erection of each course of reinforcement mats. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing. Any wall materials which become damaged or disturbed during backfill placement shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Engineer.

Backfill shall be compacted to 95 % of the maximum density as determined by ASTM D-1557-92 (AASHTO T-99 Method C or D).

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with ASTM D-1557-92.

Backfill shall be placed in complete horizontal lifts. The maximum lift thickness after compaction shall not exceed 300mm. The Contractor shall decrease this lift thickness, if necessary, to obtain the desired density.

Compaction within 900mm of the back face of the wall facing shall be achieved by at least three (3) passes of a lightweight mechanical tamper, roller or vibratory system. No soil density tests shall be taken within this area.

At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to rapidly direct run-off of rainwater away from the wall face. In addition, the Contractor shall not allow surface run-off from adjacent areas to enter the wall construction.

### 625.05 Measurement for Payment

The unit of measurement for wall erection will be the square meters, rounded to one decimal place, of wall surface area complete and in place.

### 625.06 Basis of Payment

Payment shall include compensation for all labour and materials and equipment-use required to prepare the wall foundation, place the reinforcement mats, position the backing mats and screens as shown on the plans. Backfill material shall be paid for in accordance with Section 206 Grading of Cuts, 403 Excavation for Foundations or Section 207 "Borrow" as the case may be but any additional requirements for backfilling shall be considered compensated for in the contract price for the welded wire wall. Excavation required to provide a level surface for the wall shall be paid for under Item No. 6 of the Unit Price Table: Excavation for Foundations.

# FORM 631



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 631

### SEEDING

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#### 631.01 SCOPE

This specification covers the requirements for surface preparation, the supply and spreading of topsoil and the supply and application of lime, fertilizer and grass seed, together with the provision of maintenance of the seeded areas for a period of two months.

#### 631.02 MATERIALS

The following materials shall be supplied by the Contractor and shall conform to the requirements as stated.

##### 631.02.01 Topsoil

Topsoil shall be fertile loamy material of a quantity acceptable to the Engineer. It shall be free from roots, vegetation or other debris of such size and quantity as would, in the opinion of the Engineer, prevent proper application of the topsoil, and free from stones and clods over 50 mm in greatest diameter. Topsoil badly infested by seeds and noxious weeds will not be accepted.

The topsoil may only be taken from a source of supply approved by the Engineer.

Soil removed as part of the grubbing operations may be used if the material meets the requirements of this section.

Contractors should note that legislation prohibits the removal of topsoil from areas zoned by Government for agricultural use. Information regarding the location of these agricultural zones may be obtained from the appropriate Government Department.

##### 631.02.02 Lime

Lime shall be agricultural quality lime free from lumps.

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### **631.02.03 Fertilizer**

Fertilizer shall be free from lumps and have the plant food ratio of 10 nitrogen to 20 phosphorus to 20 potash plus 2% F.T.E.

### **631.02.04 Grass Seed**

Grass seed shall consist of a mixture 45% Kentucky Blue, 10% Wild White Clover, 10% Italian Rye Grasses, and 35% Creeping Red Fescue.

### **631.02.05 Water**

Water used in the work shall be free of any impurities which would inhibit germination or otherwise adversely affect growth.

## **631.03 PREPARATION OF SURFACE**

Seeding shall be carried out only within the limits as staked by the Engineer.

Surfaces that are to be treated with seeding shall first be trimmed to restore the ground to the condition it was in prior to any erosion which may have taken place. This work shall consist of such dozer and hand work that is necessary to restore the ground to the lines and slopes as existed on completion of grading operations.

At the edges of the area to be treated with seeding, the ground shall be hand excavated to such depth that will allow for the placing of 70 mm of topsoil, such that after the topsoil is placed the ground will be flush over the joint so as to allow the free flow of water across the joint, and also so as to present a neat appearance.

All areas to be seeded shall be fine graded to a uniform surface and the surface materials shall be loosened to a depth of 25 mm. These areas shall be so maintained until the topsoil is placed.

## **631.04 PLACING TOPSOIL**

After completion of preparation of surface operations, topsoil shall be uniformly spread over the entire area to be seeded. The topsoil shall be placed to a depth not less than 70 mm. All clods or lumps shall be pulverized and any roots or foreign matter shall be raked up and removed from the site.

## **631.05 APPLICATION OF LIME, FERTILIZER AND GRASS SEEDS**

On completion of placing topsoil operations; lime, fertilizer and grass seed shall be evenly spread over the surface to be seeded using approved spreaders. They shall not be mixed before application. Lime and fertilizer shall not be spread after the sowing.

Spreading shall only be carried out on calm days so as to avoid uneven application of the materials and segregation of the grass seed mixture.

It is preferable to seed in early summer or the last two weeks of August.

Should rainfall be insufficient, during the period of sowing and initial grass growth, water shall be applied immediately before and after seeding and subsequently thereafter during the maintenance period. Watering when carried out shall be done in such a manner as not to cause any erosion.

No seeding shall take place after 20th September.

## **FORM 631**

Lime shall be applied in such quantities as to obtain a pH value of 6.5 for the topsoil. This will often be obtained by applying the lime at the rate of 4500 kilograms per hectare.

Fertilizer shall be applied at the rate of 1100 kilograms per hectare.

The grass seed mixture shall be applied at the rate of 85 kilograms per hectare.

The surface shall be lightly raked to a depth of 10 mm immediately after seeding.

### **631.06 MAINTENANCE**

The Contractor shall be responsible for maintaining seeded areas to ensure proper and adequate growth of the grass during a period of two months following sowing.

Should the treated area require watering in the Engineer's opinion, then the Contractor shall thoroughly water the seeded area taking care not to cause any erosion.

During the maintenance period, any defect caused by defects in materials, workmanship or damages caused by watering or the weather shall be re-seeded with grass seed at the Contractor's expense.

### **631.07 MEASUREMENT FOR PAYMENT**

The slope area actually seeded, from within the limits as staked by the Engineer, will be measured in square metres, rounded to the nearest whole number.

### **631.08 BASIS OF PAYMENT**

Payment at the contract price for seeding shall be compensation for all labour, materials and equipment-use for: the preparation of the ground to be treated with seeding, the supply and placing of topsoil, lime, fertilizer and grass seed and the raking of the freshly seeded ground, together with such watering and maintenance as may be required over the two month maintenance period.

# FORM 632



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 632 HYDROSEEDING

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#### 632.08 BASIS OF PAYMENT

#### 632.01 SCOPE

This section covers the requirements for the supply and application of fertilizer, grass seed and mulch by hydroseeding and hydromulching, together with the provision of maintenance during a one year warranty period provided by the Contractor.

The supply and application of lime is covered separately in Section 635 "Lime for Hydroseeding".

#### 632.02 MATERIALS

The following materials shall be supplied by the Contractor and shall conform to the requirements as stated:

##### 632.02.01 Grass Seed

Grass seed shall meet the requirements of the Seeds Act for Canada No. 1 seed, and shall be of the following varieties and respective percentages for standard applications:

BIRDSFOOT TREFOIL, VARIETY LEO	45%
WILD WHITE CLOVER	30%
CREEPING RED FESCUE, VARIETY BOREAL	10%
ANNUAL RYE GRASS	15%

The White Clover and Birdsfoot Trefoil seed must be inoculated with the following bacterial cultures at the specified rates in order to produce nodules. The inoculum is added to the hydroseed tank with the seed.

WHITE CLOVER INOCULUM	RATE: 100 GRAMS PER KG. OF WHITE CLOVER SEED
BIRDSFOOT TREFOIL INOCULUM:	BIRDSFOOT TREFOIL INOCULUM:

For late summer applications of hydroseeding the following seed mixture shall be used for slope treatment with this late condition of application:



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BIRDSFOOT TREFOIL, VARIETY LEO	25%
WILD WHITE CLOVER	10%
CREEPING RED FESCUE, VARIETY	20%
BOREAL	15%
ANNUAL RYE GRASS	10%
CANADA BLUEGRASS	10%
TIMOTHY	10%
HARD FESCUE	

### **632.02.02 Fertilizer**

Fertilizer shall be granular, non-burning, free flowing and free of lumps.

The fertilizer to be placed in the hydroseeding mixture shall have a plant food ratio of 10 nitrogen, 20 phosphorus and 20 potash plus 2% Fritted Trace Elements or 12 nitrogen, 24 phosphorus, 24 potash plus 2% Fritted Trace Elements. The fertilizer mixture shall be applied at the rate of 400 kg/ha. The fertilizer to be spread the following spring during the maintenance period shall be 5-10-30, applied at the rate of 300 kg/ha, or approved equivalent.

### **632.02.03 Mulch**

The mulch shall be of a type consisting of natural sundried straw or wood fibres.

Straw fibres shall include; oat, barley, alfalfa or wheat fibres and shall be free from any weeds or other foreign matter which may be detrimental to plant life. Any straw fibre combination shall be maintained in a dry condition to allow even distribution when processed through a blower. The addition of other vegetative material consisting of hay, chopped corn stalks or other similar substances may be used with prior approval of the Engineer.

Wood fibres shall include any wood or wood cellulose fibres and shall be free from any germination or growth inhibiting components.

Any fibres to be included in a mulch mixture shall be processed in lengths of 20 mm - 40 mm and supplied air dry in packages not exceeding 50 kg in weight for proper storage and handling.

The mulch shall be capable of dispersing in water to form a homogeneous slurry and remain in such a state when agitated or mixed with other additives.

When applied, the mulch shall be capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil.

### **632.02.04 Binder**

The binder must be capable of joining seeds, mulch and soil particles together on slopes and erodible surfaces until plant growth has been established. The binder must not form an impervious seal which would prevent the penetration of moisture to the underlying soil.

The binder shall be supplied as a water-soluble powder composed of polymerised and organic substances and must be absolutely non-toxic.

### **632.02.05 Water**

Water used in hydroseeding and hydromulching shall be free of any impurities which would inhibit germination or otherwise adversely affect growth.

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### 632.03 HYDROSEEDING OPERATIONS

The Engineer shall designate the boundaries of areas for hydroseeding and mulching treatment. These areas will usually include a 300 mm wide overlap over adjoining vegetation so as to eventually provide a continuous cover of vegetation.

No area shall be hydroseeded until surface preparation has been completed to the approval of the Engineer, and the lime applied.

Hydroseeding shall be carried out as soon as possible after completion of the surface preparation, in order to prevent erosion by wind and water.

Contractor should wait for several days after the application of lime before hydroseeding.

The hydroseeding procedure to be applied to designated areas shall be undertaken in one operation. The operation shall consist of the distribution of a slurry composed of: the required seed mixture, the fertilizer, mulch, and binder.

The rate of application of the ingredients of hydroseeding slurry shall be as follows for standard applications:

SEED MIXTURE	80 kg/ha
FERTILIZER	400 kg/ha
BINDER	20kg/ha
MULCH	1600kg/ha
INOCULUM	IN ACCORDANCE WITH SECTION 632.02.01

For late summer applications of hydroseeding the following seed mixture shall be used for slope treatment with this late condition of application:

	150 kg/ha
FERTILIZER	600 kg/ha
BINDER	20kg/ha
MULCH	1250kg/ha
INOCULUM	IN ACCORDANCE WITH SECTION 632.02.01

The Contractor shall measure the quantities of each of the materials to be charged into the seeder, either by mass or by a system of mass-calibrated volume measurements approved by the Engineer and the Contractor shall provide all equipment required for this purpose.

The ingredients required for the hydroseeding operation shall be thoroughly mixed with water in a hydroseeding tank.

In order to prevent all of one type of seed being planted on one part of the job, and all of another type of seed being planted on another part of the job, it is imperative that the hydroseeding slurry be continuously agitated during the hydroseeding operation to ensure that a homogeneous slurry is spread.

The distribution of the slurry shall be by means of an approved hydroseeder and shall be applied uniformly and in such a manner as to prevent puddling and movement of the soil surface.

Work shall proceed only in calm weather and on ground free of frost, snow, ice or standing water and when, in the opinion of the Engineer, weather and seasonal conditions are suitable. Hydroseeding shall not be carried out during periods of rainfall.

### 632.04 PROTECTION OF ENVIRONMENT

The Contractor shall take all reasonable care to prevent the contamination by his operations, of structures, signs, guide rails, fences, utilities and all such installations and, where such contamination occurs, he shall remove it to the satisfaction of, and by means approved by the Engineer.

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The Contractor shall take whatever precautions may be necessary and shall ensure that fertilizer in solution shall not come in contact with the foliage of any trees, shrubs or other susceptible vegetation.

Should the Contractor fail to meet this requirement, he shall immediately spray the affected vegetation with water, as required by the Engineer, to remove such contamination.

Mechanical damage to trees and shrubs shall, at the Contractor's expense, be repaired by trimming and painting or replacement, as required.

Such action as is herein required shall not relieve the Contractor of further responsibility should it not effectively remedy the damage, or of his liability as set out elsewhere within the contract.

### **632.05 MAINTENANCE**

The Contractor shall be responsible for maintaining hydroseeded areas to ensure proper and adequate growth of the vegetation during the warranty period. The Contractor shall also be responsible for an additional application of fertilizer the following spring. This application shall be by a method approved by the Department. The fertilizer shall be 5-10-30 and shall be applied at a rate of 300 kg/ha. No additional payment will be made for maintenance or the extra application of fertilizer.

### **632.06 CONTRACTOR'S WARRANTY PERIOD**

All areas hydroseeded under this contract shall have a warranty period of one year starting from the date of initial acceptance. This warranty shall cover any defects in materials and workmanship, and damages caused by the elements of weather. During this period, any defect brought to the attention of the Contractor by the Engineer shall be fixed, repaired or made good to the satisfaction of the Engineer and at no additional cost to the Department.

### **632.07 MEASUREMENT FOR PAYMENT**

The slope area actually hydroseeded, from within the limits as staked by the Engineer, will be measured in square metres, rounded to the nearest whole number.

### **632.08 BASIS OF PAYMENT**

Payment of the contract price for hydroseeding shall be compensation in full for all labour, materials and equipment-use for: supplying the inoculated seed mixture as specified; supplying the fertilizer, binder and mulch; carrying-out the hydroseeding operation; and supplying and placing the fertilizer in the following spring; together with a one year warranty period, during which time the Contractor shall be responsible for making good any defect to the growth of the vegetation.

Full payment shall not be made until the final acceptance of the work on satisfactory completion at the end of the warranty period. A holdback in the amount of 25% of the total payment for hydroseeding shall be retained for the warranty period and until additional application of fertilizer the following spring as per Section 632.05 of this specification.

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 633

### SODDING

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#### 633.01 SCOPE

This specification covers the requirements for surface preparation, supply, and spreading of topsoil, and the supply and placing of sod over areas to be treated with sodding, together with the provision of maintenance for the placed sodding over a period of one month.

#### 633.02 MATERIALS

The following materials shall be supplied by the Contractor and shall conform to the requirements as stated.

##### 633.02.01 Sod

Sod shall consist of a dense well rooted growth of permanent and desirable grasses, uniform in texture and free from weeds. It shall be in good healthy condition with no sign of decay and contain sufficient moisture to maintain its vitality during transportation and placing.

Grass on the sod shall be of a length not longer than 75 mm. If necessary the grass may be mowed prior to lifting the sod so as to cut the grass to within the tolerance.

All sod shall be cut in rectangular sections of uniform width and thickness and may be cut in varying lengths. The sod shall be in widths not less than 300 mm nor more than 500 mm, in thickness not less than the depth of the fibrous roots and in no case less than 50 mm.

Contractors should note that legislation prohibits the removal of sod from areas zoned by Government for agricultural use.

Information regarding the location of these agricultural zones may be obtained from the appropriate Government Department.

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### 633.02.02 Topsoil

Topsoil shall be fertile loamy material of a quality acceptable to the Engineer. It shall be free from roots, vegetation or other debris of such size and quantity as would, in the opinion of the Engineer, prevent proper application of the topsoil and free from stones and clods over 50 mm in greatest diameter. Topsoil badly infested by seeds and noxious weeds will not be accepted.

The topsoil may only be taken from a source of supply approved by the Engineer.

Soil removed as part of the grubbing operations may be used if the material meets the requirements of this section.

Contractors should note that legislation prohibits the removal of topsoil from areas zoned by Government for agricultural use.

### 633.02.03 Pegs

Pegs shall be made from good quality wood. They shall be pointed at one end and be approximately 300 mm long and have an approximate diameter of about 25 mm.

### 633.03 PREPARATION OF GROUND

Sodding shall be carried out only within the limits as staked by the Engineer.

Surfaces that are to be treated with sodding shall first be trimmed to restore the ground to the condition it was in prior to any erosion which may have taken place. This work shall consist of such dozer and hand work that is necessary to restore the ground to the lines and slopes as existed on completion of grading operations.

At the edge of shoulders and ditches and adjacent to other vegetation, the ground shall be hand excavated to such depth that will allow for the placing of topsoil and sod such that at the joint the top of the sod is flush with the top of the adjacent ground so as to allow the free flow of water across the joint and also so as to present a neat appearance.

All areas to be sodded shall be fine graded to a uniform surface and the surface materials shall be loosened to a depth of 25 mm. These areas shall be so maintained until the topsoil is placed.

### 633.04 PLACING TOPSOIL

After completion of preparation of ground operations, topsoil shall be uniformly spread over the entire area to be sodded.

The topsoil shall be placed to a depth not less than 50 mm. All clods or lumps shall be pulverized and any roots or foreign matter shall be raked up and removed from the site.

### 633.05 PLACING SOD

Sod shall be laid lengthwise across the face of the slope with ends close together. Sod shall be countersunk to the existing grade level at the edges of shoulders, ditches, and existing vegetation to allow the free flow of water across the joint between the existing grade and the new sodding and also to provide for a neat finish. Joints in adjacent rows shall be staggered. Joints and broken sod shall be pounded to a uniform surface.

Where sod is placed on slopes 3:1 and steeper, sodding shall be pegged as follows:

On slopes steeper than 1 3/4:1 each and every row of sod shall be pegged; on slopes from 1 3/4:1 to 3:1 each of the bottom three rows and each third row above shall be pegged.

In a pegged row of sod, the pegs shall be uniformly spaced across the face of the slope at uniform intervals of not greater than 0.5 m such that when the sods therein are:

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- (a) 0.5 m or less in length, there shall be a peg in each sod.
- (b) greater than 0.5 m but not greater than 1.0 m there shall be two pegs in each sod.
- (c) greater than 1.0 m but not greater than 2.0 m there shall be three pegs in each sod. The pegs shall be driven flush with the sod.

The entire work shall be done in a thoroughly workmanlike manner so that the appearance on completion shall be as nearly as possible that of a good natural growth in place.

No sod shall be laid when in a frozen condition, nor upon frozen ground, nor under any other condition not favourable to transplanting or growth of the sod.

### **633.06 MAINTENANCE**

The Contractor shall be responsible for the care of all completed sodding for a period of one month following the completion of placing.

During this period any break, which may occur through slipping of sod, shall be repaired and any sod which is dead shall be removed and replaced by the Contractor, with fresh, live sod, without charge. Should the sodding become wilted during the maintenance period, the Contractor shall thoroughly water the sodding taking care not to cause any erosion.

### **633.07 MEASUREMENT FOR PAYMENT**

The slope area actually treated with sodding, from within the limits as staked by the Engineer, will be measured in square metres, rounded to the nearest whole number.

### **633.08 BASIS OF PAYMENT**

Payment at the Contract price for sodding shall be compensation for all labour, materials and equipment-use for: the preparation of the ground to be treated with sodding, the supply and placing of topsoil, sod and pegs, together with any necessary maintenance work, materials, and watering required during the one month maintenance period.

# FORM 634



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 634 SOIL FOR HYDROSEEDING

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#### 634.06 MEASUREMENT FOR PAYMENT

#### 634.07 BASIS OF PAYMENT

#### 634.01 SCOPE

This section covers the requirements for the supply and application of soil to areas to be hydroseeded. Included in the work is the preparation of the surface by the removal of rocks and debris.

It should be noted that some areas to be hydroseeded will not require the application of soil for hydroseeding.

#### 634.02 MATERIALS

Soil for hydroseeding shall be supplied by the Contractor. The soil for hydroseeding shall consist of either Organic Loam or alternatively a Silty Other Material and Peat Mixture.

##### 634.02.01 Organic Loam

Organic Loam shall be free from weeds, large stones and debris. The Organic Loam shall meet the following gradation: maximum size of particles 100 mm, max of 10% by weight larger than 50 mm. To meet this gradation it may be necessary that the material be screened.

Only organic loam approved by the Engineer shall be used in the work.

##### 634.02.02 Silty Other Material and Peat Mixture

Silty Other Material shall consist of very poorly drained granular material having a high silt content. The maximum size of particles shall be no greater than 100 mm, and no more than 10% by weight shall be larger than 50 mm. To meet this gradation, it may be necessary that the material be screened. Only Silty Other Material deemed acceptable by the Engineer shall be used in the work.

Peat shall be bog material free of pieces of wood, roots and any deleterious material. Only peat deemed acceptable by the Engineer shall be used in the work.

The silty Other Material and peat shall be thoroughly mixed together. The mixture shall contain no less than 25% peat and no more than 50% peat. Mixing may be by either; placing the silty O.M. and peat in layers and mixing in place by the use of equipment, or by pre-mixing.

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### 634.03 PREPARATION OF SURFACE

The Contractor shall grade and clean-up areas over which soil for hydroseeding is to be placed prior to placing the soil for hydroseeding. Materials such as; rock, boulders, debris and other material, which it is necessary to remove in order to prepare the ground, shall be removed and disposed of. This shall apply to all areas to be treated with soil for hydroseeding regardless as to the source of the materials. The Contractor may elect to bury this waste on site if this meets with the approval of the Engineer.

### 634.04 TRANSPORTATION

The Contractor shall transport the materials from the source to the job site, where they shall be applied to the designated areas.

### 634.05 PLACEMENT

The area requiring the soil will be designated by the Engineer. Prior to spreading the soil, the Contractor is to grade the area to neat and sightly contours and to provide positive drainage.

The soil is to be spread over the designated areas to the depth of 100 mm.

The Contractor shall ensure that soil does not contaminate streams or water bodies.

### 634.06 MEASUREMENT FOR PAYMENT

Measurement for payment will be the product of the length by width of the area treated with a nominal 10cm of topsoil inside the limits staked by the Engineer. The area of topsoil will be computed in square meters to the nearest whole number.

### 634.07 BASIS OF PAYMENT

Payment at the contract price for soil for hydroseeding shall be compensation in full for all labour, materials, equipment-use and any other expenses to: collect debris and rocks from areas to be treated with soil, provide all haulage expenses to transport the debris and rocks to a disposal site provided by the Contractor at his own expense, dispose of the debris and rocks, provide sources of the required materials, obtain all required permits and approval, provide and transport samples to the Department's Soils Laboratory in St. John's, screen materials if required, construct and maintain access road to the sources of materials, provide all haulage of materials from the source to where the material is to be placed, mix the silty other material and peat mixture if this alternative is used, place the soil for hydroseeding to the required thickness of 10cm, pay any royalties for the materials, clean up and provide such other restoration to the sources of the materials as may be required, together with any other work necessary to complete the contract item.



# FORM 635



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 635 LIME FOR HYDROSEEDING

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#### 635.01 SCOPE

This section deals with the supply and application of lime prior to hydroseeding operations, including the work of preparing the surface to be limed. Preparing the surface involves grading and trimming the surface together with the removal of rocks and debris.

#### 635.02 MATERIALS

Lime shall be agricultural quality lime. The lime shall be free flowing and free of lumps. The Contractor shall supply the lime.

#### 635.03 PREPARATION OF SURFACE

Surfaces that are to be treated with lime shall first be shaped up and graded to prepare the surface for hydroseeding. This work shall consist of such dozer and hand work necessary to restore the ground to the smooth grades that existed prior to erosion, and to remove and dispose of all: other material, rock, boulders and debris that it is necessary to remove in order to prepare the surface for hydroseeding.

This shall apply to all areas to be hydroseeded regardless as to the source of the material. The Contractor may elect to bury this waste on site where feasible and with the Engineer's approval.

For areas over which Soil for hydroseeding is required, the placing and trimming of the Soil for hydroseeding shall be completed before the application of lime may begin.

#### 635.04 LIMING OPERATIONS

The Engineer shall designate the boundaries of areas for lime treatment. These areas will usually include a 300 mm wide overlap over adjoining vegetation so as to eventually provide a continuous cover of vegetation.

No area shall be limed until surface preparation has been completed to the approval of the Engineer.

The lime shall be applied at the even rate of 0.7 kg/m<sup>2</sup> (7.0 t/ha), or at such other rate, or rates, as the Engineer may designate. The lime shall be applied using the hydroseeding equipment. Spreading by hand will not be allowed.

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The lime shall be applied before hydroseeding, in a separate operation from the hydroseeding application.

### **635.05 PROTECTION OF ENVIRONMENT**

The Contractor shall ensure that lime does not contaminate streams or brooks.

Lime has been found to cause corrosion of galvanized metal in guide rail. The Contractor shall take all reasonable care to prevent the contamination of: structures, signs, guide rails, fences, utilities and all such installations. Should contamination by lime occur, then the Contractor shall remove the contaminating lime, to the satisfaction of, and by means approved of by the Engineer.

### **635.06 MEASUREMENT FOR PAYMENT**

Measurement for payment shall be by means of the weight of lime used measured in tonnes rounded to one decimal place.

Where the lime arrives in pre-weighed bags, the weight shall be determined by counting the bags of lime used.

Where the lime arrives in loose form, then the lime shall be weighed at the Contractor's expense.

### **635.07 BASIS OF PAYMENT**

Payment at the contract price for Lime for Hydroseeding shall be compensation in full for all labour, materials and use of equipment to: trim and prepare the surface to be limed, collect debris and rocks, provide all haulage expenses to transport the debris and rocks to a disposal site provided by the Contractor at his own expense, dispose of the debris and rocks, supply the lime, weigh the lime if in loose form, and apply the lime in conformity with this specification.

# FORM 636



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 636 EROSION CONTROL BLANKET

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#### 636.01 SCOPE

Contractors are advised that this item includes the supply and installation of the erosion control blanket, application of lime and hydroseeding.

#### 636.02 MATERIALS

The Erosion Control Blanket shall be Bonded Fibre Matrix or equivalent. Any blanket must be approved by the Department Design Engineer. Installation shall be in accordance with the manufacturers recommendations.

#### 636.03 APPLICATION

The Bonded Fibre Matrix, (BFM), shall be hydraulically applied and upon drying, adhere to the soil in the form of a continuous, 100% coverage biodegradable erosion control blanket.

The Bonded Fibre Matrix shall be comprised of long strand, thermally defibrated wood fibres, (>88% of total volume by weight), held together by organic tackifiers, (10%), and mineral bonding agents, (>2%), which upon drying, become insoluble and non-dispersible.

The matrix which forms shall be designed, tested and proven to perform in a manner equal or superior to biodegradable erosion control blankets, (ECB's). Documentation of testing at an industry recognized laboratory shall be provided which demonstrates superior performance as measured by reduced water runoff, reduced soil loss, and better plant germination, as compared to erosion control blankets. The formed matrix shall meet the following performance requirements:

1. The material, when mixed into a liquid slurry, shall pass a free liquid quality control test, (liquids separate from fibrous solids, no greater than 25 mm in 1 minute's time), as measured on a standard test board.
2. The matrix, when dry shall not dissolve or disperse upon re-wetting.
3. The matrix, shall have no holes > 1mm in size.
4. The matrix shall have no gaps between the product and the soil.
5. The matrix shall have a minimum water holding capacity of 1000g/100g, (1.2gal/LB matrix).
6. The matrix shall have no germination or growth inhibiting components, and shall not form a crust which inhibits water infiltration.
7. The matrix shall be comprised of material which are 100% biodegradable and 100% beneficial to plant growth.

The Bonded Fibre Matrix, (BFM), shall be installed by a contractor certified by the manufacturer and trained in the proper procedures for mixing and application of the product. The BFM shall be mixed according to manufacturer's recommendations, and contractor shall demonstrate "free liquid" test to inspector upon request. Bonded Fibre Matrix shall be spray applied at a minimum rate of 660 kg/ha,

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utilizing standard hydraulically seeding equipment, in successive layers as to achieve 100% coverage of all exposed soil. The BFM shall not be applied over standing water, nor immediately before, during, or immediately after rainfall. The matrix shall have opportunity to dry for 24 hours after installation, with exceptions approved by the engineer.

### **636.04 BASIS OF PAYMENT**

Payment at the contract price for this item shall be compensation in full for all labour, materials and equipment-use required to supply and install the erosion control blanket including all anchoring, application of lime for hydroseeding as per Section 635 of the Specifications Book and hydroseeding as per Section 632 of the Specifications Book. Measurement for payment shall be by means of the total surface area protected within the limits as staked by the engineer measured in square metres rounded to one decimal place.

# FORM 640



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 640

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#### 640.06 BASIS OF PAYMENT

#### 640.01 SCOPE

This specification covers the requirements for the supply and installation of various guide rail installation types together with the accompanying posts. Unless the type of guide rail installation is specified otherwise in the unit price table, the type of guide rail shall be the standard type shown on Form 1280 "Guide Rail Standard Installation".

#### 640.02 ENVIRONMENTAL REQUIREMENTS

Guide rail posts located in Protected Water Supply areas shall only be chromated copper arsenate (CCA) treated type.

#### 640.03 MATERIALS

Guide rail parts furnished under these specifications shall be interchangeable with similar parts, regardless of their source of manufacture.

##### 640.03.01 Rail Sections

The rail elements shall consist of a corrugated steel W-beam with corrugations symmetrical about the horizontal axis and such that the edges and centre of the rail element may contact each post.

The individual rail elements shall be of the Standard Type (W-beam) consisting of 2.75 mm thick (12 gauge) rail of length not less than 4 125 mm, having post bolt slots 3 810 mm apart centre to centre; unless indicated elsewhere on a drawing or supplementary general condition in which case one additional post bolt slot will be placed at mid-span.

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The rail metal shall be open hearth oxygen furnace or electric furnace steel having an elongation of not less than 12 per cent in 50 mm and shall withstand a cold bend, without cracking, of 180° around a mandrel of a diameter equal to 2½ times the thickness of the plate.

The rail elements shall be hot-dip galvanized before or after fabrication. In accordance with the specifications of ASTM Designation A-515 (Class 2½ oz) or A123. Rail element joints shall be capable of withstanding a tensile load of not less than 350 kN without failure. The rail element shall not deflect more than 140 mm when tested as a simple beam with the traffic face up and with an 8.9 kN load applied at the centre of a 3 650 mm span through a 76 mm wide flat bearing.

Workmanship shall be equivalent to good commercial practice and all edges, bolt holes and surfaces shall be free of torn metal, burns, sharp edges and protrusions.

Rail sections shall be supplied by the Contractor.

Two certified copies of mill test reports of each batch from which the rail element is formed, shall be furnished to the Engineer, if so required.

### **640.03.02 Buried End Sections**

Buried end sections shall be manufactured to meet the dimensions as shown on the drawings Section 1279 "Typical Guide Rail Installation Types" and Section 1280 "Guide Rail Standard Installation". The sections shall be shop fabricated from rail sections conforming to the requirements of Section 640.03.01. No punching, cutting or welding will be permitted in the field.

The weld shall be cleaned, pre-treated and coated with cold galvanizing compound as outlined.

Where corrugated steel beam is cut with a saw, drilled, or welded, the beam shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld splatter, etc. and wiped clean. The cleaned surface shall receive at least one application of metal conditioner to de-oxidize, de-grease and phosphatize the metal surface to be treated if the surface is oily. Pre-mixed, ready-to-apply, liquid-zinc compound shall be applied to the prepared, clean, dry metal surface. The cold-galvanizing compound must be of a type that imparts cathodic action against corrosion. The cold-galvanizing compound shall have a minimum 50 mm overlap of the surrounding undamaged galvanized metal.

Both metal conditioner and cold-galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings -organic and meet or exceed Canadian Government Specifications 1-GP-181A. All materials must be applied in accordance with the manufacturer's instructions.

The Contractor shall supply the angled sections.

### **640.03.03 Rail Terminal Sections**

Rail terminal sections shall be of the standard type, as illustrated on the drawing Sections 1279 "Typical Guide Rail Installation Types" and Section 1280 "Guide Rail Standard Installation". The metal and galvanizing shall be of the same thickness and quality as is stipulated for the rail sections in Section 640.02.01. The Contractor shall supply the terminal sections.

### **640.03.04 Bolts, Nuts, Washers and Spikes**

All bolts, nuts and washers shall conform to the specifications of ASTM Designation A-307 or A-325, except that rail splice bolts shall be button headed.

Post bolts and splice bolts shall have shoulders of such shape and size that they fit into the bolt slots in the rails and thus prevent the bolt from turning.

Post bolts shall be 16 mm diameter and 200 mm long for use with standard 150 mm x 150 mm posts, or 16 mm diameter and 250 mm long for use with 200 mm x 200 mm posts.

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Post bolt washers for the back of posts shall be 45 mm in diameter and 4 mm thick.

Bolts for anchors shall be 16 mm diameter and 350 mm long for use with standard 150 mm x 150 mm posts and anchors, or 16 mm diameter and 450 mm long for use with 200 mm x 200 mm posts and anchors. Washers shall be 45 mm round and 4 mm thick.

Spikes for anchors shall be 125 mm galvanized spikes.

Bolts, nuts, washers and other fittings shall be hot-dip galvanized in accordance with the specification of ASTM Designation A-153.

The Contractor shall supply the bolts, nuts, washers and spikes.

### 640.03.05 Signal Reflectors

Silver signal reflectors and yellow signal reflectors shall be of size 75 mm x 100 mm. The Department will supply both types of signal reflector free to the Contractor at the following district depots: White Hills in St. John's, Clarendville, Grand Falls, Deer Lake and Goose Bay.

### 640.03.06 Nails for Reflectors

Nails for securing signal reflectors, shall be supplied by the Contractor and shall consist of 30 mm galvanized flat head nails.

### 640.03.07 Posts and Anchors

Timber for posts and anchors shall be sound, well seasoned structural grade lumber. Only birch wood will be acceptable for 150 x 150 guide rail posts. Hemlock or other approved species will be acceptable for 200 x 200 guide rail posts.

Posts shall have minimum dimensions of 150 mm x 150 mm x 2400 mm, except in the particular case of posts to be used in tender items worded "Guide Rail with Additional Posts", as shown in Form 1282, in which case posts shall have minimum dimensions of 200 mm x 200 mm x 2400 mm.

Anchors shall consist of either one piece of guide rail post cut 450 mm long, or two pieces of 38 mm x 140 mm x 450 mm lumber.

Posts and anchors shall be pressure treated with an acceptable wood preservative.

The minimum required depth of penetration of wood preservative shall be 13mm. To determine penetration, a borer core shall be taken from 20 pieces in each charge. If 80% of the borings meet the penetration requirements, the charge shall be accepted.

The minimum retention of preservative shall be as follows:

PRESERVATIVE	MINIMUM RETENTION	METHOD OF DETERMINATION
PENTACHLOROPHENOL	6.4 kg/m <sup>3</sup>	BY ASSAY
CHROMATED COPPER ARSENATE	6.4 kg/m <sup>3</sup>	BY ASSAY
OTHER	IN ACCORDANCE WITH CSA 080-M 89	

Incising will normally be required. However, this requirement will be waived if specifications for both penetration and retention are satisfied.

If requested by the Engineer, the Contractor shall provide penetration and retention test reports for the guide posts and guide rail posts supplied for the project.

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The Contractor shall supply all the required wood preservative treated posts and anchors.

### **640.03.08 Wood Preservative**

Wood preservative for use in treating field cut ends of posts shall be of the same type and chemical composition as that used in the original treatment.

The Contractor shall supply the wood preservative.

### **640.04 INSTALLATION**

Galvanized materials shall be loaded, hauled and handled in such manner that galvanizing will not be damaged. All bare, abraded, and damaged surfaces shall be cleaned, pre-treated if required and coated with cold galvanizing compound as outlined above.

Guide rail shall be placed to the lengths, lines and grades set by the Engineer. Except where directed otherwise by the Engineer, the guide rail shall be installed in accordance with the requirement of the drawings: Form 1279 "Typical Guide Rail Installation Types", Form 1280 "Guide Rail Standard Installation", or Form 1282 "Guide Rail with Additional Posts", as the case may be.

A buried end section shall be placed at each end of a run of guide rail unless directed otherwise by the engineer.

On divided highways, a buried end section shall be placed at the approach end of a run of guide rail and a terminal section shall be placed at the other end unless directed otherwise by the engineer.

The end post of a buried end section shall have an anchor secured to the bottom of the post.

Where a 150 mm x 150 mm x 450 mm timber anchor is used, it shall be secured to the post by means of a galvanized nut and 16 mm diameter bolt 350 mm long together with two 45 mm round 4 mm thick galvanized washers.

Where a double 38 mm x 140 mm x 450 mm lumber anchor is used, it shall be secured to the post by means of four 125 mm galvanized spikes.

Field boring and cutting to length of anchors will be permitted, provided that the hole is treated with two coats of wood preservative before driving the bolts and provided that the cut end is treated with two coats of wood preservative before burying.

The Contractor shall excavate holes for the posts such that when placed in the holes the bottom of the posts are at least 1200 mm below the ground surface.

Posts shall be set plumb and to the established lines and grades and shall be placed at 3810 mm intervals, unless directed by the Engineer.

The posts shall be firmly backfilled with selected material, free of large rock, placed in layers of thickness not greater than 100 mm. Each layer shall be thoroughly compacted before the next layer is placed. Should the backfill be dry then each layer shall be moistened before tamping.

All backfill shall be compacted to 95% of Standard Proctor Density (ASTM D698-78).

All surplus excavated material shall be disposed of along the sides of fill, or in other locations as directed by the Engineer.

The rails shall be secured to even lines such that the centre of the rail is 500 mm above the edge of pavement.



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The Contractor shall bore holes in the posts for the post bolts and treat the holes with two coats of wood preservative before driving the bolts.

Rail elements and terminal sections shall be lapped so that the exposed ends will not face approaching traffic.

The bolted connections of the rail element to the post shall be capable of withstanding a 22.5 kN pull at right angles to the lines of the railing.

When the attachment of the rail elements to the posts has been completed, the tops of the posts shall be cut to a point 75 mm above the top of the rail as shown by Section 1279 "Typical Guide Rail Installation Types" and Section 1280 "Guide Rail Standard Installation". The tops of the posts shall be treated with two coats of wood preservative after cutting.

Signal reflectors shall be attached to posts at terminal sections, posts at the buried end sections, and to every fourth post in a length of guide rail. Silver reflectors shall be placed facing oncoming traffic and yellow reflectors shall be placed on the opposite side of the post except for divided highway. On divided highways, silver reflectors shall be placed facing oncoming traffic on the outside shoulder and yellow reflectors shall be placed facing oncoming traffic on the median shoulder.

The Contractor shall drill nail holes in the reflectors, bend the reflectors to the required shape and secure the reflectors with 30 mm galvanized flat head nails as shown as shown on drawing Section 1281 "Signal Reflectors on Guide Rail Post".

### 640.05 MEASUREMENT FOR PAYMENT

Measurement for payment for the supply and installation of Standard Type Guide Rail, Guide Rail with Additional Posts, or Type "A" Guide Rail, as the case may be, shall be the length of that type of guide rail placed within the limits designated by the Engineer, measured in metres, rounded to one decimal place, measured end to end along the face of the railing and terminal section.

Measurement for payment for the supply and installation of Type "B" Guide Rail shall be the length of rail and terminal sections placed within the limits designated by the Engineer, measured in metres, rounded to one decimal place, measured end to end along one side only.

Where the guide rail structure is a composite of more than one type of guide rail installation, then measurement for payment shall be by the length of each type of guide rail installation making up the composite.

Measurement for payment for buried end sections will be by means of the number of buried end sections placed as directed by the Engineer.

### 640.06 BASIS OF PAYMENT

Payment at the contract price for the Supply and Installation of Guide Rail of a particular type shall be compensation in full for all labour, materials and equipment-use to: excavate post holes, supply and install all posts, anchors, rail sections, rail terminal sections, bolts, nuts, washers, spikes and nails, bend rail sections where required to a uniform radius, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative, install reflectors, clean, pre-treat, and coat steel rail with cold galvanizing compound where so required, all in accordance with this specification.

Payment at the contract price for the Supply and Installation of buried end sections shall be compensation in full for all labour, materials and equipment-use to: excavate post holes, supply and install posts, anchors, buried end sections, bolts, nuts, washers, spikes and nails, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative, install reflectors, clean, pre-treat, and coat steel rail with cold galvanizing compound where so required, all in accordance with this specification.

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Department of Transportation and Works  
Highway Design Division

## SECTION 643

### SALVAGE AND REINSTALLATION OF GUIDE RAIL

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##### 643.09.02 Basis of Payment for Salvage and Reinstallation of Guide Rail with Salvaged Posts

#### 643.01 SCOPE

This specification covers the requirements for the salvage of existing guide rail, including buried ends, terminal ends and hardware, and posts from one location, and the reinstallation of the guide rail at another location using either the salvaged rail, including buried ends, terminal ends and hardware and posts, or the salvaged rail including buried ends, terminal ends and hardware, and new posts.

#### 643.02 ENVIRONMENTAL REQUIREMENTS

Guiderail posts located in Protected Water Supply areas shall only be chromated copper arsenate treated type.

#### 643.03 MATERIALS

##### 643.03.01 Rail Sections and Rail Terminal Sections

Only salvaged rail sections, angled rail sections and rail terminal sections deemed acceptable by the Engineer shall be used in the re-assembly.

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### 643.03.02 Bolts, Nuts, Washers and Spikes

All bolts, nuts and washers shall conform to the specifications of ASTM Designation A-307 or A-325, except that rail splice bolts shall be button headed.

Post bolts and splice bolts shall have shoulders of such shape and size that they fit into the bolt slots in the rails and thus prevent the bolt from turning.

Post bolts shall be 16mm diameter and 200mm long unless otherwise required. Post bolt washers for the back of the post shall be 45mm round and 4mm thick.

Bolts for anchors shall be 16mm diameter and 350mm long unless otherwise required and washers shall be 45mm round and 4mm thick.

Spikes for anchors shall be 125mm galvanized spikes.

Bolts, nuts washers and other fittings shall be hot-dip galvanized in accordance with the specification of ASTM Designation A-153.

The Contractor shall supply the bolts, nuts washers and spikes.

However, should any of the salvaged bolts, nuts and washers be suitable for re-use, then the Contractor may use these.

### 643.03.03 Signal Reflectors

Silver signal reflectors and yellow signal reflectors shall be of size 75mm x 100mm. The Department will supply both types of signal reflector free to the Contractor at the following district depots: White Hills in St. John's, Clarendville, Grand Falls, Deer Lake and Goose Bay.

### 643.03.04 Nails for Reflectors

Nails for securing signal reflectors, shall be supplied by the Contractor and shall consist of 30mm galvanized flat head nails.

### 643.03.05 New Posts and Anchors

Timber for new posts and anchors shall be sound, well seasoned structural grade lumber.

Only birch wood will be acceptable for new 150 x 150 guide rail posts. Hemlock or other approved species will be acceptable for 200 x 200 guide rail posts.

Posts shall have minimum dimensions of 150mm x 150mm x 2400mm, except in the particular case of posts to be used in Tender Items worded "Guided Rail with Additional Posts", as shown in Form 1282, in which case posts shall have minimum dimensions of 200mm x 200mm x 2400mm.

Anchors shall consist of either one piece of 150mm x 150mm x 450mm timber, or two pieces of 38mm x 140mm x 450mm lumber.

Posts and anchors shall be pressure treated with an acceptable wood preservative.

The minimum required depth of penetration of wood preservative shall be 13mm. To determine penetration, a borer core shall be taken from 20 pieces in each charge. If 80% of the borings meet the penetration requirements, the charge shall be accepted.

The minimum retention of preservative shall be as follows:

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PRESERVATIVE	MINIMUM RETENTION	METHOD OF DETERMINATION
PENTACHLOROPHENOL	6.4 kg/m <sup>3</sup>	BY ASSAY
CHROMATED COPPER ARSENATE	6.4 kg/m <sup>3</sup>	BY ASSAY
OTHER	IN ACCORDANCE WITH CSA 080-M 89	

Incising will normally be required. However, this requirement will be waived if specifications for both penetration and retention are satisfied.

If requested by the Engineer, the Contractor shall provide penetration and retention test reports for the guide posts and guide rail posts supplied for the project.

Where the contract item is given as "Salvage and Reinstallation of Guide Rail with New Posts" then, the Contractor shall supply all the required wood preservative treated new posts and anchors.

### **643.03.06 Re-usable Posts and Anchors**

Only salvaged posts and anchors deemed acceptable by the Engineer shall be used in the re-assembly, and then only if the contract item is given as, "Salvage and Reinstallation of Guide Rail with Salvaged Posts". Where the contract item is given as, "Salvage and Reinstallation of Guide Rail with New Posts" then, salvaged posts shall not be used.

### **643.03.07 Wood Preservative**

Wood preservative for use in treating field cut ends of posts shall be of the same type and chemical composition as that used in the original treatment.

The Contractor shall supply the wood preservative.

### **643.04 DISMANTLING OF EXISTING GUIDE RAIL**

The Contractor shall exercise care in dismantling and removing rails and terminal sections so that they are not damaged and remain suitable for re-use. The rails and terminal sections shall be transported to, and stored at, a secure storage site provided by the Contractor at this own expense, pending their re-assembly at a new location.

Should any material, designated for reinstallation, be damaged or lost by the Contractor, then the Contractor shall be charged with the costs of replacement with equivalent new material. Damaged material shall become the property of the Contractor and shall be disposed of.

### **643.05 REMOVAL AND SALVAGE OF EXISTING POSTS**

The Contractor shall exercise care in excavating posts so that they are not damaged and remain suitable for re-use.

Where the contract item is given as, "Salvage and Reinstallation of Guide Rail with New Posts" then, the salvaged posts shall be transported to, and stored at, the nearest Department Depot.

However, should the contract item be given as, "Salvage and Reinstallation of Guide Rail with Salvaged Posts" then, the posts shall be transported to and stored at, a secure storage site provided by the Contractor at his own expense pending their re-use at a new location.

Should any post designated for salvage, be damaged or lost by the Contractor, then the Contractor shall be charged with the cost of replacement. Damaged posts shall become the property of the Contractor and shall be disposed of.

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### 643.06 BACKFILLING POST HOLES

The Contractor shall backfill to the required grade using the excavated materials if suitable. Should the excavated material be unsuitable, or should there be insufficient suitable backfill material from the excavation, then the Engineer will direct that material from a cut or from a borrow area will be used to complete the backfilling.

Backfilling shall be placed in layers not exceeding 200mm in thickness loose measurement. Each layer shall then be compacted to the required compaction before a further layer is placed.

Backfill consisting of other material or other material borrow shall be compacted to not less than 95% of the Standard Proctor Density (ASTM D698-78).

In rock backfill material where Standard Proctor tests cannot be carried out, compaction shall be continued until a compaction is achieved that is equivalent to that obtained in a fill when there is no visible movement of fill under a vibrating vibratory compactor with vibratory roller of length not less than one decimal five metres.

The backfilled hole or trench shall be levelled and trimmed to provide slightly contours and adequate drainage.

### 643.07 INSTALLATION

The rail sections, buried end sections, terminal sections and posts shall be transported to the location where they are required.

Guide rail shall be placed to the lengths, lines and grades set by the Engineer. The guide rail shall be installed in accordance with the requirements of the drawing Section 1279 "Typical Guide Rail Installation Types", and Section 1280 "Guide Rail Standard Installation", except where directed otherwise by the Engineer.

An angled rail section shall be placed at each end of a run of guide rail unless directed otherwise by the Engineer.

The end post at an angled rail section shall have an anchor secured to the bottom of the post.

Where a 150mm x 150mm x 450mm timber anchor is used it shall be secured to the post by means of a galvanized nut and 16mm diameter bolt 350mm long together with two 45mm round 4mm thick galvanized washers.

Where a double 38mm x 140mm x 450mm lumber anchor is used it shall be secured to the post by means of four 125mm galvanized spikes.

Field boring and cutting to length of anchors will be permitted, provided that the hole is treated with two coats of wood preservative before driving the bolts and provided that the cut end is treated with two coats of wood preservative before burying.

Where the contract item is given as, "Salvage and Reinstallation of Guide Rail with Salvaged Posts" then, posts with the original anchors may be used provided that the anchor is sound. Should the anchor have been damaged during salvage then the Contractor shall replace the anchor on the post using new materials.

The Contractor shall excavate holes for the posts such that when placed in the holes the bottom of the posts are at least 1200mm below the ground surface.

Posts shall be set plumb and to the established lines and grades and shall be placed at 3810mm intervals, unless directed otherwise by the Engineer.

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The posts shall be firmly backfilled with selected material, free of large rock, placed in layers of thickness not greater than 100mm. Each layer shall be thoroughly compacted before the next layer is placed. Should the backfill be dry then each layer shall be moistened before tamping.

All backfill shall be compacted to 95% of Standard Proctor Density (ASTM D698-78).

All surplus excavated material shall be disposed of along the sides of fill, or in other locations as directed by the Engineer.

The rails shall be secured to even lines such that the centre of the rail is 500mm above the edge of pavement.

The Contractor shall bore holes in the posts for the post bolts and treat the holes with two coats of wood preservative before driving the bolts.

Rail elements and terminal sections shall be lapped so that the exposed ends will not face approaching traffic.

The bolted connections of the rail element to the post shall be capable of withstanding a 22.5 kN pull at right angles to the lines of the railing.

When the attachment of the rail elements to the posts has been completed, the tops of the posts shall be cut to a point 75mm above the top of the rail as shown by Section 1279 "Typical Guide Rail Installation Types" and Section 1280 "Guide Rail Standard Installation". The tops of the posts shall be treated with two coats of wood preservative after cutting.

Signal reflectors shall be attached to posts at terminal sections, posts at the buried end sections, and to every post in a length of guide rail. Silver reflectors shall be placed facing oncoming traffic and yellow reflectors shall be placed on the opposite side except for divided highway. On divided highways, silver reflectors will be placed facing oncoming traffic on the outside shoulder and yellow reflectors will be placed facing traffic on the median shoulder.

The Contractor shall drill nail holes in the reflectors, bend the reflectors to the required shape and secure the reflectors with 30mm galvanized flat head nails as shown on drawing Section 1281 "Signal Reflectors on Guide Rail Post".

When reinstalling salvaged posts, the original reflectors shall be removed and new reflectors shall be attached.

### **643.08 MEASUREMENT FOR PAYMENT**

Measurement for payment for the Salvage and Reinstallation of Guide Rail shall be the length of the reinstalled guide rail placed within the limits designated by the Engineer, measured in metres, rounded to one decimal place, measured end to end along the face of the railing and terminal sections.

### **643.09 BASIS OF PAYMENT**

#### **643.09.01 Basis of Payment for Salvage and Reinstallation of Guide Rail with New Posts**

Payment at the contract price for Salvage and Reinstallation of Guide Rail with New Posts, shall be compensation in full for all labour, materials and use of equipment to: dismantle the rail sections, transport the rail sections and terminal sections to a secure storage site provided by the Contractor at his own expense, store the rail sections, excavate and salvage the guide rail posts and transport them to the nearest Department Depot, backfill and compact the excavation, excavate holes for posts at the required new location, supply new preserved wood posts and anchors, transport the stored rail sections and rail terminal sections from the storage site to the place of installation, supply the bolts, nuts, washers and spikes, assemble and secure the anchors to the posts, assemble the guide rail to the required lines and grade, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative to cut ends and drill holes, and install reflectors.

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### **643.09.02 Basis of Payment for Salvage and Reinstallation of Guide Rail with Salvaged Posts**

Payment at the contract price for Salvage and Reinstallation of Guide Rail with Salvaged Posts, shall be compensation in full for all labour, materials and use of equipment to: dismantle the rail sections, excavate and salvage the guide rail posts, transport the rail parts and posts to a secure storage site provided by the Contractor at his own expense, store the rail parts and posts, backfill and compact the excavation, excavate holes for posts at the required new location, transport the stored rail parts and posts from the storage site to the place of installation, supply the bolts, nuts, washers and spikes, supply assemble, and secure new anchors where the original anchors are damaged, assemble the guide rail to the required lines and grade, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative to cut ends and drill holes, remove original reflectors, and install new reflectors.

# FORM 645



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 645

### SUPPLY AND INSTALLATION OF WOODEN GUIDE POSTS

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#### 645.03 MATERIALS

#### 645.04 ASSEMBLY AND INSTALLATION

#### 645.05 MEASUREMENT FOR PAYMENT

#### 645.06 BASIS OF PAYMENT

#### 645.01 SCOPE

This specification covers the requirements for the supply and installation of wooden guide posts.

#### 645.02 ENVIRONMENTAL REQUIREMENTS

Guide posts located in Protected Water Supply areas shall only be chromated copper arsenate treated type.

#### 645.03 MATERIALS

Wooden guide posts shall consist of a post with an anchor attached to the base as shown on the drawing Section 1285 "Wooden Guide Post".

Lumber for posts and anchors shall be sound, well seasoned structural grade lumber free from cracks and warp.

Only birch wood will be acceptable for the guide posts.

Posts shall be of 150mm x 150mm lumber. The length shall be approximately 2400mm.

Anchors shall consist of two pieces of 38mm x 89mm lumber each of length 450mm.

Posts and anchors shall be pressure treated with an acceptable wood preservative.

The minimum required depth of penetration of wood preservative shall be 13mm. To determine penetration, a borer core shall be taken from 20 pieces in each charge. If 80% of the borings meet the penetration requirements, the charge shall be accepted.

The minimum retention of preservative shall be as follows:

PRESERVATIVE	MINIMUM RETENTION	METHOD OF DETERMINATION
PENTACHLOROPHENOL	6.4 KG/M <sup>3</sup>	BY ASSAY
CHROMATED COPPER ARSENATE	6.4 KG/M <sup>3</sup>	BY ASSAY
OTHER	IN ACCORDANCE WITH CSA 080-M 89	

Incising will normally be required. However, this requirement will be waived if specifications for both penetration and retention are satisfied.



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If requested by the Engineer, the Contractor shall provide penetration and retention test reports for the guide posts and guide rail posts supplied for the project.

Nails for attaching anchor pieces to the post shall consist of 100mm galvanized nails.

Nails to secure Department supplied reflectors, shall be 30mm galvanized flat head nails.

All materials, with the exception of the reflectors, shall be supplied by the Contractor. The Department will supply the silver signal reflectors and the yellow signal reflectors which will both be of size 75mm x 100mm.

### 645.04 ASSEMBLY AND INSTALLATION

Anchors shall be attached to the posts as shown on drawing Section 1285 "Wooden Guide Post". Each piece of 28mm x 89mm x 450mm lumber shall be nailed near its centre to the post so that the lower edge of the anchor is 30mm above the bottom of the post. Each piece shall be secured by means of two galvanized nails of length 100mm.

Should any piece of lumber become split or cracked during nailing, then the Contractor shall, at his own expense, replace the damaged piece with sound lumber.

Guide posts shall be placed at the locations as set by the Engineer. The Contractor shall excavate holes for the posts such that when placed in the holes the bottom of the posts are at least 1200mm below the ground surface.

The posts shall be set plumb, and firmly backfilled with selected material, free of large rock, placed in layers of thickness not greater than 150mm. Each layer shall be thoroughly compacted before the next layer is placed. Should the backfill material be dry, then each layer shall be moistened before tamping.

All surplus excavated material shall be disposed of along the sides of fill, or in other locations as directed by the Engineer.

The tops of the posts shall be cut to a point 1000mm above the edge of the pavement, as shown on drawing Section 1285 "Wooden Guide Post", or cut otherwise as directed by the Engineer.

The tops of the posts shall be treated with 2 applications of wood preservative as in Section 590, "Wood Preservation".

Signal reflectors shall be attached to the top of the guide posts, as shown on drawing Section 1285, "Wooden Guide Post".

The Contractor shall drill nail holes in the reflectors, bend the reflectors to the required shape and then secure the reflectors with 30mm galvanized flat head nails so that silver reflectors are placed facing on-coming traffic and yellow reflectors are placed on the opposite side except on divided highway. On divided highways, silver reflectors are to be placed facing oncoming traffic on the outside shoulder and yellow reflectors are to be placed facing oncoming traffic on the median shoulder.

### 645.05 MEASUREMENT FOR PAYMENT

Measurement for Payment will be by means of the number of completed new wooden guide posts placed at the required locations.

### 645.06 BASIS OF PAYMENT

Payment at the contract price for the Supply and Installation of Wooden Guide Posts shall be compensation in full for all labour, materials and equipment-use to: supply the posts, anchor, nails, and wood preservative, assemble the guide posts, excavate the post hole, install the post, backfill the hole, tamp the backfill, dispose of all surplus materials, trim the post, apply wood preservative to top of post and install the reflectors all in accordance with this specification.

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 660

### SUPPLY AND INSTALLATION OF CHAIN LINK FENCE

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## 660.01 SCOPE

This specification covers the requirements for the construction of chain link fence of the fabric full height type, with no barbed wire on top. See Form 1213"Typical Chain Link Fence End Features" and Form 1214"Typical Chain Link Fence Gates" for details.

## 660.02 DEFINITIONS

For the purpose of this specification the following definitions shall apply:

**Fence Post** - An upright tubular or fabricated steel member for supporting fencing material.

**Line Posts** - Fence posts spaced at regular intervals between terminal posts throughout each stretch of fence.

**Terminal Posts** - Fence posts which include end, gate, corner and straining posts.

**End Posts** - Fence posts positioned at the ends of a stretch of fence.

**Gate Posts** - The two fence posts forming a gateway.

**Corner Posts** - Fence posts positioned at corners, and changes of direction greater than ten degrees.

**Straining Posts** - Fence posts positioned at changes in grade greater than thirty degrees.

**Top Rail** - A tubular or fabricated steel section continuously joined by means of sleeves or couplings throughout each stretch of fence extending between terminal posts.

**Brace Rail** - A tubular or fabricated steel section used for bracing terminal posts.

**Bottom Wire** - Wire installed at the bottom of the fence and extending through each stretch of fence between terminal posts.

**Fittings** - Mechanical connections of various designs, shapes and metals to join fence components into an integral structure.

**Wire Ties** - Wire that is used to tie chain link fence fabric to the line posts, bottom wires and top rails or top wires.

**Knuckled** - The type of selvage obtained by interlocking adjacent wire ends, in pairs, and then bending the wire ends back into a closed loop.

## 660.03 MATERIALS

### 660.03.01 Fence Fabric

The steel wire for chain link fence fabric shall conform to Canadian General Standards Board CAN2-138.1-M80.

The fabric shall be of the width as specified in the drawings, or as specified in the unit price table. Typical widths are 1200mm and 1800mm.

The chain link fence fabric shall be industrial quality, Type 1 Steel Fabric 9 gauge with galvanized wire mesh. The mesh shall be a uniform 50mm diamond pattern.

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### 660.03.02 Line Posts

Line posts shall be 60.3mm O.D., standard continuous weld schedule 40 galvanized steel pipe, and shall conform to Canadian General Standards Board CAN2-138.2-M80. The minimum weight per metre shall be not less than 5.45kg. The length shall be 838mm longer than the height of the fabric.

### 660.03.03 End, Corner and Straining Posts

End and Straining posts shall be 88.9mm O.D., standard continuous weld schedule 40 galvanized steel pipe, and shall conform to Canadian General Standards Board CAN2-138.2-M80. The minimum weight per metre shall be not less than 11.22kg. The length shall be 1067mm longer than the height of the fabric.

### 660.03.04 Gate Posts

For gates of up to 2.4 m in height, the following shall apply for the posts. The length shall be 1067mm longer than the height of the fabric.

Gate posts shall comprise standard continuous weld schedule 40 galvanized steel pipe conforming to Canadian General Standards Board CAN2-138.2-M80. The length shall be 1067mm longer than the height of the fabric.

For gate posts for use with single gates of span up to 3.6m, and double gates of span up to 7.3m., the post O.D. shall be 88.9mm. The minimum weight per metre shall be not less than 11.22kg.

For gate posts for use with single gates of span of over 3.6m and to up to 4.6m, and double gates of span of over 7.3m and to up to 9.1m, the post O.D. shall be 114.9mm. The minimum weight per metre shall be not less than 15.92kg.

For gate posts for use with single gates of span of over 4.6m and to up to 7.6m, and double gates of span of over 9.1m and to up to 15.2m, the post O.D. shall be 168.3mm. The minimum weight per metre shall be not less than 28.3kg.

### 660.03.05 Top Rails and Brace Rails

Top Rails and Brace Rails shall comprise standard continuous weld schedule 40 galvanized steel pipe of 42.9mm O.D. with plain ends, conforming to CAN2-138.2-M80. The lengths shall be random lengths.

### 660.03.06 Bottom Wire

The diameter of the wire shall be 5.0mm. The wire shall be zinc-coated with not less than 610g/m<sup>2</sup>. The mass per unit area of zinc coating shall conform to CSA G162.1-M1977.

### 660.03.07 Gates

Gates shall be in sizes defined as the distance between the inside faces of the gate posts.

For gates of up to 2.4 m in height, the gate frames shall be made from 42.9mm O.D. galvanized pipe. Gates shall be constructed from galvanized steel pipe frames and braces, conforming to CAN2-138.4-M82. All joints shall be electrically welded and hot-dip galvanized after welding.

All gates shall be supplied with galvanized malleable iron hinges, latch and latch catch, and shall be capable of opening approximately 180 degrees. Gate latches shall be suitable for the use of padlocks which may be attached and operated from either side of the gate.

Gates shall be supplied completely assembled, including the fabric. Gate fabrics shall be similar to adjacent fence fabric.

Double gates shall have a centre rest with iron foot for closed position and chain hold open when open. The double gates shall have braces comprising 33.3mm O.D. galvanized steel pipe.

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### 660.03.08 Fittings and Accessories

All required fittings and accessories and galvanizing of such material shall conform to CAN2-138.4-M82.

All posts shall be fitted with waterproof galvanized metal caps designed to fit and fasten securely over the posts and carry the top rail in a horizontal position.

Fasteners for attaching fence fabric to posts, bottom wire, and top rail shall be 3.5mm aluminum or galvanized steel wire.

Stretch bars shall consist of 5mm x 20mm galvanized steel.

Stretch bar fastening bands shall be fabricated from 3mm x 20mm galvanized steel, or 5mm x 20mm aluminum.

Top rail sleeve couplers shall be galvanized, be of the outside sleeve type, and be at least 178mm in length.

Touch-up paint shall be zinc pigmented paint conforming to CGSB 1-GP-178Ma.

### 660.03.09 Concrete

Concrete for post holes shall have a compressive strength of at least 15 MPa at 28 days.

## 660.04 CONSTRUCTION

The fence shall be installed at the location indicated in the drawing, and to the lines designated by the Engineer.

The work shall be carried out in accordance with CAN2-138.3-M80.

### 660.04.01 Site Preparation

Prior to the installation of the fence, the Contractor shall remove any debris, and trim and contour the ground to correct ground undulations, so as to obtain a smooth uniform gradient for the fence.

The Contractor shall cut off at ground level, such trees, stumps and brush and remove and dispose of such logs, debris and overhanging branches which would interfere with the installation of the fence.

### 660.04.02 Post Installation

Post spacing shall be equal horizontal distances. The spacing shall not be greater than 2400mm. All posts shall be placed in a vertical position and set accurately in line and position, as required by the Engineer.

All posts shall be cut to the required height above the ground so as to present a smooth and uniform profile.

Straining posts shall be installed at equal intervals not exceeding 150m. Additional straining posts shall be installed where changes in vertical alignment exceed 30 degrees.

Horizontal deflections in the fence alignment of 10 degrees or more shall be considered as corners, and corner posts shall be installed.

End posts shall be installed at each end.

All posts set in Other Material, or loose rock, or where overburden to solid rock is 450mm or greater, shall be set in concrete footings. The concrete footings shall be domed above ground to shed water.

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Concrete footings for line posts shall be at least 250mm wide and at least 1067mm deep.

Concrete footings for terminal posts shall be at least 300mm wide and at least 1220mm deep.

Where the size of the hole exceeds the minimum dimensions of the footings, the Contractor shall either; place the footing against undisturbed ground, or shall backfill the hole with suitable Other Material in layers, compact each layer to 95% of Proctor Density, and then excavate the hole to the required minimum dimensions.

For posts in solid rock or where overburden is less than 450mm, holes for the posts shall be drilled in the rock to a minimum depth of 380mm with a diameter 25mm greater than the outside diameter of the post. The annular space around the post shall be filled with non shrink cement grout.

Posts shall be set in the ground so as to give the required height above ground.

Concrete placing, curing and protection from the elements shall conform with the requirements of Section 904"Concrete Structures".

### **660.04.03 Rail, Brace and Gate Installation**

Rails, braces, gates, or fence fabric shall not be placed until the footings have cured a minimum of 5 days.

Top rails shall be fastened securely to line post tops using waterproof line post caps. In sag locations it may be necessary to drill the post and cap, and fasten with a bolt, to ensure a secure fit.

Install brace rails between all terminal posts and the nearest line post on each side. The brace rails shall be placed in the centre of the panel and parallel to the ground.

Gates shall be installed with the fabric on the side farthest from the roadway, and with the barbed edge at the top. Double gates shall have a steel gate centre rest installed.

Gates shall be installed such that when closed, the bottom of the gates are 40mm above the finished grade.

The Contractor shall perform such grading as may be necessary to ensure that the surface grade, within the required gate sweep area, shall be low enough to permit free movement of the gate.

### **660.04.04 Tension Wire and Fence Fabric Installation**

Install bottom tension wire, stretch tightly to the tension recommended by the manufacturer and fasten securely to terminal posts with turnbuckles and tension bar bands. The fence fabric shall be stretched tight and fastened with tension bars secured to terminal posts. Tension bars shall be secured to terminal posts at 300mm intervals. The fabric shall be installed on the side of the post nearest the roadway, with the barbed edge at the top.

The fabric shall be securely fastened to the line posts, bottom wire and top rail with tie wires. The tie wires shall be placed at 250mm intervals. The tie wires shall be secured with a minimum of two twists.

### **660.04.05 Paint Touch-up**

Damaged parts shall not be used in the work. However, surface scratches may be painted.

Surfaces to be treated with paint shall be thoroughly cleaned with a wire brush to remove loose and cracked coatings. The scratched area shall be painted with two coats of zinc pigmented paint.

### **660.04 06 Clean-up**

After fence installation, the Contractor shall clean and trim the site, and restore the ground to a neat condition.

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## 660.05 MEASUREMENT FOR PAYMENT

### 660.05.01 Total Composite Fence Structure Measurement

Measurement for payment will be made in units of each; for each completed chain link fencing structure comprising all specified fence fabric, posts and gates, all as specified in the drawings.

### 660.05.02 Fence Item Measurement

#### 660.05.02.01 Chain link Fence

Measurement will be made of the actual length of the fence fabric installed, following the contour of the ground. Gate openings will not be included in this measurement.

The measurement shall be calculated in metres, rounded to one decimal place.

#### 660.05.02.02 Terminal Posts for Chain Link Fence

Measurement will be made in units of each, for each end post, gate post, corner post, and straining post installed, as required by the Engineer.

#### 660.05.02.03 Gate for Chain Link Fence

Measurement will be made in units of each, for each type and size of gate installed, as required by the Engineer. The two gates comprising a set of double gates, shall be counted as one double gate.

## 660.06 BASIS OF PAYMENT

### 660.06.01 Basis of Payment for Composite Fence Structure

Payment at the lump sum contract price for the supply and installation of the chain link fence specified in the drawings, shall be compensation in full for all materials, labour and use of equipment: to prepare the fence line for fence installation, to supply all fence posts, fence fabric, rails, wire, gates, fittings and accessories, together with concrete and grout for the footings, to excavate post holes, to install the posts, fence, gates, and fittings according to the drawings, to provide paint touch-up to minor scratches, and to clean up the site on completion of the fence installation.

### 660.06.02 Basis of Payment for Fence Items

#### 660.06.02.01 Basis of Payment for Chain Link Fence

Payment at the contract price for the supply and installation of the chain link fence of the specified height, shall be compensation in full for all materials, labour and use of equipment: to prepare the fence line for fence installation, to supply all line posts, fence fabric, rails, wire, fittings and accessories, together with concrete and grout for the footings, to excavate the line post holes, to install the line posts, fence, and fittings according to the Engineer's requirements, to provide paint touch-up to minor scratches, and to clean up the site on completion of the fence installation.

Payment for the end, straining, corner and gate posts, shall be compensated for separately under terminal posts for chain link fence.

Payment for the supply and installation of gates, if any, will be compensated for separately, under an item for the gates.

#### 660.06.02.02 Basis of Payment for Terminal Posts

Payment at the contract price for the supply and installation of the required terminal posts, shall be compensation in full for all materials, labour and use of equipment: to supply the terminal posts of the required height for the fabric, and to supply post caps, and concrete and grout for the footings, to

## **FORM 660**

excavate post holes, to install the posts and post caps according to the Engineer's requirements, to provide paint touch-up to minor scratches, and to clean up the site on completion of the post installation.

### **660.06.02.03 Basis of Payment for Gate for Chain Link Fence**

Payment at the contract price for the supply and installation of a chain link fence gate of the specified type, height and gate opening width, shall be compensation in full for all materials, labour and use of equipment: to prepare the gate opening for the gate, to supply the completed gate, hinges, latch, latch catch, and fittings, to install the gate according to the Engineer's requirements, to provide paint touch-up to minor scratches, and to clean up the site on completion of the gate installation.

In the case of a double gate, payment at the contract price for the supply and installation of the gate, shall also include compensation in full for all materials, labour, and use of materials: to supply a centre rest together with concrete and grout for the centre rest footing, to excavate the hole for the centre rest, and to install the centre rest.

Payment for the gate posts, shall be compensated for separately under terminal posts for chain link fence.



# FORM 700



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## DIVISION 7

### TEMPORARY CONDITION SIGNS AND DEVICES

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# FORM 701



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 701 INTRODUCTION

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#### 701.11 BASIS OF PAYMENT

#### 701.01 SCOPE

The provisions for public protection established herein are for application by contractors employed under contract by the Department of Transportation & Works. Traffic safety in construction zones should be an integral and high priority element of every project. The goal should be to route traffic through such areas, with temporary condition signs and devices, as nearly as possible comparable to those for normal situations.

The responsibility for temporary condition signs and devices rests with the Contractor. Thus, while this specification provides standards for design and application of temporary condition signs and devices installation, it is not a substitute for good engineering judgment. The decision to use a particular device at a particular location should be made on the basis of an engineering study at the location.

The provisions for public protection established herein are for application by contractors performing any work for the Department of Transportation & Works. All costs associated with temporary condition signing to standards as outlined in Division 7 shall be the responsibility of the Contractor. Cost of signs, handling, installation, materials, and labour shall be paid by the Contractor and no payment shall be considered by the Department of Transportation & Works.

#### 701.02 FUNDAMENTAL PRINCIPLES

1. All traffic signs used for temporary conditions are designed and erected for the safety and convenience of the travelling public and for the safety of the workmen on the construction projects. Additional information on temporary condition signage may be found in "Traffic Control Manual for Roadway Work Operations 2011 Field Edition.
2. The Project Engineer shall be contacted three weeks in advance for assistance in signing major construction detours.
3. Work sites should be carefully checked to make sure that traffic controls are changed to suit changing construction conditions due to work staging and progress, or if an immediate improvement to the traffic control is needed. Any problems shall be dealt with immediately.

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4. All signs shall conform to the required standards in shape, colour, size and position as outlined in this division for Temporary Condition Signing and the Department of Transportation & Works Traffic Control Manual and the Manual of Uniform Traffic Control Devices.
5. Throughout the normal construction season, including weekends and overnight, all temporary condition signage shall be securely installed on either portable sign supports or permanently installed sign supports. During periods of inactivity in a construction zone, if signs are not maintained, they may be required to be installed on permanent sign supports. When portable sign supports are used, they shall be vertically adjustable such that signs will be displayed at the minimum required height. If this cannot be achieved, flags shall be added to the top of the sign supports to meet the minimum required height as per drawing # 790-1. The base of the sign supports shall not be appreciably wider than the signs. Bases which require weighting for support shall be weighted using sandbags only. The use of rocks, boulders, concrete blocks, etc, as weights shall not be permitted.

When signs are removed from the construction zone, the sandbags must also be removed and not left along the shoulder of the highway. Where portable sign supports are poorly maintained or unable to provide constant uninterrupted support for temporary condition signage, the contractor shall be required to install permanent sign supports

6. Poorly maintained, defaced, damaged, or dirty temporary condition signs are ineffective and shall be replaced, repaired, or cleaned without delay. Signs which have been defaced or damaged and are not replaced within 24 hours of notification shall be expropriated by the Department. All signage expropriated in this manner will remain the property of the Department of Transportation and Works. Any work or costs associated with sign removal, sign replacement or traffic control will be the responsibility of the contractor.
7. No work will be permitted to commence until all traffic control devices are installed in position, as shown in this manual and approved by the user's representative.
8. After a work zone is completed all traffic signs used on that construction zone shall be removed immediately. Any erected signs not applicable during a phase of construction shall be removed or covered. The Department reserves the right to expropriate all highway signs that are left in place after the work zone is completed. In particular the Department especially focuses upon unwarranted and misused speed limit signage and flagperson signage. All signage expropriated in this manner will remain the property of the Department of Transportation & Works.
9. Objects within the roadway or immediately adjacent to the roadway, which constitute a hazard to traffic shall be marked with a delineator device.
10. Construction Speed Zones shall be implemented only as shown on the applicable drawing.
11. After dark all signs shall be checked for visibility and those that cannot be clearly seen shall be cleaned, replaced or adjusted.
12. Any signs not supplied by the Department of Transportation & Works shall meet all specifications in the Manual of Traffic Control Devices for Canada and the Traffic Control Manual of the Department of Transportation & Works.
13. Sound engineering judgment must be utilized in the application of the principles put forward in this Traffic Control Manual.

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### 701.03 CLASSIFICATION OF SIGNS

Unless modified by the following, the specifications outlined in the Manual of Uniform Traffic Control Devices for Canada will apply to temporary conditions signs in all details concerning symbols, lettering, illumination, reflectorization, position, installation, material, support, and maintenance.

One sign only shall be placed on each support, with the exception of tab signs installed to provide supplementary or complementary information associated with warning signs or detour signs, or with the exception of signs placed on the back (reverse) side of the same support, which is intended for motorists traveling in the opposite direction.

**Temporary Condition Signs** – shall have black symbols or lettering on an orange retro-reflectORIZED High Intensity Prismatic background. **The use of florescent paint on signage shall not be considered.**

**Regulatory and Information Signs** – which may be used for temporary traffic control or guidance shall have the same color and shape as described in the Manual of Uniform Traffic Control Devices for Canada.

### 701.04 SPECIFICATIONS

Unless modified by the following, the specifications outlined in the Traffic Control Manual or the Metric Edition of Uniform Traffic Control Devices of Canada will apply to temporary conditions signs in all details concerning symbols, lettering, illumination, reflectorization, position, erection, material, support, and maintenance.

One sign only shall be placed on each support with the exception of tab signs installed to provide supplementary or complementary information associated with warning signs or detour signs, or with the exception of signs placed on the back (reverse) side of the same support, which is intended for motorists traveling in the opposite direction.

### 701.05 COLOURS, SHAPES AND MATERIALS

**Warning Signs** - shall have black symbols or lettering on an orange retro-reflectORIZED background of 3M high intensity grade or equivalent. The use of fluorescent paint on signage shall not be considered.

**Regulatory and Information Signs** - which may be used for temporary traffic control or guidance shall have the same colour and shape as described in the Traffic Control Manual, Department of Transportation & Works.

All temporary construction signage shall be made with a rigid backing consisting of either plywood or aluminum. Flexible or roll up type signs will not be permitted.

### 701.06 DIMENSIONS OF ALL TEMPORARY CONDITION SIGNS

The size and dimensions of temporary condition signage shall be as described in the manual of Standard Signs, Department of Transportation & Works and shall be to approved methods as directed by the Engineer.

### 701.07 USE OF PORTABLE OR REMOVABLE SIGN SUPPORTS

As outlined in Section 701.02.5, the use of portable or removable sign supports shall be permitted for temporary conditions and shall be securely installed on either portable sign supports or permanently installed sign supports. During periods of inactivity in a construction zone, if signs are not maintained, they may be required to be installed on permanent sign supports. Signs shall be located on the right side of the roadway with the near edge not to exceed 4 m from the edge of the travelled portion of the roadway. Supplementary signs will be located on the left hand side of the roadway on divided highways.

If portable sign supports do not elevate temporary condition signs to the minimum required height, then two orange flags must be installed on the portable sign support, such that the required height is achieved. See drawing 790-1

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### 701.08 PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS

In construction zones, where the use of portable sign supports are not desired or properly maintained, temporary condition signs shall be installed on permanently installed rigid sign posts, as directed by the owner. Signs shall be located on the right side of the roadway not to exceed 4.0m from the edge of the traveled portion of the roadway. Supplementary signage shall be located on the left hand side of the roadway on divided highways.

Signs 900mm or less in width/length shall be installed on a single post to a height of 1.5m to 2.5m above the traveled portion of the roadway to the bottom edge of the sign. Most signs in this category can be securely installed on 100mm x 100mm wooden posts with a minimum of 1.0m of the post in the ground. Care must be exercised to ensure that the post is securely anchored in the ground so that it cannot be 'turned' or removed by vandals.

Signs exceeding 900mm in width/length shall be installed according to guidelines in the Department of Transportation and Works Specification Book, Section 580, Sign and Signpost Installations, for the corresponding size of the sign.

The use of flags to achieve minimum required heights on permanently installed sign posts shall not be permitted.

### 701.09 MOUNTING CHEVRON AND HAZARD MARKERS ON REBAR FOR INSTALLATION ON PAVED SURFACES

Where traffic has to be diverted or channelized to cross multi-lanes of paved surfaces, delineator devices, such as hazard markers and chevrons, shall be installed as outlined in this section.

Signs 300 mm or less in width shall be installed on a single piece of 25 mm rebar to a height of 1 m minimum above the traveled portion of the roadway to the bottom edge of the sign.

Signs greater than 300 mm in width shall be installed on two pieces of 25 mm rebar to a height of 1 m minimum above the traveled portion of the roadway to the bottom edge of the sign.

### 701.10 MOUNTING CHEVRON AND HAZARD MARKERS DURING WINTER SEASON

Chevrons and Hazard markers may be mounted on rebar or wooden posts in order to delineate traffic through a transition. Signs shall be installed as outlined in the Specification's Book, sections 701.08 and 701.09

### 701.11 BASIS OF PAYMENT

All costs associated with temporary condition signing to standards as outlined in this section shall be the responsibility of the Contractor. Costs of the signs, handling, installation, removal, asphalt reinstatement and / or repair, materials, and labour shall be paid by the Contractor and no payment shall be considered by the Department of Transportation & Works.

## SECTION 705 LOCATION AND PLACEMENT OF SIGNS

### INDEX

#### 705.01 GENERAL

#### 705.02 ADVANCE SIGNING

#### 705.03 APPROACH SIGNING

#### 705.04 BASIS OF PAYMENT

#### 705.01 GENERAL

Six categories of signing are distinguished with regard to location of devices relative to work sites, namely, **Advance Warning Area, Approach Area, Buffer Zone, Taper, Work Zone** and **Intersecting Roads**.

The work site as used in this Division is defined by the beginning of tapers, buffer and the work itself.

#### 705.02 ADVANCE WARNING AREA

The advance area is the section of the roadway where motorists are first alerted about roadwork ahead. Signing in this area may begin up to 2km from the approach area and ending at the TC-1 CONSTRUCTION AHEAD sign.

#### 705.03 APPROACH AREA

The approach area is the section of the roadway where motorists are given final warning and information on what actions to take before entering the work zone. Signing in this area typically begins immediately following the TC-1 CONSTRUCTION AHEAD sign and ends at the beginning of the buffer zone.

#### 705.04 BUFFER ZONE

The buffer zone is the distance from the last sign in the approach signing to the work site.

#### 705.05 TAPER

The gradual narrowing of a lane using successive cones or markers is intended to safely guide drivers into the next lane. The taper length is the length of the section of roadway required to achieve the closure and shall be as follows:

50 km/h or less	30 m
60-70 km/h	60 m
80 km/h	120 m
90 km/h and TCH	240 m

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### 705.06 WORK ZONE

The work zone is that portion of the roadway which contains the work activity (workers, equipment, and construction materials).

Work areas may be fixed or moved as the work progresses. The area is usually delineated by channelizing devices or in some instances shielded by barriers.

Potential hazards and conflicts will increase in the work area if:

- < The work area is close to the travel lane(s);
- < A physical obstruction exists (uneven pavement, trucks turning, etc.);
- < Speed of traffic increases;
- < The distance the traffic is shifted gets greater or more complex.

Long term work areas (in excess of 12 hours) have a greater need for delineation.

### 705.07 INTERSECTING ROADS

Consideration shall be given to signing intersecting secondary roadways that exist within a work zone and the area reserved for the approach signage to the work zone. As a minimum, this signing shall consist of a TC-1 Construction Ahead sign displaying an appropriate directional arrow. See drawings 756-1 and 756-2 on pages 69 and 70 for examples of signing intersecting roads. Additional signage on the intersecting roadway may only be considered if the last two signs in the sequence of approach signage are not apparent to motorists on the intersecting roadway. Adjusting sign spacing may also be considered as a means of reducing sign requirements on intersecting roadways while providing pertinent information that is apparent to all motorists. In all situations, the placing of signs shall be based on a review of traffic conditions, traffic volumes, sight distances and sound engineering judgment.

### 705.07 BASIS OF PAYMENT

All costs associated with temporary condition signing to standards as outlined in this Section shall be the responsibility of the Contractor. Cost of the signs, handling, installation, removal, asphalt reinstatement and / or repair, materials, and labour shall be paid by the Contractor and no payment shall be considered by the Department of Works, Services and Transportation.

# FORM 708



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 708 DELINEATION DEVICES

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#### 708.01 APPLICATION

#### 708.02 LOCATION OF DELINEATION DEVICES

#### 708.03 SPACING OF DELINEATORS

#### 708.04 DESIGN AND COLOUR

#### 708.05 FORMS OF DELINEATORS

#### 708.06 BASIS OF PAYMENT

#### 708.01 APPLICATION

Delineation devices shall be used to channelize traffic when the traffic flow is impeded as a result of obstructions, work areas or a narrowing of the roadway. They form part of the general category called Traffic Control Devices and shall be used as a supplement to signs and barricades.

Where the temporary condition exists during darkness, delineation shall be achieved by the use of construction markers, traffic barrels, barricades, chevron markers, delineator posts, flashing beacons or similar devices. In all cases, markers and barricades used to achieve delineation during the hours of darkness shall be retro-reflectorized using high intensity grade sheeting to show the same color and shape by night as by day. **Fluorescent paint shall not be used as a reflectorized substitute.**

#### 708.02 LOCATION OF DELINEATION DEVICES

Any construction or maintenance activity on or within 1 m of a roadway shall be marked by delineators along the work site and the approaches to the work site or obstruction. The angle at which the delineations are placed across the closed portion of the road is called the taper and should vary according to the maximum regulatory speed and shall be as follows:

REGULATORY SPEED LIMIT	MINIMUM TAPER
50 KM/H AND LESS	30 M
60 TO 70 KM/H	60 M
80 KM/H	120 M
90 KM/H AND MORE	240 M

If the work area affects more than one traffic lane width, each traffic lane shall be closed separately and a tangent section provided between the two tapers. The minimum length of the tangent section shall be as follows:

REGULATORY SPEED LIMIT	MINIMUM TANGENT BETWEEN TAPERS
50 KM/H AND LESS	50 M
60 TO 70 KM/H	100 M
80 KM/H	150 M
90 KM/H AND MORE	240 M



# FORM 708

## 708.03 SPACING OF DELINEATORS

The centre to centre distance between delineators varies with the regulatory speed for both tapers and tangents. Refer to the Construction Distance Table shown on Form 799-1.

## 708.04 DESIGN AND COLOUR

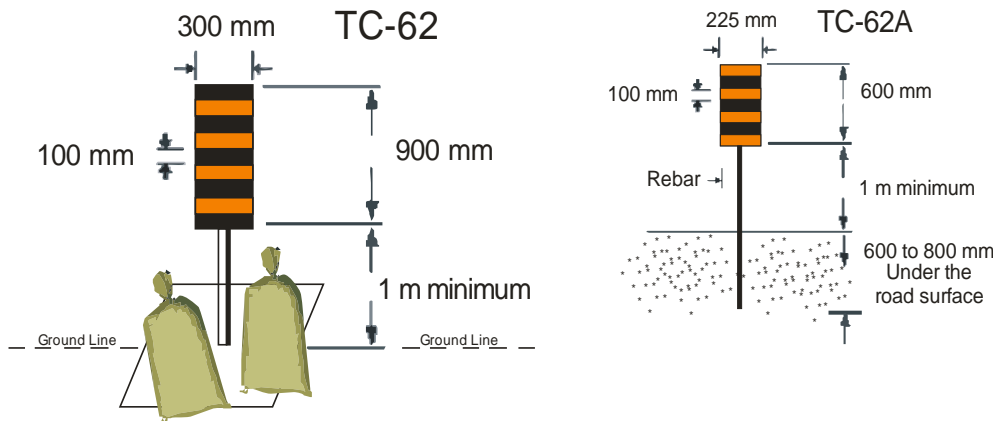
Delineators, with the exception of traffic cones and delineator posts, shall be designed with alternating striped orange and black colour placed in a horizontal position. Traffic cones shall be solid orange in colour. Delineator posts shall be orange in colour with two reflectorized white strips (75 mm) per post.

## 708.05 FORMS OF DELINEATORS

A number of forms of delineation may be used, as outlined in the following:

### 1. Construction Markers

Construction markers shall be of the dimension indicated. They shall be retro-reflectorized with high intensity grade orange reflective sheeting to indicate the same colour and shape by night as by day.



Where Construction Markers are required for a distance of greater than 300 m the use of 225 mm x 600 mm marker is permissible. (TC-62A).

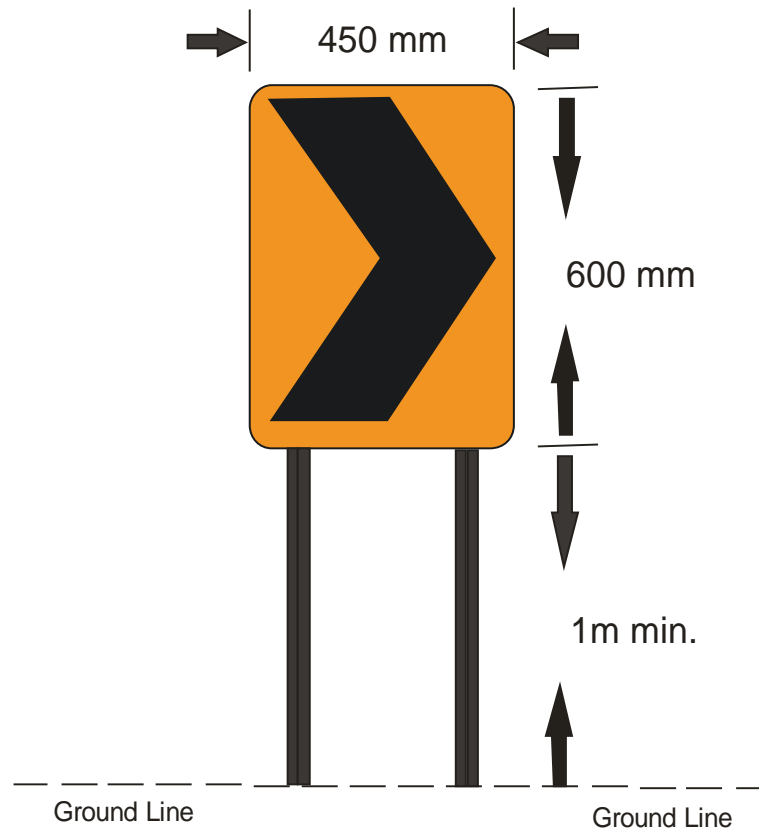
### 2. Chevron Markers

Chevron markers shall be used on tapers for detours and diversions. They shall replace the normal construction marker at a spacing of 30 m. The arrowhead shall point in the direction of the turn. They shall be retro-reflectorized using high intensity grade orange reflective sheeting to indicate the same color and shape by night as by day.

Markers that may require a weight to keep them from being knocked down or blown over, shall use sandbags. **The use of rocks or boulders will not be considered.**

TC-31 signs shall be installed on two piece of 25 mm rebar to a height of 1 m minimum above the traveled portion of the roadway to the bottom edge of the sign.

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Where chevron markers are used to divide two-way traffic, chevron markers must be installed back-to-back on both sides of the same rebar installation.

### 3. Barricades

For reasons of traffic safety and for the protection of workers, barricades shall be used to define the work area. Such protection is considered a part of the temporary signing arrangement. Barricades shall also be used to close streets or roads in the area where the work is being carried out.

Barricades are always placed immediately preceding the work area on the approach side between the road user and the obstruction or activity.

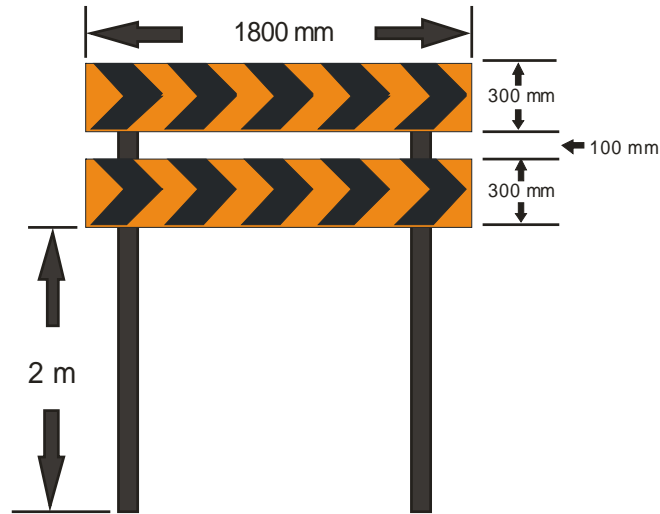
These barricades shall be reflectorized to indicate the same color and shape by night as by day. **The use of fluorescent paint on barricades shall not be considered for use after dark.**

All barricades shall have a retro-reflective high intensity grade orange background and black print meeting the approval of the Engineer.

Heavy barricades shall be used to provide complete closure of a road or lane for an extended period of longer than five days. Their supports shall consist of posts set in the ground with two TC-64C heavy barricade faces attached as shown below:

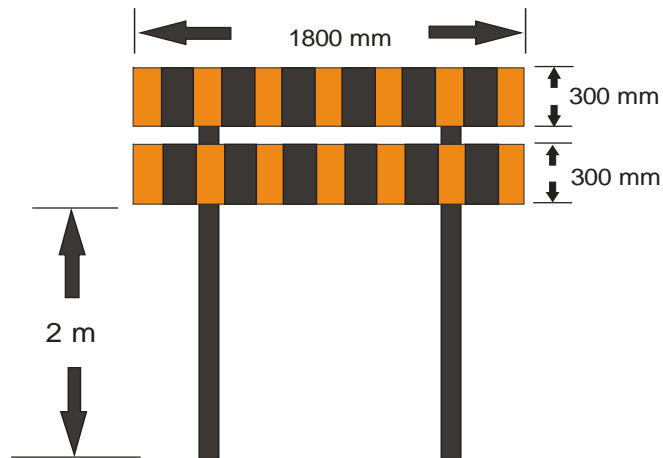
# FORM 708

The direction of traffic indicated by arrow.  
Posts shall be 100 mm x 100 mm minimum.



## 4. Heavy Barricades

Where no direction is required barricade TC-64B shall be used, as shown below:

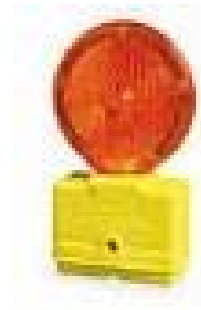
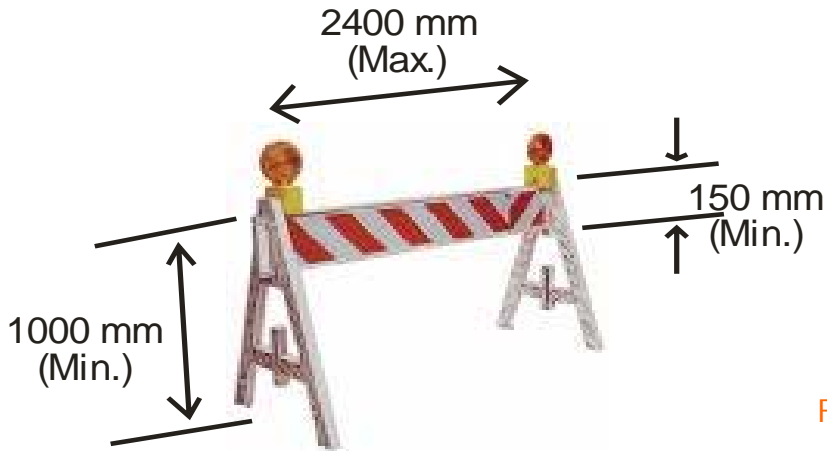


Posts shall be 100 mm x 100 mm minimum.

## 5. Light Barricades

Light barricades shall be used for works of short duration to provide closure of a traffic lane or roadways or blocking off road excavation sites or other work site hazards. Light barricades shall not be used as a channelized device. The use of fluorescent paint on light barricades shall not be considered for use after dark (TC-64A sign is required on each light barricade).

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Flashing Beacon (Optional)

### 6. Drums

Drums are to be flexible and normally 200 liters capacity set on end and used as delineators. Drums shall be reflectorized to indicate the same color and shape by night as by day. The drums are to be predominantly orange, not fluorescent, but a minimum of two white reflectorized strips (100 mm width minimum) per drum is required.

Flexible drums may be used as an alternative method to channelize or delineate flow and shall be approximately 1000 mm in height and a minimum of 550 mm in diameter at the base. The markings on the flexible drums shall be horizontal, circumferential alternating black and reflectorized orange strips.



### 7. Delineator Posts

Delineator posts used to channelize or delineate traffic shall be 1100 mm in height and 100 mm in diameter. The markings consist of two white high intensity reflective bands 75 mm in width. Unit is weighed down with a standard 6.8kg (15lb) rubber base. +Extra 6.8kg (15lb) base inserts can be used when required by wind conditions.



# FORM 708

## 8. Traffic Cones

The dimensions of traffic cones should be related to the maximum speed on the roadway and their height shall comply with the following minimum requirements.

MAXIMUM SPEED KM/H	MINIMUM HEIGHT (MM)
50 OR LESS	450
GREATER THAN 50	700



The use of traffic cones is only permitted during hours of daylight.

## 8. Stand Alone Arrow Board

For highways with a speed limit of 90 km/h or higher, detours and diversions that are anticipated to be in place 12 hours or greater shall have a flashing arrow light trailer unit located within each taper.

The arrow board shall be a minimum size, 1200 mm in width by 600 mm high, and shall be of a type and design as approved by the Engineer.

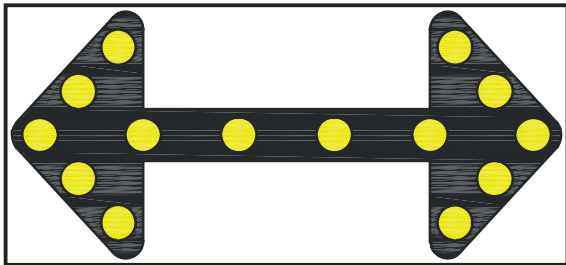


Diagram of a Stand Alone Flashing Arrow Board as used in Sign Layout Diagrams.

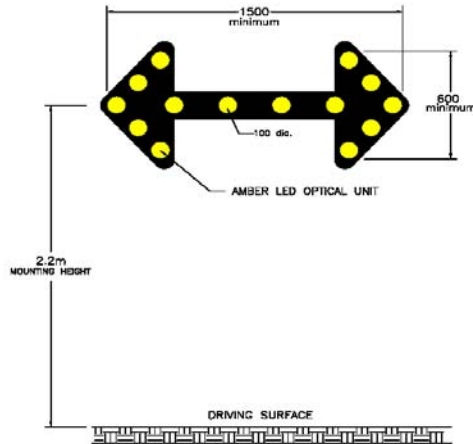
## 9. Control Vehicle

Control vehicles used during Very Short Term Work (low speed or low volume), Short Term Work (low speed or low volume), and Snow Cleanup Operations, shall be equipped with a vehicle mounted flashing arrow signal (see specifications below). In addition, the vehicle shall be equipped with a blue strobe light, standard four-way flashers and two bumper mounted signs, being 150mm high x 450mm long, with orange and black alternating and opposite stripes at 45°. The signs shall be reflectorized to indicate the same shape and color by day or night. Examples of the use of this vehicle can be found on pages 35 to 40 of the Department of Transportation & Works Traffic Control Manual.

Where the nature of the operations does not encroach on the travel lane or impede traffic flow, such as slow moving inspection of culverts or utility lines, etc., the control vehicle may be substituted by an alternate vehicle equipped with flashing lights and a roof mounted revolving appropriately coloured beacon. If this type of operation becomes stationary for periods exceeding 30 minutes and the parked distance from the travel lane does not exceed 0.6m, then the operation is no longer considered very short term work, and shall be signed as per Work Adjacent to Roadway diagrams on FORM 750-1.

**10. Vehicle Mounted Flashing Arrow Signals for Control Vehicles**

Flashing arrow signals shall have a minimum arrow head height of 600mm (760mm maximum) and a minimum length of 1500mm. See diagram below. These arrow signals shall consist of an array of a minimum of fourteen (14) AMBER high intensity LED lights, with each light being 100mm in diameter, providing a minimum legibility distance of 600m. The AMBER arrow signals shall be on a black background.



**11. Vehicle Strobe Lights**

Government maintenance vehicles are to be equipped with Blue Strobe Lights. All other vehicles, such as contractor vehicles, tow trucks, survey vehicles, etc. are to be equipped with Amber Strobe Lights.

**12. Portable Traffic Lights**

With the approval of the Department of Transportation and Works, portable lane control signals may be used to alternate traffic past a work area, in lieu of flag persons. The Department's Director of Maintenance shall be advised in each case of the intent to use this device, at least four weeks before application.

Portable signals shall be used only under conditions where the lights are clearly visible to an approaching motorist such that the vehicle can be brought to a safe stop. Intensity of the signal lamps shall be maintained in such a manner that the lights are clearly visible for a distance of at least 500 meters.

It is essential that these devices be removed immediately when conditions no longer require them.

Traffic light timings are calculated using the table shown in drawing 791-1. It is essential that traffic flow be monitored to determine if timing adjustments are required.

**13. Variable Message Signs**

Variable Message Signs are electronic signs that are used to convey additional information about upcoming road work. These signs shall be used only as a supplement to, but not a substitute for, conventional temporary condition signs and devices. Their use in the field shall be limited to installation either prior to, or within the advance warning area. The Highway Maintenance Division of the Department of Transportation and Works shall be contacted prior to the use of Variable Message Signs on provincially controlled highways or projects.

## FORM 708

Variable Message Signs may display either a single fixed message or a number of sequential messages. When programmed to display sequential messages, each message will be referred to as a phase. Each phase shall be visible to approaching motorists for a minimum of three seconds, and shall be able to be read a least twice by the approaching motorist. If sequential messages exceed two phases, additional Variable Message Signs may be required. In this situation, the distance between Variable Message Signs shall be given careful consideration, based on the speed limit and the phase cycle, ensuring that the message(s) on each sign can be read twice by approaching motorists.

### **The following guidelines shall be used to determine the information to be displayed on Variable Message Signs:**

- Messages shall consist of upper case text with a minimum letter height of 30cm.
- The messages shall be displayed in bright yellow or orange, providing a sharp contrast to the sign's black or dark blue/grey background colour.
- Each message shall convey a single, relevant and concise thought.
- Abbreviations shall only be used if they are easily understood.

### **Roadway construction or maintenance applications, where Variable Message Signs may be considered, include the following:**

- On high speed, multi-lane roadways where significant delays, queuing or lane changes are anticipated;
- On high volume roadways where complex and frequently changing alignment or surface conditions exist;
- Approaching a construction or maintenance project where an alternate route may be available, but not apparent to approaching motorists.

## **14. Radar Display Speed Signs**

Radar Display Speed Signs are electronic signs that are equipped with a radar unit that detects an approaching vehicle's speed, and displays the information back to the driver. These signs shall be used only as a supplement to, but not a substitute for, conventional temporary condition signs and devices. Their use in the field shall be limited to installation within the approach area, where speed control is essential. The Highway Maintenance Division of the Department of Transportation and Works shall be contacted prior to the use of Radar Display Speed Signs on provincially controlled highways or projects.

Radar Display Speed Signs shall only be used where speeding is an issue, and to achieve maximum effectiveness, their use should be supplemented with law enforcement from time to time. The numbers displayed on Radar Display Speed Signs shall be a minimum of 45cm high. If these signs are capable to display any supplementary message, then the minimum requirements for Variable Message Signs shall apply.

## **15. Miscellaneous**

Other miscellaneous traffic control devices, such as flares, flashlights, floodlights, lanterns, etc., may be used, as required, to supplement the signs and other devices described in this section.

## **708.06 BASIS OF PAYMENT**

All costs associated with temporary condition signing to standards as outlined in this Section shall be the responsibility of the Contractor. Cost of the signs, handling, installation, removal, asphalt reinstatement and / or repair, materials, and labour shall be paid by the Contractor and no payment shall be considered by the Department of Transportation and Works.

# FORM 715



GOVERNMENT OF NEWFOUNDLAND AND  
LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 715

### FLAGPERSON OPERATIONS

#### INDEX

#### 715.01 SCOPE

#### 715.02 FLAGPERSON EQUIPMENT

#### 715.03 FLAGPERSON ADVANCE SIGN

#### 715.04 GENERAL GUIDELINES

#### 715.05 FLAGPERSON REQUIREMENTS

#### 715.06 FLAGPERSON SIGNALS

#### 715.07 BASIS OF PAYMENT

#### 715.01 SCOPE

Under certain conditions during construction or maintenance activities on or along a roadway, the use of a flagperson may be required to safely guide motorists through the work site area. The following sections specify the appropriate equipment, signs, and usage of flagpersons under such circumstances. The final decision as to the use of flagpersons shall be as directed by the user's representative.

#### 715.02 FLAGPERSON EQUIPMENT

The flagperson shall wear a high visibility safety jacket or vest, safety boots (CSA Grade 1), CSA approved safety headgear, and hearing and eye protection. They shall be equipped with a flagpersons "STOP" and "SLOW" reflectorized sign. This sign shall be attached to a support pole, such that the sign and pole combination has an overall height of 2.0m to 2.3m. For night operation, the flagperson shall have a red signaling baton flashlight to supplement the diamond sign.

#### 715.03 FLAGPERSON ADVANCE SIGN

Except for very short term work situations "Flagperson Ahead" (TC-21) signs shall be posted in advance of each flagperson. It shall be of a design as shown in the Manual of Uniformed Traffic Control Devices for Canada. It shall be retro-reflectorized with high intensity prismatic grade sheeting to indicate the same color and shape by night as by day.

All advance flagperson signage shall be removed or covered promptly when the flagging operations are terminated from a construction work zone for any period of time. Signage left up will be expropriated by the Department of Transportation and Works.

#### 715.04 GENERAL GUIDELINES

Flagpersons should be highly visible. For this reason, they must stand alone, never permitting a group of workers to congregate around them.



## FORM 715

Flagpersons working as a team shall agree to appropriate signals before commencing their duties. If the flagpersons are not visible to one another, two-way radios are necessary to ensure proper communications and directing of traffic.

No flagperson shall start working unless all required advance flagperson signs are in place. No other construction signs shall be located between the flagperson position and the advance flagperson signage.

The flagperson is not permitted to use a radio, cell phone or any other device which impairs sight, hearing, or attention while working.

At no time are flagpersons permitted to use flags to control traffic.

No flagperson shall leave their post unless authorized to do so or replaced by another flag person. As long as traffic cannot flow freely, even at mealtime, the flagperson must stay on duty until relieved.

Flagpersons should stand just outside the lane of traffic at a point from the end of the working area so as to be able to protect personnel and equipment. The distance from the flagperson to the work site shall be 10 m for every 10 km/h of normal speed limit.

Flagpersons and equipment operators working at a location are to make every effort to keep delays to motorists to a minimum. In heavy traffic, delays should be split equally between the opposing lanes of traffic and in normal operations traffic shall not be delayed in excess of five (5) minutes per direction. At all times priority shall be given to the motorist to proceed through the construction zone. Flagpersons not following these guidelines shall be dismissed from the work site.

When the flagperson leaves their position at the end of operation on a work zone, the Contractor must remove or cover all applicable advance flagperson signage.

### 715.05 FLAGPERSON REQUIREMENTS

Any maintenance or construction job which results in lane blockage requires traffic control, usually in the form of flagpersons. The following construction situations shall be used as guidelines in the use of flagpersons:

- (a) At least one flagperson shall be provided on local roads when the traffic flow in one direction is diverted wholly or partially into the lane of oncoming traffic and the lane of oncoming traffic is clearly visible beyond the one lane section for the distance as shown in Table 715.05.01 for the appropriate speed limit.

TABLE 715.05.01

MAX SPEED	CLEAR VISIBILITY REQUIRED IN EACH DIRECTION
80 KM/H	230 M
70 KM/H	200 M
60 KM/H	170 M
50 KM/H	140 M
40 KM/H	110 M

- (b) At least two flagpersons shall be provided on local roads when the traffic flow in one direction is diverted wholly or partially into the lane of oncoming traffic and the lane of oncoming traffic is not clearly visible beyond the one lane section as noted in Table 715.05.01.
- (c) The user may, where the normal traffic volume on a local road is less than fifteen vehicles per hour, reduce the flagperson requirements.

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## FORM 715

- (d) At least two flagpersons shall be provided on collector and arterial roads when the work activities require the traffic flow in one direction to be diverted either wholly or partially into the lane of oncoming traffic.
- (e) At least two flagpersons shall be provided when the traffic flow in both directions is diverted from the normal vehicle path onto a one lane section. Where traffic flow in both directions is diverted from the normal vehicle path onto a two lane section, the use of a flagperson is not required. Traffic flow may be safely regulated through the area by the proper use of construction signs.
- (f) At least two flagpersons shall be provided to direct traffic at a major detour. These flagpersons must be located at each end of the detour and must be familiar with the area of the detour route. Extended operations of a detour will require public advertising and detour signs along the complete detour route in place of the flagpersons.
- (g) At least two flagpersons are required / shall be provided at truck entrances/exits on arterial roads when the truck traffic entering or exiting the access road is in excess of ten vehicles per hour.
- (h) At least two flagpersons are required / shall be provided at truck entrances/exits on collector and local roads with a normal traffic volume of fifty vehicles per hour on the through road and when the truck traffic entering and exiting the access road is in excess of ten vehicles per hour.
- (i) At least three flagpersons shall be provided, positioned as shown in Section 750 ( form 757-1 and 757-2), on collector and arterial roads when the work activities require the traffic flow in one direction to be diverted either wholly or partially into the lane of oncoming traffic and when the horizontal and/or vertical alignment at the work site does not have the distance of clear visibility required in Table 715.05.01.
- (j) At least one flagperson shall be provided on arterial roads which have two lanes of one-way traffic and traffic volumes in excess of one hundred vehicles per hour where the work activities require one lane be closed at the work site.
- (k) The use of a flagperson is not required on sections of new highway which are not open to public use.
- (l) At least one flagperson shall be provided on a temporary bridge by-pass of one lane width. At locations where portable traffic lights are in operation, the use of a flagperson is not required. At a two lane by-pass, the use of a flagperson is not required as traffic flow may be safely regulated through the area by the proper use of construction signs.
- (m) When traffic control is required at signalized intersections, due diligence shall be exercised and every effort made by the user's representative to deactivate the traffic lights, immediately before flagpersons are required to direct traffic through the intersection. If in the event that traffic control is required through a signalized intersection, and time restraints or emergency situations exist, such that the traffic lights cannot be deactivated immediately prior to work commencing through the intersection, then the flagpersons shall exercise caution and good judgement to ensure the traffic flow around the work zone is maintained in conjunction with the operation of the traffic light sequences. A minimum of two flagpersons shall be used at a signalized intersection. However, there may be situations, depending on the location and type of work, that require more flagpersons to be utilized.
- (n) Any other situation as determined by the user's representative.

### 715.06 FLAGPERSON SIGNALS

Standard flagging signals shall be used and given in a clear and precise manner.

## FORM 715

To instruct a fellow flagperson to halt traffic, raise the free hand with fist clenched straight above the shoulder, wave the entire arm slowly from the upright position to a position directly out to the side at shoulder height and repeat signal as long as necessary;

To indicate an all clear situation and instruct a fellow flagperson that he or she may allow traffic to proceed, raise the free hand directly out to the side at shoulder height, lower the entire arm until it rests against the side of the body and repeat signal as long as necessary;

To indicate the approach of emergency vehicles, drop the stop and slow paddle, raise both arms to the side at shoulder height, then rapidly wave both arms from the shoulder level to a point above the head where the wrists will cross and continue signal until the fellow flagperson is seen to take necessary action;

A flagperson shall stand in a safe position, preferably on the driver's side of the lane used by traffic under his or her control, where he or she will be clearly visible and where he or she has an unobstructed view of approaching traffic.

Flagperson's shall use normal signals when stationed on the driver's (left) side of the lane used by traffic under his or her control and appropriate signals shall be used only when the flag person is stationed on the right side of traffic under his or her control.

- Normal signals to STOP traffic are:

### In daylight,

The flagperson shall face approaching traffic and shall extend his or her free arm horizontally across the approach lane and

The flagpersons paddle shall be held upright with the "STOP" side facing traffic

and

When an approaching vehicle has almost stopped, the free arm shall be used to indicate the point at which vehicles are required to stop.

### In darkness,

The flagperson shall assume the same basic position as for the day signal.

He or she shall hold a reflectorized paddle in his or her free hand and flashlight with red signaling baton attached in his or her free hand,

The free arm shall be moved slowly back and forth between limits corresponding to the third and sixth hour positions on a clock face, and

When an approaching vehicle has almost stopped, the flashlight and baton shall be used to indicate the point at which the vehicle is required to stop;

- Normal signals to SLOW traffic are:

### In daylight,

The flagperson shall take up a position similar to the one used for the signal to stop with the "SLOW" side of the paddle facing approaching traffic;

### In darkness,

The same position and motions shall be assumed as for the night stopping signal except that the "SLOW" side of a reflectorized paddle shall face approaching traffic;

## FORM 715

- Normal signals to MOVE traffic are:

### In daylight,

The flagperson shall face across the approaching traffic lane and shall look across his or her shoulder at the traffic he or she is about to move;

Traffic shall be advanced by rotating the lower free arm in an oval manner corresponding to the direction in which the vehicle wheels will rotate;

If traffic is required to proceed slowly, the flagperson shall also extend his or her free arm horizontally towards the approach lane with the "SLOW" side of the paddle facing traffic; and

If traffic is allowed to proceed at the prevailing speed limit, the flagperson shall lower the STOP/SLOW Paddle and ensure it is hidden from motorists.

### In darkness,

The same signals as for daytime shall apply.

A flashlight with red baton attached shall be used in the free hand.

The order to proceed or to proceed slowly may be given verbally.

The flagpersons paddle shall not be used to wave traffic on and shall never be displayed to traffic in other than a static manner.

All motions of the flagpersons arms, both by day and night, shall be performed precisely and unhurriedly so that the meaning of signals given cannot be misunderstood.

### **715.07 BASIS OF PAYMENT**

Refer to "Wages of Flagperson", Section 125.

# FORM 717



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 717 CONSTRUCTION SPEED ZONES

### INDEX

#### 717.01 SCOPE

#### 717.02 GENERAL INFORMATION

#### 717.03 SPEED SIGNS

#### 717.04 GUIDELINES FOR SPEED LIMITS

#### 717.05 BASIS OF PAYMENT

#### 717.01 SCOPE

Construction Speed Zones will be established on all construction projects or portions of projects requiring traffic control.

#### 717.02 GENERAL INFORMATION

Speed limits must reflect the road conditions in existence at the time. Signs must be removed or changed immediately when the condition changes. When the road condition does not warrant reduced speed during non-working periods, overnight, or weekends, the signs shall be removed or covered.

On a divided highway, if construction involves only one side of the highway, the speed limit will be lowered in the affected direction of travel only and will remain unaltered in the opposite direction.

The reducing of a speed limit through the entire work project will not be permitted. Having each work zone individually considered, based on the general geometric conditions of the work zone, is the only acceptable method of speed limit signing.

All conflicting signs within the reduced speed zone shall be removed or covered while the temporary speed limit is in effect.

#### 717.03 SPEED SIGNS

All speed limits shall be signed using reflectorized maximum speed limit signs as specified in the Manual of Uniform Traffic Control Devices for Canada.

All speed limits indicated on these signs shall be in 10 km/h increments.

The Maximum Speed Ahead signs shall be placed 150 m to 250 m in advance of a construction speed sign where the speed reduction is more than 10 km/h.

Where the Maximum Speed Ahead sign is positioned in advance of normal temporary condition signage an advance "Construction Ahead" sign must be installed ahead of the speed ahead sign.

At the end of the construction zone, which has a reduced speed limit posted, a speed limit sign shall be posted indicating a return to the normal speed limit on that particular section of highway. This sign may

## FORM 717

be omitted if there exists a permanently installed speed limit sign within 300 m of the end of the reduced speed zone.

Reduced speed limit signs left in place when the work zone condition does not warrant any reduction may be expropriated by the Department of Transportation and Works.

### 717.04 GUIDELINES FOR SPEED LIMITS

The recommended speed limits shown in Table 717.04.01 are provided for geometrics only and judgment must be used to adjust these speeds depending on the surface condition, the proximity and number of workers, equipment, and type of obstruction to the through traffic.

TABLE 717.04.01

CONSTRUCTION ZONE SPEED LIMIT	SIGHT DISTANCE IN EACH DIRECTION
90 KM/H	280 M OR GREATER
80 KM/H	230 M TO 279 M
70 KM/H	200 M TO 229 M
60 KM/H	170 M TO 199 M
50 KM/H	140 M TO 169 M
40 KM/H	110 M TO 139 M
30 KM/H	LESS THAN 109 M

All posted speed limits on construction zones must have prior approval from the Engineer.

### 717.05 BASIS OF PAYMENT

All costs associated with provision and maintenance of construction speed zones to standards as outlined in this section including costs of the signs, handling, installation, materials, and labour shall be paid by the Contractor and no payment shall be considered by the Department of Transportation & Works.

# FORM 720



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 720 PROJECT SIGNS

### INDEX

#### 720.01 SCOPE

#### 720.02 TYPES OF SIGNS

#### 720.03 HANDLING AND ERECTION OF SIGNS

#### 720.04 REMOVAL OF SIGNS

#### 720.05 BASIS OF PAYMENT

#### 720.01 SCOPE

On all construction projects undertaken for the Department of Transportation & Works, the Contractor shall be responsible for erecting two project signs at each work site included in the project, one at each end of the work site, in a location approved by the Engineer. The Contractor is also required to supply and install two warning advisory signs at the beginning of construction zones identifying "FINES DOUBLED IN CONSTRUCTION ZONES MAXIMUM FINE \$1500" as detailed on Section 750.

#### 720.02 TYPES OF SIGNS

The Department of Transportation & Works produces two different types of project signs for use on construction projects:

1. On Provincially funded projects two Provincial signs, 1200mm x 2400mm, each shall be erected.
2. On federally funded projects two Transport Canada signs, 1200mm x 2400mm, each shall be erected.

The Department of Transportation & Works retails custom signage for "FINES DOUBLED IN CONSTRUCTION ZONES MAXIMUM FINE \$1500." Contractors can avail of this source or use another vendor providing signage meeting Department Standards.

#### 720.03 HANDLING AND ERECTION OF SIGNS

These project signs can be picked up by the Contractor at either of the following Department of Transportation & Works depots: White Hills (St. John's), Clarenville, Grand Falls-Windsor or Deer Lake.

These signs shall be erected and installed by the Contractor using proper methods and materials as required for the size of the project signs used, as outlined in Section 580, sign post installations.

After the sign posts are firmly in the ground, the Contractor shall affix the sign to the posts using 9mm x 75mm galvanized lag screws.

#### 720.04 REMOVAL OF SIGNS

After the project is completed, these signs and posts shall be removed by the Department of Transportation & Works without claim from the Contractor.

#### 720.05 BASIS OF PAYMENT

Project signs shall be supplied by the Department of Transportation & Works at no charge to the

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## **FORM 720**

Contractor. However, all handling charges from the depots previously mentioned, to the project and all installation costs for all required project signs shall be the Contractor's responsibility, and no payment shall be considered by the Department of Transportation & Works. "FINES DOUBLED IN CONSTRUCTION ZONES MAXIMUM FINE \$1500." signs can be purchased by the Contractor from the Department but all handling charges from the point of purchase to the project and all installation costs for these signs shall be the Contractor's responsibility, and no payment shall be considered by the Department of Transportation & Works.

**MARCH 2011**



# FORM 730



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 730

### PROCUREMENT AND COST OF SIGNAGE (TEMPORARY)

#### INDEX

#### 730.01 SCOPE

#### 730.02 COST

#### 730.03 PROCUREMENT OF SIGNS

#### 730.01 SCOPE

As previously stated in Section 701.02 no construction work will be permitted to commence until all traffic control devices are erected in position, as shown in this Division and approved by the Engineer.

#### 730.02 COST

All costs associated with temporary condition signing to standards as outlined in Division 7 shall be the responsibility of the Contractor. Costs of the signs, handling, installation, materials, and labour shall be paid by the Contractor and no payment shall be considered by the Department of Works, Services, and Transportation. Project signs shall be supplied by the Department of Works, Services, and Transportation at no charge to the Contractor. However, all handling charges from the depots listed in Section 720 to the project and all installation costs for the project signs shall be the Contractor's responsibility.

#### 730.03 PROCUREMENT OF SIGNS

Temporary Condition signs described in this Division can be purchased from the Department of Works, Services, and Transportation, Sign Shop, White Hills, St. John's.

Orders for signs shall be placed through the Engineer who will complete the sign requisition to Department requirements and verify that the correct signs are being used.

Purchase price for signs will be approximately \$110 per m<sup>2</sup> excluding sales taxes, subject to change without notice.

Contractor's sign orders must include a purchase order number, certified cheque, or money order made payable to the Newfoundland Exchequer Account.

# FORM 750



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 750 TYPICAL APPLICATIONS

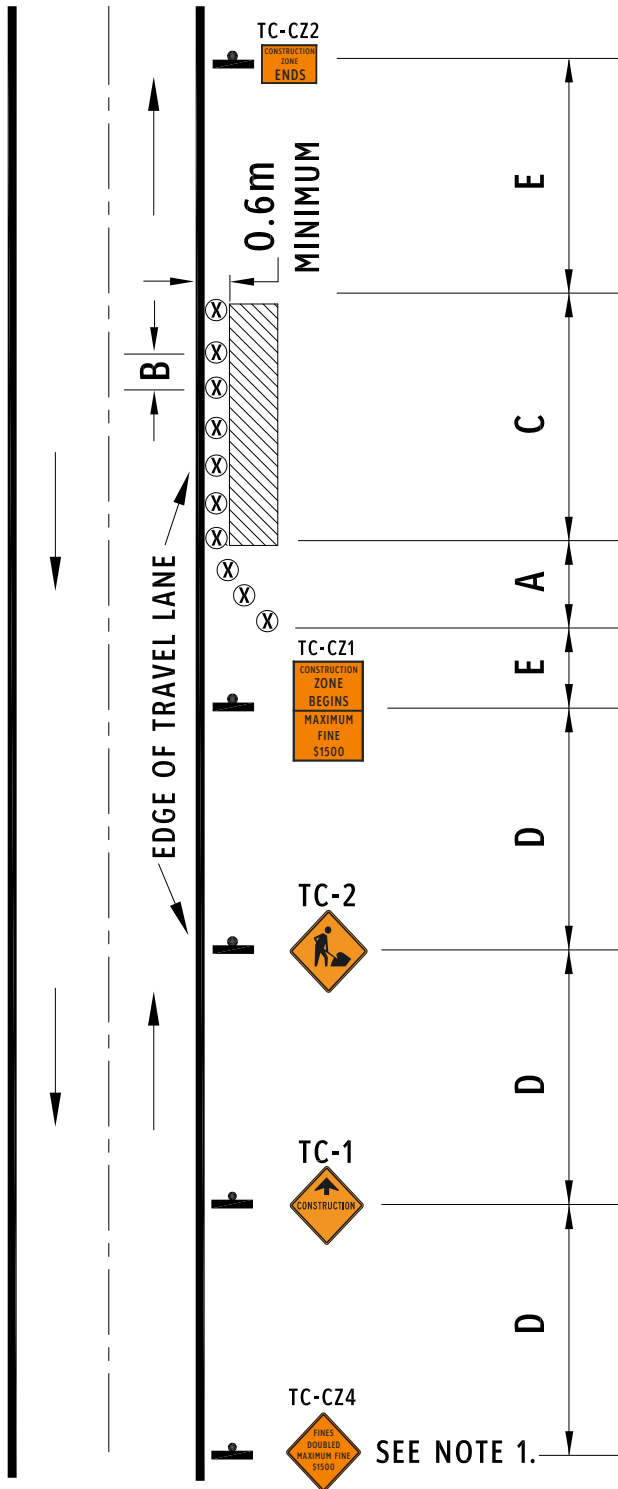
This Section is composed of several examples of various signing arrangements for typical work areas.

FORM		PAGE
750	Work Adjacent to Roadway Two Way Traffic	750-1
751	Work at Edge of Roadway Two Lanes - Two Way Traffic Two Lanes - One Way Traffic	751-1 751-2
752	Lane Closed One Lane Closed - Speed Limit Greater Than 60km/h One Lane Closed - Speed Limit Less Than or Equal to 60 km/h One Lane Closed - Slow Moving Operations One Lane Closed - Long Term Work Center Lane Closed – Speed Limit Less Than 60km/h One Lane Closed - Divided Highway One Lane Closed – Long Term Work Low Volume Roads	752-1 752-2 752-3 752-4 752-5 752-6 752-7
753	Successive Work Areas	753-1
754	Roadside Diversion Two Way Traffic Divided Highway Part A Divided Highway Part B	754-1 754-2 754-3
755	Detour Short Term Work Long Term Work	755-1 755-2
756	Intersecting Roads in Work Areas Speed Limit Greater Than 60km/h Speed Limit Less Than or Equal to 60 km/h	756-1 756-2
757	Positioning of Flagperson On Straight Road and Curve On a Hill Flagperson Instructions	757-1 757-2 757-3
758	Pavement Drop Off	758-1
759	Truck Entrance	759-1
760	Typical Advance Warning & Approach Work Area Signage Typical Advance Warning & Approach Work Area Signage on Construction Projects Typical Advance Warning & Approach Work Area Signage on Construction Projects	760-1 760-2
790	Portable Sign Supports	790-1
799	Traffic Control Manual Construction Distance Table Legend	799-1 799-2

# Traffic Control Manual

2011

## TWO WAY TRAFFIC



**NOTE 1:**  
 WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-CZ4 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-CZ3, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS" PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS", PAGE 4.



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 Highway Maintenance Division

### WORK ADJACENT TO ROADWAY

DRAWN BY: G.Clarke

DATE: May 2010

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# Traffic Control Manual

2011

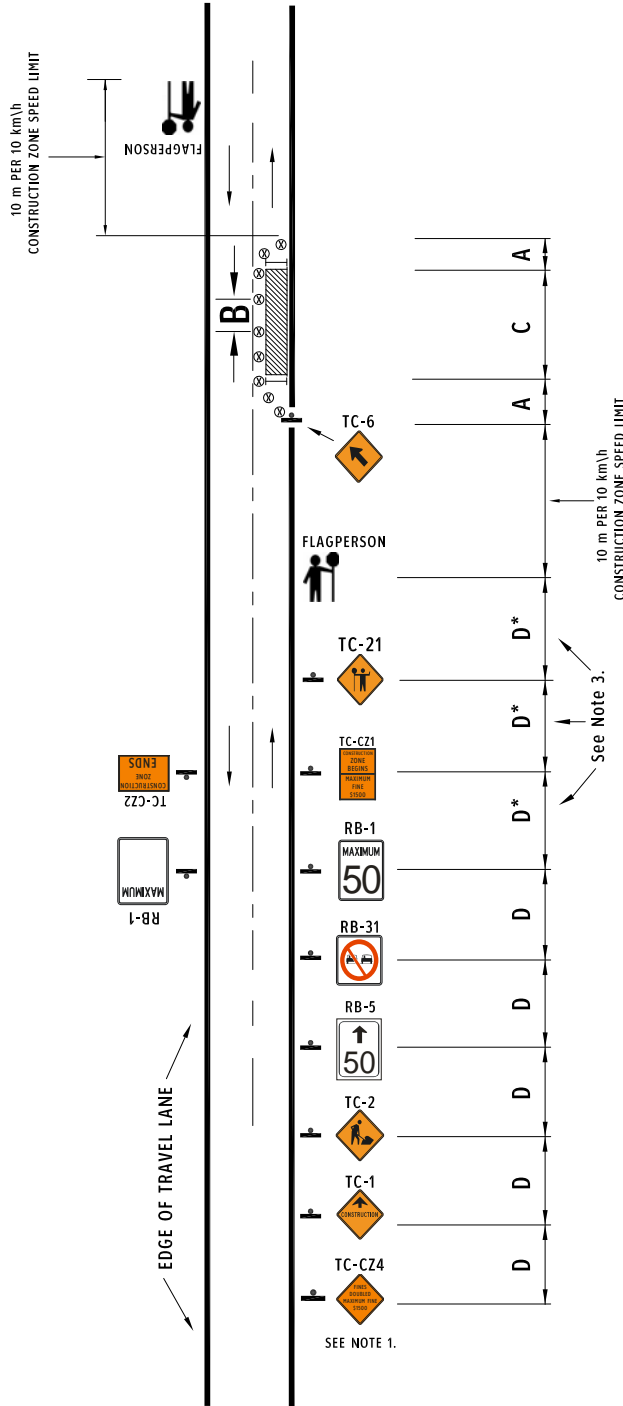
## ONE LANE CLOSED

SPEED LIMITS > 60 km/h

DUPLICATE SIGNS FROM OTHER DIRECTION.

Line of sight shall be maintained between Flagpersons.

( Refer to Drawings 757-1 and/or 757-2 )



- NOTE 1:  
WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-CZ4 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-CZ3, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS", PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS, PAGE 4.
- NOTE 2:  
DURING DARKNESS, WHEN DAILY OPERATIONS HAVE ENDED, THE FLAGPERSONS SHALL BE REPLACED BY PORTABLE TRAFFIC LIGHTS AND THE FLAGPERSON SIGNS, TC-21 SHALL BE REPLACED BY TRAFFIC LIGHTS AHEAD SIGNS, TC-181.
- NOTE 3:  
BASED ON CONSTRUCTION ZONE SPEED LIMIT.



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## LANE CLOSED SPEED LIMIT GREATER THAN 60 km/h

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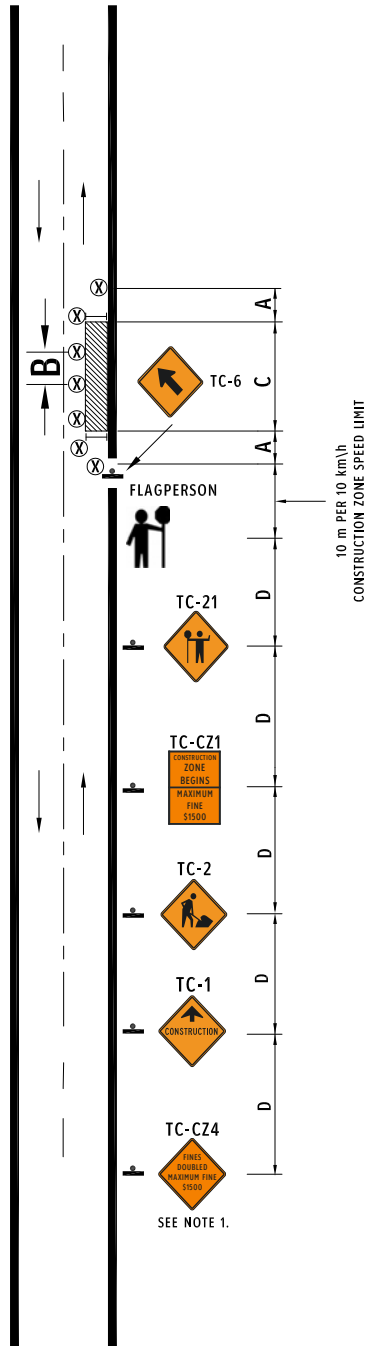
2011

## ONE LANE CLOSED

NORMAL SPEED LIMIT  $\leq$  60 km/h  
 DUPLICATE SIGNS FOR OTHER DIRECTION.

LINE OF SIGHT TO BE MAINTAINED BETWEEN FLAGPERSONS  
 REFER TO DRAWINGS 757-1 AND 757-2

\* LOW TRAFFIC VOLUME IS DEFINED AS  
 LESS THAN 20 VEHICLES IN 3 MINUTES.



NOTE 1: WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-CZ4 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-CZ3, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS", PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS", PAGE 4.

NOTE 2: DURING DARKNESS, WHEN DAILY OPERATIONS HAVE ENDED, THE FLAGPERSONS SHALL BE REPLACED BY PORTABLE TRAFFIC LIGHTS AND THE FLAGPERSON SIGNS, TC-21 SHALL BE REPLACED BY TRAFFIC LIGHTS AHEAD SIGNS, TC-181.



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## LANE CLOSED SPEED LIMIT LESS THAN OR EQUAL TO 60 km/h

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DATE: April 2011 (Rev)

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# Traffic Control Manual

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## ONE LANE CLOSED

SLOW MOVING OPERATIONS

(PAVING SPREADER, CRACK SEALING ETC.)

LINE OF SIGHT TO BE MAINTAINED BETWEEN FLAGPERSONS  
REFER TO DRAWINGS 757-1 & 757-2

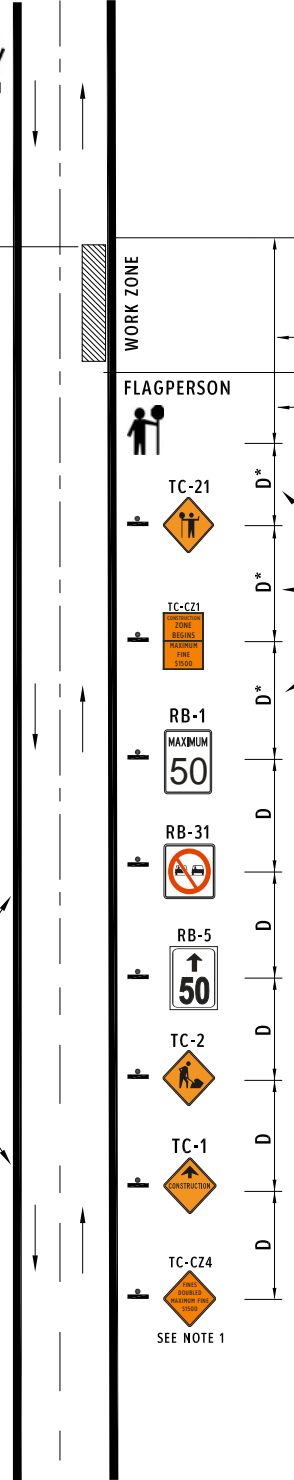
10 m PER 10 km/h CONSTRUCTION ZONE SPEED LIMIT  
TO BE MAINTAINED BETWEEN  
THE FLAGPERSON AND THE WORKSITE  
(MOBILE OPERATION)

NOTE: DUPLICATE SIGNS FROM OTHER DIRECTION

TC-CZ2  
ENDS  
CONSTRUCTION ZONE

RB-1  
MAXIMUM

EDGE OF TRAVEL LANE



10 m PER 10 km/h CONSTRUCTION ZONE SPEED LIMIT  
TO BE MAINTAINED BETWEEN  
THE FLAGPERSON AND THE WORKSITE  
(MOBILE OPERATION)

See Note 2.

- NOTE 1:  
THE SIGN 'FINES DOUBLED IN CONSTRUCTION ZONES - MAXIMUM FINE \$1500' MUST BE INSTALLED ON ALL CONSTRUCTION PROJECTS, JUST IN ADVANCE OF THE TC-1, CONSTRUCTION AHEAD SIGN.
- NOTE 2:  
BASED ON CONSTRUCTION ZONE SPEED LIMIT.



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## LANE CLOSED SLOW MOVING OPERATIONS

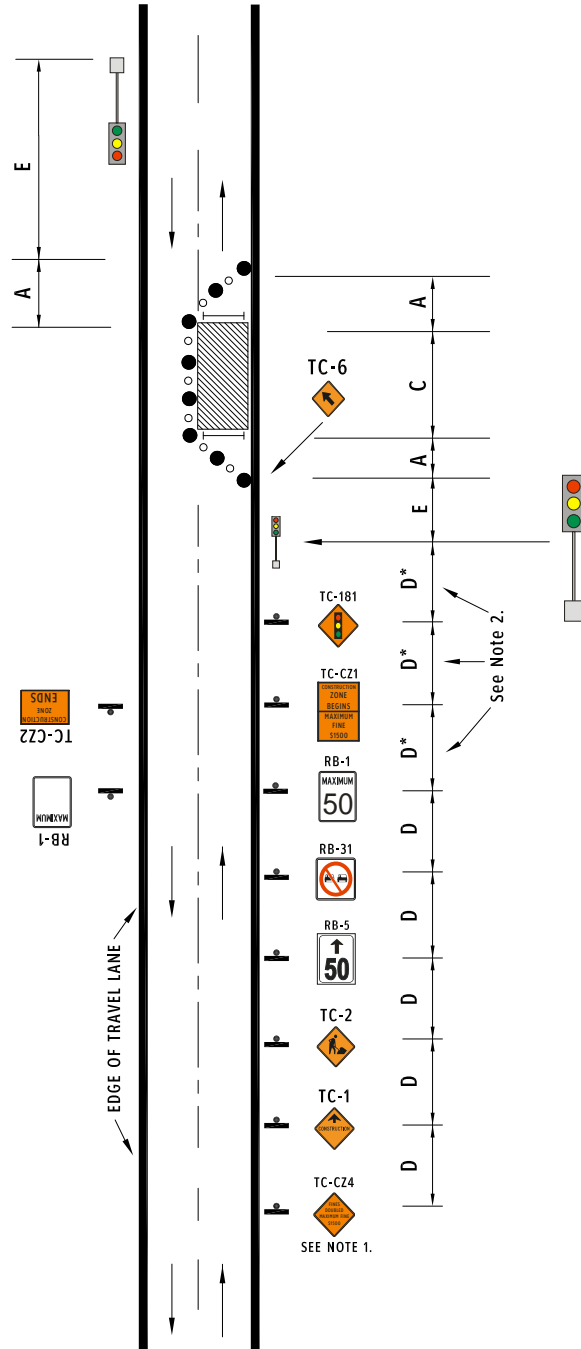
DRAWN BY: G.Clarke      DATE: April 2011 (Rev)      NOT TO SCALE

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## ONE LANE CLOSED

LONG TERM WORK  
USING PORTABLE TRAFFIC LIGHTS  
DUPLICATE SIGNS FROM OTHER DIRECTION



NOTE 1:  
WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-CZ4 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-CZ3, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS", PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS," PAGE 4.

NOTE 2:  
BASED ON CONSTRUCTION ZONE SPEED LIMIT.



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## LANE CLOSED LONG TERM WORK

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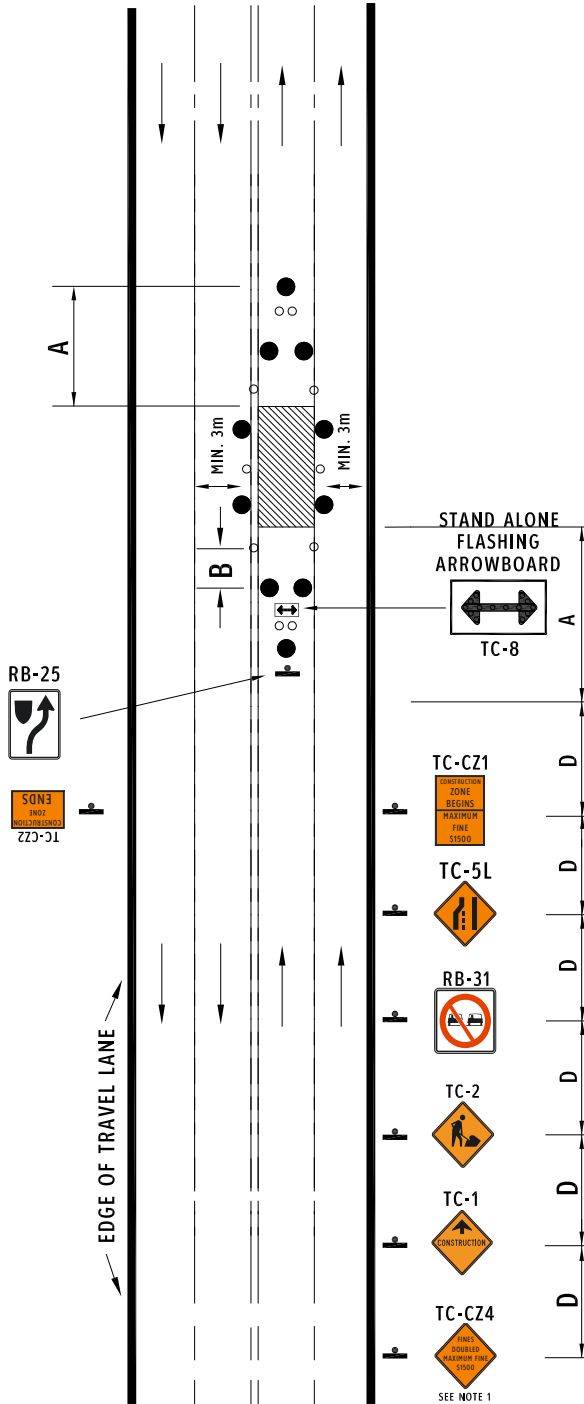
## CENTER LANE CLOSED

SPEED LIMIT < 60 km/h

URBAN STREETS FOUR LANES

TWO WAY TRAFFIC

NOTE: DUPLICATE SIGNS FROM OTHER DIRECTION  
BUT ELIMINATE TC-5L



NOTE 1:  
WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-CZ4 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-CZ3, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS", PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS", PAGE 4.



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## LANE CLOSED CENTRE LANE

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DATE: May 2010

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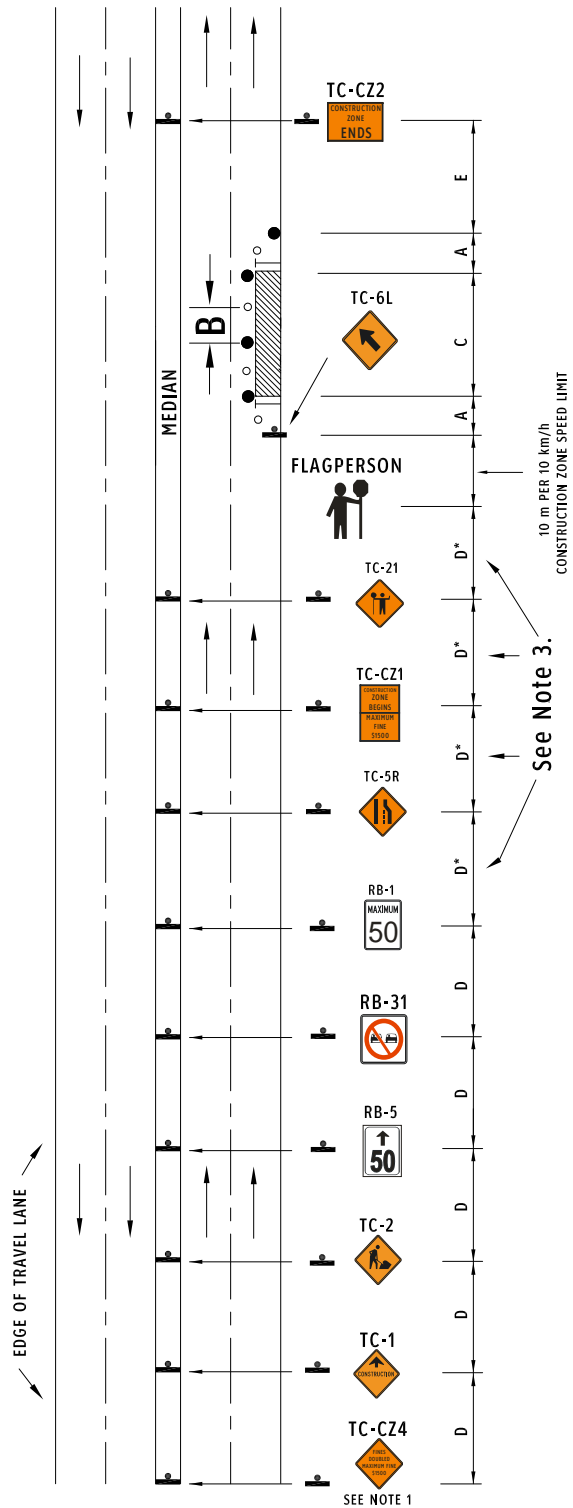
# Traffic Control Manual

2011

## ONE LANE CLOSED DIVIDED HIGHWAY

NOTE: WHEN LEFT LANE IS CLOSED, CHANGE SIGN TC-6L TO TC-6R  
AND CHANGE TC-5R TO TC-5L

NOTE: ALL SIGNS TO BE REPEATED ALONG THE  
LEFT SHOULDER OF THE LEFT LANE.



- NOTE 1:  
WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-CZ4 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-CZ3, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS", PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS", PAGE 4.
- NOTE 2:  
WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK", THE FLAGPERSON AND FLAGPERSON SIGN TC-21, SHALL BE REPLACED BY THE FLASHING ARROWBOARD IN THE TAPER.
- NOTE 3:  
BASED ON CONSTRUCTION ZONE SPEED LIMIT.



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## LANE CLOSED DIVIDED HIGHWAY

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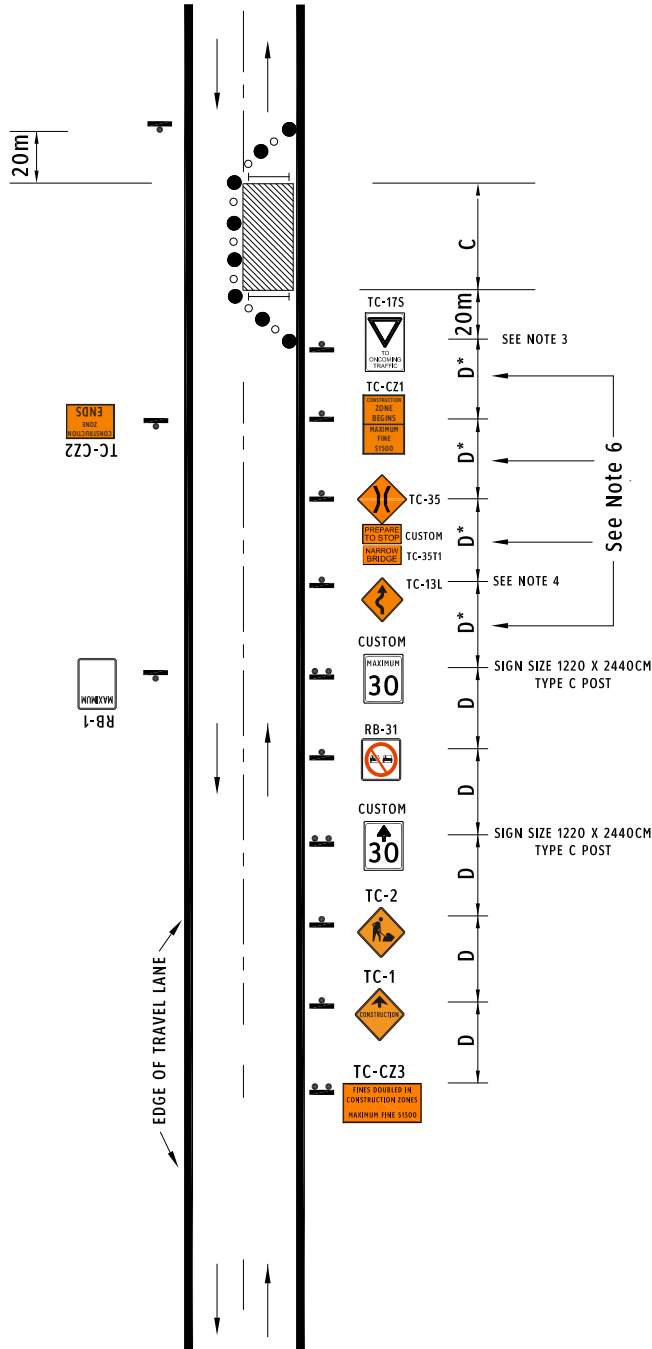
# Traffic Control Manual

2011

## ONE LANE CLOSED

LONG TERM WORK ON HIGHWAYS WITH LOW TRAFFIC VOLUMES

DUPLICATE SIGNS FROM OTHER DIRECTION, BUT CHANGE TC-13L TO TC-13R IF A DIVERSION EXISTS. SEE NOTES 3 AND 4.



**NOTE:**

1. THIS SIGN LAYOUT SHALL BE USED ON ROADWAYS WHERE ONE LANE IS CLOSED FOR LONG TERM WORK AND WHERE TRAFFIC VOLUMES ARE DETERMINED TO BE LOW. IN THESE SITUATIONS, PORTABLE TRAFFIC LIGHTS ARE NOT REQUIRED IF MINIMUM SIGHT DISTANCE IS EXCEEDED BETWEEN THE LAST SIGN IN EACH APPROACH. IF MINIMUM SIGHT DISTANCE IS NOT ACHIEVED, THEN THE SIGN LAYOUT IN DRAWING 752-4 SHALL BE USED, INCLUDING THE USE OF PORTABLE TRAFFIC LIGHTS.
2. ALL SIGNS TO BE INSTALLED AS PER SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS", PAGE 4.
3. THE SIGN TC-17S SHALL ONLY BE PLACED IN ONE DIRECTION, AS DETERMINED BY THE DEPARTMENT'S RESIDENT ENGINEER, IN THE APPROACH WITH THE LEAST SIGHT DISTANCE.
4. SIGN TC-13L AND TC-13R ARE ONLY REQUIRED IF THE ONE LANE SECTION FORMS A DIVERSION AROUND THE WORK ZONE.
5. IF A BAILEY BRIDGE IS USED, BRIDGE END MARKERS WA-36AL AND WA-36AR SHALL BE INSTALLED AT THE FOUR BRIDGE ENDS.
6. BASED ON CONSTRUCTION ZONE SPEED LIMIT.



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## LANE CLOSED LONG TERM WORK - LOW VOLUME ROADS

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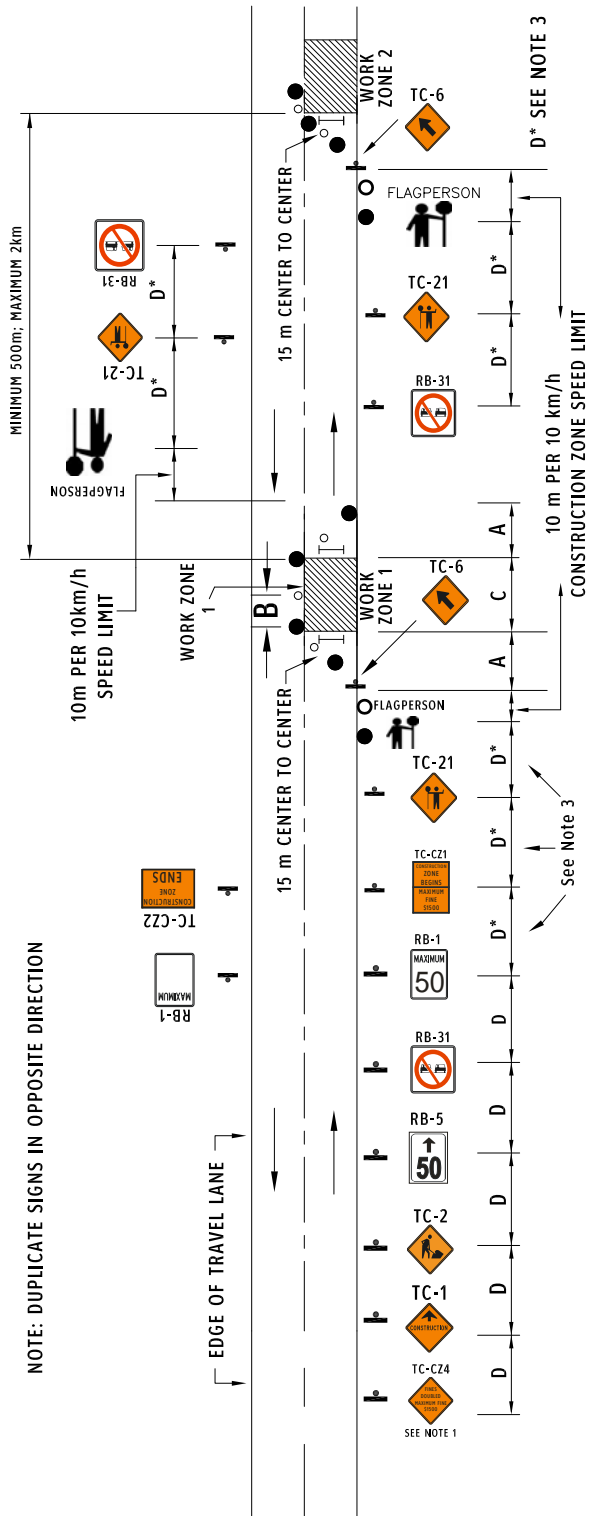
DATE: April 2011 (Rev)

NOT TO SCALE

# Traffic Control Manual

2011

## ONE LANE CLOSED TWO WAY TRAFFIC



- NOTE:
- WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-C24 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-C23, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS", PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS", PAGE 4.
  - THIS LAYOUT APPLIES WHEN THE DISTANCE BETWEEN SUCCESSIVE AREAS IS OVER 500m, the entire operation shall be considered as a single work area. WHEN THE DISTANCE IS 2km OR GREATER, IT SHALL BE CONSIDERED AS A SEPARATE WORK AREA, AND SIGNED WITH ALL APPROACH SIGNING.
  - BASED ON CONSTRUCTION ZONE SPEED LIMIT.



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### SUCCESSIVE WORK AREAS

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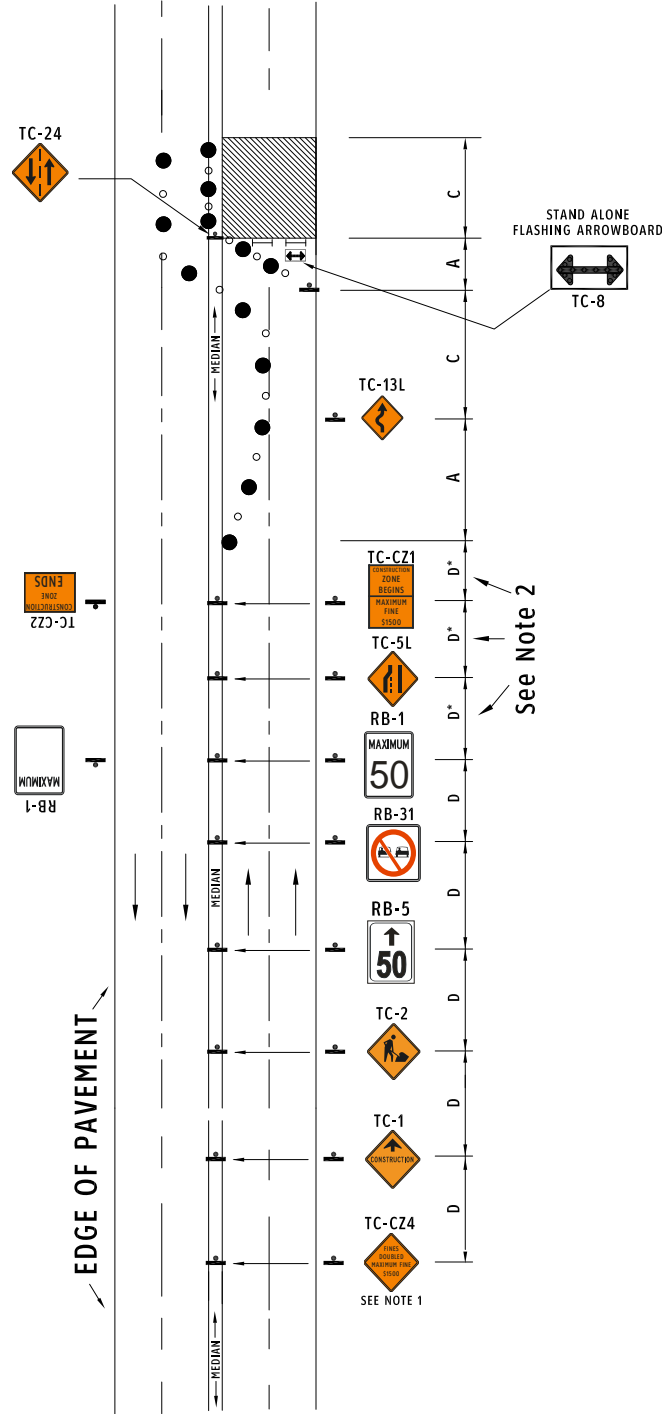


# Traffic Control Manual

2011

## DIVIDED HIGHWAY PART A

(SEE PART B FOR SIGNING IN OPPOSITE DIRECTION)



NOTE 1: WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-CZ4 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-CZ3, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS", PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS", PAGE 4.

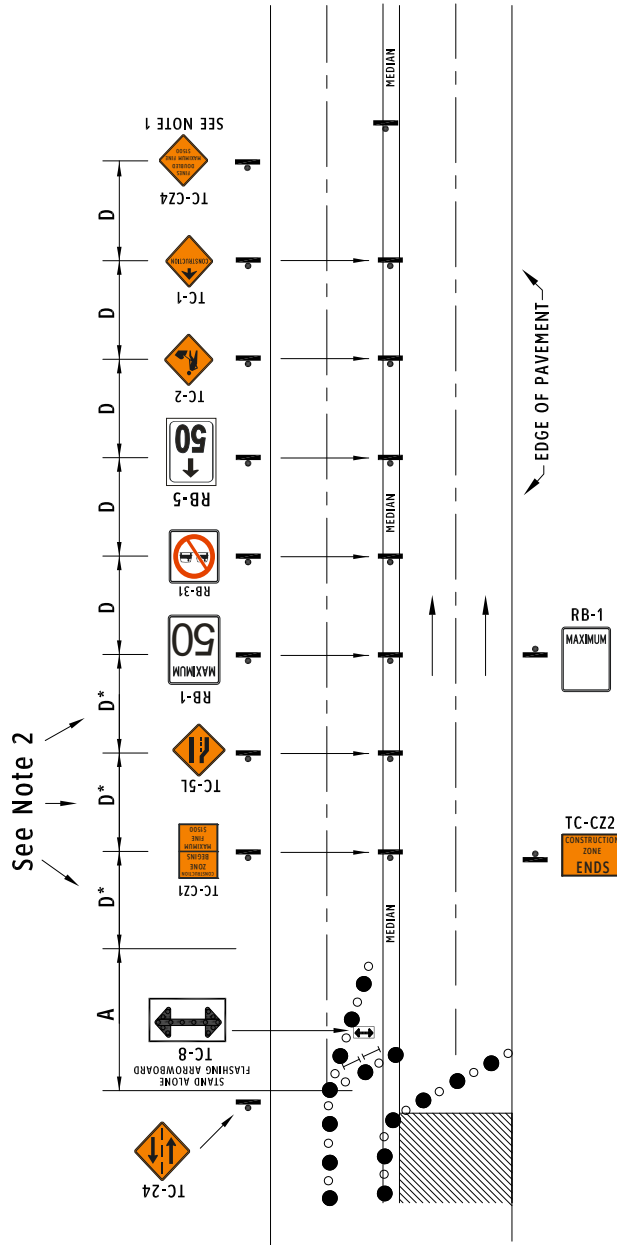
NOTE 2: BASED ON CONSTRUCTION ZONE SPEED LIMIT.

# Traffic Control Manual

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## DIVIDED HIGHWAY PART B

(SEE PART A FOR SIGNING IN OPPOSITE DIRECTION)



NOTE 1:  
WHERE THE DURATION OF THIS ACTIVITY IS DEFINED AS "LONG TERM WORK," SIGN TC-C24 SHALL BE REPLACED BY THE LARGER (1200 X 2400mm) TC-C23, AND INSTALLED AS PER SECTION "PORTABLE OR REMOVABLE SIGN SUPPORTS WITH FLAGS", PAGE 3 AS WELL AS SECTION "PERMANENTLY INSTALLED TEMPORARY CONDITION SIGN SUPPORTS", PAGE 4.

NOTE 2:  
BASED ON CONSTRUCTION ZONE SPEED LIMIT.



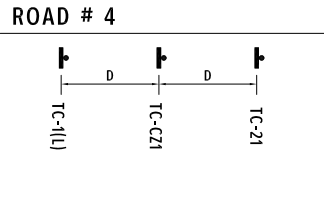




# Traffic Control Manual

2011

ADD A TC-1(L) (with left arrow), A TC-CZ1 AND A TC-21 TO INTERSECTING ROAD 4.

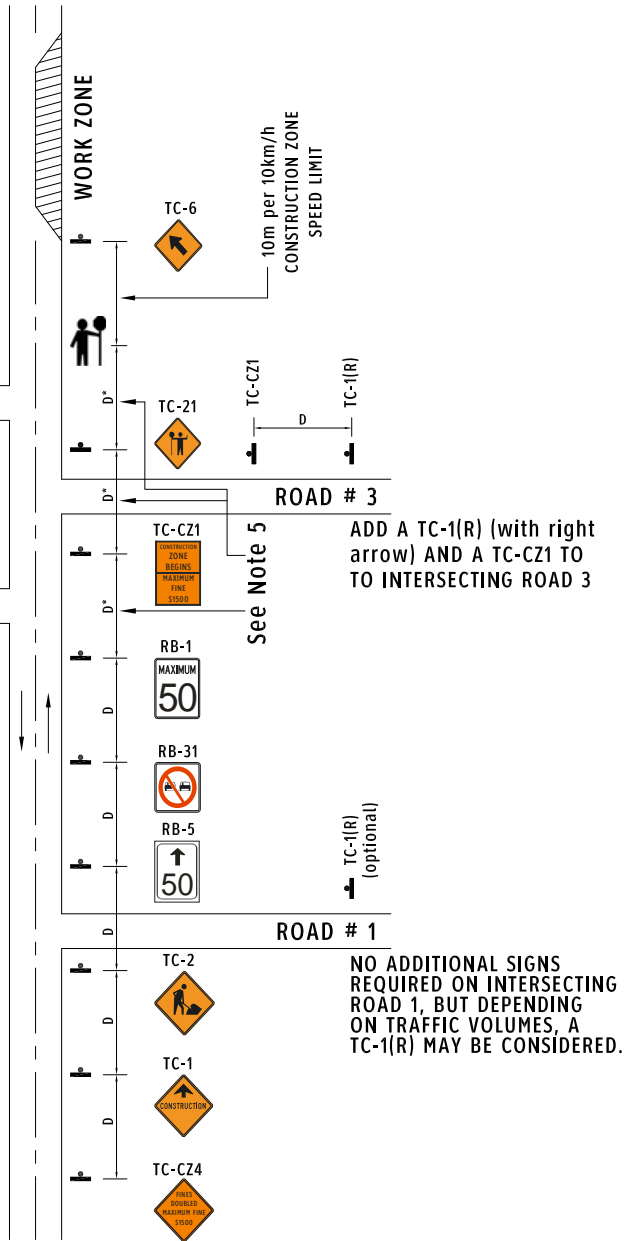


ADD A TC-1(L) (with left arrow) TO INTERSECTING ROAD 2.



**NOTE:**

1. THIS DIAGRAM IS AN EXAMPLE ONLY, USING LANE CLOSED DRAWING 752-1, WHERE INTERSECTING ROADS MAY EXIST WITHIN THE APPROACH SIGNAGE.
2. SOUND ENGINEERING JUDGEMENT SHALL BE USED TO DETERMINE IF ADDITIONAL SIGNS ARE REQUIRED.
3. THE SPACING BETWEEN SIGNS ARE DETERMINED BY THE CONSTRUCTION DISTANCE TABLE. SEE DRAWING 799-1.
4. THIS DIAGRAM APPLIES TO LONG TERM WORK SITUATIONS. THE SIGNING OF INTERSECTING ROADS FOR SHORT TERM WORK AND VERY SHORT TERM WORK SITUATIONS, SHALL BE DETERMINED USING SOUND ENGINEERING JUDGEMENT.
5. BASED ON CONSTRUCTION ZONE SPEED LIMIT.



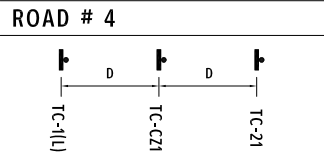
ADD A TC-1(R) (with right arrow) AND A TC-CZ1 TO INTERSECTING ROAD 3

NO ADDITIONAL SIGNS REQUIRED ON INTERSECTING ROAD 1, BUT DEPENDING ON TRAFFIC VOLUMES, A TC-1(R) MAY BE CONSIDERED.

# Traffic Control Manual

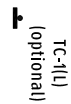
2011

ADD A TC-1(L) (with left arrow), A TC-CZ1 AND A TC-21 TO INTERSECTING ROAD 4



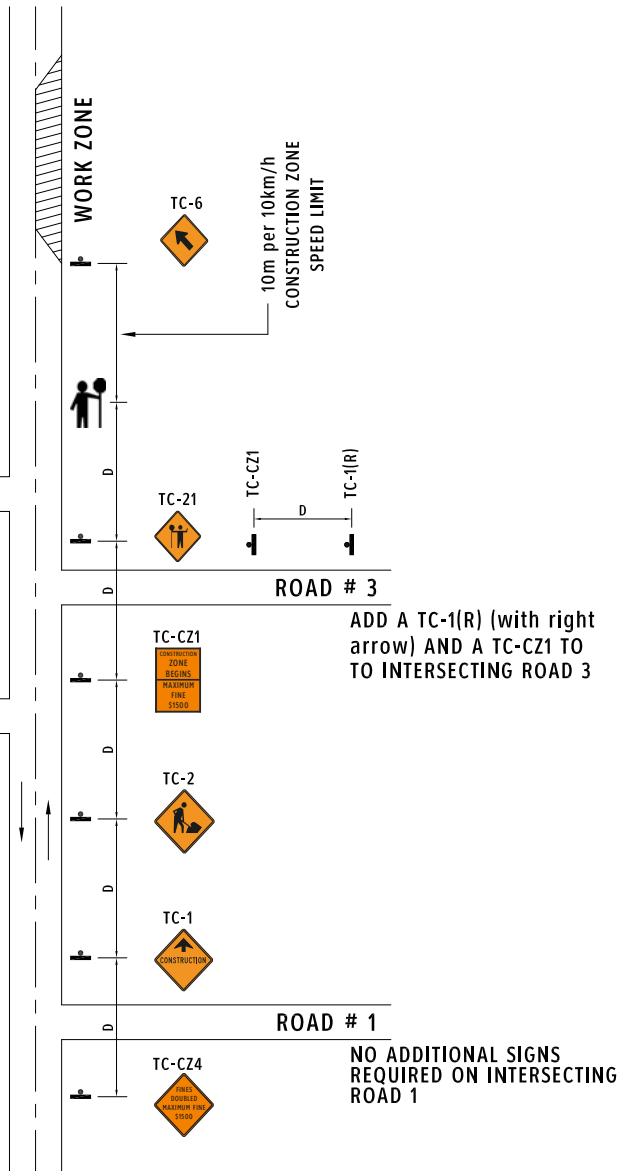
ROAD # 2

NO ADDITIONAL SIGNS REQUIRED ON INTERSECTING ROAD 1, BUT DEPENDING ON TRAFFIC VOLUMES, A TC-1(L) MAY BE CONSIDERED.



**NOTE:**

1. THIS DIAGRAM IS AN EXAMPLE ONLY, USING LANE CLOSED DRAWING 752-2, WHERE INTERSECTING ROADS MAY EXIST WITHIN THE APPROACH SIGNAGE.
2. SOUND ENGINEERING JUDGEMENT SHALL BE USED TO DETERMINE IF ADDITIONAL SIGNS ARE REQUIRED.
3. THE SPACING BETWEEN SIGNS ARE DETERMINED BY THE CONSTRUCTION DISTANCE TABLE. SEE DRAWING 799-1.
4. THIS DIAGRAM APPLIES TO LONG TERM WORK SITUATIONS. THE SIGNING OF INTERSECTING ROADS FOR SHORT TERM WORK AND VERY SHORT TERM WORK SITUATIONS, SHALL BE DETERMINED USING SOUND ENGINEERING JUDGEMENT.



ADD A TC-1(R) (with right arrow) AND A TC-CZ1 TO INTERSECTING ROAD 3

NO ADDITIONAL SIGNS REQUIRED ON INTERSECTING ROAD 1



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Highway Maintenance Division

## INTERSECTING ROADS IN WORK AREAS

SPEED LIMIT <= 60km/h

DRAWN BY: G. Clarke

DATE: April 2011 (Rev)

NOT TO SCALE

# Traffic Control Manual

2011

## ON STRAIGHT ROAD AND CURVE

**NOTE: 1**

ON CURVES AND HILLS WHERE THREE FLAGPERSONS ARE REQUIRED, THE DUTY OF FLAGPERSON NUMBER 2 IS TO RELAY SIGNALS BETWEEN FLAGPERSON NUMBER 1 AND FLAGPERSON NUMBER 3.

**NOTE: 2**

LINE OF SIGHT MUST BE MAINTAINED BETWEEN TWO CONSECUTIVE FLAGPERSONS.

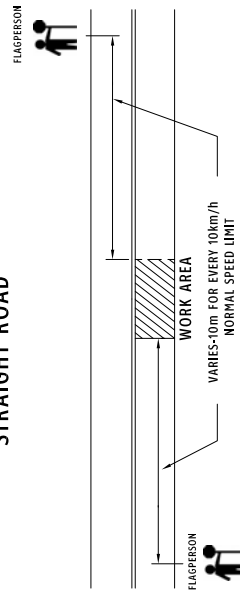
**NOTE: 3**

ALL FLAGPERSON ACTIVITIES SHALL NOT COMMENCE UNTIL ALL SIGNS ARE IN PLACE.

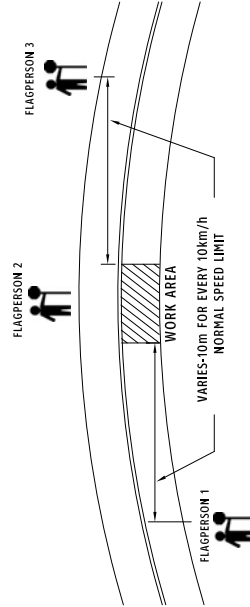
**NOTE: 4**

THE INTERMEDIATE FLAGPERSON MAY BE ELIMINATED IF PROPER ELECTRONIC COMMUNICATION IS PROVIDED TO THE FLAGPERSONS.

**STRAIGHT ROAD**



**CURVE**



# Traffic Control Manual

2011

## ON A HILL

**NOTE: 1**

ON CURVES AND HILLS WHERE THREE FLAGPERSONS ARE REQUIRED, THE DUTY OF FLAGPERSON NUMBER 2 IS TO RELAY SIGNALS BETWEEN FLAGPERSON NUMBER 1 AND FLAGPERSON NUMBER 3.

**NOTE: 2**

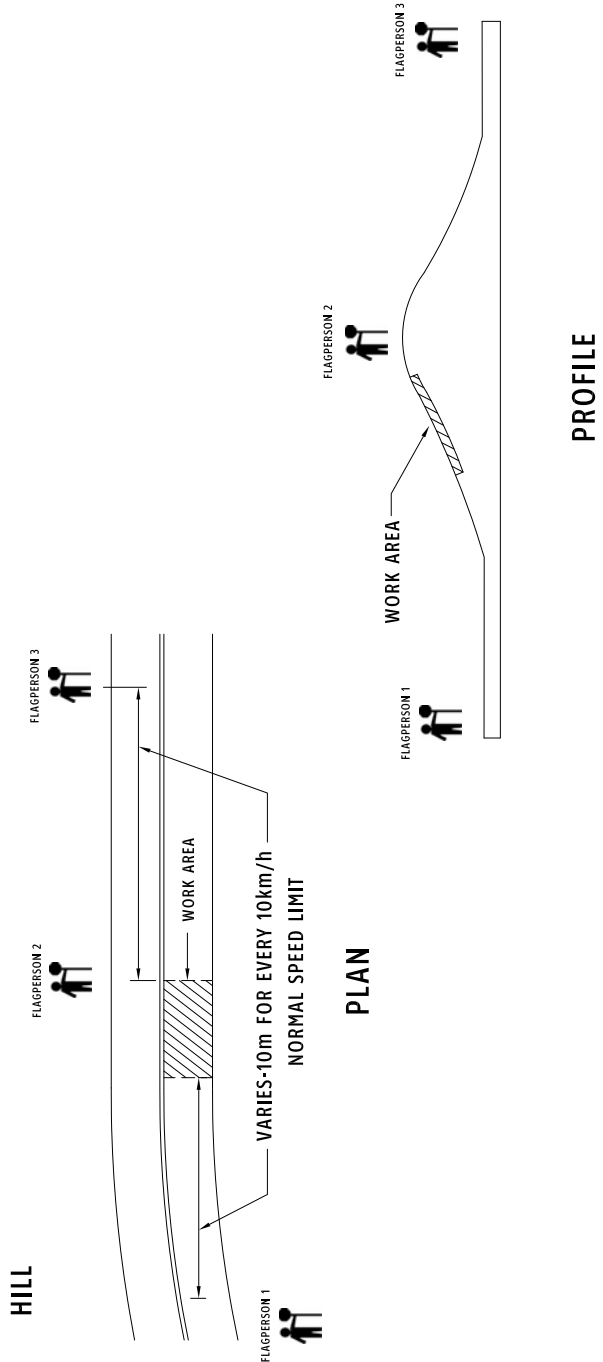
LINE OF SIGHT MUST BE MAINTAINED BETWEEN TWO CONSECUTIVE FLAGPERSONS.

**NOTE: 3**

ALL FLAGPERSON ACTIVITIES SHALL NOT COMMENCE UNTIL ALL SIGNS ARE IN PLACE.

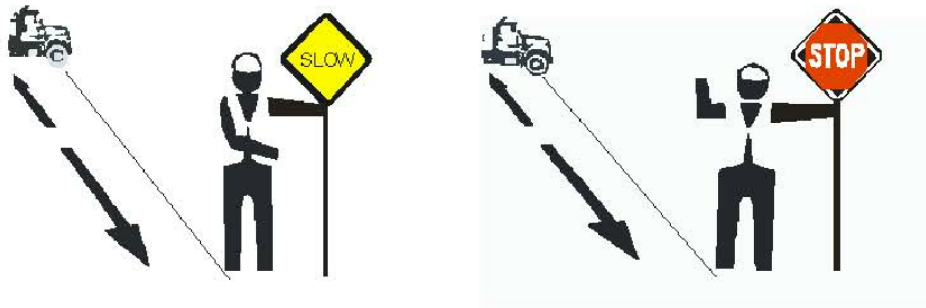
**NOTE: 4**

THE INTERMEDIATE FLAGPERSON MAY BE ELIMINATED IF PROPER ELECTRONIC COMMUNICATION IS PROVIDED TO THE FLAGPERSONS.



## WHERE TO STAND

1. Stand outside the lane of traffic.
2. Stand 10 m per 10 km/h of the construction zone speed limit from the working area, so as to be able to protect personnel, equipment and motorists.
3. Stand where you can see and be seen by approaching traffic.



## REMEMBER TO WEAR PROTECTIVE CLOTHING

1. A Hard Hat.
2. A vest or other apparel which shall be reflective fluorescent and coloured blaze orange or red.
3. Safety Footwear.
4. Hearing Protection.
5. Eye Protection.

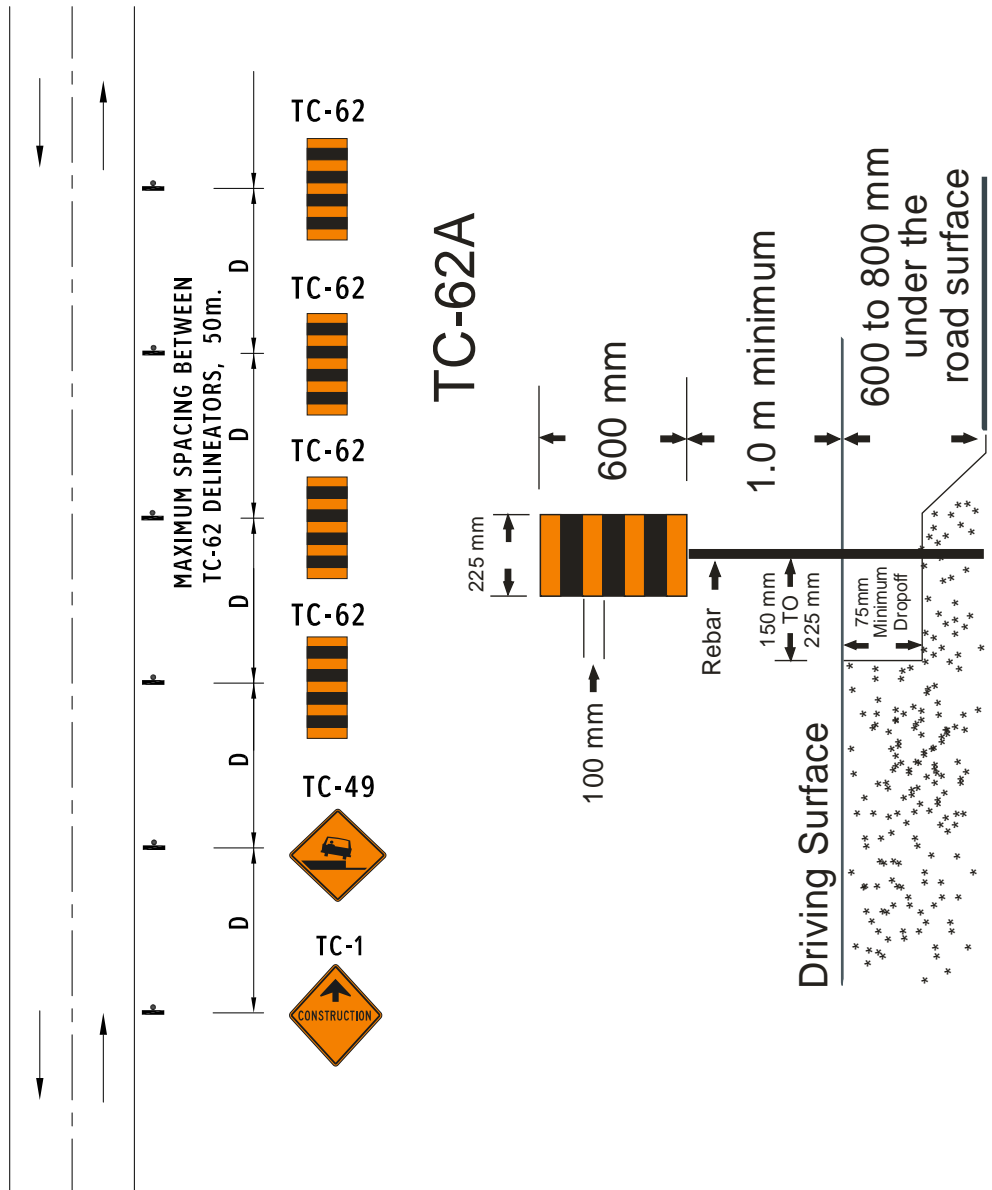
All items (1 thru 5) must be C.S.A. Approved.

DO NOT OPERATE ANY DEVICE THAT IMPEDES SIGHT OR HEARING.

# Traffic Control Manual

2011

## PAVEMENT DROP OFF



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Department of  
Transportation and Works  
Highway Maintenance Division

## PAVEMENT DROP OFF

DRAWN BY: G. Clarke

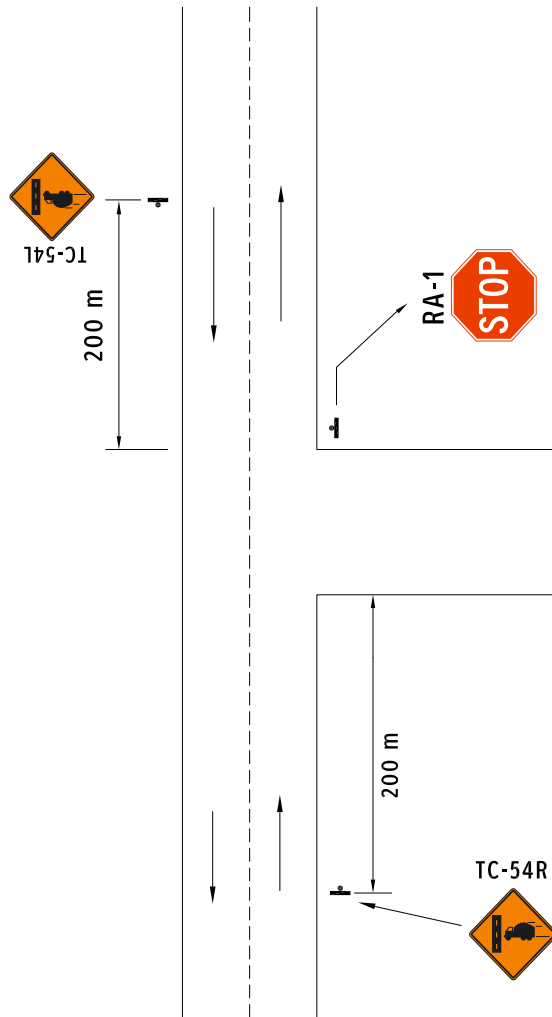
DATE: April 2011 (Rev)

NOT TO SCALE

# Traffic Control Manual

2011

## TRUCK ENTRANCE



FLAGPERSON CONTROL AS PER SECTION 715.05 (G) OR (H)  
OF THE DEPARTMENTS SPECIFICATION BOOK



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## TRUCK ENTRANCE

DRAWN BY: G. Clarke

DATE: May 2010

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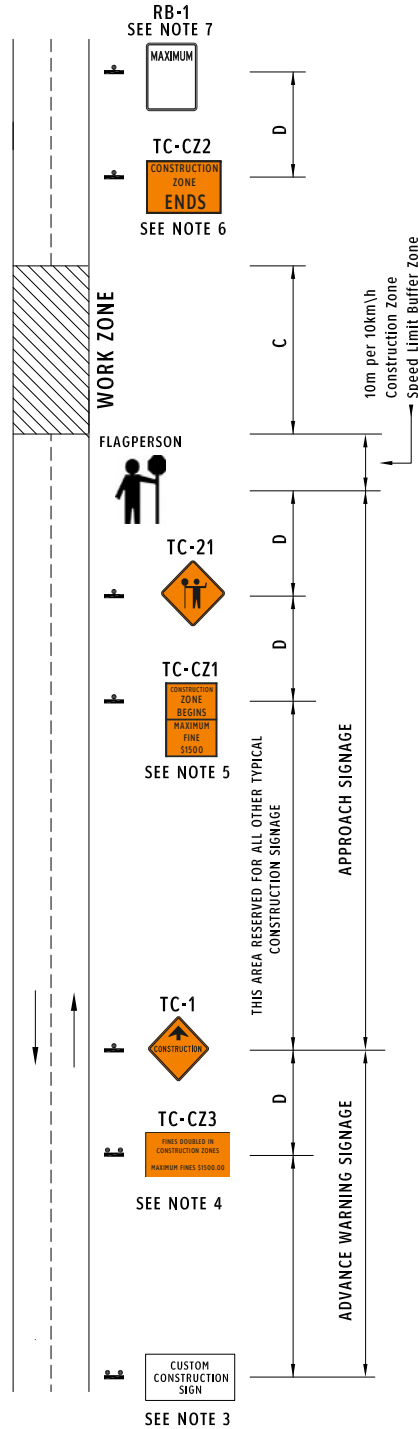


# Traffic Control Manual

2011

## ADVANCE WARNING & APPROACH SIGNAGE

NOTE: DUPLICATE SIGNS FROM OTHER DIRECTION



**NOTE:**

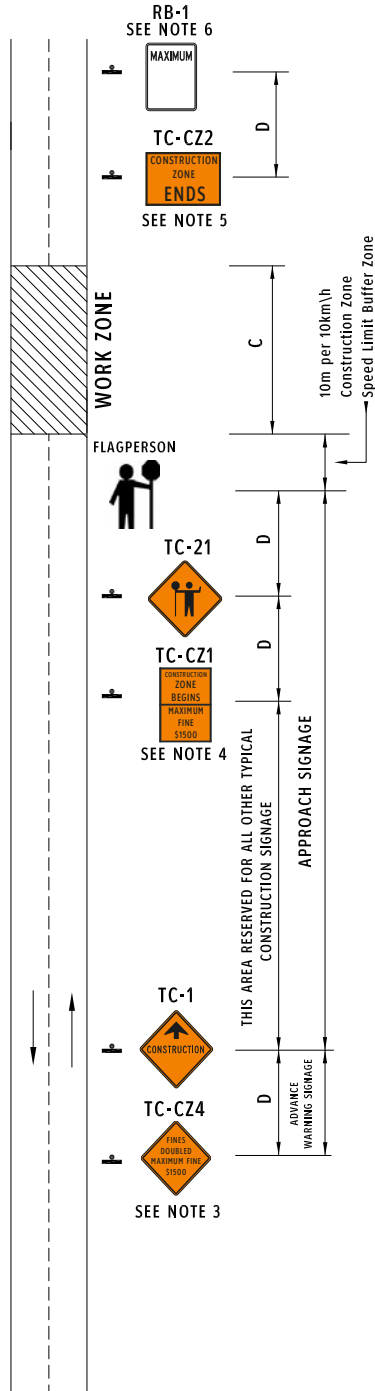
1. ALL CONSTRUCTION OPERATIONS MUST BE SIGNED IN ACCORDANCE WITH TYPICAL SIGN LAYOUTS AS SHOWN IN EITHER THE DEPARTMENT'S SPECIFICATIONS MANUAL, OR THE TRAFFIC CONTROL MANUAL FOR ROADWAY WORK OPERATIONS, FIELD EDITION.
2. ANY SPACINGS NOTED ON THE ABOVE DIAGRAM, SUCH AS 'D' OR 'C', REFER TO THE CONSTRUCTION DISTANCE TABLES, PAGE 98.
3. A LARGER CUSTOMIZED SIGN, MAY BE REQUIRED ON MAJOR TRUNK
4. THE SIGN 'FINES DOUBLED IN CONSTRUCTION ZONES - MAXIMUM FINE \$1500' MUST BE INSTALLED ON ALL CONSTRUCTION PROJECTS, JUST IN ADVANCE OF THE TC-1, CONSTRUCTION AHEAD SIGN.
5. THE SIGN 'CONSTRUCTION ZONE BEGINS - MAXIMUM FINE \$1500' MUST BE INSTALLED AS THE LAST SIGN IN THE SEQUENCE OF TYPICAL CONSTRUCTION SIGNS, EXCEPT WHERE FLAGPERSONS OR PORTABLE TRAFFIC LIGHTS ARE REQUIRED. IN THESE CASES, THIS 'CONSTRUCTION ZONE BEGINS - MAXIMUM FINE \$1500' SIGN MUST BE INSTALLED JUST PRIOR TO THE TC-21 FLAGPERSON SIGN OR THE TC-181 TRAFFIC LIGHT SIGN.
6. THE SIGN 'CONSTRUCTION ZONE ENDS' MUST BE INSTALLED FOLLOWING THE END OF EACH CONSTRUCTION ZONE, DIRECTLY ACROSS FROM THE TC-CZ1 THAT IS INSTALLED IN THE OPPOSITE DIRECTION.
7. A RB-1 MAXIMUM SPEED LIMIT SIGN IS REQUIRED TO RETURN REGULAR OPERATING SPEED LIMIT, IF THE SPEED LIMIT HAS BEEN REDUCED THROUGH THE CONSTRUCTION ZONE.
8. THE FINAL PLACEMENT OF ALL CONSTRUCTION SIGNS AND ANY ADDITIONAL SIGNS, INCLUDING SIGNS ON INTERSECTING ROADS WITHIN THE CONSTRUCTION ZONE, WILL BE DETERMINED BY THE USER'S REPRESENTATIVE AND BASED ON SOUND ENGINEERING PRACTICES.

# Traffic Control Manual

2011

## ADVANCE WARNING & APPROACH SIGNAGE

NOTE: DUPLICATE SIGNS FROM OTHER DIRECTION



**NOTE:**

1. ALL CONSTRUCTION OPERATIONS MUST BE SIGNED IN ACCORDANCE WITH TYPICAL SIGN LAYOUTS AS SHOWN IN EITHER THE DEPARTMENT'S SPECIFICATIONS MANUAL OR THE TRAFFIC CONTROL MANUAL FOR ROADWAY WORK OPERATIONS, FIELD EDITION.
2. ANY SPACINGS NOTED ON THE ABOVE DIAGRAM, SUCH AS 'D' OR 'C', REFER TO THE CONSTRUCTION DISTANCE TABLES, PAGE 98.
3. THE SIGN 'FINES DOUBLED IN CONSTRUCTION ZONES - MAXIMUM FINE \$1500' MUST BE INSTALLED ON ALL CONSTRUCTION PROJECTS, JUST IN ADVANCE OF THE TC-1, CONSTRUCTION AHEAD SIGN.
4. THE SIGN 'CONSTRUCTION ZONE BEGINS - MAXIMUM FINE \$1500' MUST BE INSTALLED AS THE LAST SIGN IN THE SEQUENCE OF TYPICAL CONSTRUCTION SIGNS, EXCEPT WHERE FLAGPERSONS OR PORTABLE TRAFFIC LIGHTS ARE REQUIRED. IN THESE CASES, THIS 'CONSTRUCTION ZONE BEGINS - MAXIMUM FINE \$1500' SIGN MUST BE INSTALLED JUST PRIOR TO THE TC-21 FLAGPERSON SIGN OR THE TC-181 TRAFFIC LIGHT SIGN.
5. THE SIGN 'CONSTRUCTION ZONE ENDS' MUST BE INSTALLED FOLLOWING THE END OF EACH CONSTRUCTION ZONE, DIRECTLY ACROSS FROM THE TC-CZ1 THAT IS INSTALLED IN THE OPPOSITE DIRECTION.
6. A RB-1 MAXIMUM SPEED LIMIT SIGN IS REQUIRED TO RETURN REGULAR OPERATING SPEED LIMIT, IF THE SPEED LIMIT HAS BEEN REDUCED THROUGH THE CONSTRUCTION ZONE.
7. THE FINAL PLACEMENT OF ALL CONSTRUCTION SIGNS AND ANY ADDITIONAL SIGNS, INCLUDING SIGNS ON INTERSECTING ROADS WITHIN THE CONSTRUCTION ZONE, WILL BE DETERMINED BY THE USER'S REPRESENTATIVE AND BASED ON SOUND ENGINEERING PRACTICES.



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Highway Maintenance Division

### TYPICAL ADVANCE WARNING & APPROACH WORK AREA SIGNAGE ON MAINTENANCE PROJECTS

DRAWN BY: G. Clarke

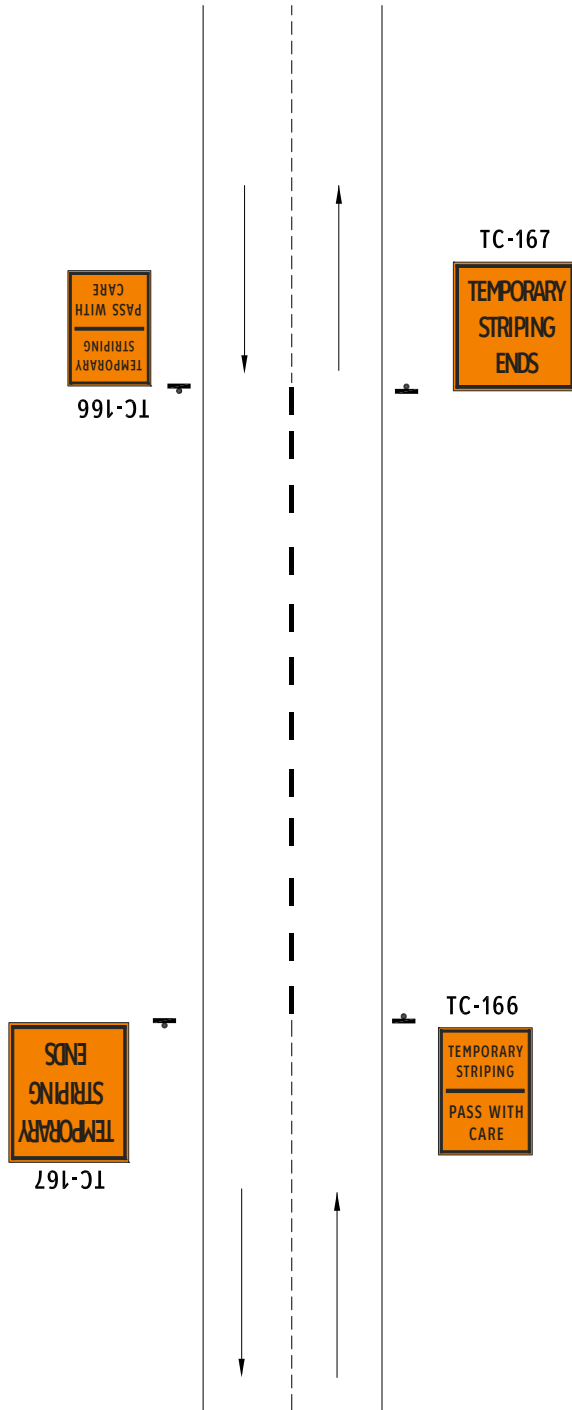
DATE: April 2011 (Rev)

NOT TO SCALE

# Traffic Control Manual

2011

## TEMPORARY STRIPING APPLICATION



Government of  
Newfoundland and Labrador  
Department of  
Transportation and Works  
Highway Maintenance Division

## TEMPORARY STRIPING SIGNING

DRAWN BY: G. Clarke

DATE: May 2010

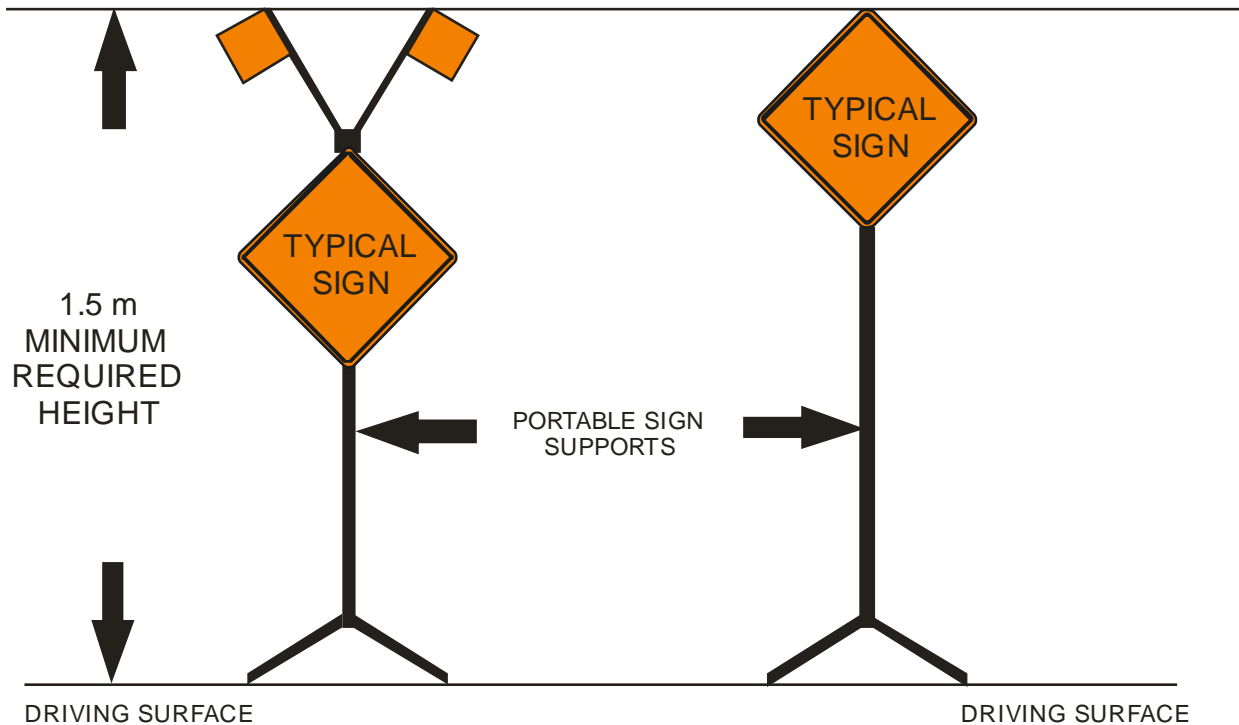
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# Traffic Control Manual

2011

MINIMUM HEIGHT  
ACHIEVED WITH  
FLAGS

MINIMUM HEIGHT  
ACHIEVED  
WITHOUT FLAGS



# Traffic Control Manual

2011

## TIMING OF PORTABLE TRAFFIC LIGHTS

SERVICE VOLUME AT SIGNALIZED SINGLE LANE CONSTRUCTION SITES  
VEHICLES PER HOUR - ON WAY TRAFFIC

Length of Single Lane (m)	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	360
All Red Interval One Way (sec)	2	4	6	9	11	13	15	17	19	22	24	26	28	30	32	35	37	39	41	43	45	47	50	52
	150	810	785	760	725	700	675	650	625	605	570	545	520	495	470	450	390	370	345	325	300	275	245	220
	140	800	775	750	710	685	660	635	610	580	545	520	490	470	445	420	380	360	335	310	285	260	235	200
	130	795	765	735	695	670	640	610	585	560	520	490	465	440	410	385	345	320	290	270	240	215	195	175
	120	785	755	725	680	650	620	590	560	535	490	460	430	405	375	345	305	275	250	220				
	110	775	740	710	660	630	595	565	530	500	460	425	395	360	330	300	255							
	100	760	725	690	640	600	570	535	500	465	415	380	345	315	285									
	90	754	710	670	615	575	540	500	460	420	365	330	295											
	85	740	700	660	600	560	520	480	440	395	340	305												
	80	730	690	645	585	545	500	455	410	370	315													
	75	725	680	630	565	520	475	430	385	340														
	70	715	670	620	545	500	450	405	360															
	65	705	650	600	620	470	420	370																
	60	695	635	580	495	440																		
	55	675	610	555	470																			
	50	660	595	530																				
	45	640	570																					
	40	625																						

Cycle Length (seconds)

**EXAMPLE**

Given: Heaviest Approach Volume, One Way = 365 v/hr  
Length of Single Lane Section = 150m

Find: Length of Green Interval, One Direction  
Length of All Red Interval

Solution: By Applying the given figures to the table,  
We Find:  
a) Cycle Length = 90s  
b) All Red Interval = 22s  
c) Green Interval for Each Approach =  
 $(\text{Cycle Length} - (2 \times \text{All Red})) / 2 = 20s$   
 $(90 - (2 \times 22)) / 2 = 20s$

- NOTES:**
1. Operating Speed of 25km/h
  2. Minimum Green 15 seconds
  3. Amber is 3 seconds
  4. Base on 50% Probability



Government of Newfoundland and Labrador  
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Highway Maintenance Division

### TIMING OF PORTABLE TRAFFIC LIGHTS

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# Traffic Control Manual

2011

## CONSTRUCTION DISTANCE TABLE

	REGULATORY SPEED LIMIT	50 km\h & LESS	60-70 km\h	80 km\h	90-100 km/h
<b>A</b>	TAPER LANE (m)	30	60	120	180
<b>B</b>	MAXIMUM DELINEATOR SPACING IN TAPER\TANGENT (m)	5/8	8/10	10/15	15/20
<b>C</b>	MIN. TANGENT BETWEEN TAPERS (m)	50	100	150	240
<b>D</b>	DISTANCE BETWEEN CONSTRUCTION SIGNS	50	75	100	150
<b>E</b>	BUFFER AREA (m)	35	50	75	75



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Highway Maintenance Division

### CONSTRUCTION DISTANCE TABLE

DRAWN BY: G. Clarke









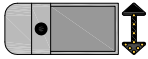

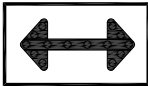

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# Traffic Control Manual

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## LEGEND

	Work Area
	Sign
	Sign
	Delineator
	Traffic Cones or Delineator Posts
	Chevron
	Barrels
	Barricade
	Control Vehicle
	Service Vehicle
	Stand Alone Flashing Arrow Board (TC-8)
	Vehicle Mounted Flashing Arrow Signals for Control Vehicles (TC-9)

## FORM 800



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### DIVISION 8 GENERAL ENVIRONMENTAL REQUIREMENTS

#### INDEX

<b>Section</b>		<b>Number of Pages</b>
800	Index	1
801	Owner's Policy	1
805	Contractor's Responsibilities - Regulatory Agencies	2
810	Use of Herbicides for Brush Control Operations	6
815	Protection of Watercourses and Water Bodies	5
816	Silt Fence	2
817	Check Dam Sediment Trap	2
818	Floating Silt Curtain/Turbidity Barrier	2
820	Storage & Handling of Fuels and Other Hazardous, Toxic or Dangerous Material	2
825	Waste Management	1
830	Marshalling Yards & Temporary Work Camps	1
835	Forest Fire Protection	1
840	Dust Control	1
845	Equipment Operation & Prevention of Erosion and Siltation	2
850	Protection of Vegetation and Wetlands	2
855	Re-vegetation	2
860	Protection of Historic Resources	1
865	Other Environmental Requirements	1



## **FORM 801**



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### **SECTION 801**

#### **OWNER'S POLICY**

#### **OWNER'S POLICY**

To ensure protection of the environment, the work at all times shall be subject to inspection by the staff of relevant municipal, provincial and federal agencies. Normally, all inspections other than by the Engineer will be arranged in advance through the Engineer. Any specific matters relating to environmental protection will be dealt with between the Contractor and the Engineer.

Any violations of environmental permits or authorizations or any environmental related incidents which are observed by inspectors representing regulatory agencies are to be reported by them prior to leaving the site to the Engineer. Except in emergency situations, environmental protection measures required by other agencies must be approved by the Engineer prior to implementation by the Contractor.



**SECTION 805**

**CONTRACTOR’S RESPONSIBILITIES - REGULATORY AGENCIES**

The Contractor shall ensure that its employees, Sub-contractors and their employees, machinery and equipment operators, and truckers comply with the conditions of the contract and with all applicable environmental laws, regulations, permits, and requirements of federal, provincial and municipal authorities, and such other rules and regulations as the Owner may establish.

Contractors, Subcontractors and their personnel shall not harass wildlife or waterfowl or unduly disturb fish. Any contravention of environmental requirements, including employee actions accidental or otherwise, resulting in environmental damage shall be reported to the Engineer without delay.

The Contractor may be required to obtain all or some of the following permits where such are required:

**MAJOR REGULATORY APPROVALS BY TYPE AND AGENCY**

<b><u>TYPE OF PERMIT</u></b>	<b><u>AGENCY</u></b>
1. Stream Crossing Authorizations	Fisheries and Oceans Canada Water Resources Division Department of Environment
2. Wood Cutting/Clearing	Forestry Division, Department of Natural Resources
3. Burning Permit	Forestry Division, Department of Natural Resources
4. Fuel Storage/ Handling	Government Services Center, Department of Government Services
5. Water Supply/ Sewage Disposal	Government Services Center, Department of Government Services
6. Asphalt Plants	Government Services Center, Department of Government Services
7. Solid Waste Disposal	Local Municipal Authority
8. Quarry or Pit Operations	Mineral Lands Division, Department of Natural Resources
9. Structures at Navigable Waters	Canadian Coast Guard, Transport Canada
10. Herbicide Application	Pesticide Control Branch, Department of Environment and Conservation
11. Stream Crossings (Designed by the Contractor)	Water Resources Division Department of Environment and Conservation

The Contractor shall obtain all other permits and approvals which may be necessary to comply with government laws and regulations. Prior to the commencement of specific work elements, the Contractor shall immediately provide the Engineer with two copies of all permits.

**FORM 805**

Contractor's failure to comply with the regulations of any authority having jurisdiction over the works, or part thereof, or any aspect of the performance of the work and the manner of carrying out the work, will entitle and result in the Owner appointing such engineer, engineers, compliance officer or officers as may be necessary to more fully cause compliance by the Contractor with the requirements of the relevant regulatory authority.

The Owner may thereafter, and for so long as the Owner may keep such engineer, engineers, compliance officer or officers, on the site of the works, deduct from the progress payments otherwise due to the Contractor the costs including but not limited to payroll, payroll burdens, accommodations, meals, and transportation costs associated with the work of such engineer, engineers, compliance officer or officers as the case may be. The Contractor shall have no right to dispute the Owner's right to appoint such engineer, engineers, compliance officer or officers, the reasonableness of the deduction of such costs or the amount thereof and the Engineer's certificate of the amount of such costs shall be final and binding upon the Contractor and the Owner.

# FORM 810



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 810

### USE OF HERBICIDES FOR BRUSH CONTROL OPERATIONS

#### INDEX

#### 810.01 SCOPE

810.01.01 General

#### 810.02 MATERIALS

#### 810.03 HERBICIDE STORAGE & HANDLING PROCEDURES

#### 810.04 EQUIPMENT

#### 810.05 GENERAL APPLICATION REQUIREMENTS

810.05.01 Spray Conditions and Restrictions

810.05.02 Daily Logs and Written Reports

810.05.03 Safety

810.05.04 Clean Up

810.05.05 Spills

810.05.06 Newspaper Notice

810.05.07 Signs

810.05.08 Notices to Adjacent Property Owners

810.05.09 Guarantee

#### 810.06 MEASUREMENT FOR PAYMENT

#### 810.07 BASIS FOR PAYMENT

#### 810.01 SCOPE

This specification covers the supply and application of herbicide to broadleaf brush and trees.

Specific locations to be sprayed, and areas to be omitted, shall be designated by the Engineer.

##### 810.01.01 General

The Contractor and Subcontractor(s) are required to comply with environmental protection measures contained in this section and all applicable environmental protection regulations of Federal, Provincial, and Municipal Authorities.

No pesticides or other products shall be used without prior approval of the owner and the Department of Environment & Conservation. Each pesticide to be used, its application rate, and area of use, shall be subject to regulations under the Environmental Protection Act, 2002 and the Pesticide Control Regulations, 2003. A copy of the Material Safety Data Sheet (MSDS) and Pesticide Label Information shall be supplied to the Resident Engineer 5 days prior to any use by the Contractor. Two copies of any approval issued to the Contractor for chemical usage under these Regulations shall be provided to the Engineer. As part of the Contractors Hazard Assessment prior to the start of contract work an emergency/contingency plan shall be developed in case of a spill and provide a copy of this plan to the Resident Engineer.

## FORM 810

### 810.02 MATERIALS

The herbicide to be used to execute the work of this contract shall be, as specified in the contract documents, and shall be approved on the Pesticide Operator Licence issued to the pesticide operator by the Department of Environment & Conservation.

All herbicide brought onto site for the execution of the contract shall be contained in sealed containers and will be inspected by the owner to ensure that such herbicides are properly registered under the Pesticides Control Act RSN 1990, and approved by the Newfoundland Department of Environment, and are of the type, strength and quality specified therein. Any herbicide not meeting these requirements shall be rejected. "BLAZON" dye shall be used as colouring agent at the manufacturer's recommended concentration.

### 810.03 HERBICIDE STORAGE & HANDLING PROCEDURES

Contractor shall ensure that herbicides are handled only by personnel who are licensed, trained and qualified in handling these materials in accordance with manufacturers' instructions and government regulations (**Section 13 of the Pesticides Control Regulations**). The Contractor will be required to verify personnel qualifications as they pertain to this item and provide written confirmation of same to the Engineer. The Contractor shall supply a copy of the product safety data sheet to the Engineer of all herbicides or hazardous substances which will be used during the course of the contract. Tank refilling operations shall be supervised at all times. Under no circumstances shall any tank refilling procedure be left unattended by the operator.

Handling and tank filling/transferring procedures shall be carried out to prevent the contamination of soil or water. Tank filling or servicing of mobile equipment shall not be allowed within **100 m** of a watercourse, water body, or designated wetlands. Herbicides and other chemicals shall be stored at least **100m** (horizontal distance) from any water course, water body, or designated wetland unless otherwise approved by the Engineer and/or the Department of Environment and Conservation.

Any pesticide storage sites must meet the requirements of Section 13 of the Pesticides Control Regulations, 2003 as follows:

- A source of water must be kept in an area in or adjacent to the storage area;
- Approved safety equipment as required which is properly maintained, functional and available at all times for personnel handling and working with pesticides;
- Flooring in a storage area shall not contain a floor drain or catch basin which is directly or indirectly connected to a private or municipal sewage system or public water course;
- Flooring shall be capable of being cleaned and decontaminated of pesticides stored within;
- Adequate ventilation by either natural or mechanical means so as to prevent the accumulation of toxic and/or flammable vapours;
- A "Danger Stored Pesticide" sign posted on all entrances which is printed in block letters 5 centimeters or more in height;
- Cleanup procedures, materials, and equipment available to cleanup spills or leakage;
- Security procedures consistent with the instructions of the Minister or persons designated by the Minister.

In addition to these storage requirements each pesticide storage site shall have prominently displayed on all entrances contact telephone numbers for the operator and the Department of Environment & Conservation, Pesticides Control Section, and indicated accordingly.

All entrances to the storage sites must be locked when the owner or an employee of the owner is not present.

Pesticides shall be stored in their original container or a substitute container approved by the manufacturer. Substitute containers shall be labelled appropriately with labels provided by the manufacturer.

## FORM 810

Concentrated pesticides transported in a vehicle during spray operations shall be contained in a locked box, secure area or compartment which must be locked while unattended. Pesticides shall not be transported in the passenger compartment of any vehicle.

### 810.04 EQUIPMENT

Prior to acceptance of the tender, the Contractor shall provide proof that the spray equipment, auxiliary mixing and storage equipment, and associated equipment that is intended to be used meets the requirements of the manufacturer of the herbicide. Equipment shall be in good working condition with tanks secured properly, have hoses of good integrity (not cracked) and all pumps seals and joins tight with no leaks.

All equipment applying liquid herbicide solution shall be capable of ensuring that all active ingredients are contained in the target area.

The Contractor shall provide all material, construction plant and personnel necessary for the continued operation of application equipment. All vehicles used in the application of pesticides shall have a copy of the contingency plan located within the vehicle.

### 810.05 GENERAL APPLICATION REQUIREMENTS

Herbicides shall be applied by low volume broadcast spray ground application in all areas to be treated utilizing a spray delivery system (such as the Radiarc sprayer or approved equivalent) which offers effective drift control. Aerial spraying from planes and helicopters will not be permitted. The spray system utilized must be acceptable to both the herbicide manufacturer the Resident Engineer assigned to monitoring the herbicide application and Pesticides Control Section of the Department of Environment & Conservation.

The Contractor is required to obtain a Pesticide Operator's License from the Pesticide Control Section, Department of Environment.

Prior to the commencement of specific work elements, the Contractor shall immediately provide the Engineer with two copies of all permits.

Any contravention of environmental requirements, including employee actions accidental or otherwise, resulting in environmental damage shall be reported to the Engineer without delay.

Contractor shall be responsible for clean-up, reclamation and/or restorative measures as may be directed by the Engineer, or by provincial or federal agencies through the Engineer.

#### 810.05.01 Spray Conditions and Restrictions

The Contractor shall provide proof satisfactory to the Engineer that the strength of spray solution and the method of application meet the requirements of the manufacturer supplying the herbicide as specified on the product label. A supervisor from the Department will be appointed to monitor the Contractor at all times when he is working with the herbicide and shall be supervised by Department personnel trained in the application of pesticides.

Contractors are advised that, notwithstanding the stipulations included with the Contractor's Pesticide Operators License issued by the Pesticide Control Section of the Department of Environment, the Contractor will ensure that:

- (a) The herbicide shall be applied only to the highway right-of-way which has been previously cut, and subsequently designated for treatment.
- (b) The Contractor shall be aware that some watercourses may be in close proximity to the designated spray area. Due care and caution shall be taken to ensure that herbicide spraying operations do not impact on any watercourses or water bodies and meet approved buffer zone requirements of the Department of Environment and Conservation and the manufacturer.

## FORM 810

- (c) Ground based spraying is permitted only when: wind speeds are between 2 and 15km/h, air temperatures are below 25°C, the relative humidity is above 50%, it is not raining, and rain is not anticipated over the next two hour period.
- (d) The Engineer in consultation with the Contractor and officials of the nearest weather office shall determine daily the suitability of weather conditions to undertake the application of herbicide. The Engineer has the authority to stop the spraying of herbicide at any time based on local conditions and weather measurements. The site supervisor for the Department of Transportation & Works shall be given access to an anemometer on site to determine the wind speed, temperature and humidity at the site.
- (e) There shall be no herbicide application within densely populated areas. Spray areas within commercial or residential developments, house or cottage areas are to be determined in the field by the Engineer. A **50 m** buffer shall be maintained.
- (f) Areas designated by the Engineer, in consultation with the Department of Environment, as areas to be omitted from spraying, shall not be sprayed.
- (g) The Contractor shall take due care and caution when applying herbicide in close proximity to land used for agricultural purposes. Drifting of spray onto land utilized for agricultural purposes shall not be permitted.
- (n) Equipment is not permitted to operate in any watercourse or ditch containing or which may contain water which enters a watercourse.

### 810.05.02 Daily Logs and Written Report

Contractors are advised that reports and records are required by the provincial Department of Environment. Their use is of the utmost importance to any right-of-way management program and they shall form an important part of this contract. The Contractor shall ensure that all logs, records and reports are completed fully, are legible, and are signed by authorized personnel.

The submission of appropriate documentation as may be required shall be a requirement to the satisfactory completion of this contract.

### 810.05.03 Safety

The Contractor shall be responsible for the proper handling and safe use of all herbicides.

The Contractor shall be responsible for the safety of its employees in the application of herbicides and for the supply and use of all recognized safety equipment.

The Contractor shall have with each crew, a minimum of one person who is qualified in First Aid. This person(s) shall also be in possession of a valid Standard First Aid Certificate.

In addition to standard First Aid Kits, Contractor shall, at its own expense, have on site with each of its crews adequate first aid supplies that are unique to accidental herbicide exposure.

The Contractor shall rinse empty herbicide containers three times and use the rinse in the spray mixture. If the rinsed containers are not to be returned for refilling with herbicide then the rinsed containers shall be punctured several times to ensure they will not be used for filling with other substances and then disposed of in a manner approved by the Department of Environment.

The Contractor shall ensure the safety of all individuals including pedestrians, residents, vehicular passengers and operators or others as may be encountered during spray operations.

## FORM 810

### 810.05.04 Clean Up

Upon completion of herbicide application, the Contractor shall remove all of their rubbish, debris, surplus materials and equipment from the site.

The Contractor shall place rubbish and refuse in proper containers and shall dispose of same at an approved waste disposal site with permission of the waste disposal site owner/operator.

The Contractor shall not wash equipment or containers, nor dump herbicides in or near any fresh or salt water bodies, or at any location where the herbicide may enter a body of water.

### 810.05.05 Spills

- (a) The Contractor shall maintain on site with each crew engaged in the mixing and application of the herbicide mixture, an approved supply of absorbent materials as part of the overall spill cleanup kit.

Absorbent materials shall consist of activated charcoal, sawdust, peat moss or other materials in quantities as may be required by appropriate authority and the Engineer.

In the occurrence of spillage or leakage, the Contractor shall undertake prompt action to minimize the extent of damage through the application of absorbent materials or other procedures as may be required.

Any soils or other materials contaminated as a result of spillage, leakage or inappropriate actions taken by applicators shall be removed and the affected areas subsequently rehabilitated at the Contractor's expense.

Disposal of contaminated soils and other materials shall be the responsibility of the Contractor subject to approval by the appropriate authority, the Engineer and the Pesticide Control Section.

- (b) All spills involving greater than 10 litres of mixed formulation or the equivalent of unmixed formulation shall be reported immediately to the Pesticides Control Section as described below. All spills involving mixed or unmixed pesticide in or within 500m of water bodies, wells or areas frequented by people, shall be reported immediately to the Pesticides Control Section, St. John's (Ph: 729-3395) and Environment Canada (EPS) St. John's (Ph: 772-2083).

The Contractor shall submit a corresponding written report within two (2) days of occurrence to the project supervisor who will in turn forward the report to the Director of Design and Construction. The report shall identify cause, actions taken to clean up area, actions taken to prevent a recurrence, actions taken to dispose of contaminated material and any environmental damage.

### 810.05.06 Newspaper Notice

The Contractor shall advise the public of the purpose and scope of the project by means of newspaper notices. The Contractor shall place the notices in at least one newspaper with circulation in the municipalities whose boundaries encompass treatment areas. The newspaper ad will appear in any issue at least one week prior to commencing the program. The ad will state the area that is proposed for treatment over the next 21 calendar days at the end of which another ad is to be placed until the program is completed. The ad will contain a phone number at which the Contractor may be contacted for information regarding the spraying operation and the Department of Environment Pesticides Control Section 729-3395.

### 810.05.07 Signs

The Contractor shall provide and erect signs indicating that the right-of-way has been treated with herbicide. These signs shall be posted at the time of treatment and indicate the type of herbicide (name of formulation) used, PCP Act Registration Number, Date of Application, Company Name carrying out the application of herbicide and phone number for additional information, Department of Environment and Conservation phone number 1-800-563-6181 and the locations treated as stipulated in the Pesticide Operator's Licence Terms and Conditions issued by the Department of Environment and Conservation.



## **FORM 810**

### **810.05.08 Notices to Adjacent Property Owners**

The Contractor shall make every reasonable attempt to verbally notify adjacent property owners, prior to the spray program. In the event this cannot be done, the Contractor shall use written notification to all dwellings to the satisfaction of the Resident Engineer and the Pesticides Control Section of the Department of Environment & Conservation.

### **810.05.09 Guarantee**

The Contractor shall achieve a 95% brush kill in the target area. If spot checks, after the herbicide treatment is completed, reveals that the 95% brush kill was not achieved, then the Contractor will be required, at his own expense, to retreat these areas to obtain the 95% brush kill in the target area.

### **810.06 MEASUREMENT FOR PAYMENT**

Measurement will be made of the horizontal area actually sprayed with herbicide within the area indicated to be sprayed or as staked out by the Engineer. These measurements shall be computed to obtain the area in hectares, measured to three decimal places.

Spraying of areas beyond the limits as designated by Engineer will not be measured for payment.

### **810.07 BASIS OF PAYMENT**

Payment at the contract price for supply and application of herbicide shall be compensation in full for all labour, materials and equipment use to carry out the work indicated in these specifications, and shall include all costs involved in: placing newspaper notices, providing signs, and obtaining and conforming to the conditions of required permits, together with the removal of any debris (containers, absorbent, etc.) including obtaining an approved waste disposal area and hauling away and disposing of the debris in the waste disposal area, if required.

# FORM 815



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 815 PROTECTION OF WATERCOURSES AND WATER BODIES

### INDEX

#### 815.01 SCOPE

#### 815.02 LEGISLATIVE REQUIREMENTS

#### 815.03 FORDING OF WATERCOURSES

#### 815.04 CLEARING AND/OR GRUBBING ADJACENT TO WATERCOURSES

#### 815.05 GENERAL PROCEDURES FOR INSTALLING WATERCOURSE CROSSINGS

#### 815.06 USE OF FRESH CONCRETE IN OR NEAR BODIES OF WATER

#### 815.07 CONTROL AND TREATMENT OF SILTED WATER

#### 815.08 FILL PLACEMENT AT WATER BODIES

#### 815.01 SCOPE

This specification covers the environmental requirements for work being carried out at watercourses and water bodies. It includes references to Federal and Provincial Legislation and prescribed methods and procedures to employ when carrying out such work as culvert or bridge installations, stream diversions, fording, fill placement at water bodies, and any other work which may alter or impact any watercourse or water body, or the quality of the water therein.

#### 815.02 LEGISLATIVE REQUIREMENTS

The Contractor shall be aware of all Federal and Provincial Legislation governing the protection of watercourses and water bodies and all revisions and amendments to this legislation.

##### 815.02.01 PROTECTION OF INLAND FISHERIES ENVIRONMENT

All permanent or temporary works or undertakings which are proposed for watercourses or water bodies constituting fish habitat require authorization from the Fish Habitat Management Branch of the Department of Fisheries and Oceans Canada at least two weeks prior to the commencement of any work. The Contractor is required to obtain approval for all temporary stream crossings and provide the Engineer with two copies prior to any work.

Application forms for authorization for works or undertakings affecting fish habitat are available at Department of Fisheries and Oceans Canada offices located at St. John's, Grand Bank, Grand Falls, Goose Bay, and Corner Brook.

Contractors are referred to the Department of Fisheries and Oceans Canada publication entitled "Resource Road Construction - Environmental Guidelines and Design Criteria", latest edition, (and to other technical information). The DFO "fact sheets" contain recommended guidelines for culvert installations, road and bridge construction, and other works. They include mitigative measures and procedures intended to assist Contractors in minimizing impacts on fish and fish habitat.

## FORM 815

Contractors are advised that Environmental and Fisheries regulations require that any work done in or near a watercourse, deemed to be viable fish habitat, must be restricted to the minimum of disturbance. The establishment of temporary and permanent buffer zones are required. (Reference, Standard Drawing No.1237). Great care must be taken during construction not to harmfully alter, disrupt, or destroy fish habitat or to deposit any substance which may be harmful to fish habitat in or near any watercourse where it may enter the watercourse. Culvert pipes must be constructed, according to the requirements of the applicable permits, to allow free movement of fish.

Contractors are advised to refer to the Fisheries Act with particular attention to:

- Section 35 - Outlines required authorization for work or undertaking which may affect fish habitat.
- Section 36 - Prohibits the deposit of a harmful substance of any type into water frequented by fish.
- Section 37 - Powers of the Minister for the provision of information such as plans, specifications, studies, etc., and to require any modifications to such plans and/or related information.
- Section 38 - Powers of a Ministerial Inspection.
- Sections 40-42 - Enforcement and Penalties.

### 815.02.02 THE ENVIRONMENTAL CONTROL (WATER AND SEWAGE) REGULATIONS

Contractors shall maintain compliance with the Environmental Control (Water and Sewage) Regulations, 2003 or latest edition. This legislation is administered by the Water Resources Division of the NL Department of Environment.

No person shall discharge into a body of water any sewage or effluent.

### 815.02.03 THE WATER RESOURCES ACT DEPARTMENT OF ENVIRONMENT

Where the Contractor must carry out any alteration of a body of water **which is not required specifically as part of the contractual work with the Department of Transportation and Works**, the Contractor must obtain a Permit from the Department of Environment and Conservation before carrying out the work. Alterations to watercourses and water bodies such as culvert installations, bridges, stream diversions, rock fill placement in water bodies, etc., which are typically required as part of the contractual work are authorized and administered by DT&W and do not require separate approval from the Department of Environment and Conservation. All such alterations to bodies of water must be carried out according to established procedures of the regulatory agencies so as to prevent pollution or damage to the environment.

The Contractor is referred to the following **Environmental Guidelines** of the NL Department of Environment and Conservation, Water Resources Division, regarding construction procedures at watercourses:

Chapter	Title	Chapter	Title
3	WATERCOURSE CROSSINGS	7	DIVERSIONS, NEW CHANNELS, AND MAJOR ALTERATIONS
4	BRIDGES	9	PIPE CROSSINGS
5	CULVERTS	13	GENERAL CONSTRUCTION PRACTICES
6	FORDING		

### 815.03 FORDING OF WATERCOURSES

The use of equipment or machinery in a watercourse or water body is generally not permitted. Should it be necessary for equipment to ford a watercourse, then the approval of the Resident Engineer is required for the specified equipment only and at a designated location. The same crossing point shall be used each time that a fording is required. When extensive or frequent crossing of a watercourse is necessary, a temporary culvert or bridge installation may be required instead of fording. The Contractor is referred to the NL Environmental Guidelines

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Chapter 6, "Fording" of the Dept. of Environment and Conservation, regarding the selection, site preparation, and use of fording sites. The Contractor shall discuss all proposed fording sites with DT&W a minimum of 5 working days before any fording activity. Site selection require the written approval of the Engineer.

### 815.04 CLEARING AND/OR GRUBBING ADJACENT TO WATERCOURSES

The Engineer shall mark limits for clearing and grubbing adjacent to watercourses. Buffer zones of undisturbed vegetation shall be maintained at watercourse crossings as marked in the field. (Reference, Standard Drawing No.1237, Typical Temporary and Permanent Buffer Zones at Stream Crossings.) A permanent buffer zone shall be maintained both sides of the construction zone at watercourse crossings, wherein, no disturbance or cutting of vegetation is to take place. A temporary ungrubbed buffer zone shall be maintained on both sides of the watercourse, unless otherwise directed by the Engineer, within the construction zone at watercourse crossings until such time as the installation of the crossing is to be carried out. The Contractor shall use appropriate mitigative measures such as the use of silt fencing, sedimentation basins and take-off ditches to control sediment laden runoff from entering watercourses.

### 815.05 GENERAL PROCEDURES FOR INSTALLING WATERCOURSE CROSSINGS

The Contractor shall present to the Engineer for approval, a plan for the construction of unwatering systems including diversion systems, pumping systems, settling and/or filtration systems, a minimum of **3 working days** prior to the start of any work at the site.

A pre-construction meeting shall be convened on-site between the Contractor and the Engineer to review environmental protection measures and associated contract details pertaining to the watercourse crossing, prior to any work being carried out at the proposed crossing site.

All work carried out at watercourses shall be performed in the dry and with due care and caution so as to prevent unnecessary disturbance or impact on adjacent land or downstream areas. Where watercourses are deemed fish habitat, work within the channel is generally prohibited between September 15 and June 1, on the island portion of the province, and between September 1 and June 30 for Labrador, unless otherwise approved by DFO and the Resident Engineer. The Contractor shall carry out all work in and around watercourses in accordance with all Federal and Provincial permits and requirements, the relevant sections of the DT&W Specifications Book, and the contract drawings.

The Contractor shall give **3 working days** notice prior to any in stream or near stream grubbing or excavation.

**Buffer zones** shall be established and maintained as described in section 815.04.

An approved cofferdam shall be installed at the low end of the construction zone to collect all site water which is to be disposed of in an approved manner. (See Section 815.07 Treatment of Silted Water).

The operation of heavy equipment shall be confined to dry stable areas in order to prevent the generation of mud and silted water. All flow shall be diverted or pumped around or through the work area, by a means acceptable to the Engineer, so as to maintain flow in the watercourse immediately below the site, prevent erosion, and maintain acceptable water quality. The flow diversion system shall have sufficient freeboard to be capable of accommodating rain events or provision shall be made to safely discharge elevated flows without causing washouts of constructed works, erosion, or siltation in downstream areas. The discharge location of the pumping or diversion system shall be stabilized to prevent erosion. All unwatering operations shall be constantly monitored by the Contractor.

Work should be carried out from the downstream section of the work area and progress to the upstream.

The Contractor shall ensure that fish are not left stranded in the work area at the time the diversion system is made operational. All stranded fish shall be removed by appropriate means and quickly returned to the watercourse below the construction area to prevent mortalities. An impermeable cofferdam of non-erodible material, such as sandbags and sheet plastic, shall be constructed at the outlet area of the construction zone to prevent any silted water from entering downstream areas and to assist in unwatering operations.

## FORM 815

The location, size, construction, and operation of sedimentation basins shall be carried out according to Department specifications or as directed by the Engineer and so as to achieve adequate settling parameters within the basins and ensure that discharged water from the basins, which is entering any watercourse, meets the water quality standards set forth in the Environmental Control (Water and Sewage) Regulations, ( See Section 815.02.02 ).

Operation of the sedimentation basins shall be continuously monitored by the Contractor to ensure proper functioning and maintenance.

Excavation shall be carried out to the limits marked in the field by the Engineer. All excavations shall be carried out using a tracked excavator which will operate within the limits of the work area or as directed by the Engineer.

Excavated material shall be removed from the site and stockpiled at an approved location where it will not enter any watercourse.

When corrugated steel pipes are installed, impervious material shall be placed under the invert of the pipe and around the haunches of the pipe at the inlet area so as to ensure that all flow is confined within the pipe, particularly during low flow conditions, and not lost into the porous fill zones outside the pipe.

All sections of newly constructed channel and pipe inlet and outlet areas shall be adequately stabilized so as to prevent destabilization, erosion, or scouring of the channel and fill embankments. Rip-rap on road slopes shall be placed concurrently with backfilling operations on the pipe so that inlet and outlet areas are protected immediately from erosion.

Any disturbed areas or exposed soils within the high water zone of the watercourse shall be stabilized by such means as placing rip-rap or well staked sodding within 48 hours of completion of backfilling operations. Other adjacent disturbed areas shall be rehabilitated by sodding or seeding, or as directed by the Resident Engineer.

Upon completion of the work, flow shall be introduced slowly into the new channel or watercourse crossing. Any silted water generated as a result shall be prevented from entering downstream areas of the watercourse, and pumped or treated as required.

Where baffles are required as part of a culvert installation all activities associated with the baffle pipe installation including the diversion of all water flow from the natural watercourse into the baffled pipe, abandonment of any temporary stream diversion system and rehabilitation of the surrounding disturbed area shall be carried out efficiently without delay so as to not interfere with fish migration.

All construction related waste materials shall be removed from the work site(s).

Sedimentation basins shall be pumped dry and backfilled with the original excavated material and compacted. Hand seeding, hydroseeding and/or sodding of disturbed areas shall be carried out as directed by the Resident Engineer. Additional rehabilitation may be required by the Engineer.

### **815.06 USE OF FRESH CONCRETE IN OR NEAR BODIES OF WATER**

When concrete is placed in or adjacent to a watercourse or water body, all necessary precautions shall be taken to prevent the concrete from adversely affecting water quality. Whenever possible, fresh concrete shall not come in contact directly with the waters of a watercourse. Standing water zones shall be drawn down prior to placing fresh concrete. All form work shall be well secured and made tight to prevent leakage of fresh concrete into any adjacent waters. Where tremmie concrete is required, the work shall be carried out under the specific directions of the Engineer. The washing of concrete delivery trucks or chutes is not permitted within 100 m of any watercourse or water body. All necessary precautions shall be taken when handling related substances such as form coatings and concrete admixtures to prevent any spill or leakage of these substances.

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### **815.07 CONTROL AND TREATMENT OF SILTED WATER**

Silted or muddy water is not permitted to be released into any watercourse or water body or into any ditch or area that leads directly to a watercourse or water body. Runoff from adjacent areas shall be channeled, piped, diverted, or confined to prevent the water from entering construction zones and becoming polluted. Where due to rain events, runoff from construction zones and areas of exposed soils contains mud or silt, appropriate measures shall be taken by the Contractor to confine, settle, or channel such water so that adjacent watercourses or water bodies are not adversely affected. Such measures may include the provision of mud basins, settling basins, ditch blocks, silt fencing, temporary ditching, or other means necessary to prevent pollution. Silted runoff water or water released or pumped from construction zones may be discharged to an approved vegetated area where ground absorption will occur or to an approved settling area or to a settling basin constructed in accordance with contract drawings or as directed by the Engineer.

### **815.08 FILL PLACEMENT AT WATER BODIES**

Fill material placed in or at water bodies shall be clean blasted rock. Where in the opinion of the Engineer, significant silty bottom sediments will disperse with potential of creating water quality problems, the fill zone shall be isolated from the remainder of the water body by such means as a silt curtain as approved by the Engineer. Rock shall be placed into the water zone so as to create the least amount of disturbance of bottom sediments. Rock shall be placed along the outer edge of the fill zone to close off and isolate the fill zone from the rest of the water body. Fill placement shall proceed with runs of rock along the inside of the first outer run of fill. Successive runs of rock fill shall be placed in this manner until the zone is filled back to the inner fill limits. Height of the placed rock fill shall be maintained a minimum of 300 mm above water level during fill operations. Equipment shall not operate in standing water zones. Removal of displaced sediments and/or bog shall be carried out as directed by the Owner. Pumping of water from the fill zone to a designated area may be required by the Owner to reduce water levels in the fill zone and prevent movement of silted water through the rock fill back into the water body.

# FORM 816



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 816

### SILT FENCE

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#### 816.01 SCOPE

#### 816.02 MATERIALS

#### 816.03 CONSTRUCTION

#### 816.04 MAINTENANCE AND CLEAN OUT

#### 816.05 REMOVAL

#### 816.06 MEASUREMENT FOR PAYMENT

#### 816.07 BASIS OF PAYMENT

#### 816.01 SCOPE

This specification deals with the requirements for the provision, maintenance, and eventual removal of silt fence. Silt Fences are intended for reducing the amount of silt present in run off from highway projects during the construction process.

#### 816.02 MATERIALS

The silt fence shall consist of a filter fabric fence held in place by posts. The filter fabric shall be of a weight of at least 200g/m<sup>2</sup>. The fabric shall be at least 900mm wide. The fence posts shall be of sufficient length to support the fabric, be sturdy and be of dimensions of at least 50mm square. The staples shall be sufficiently sturdy to support the fabric for the required life of the fence.

#### 816.03 CONSTRUCTION

The silt fence shall be constructed as shown on Form 1238 "Typical Silt Fence", and placed at the location, or locations, as required by the Engineer.

At the location required by the Engineer, the Contractor shall excavate a trench in a crescent shape across the projected flow path with ends pointing up slope. The trench shall have a width of approximately 100mm, and a depth of approximately 100mm.

The posts shall be secured at 3m intervals on the immediate down slope side of the trench.

The filter fabric shall be taken from a continuous roll, and cut to the required length. The filter fabric shall be stapled to the upstream side of the stakes, with 200mm of fabric extending into the trench and spread over the trench bottom.

The trench shall be backfilled and compacted to secure the fabric in the ground. The silt fence shall be properly constructed to ensure continuous protection along its perimeter. Under no circumstances are silt fences to be installed in a watercourse or waterbody.

#### 816.04 MAINTENANCE AND CLEAN OUT

The Contractor shall maintain the silt fence, until such times as the Engineer requires that the silt fence be removed.

The Contractor shall carry out such silt and debris clean out, as required, in order that the silt fence continues to perform its function of reducing the amount of silt present in the run-off. Should the fabric become clogged, and rendered useless, then the Contractor shall replace the fabric with new fabric at his own expense.

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## **FORM 816**

### **816.05 REMOVAL**

The Contractor shall remove the silt fence, when required to do so by the Engineer. The posts shall be taken out of the ground and the site cleaned up. Waste materials shall be disposed of in an approved waste disposal area, provided by the Contractor.

### **816.06 MEASUREMENT FOR PAYMENT**

Measurement for payment will be made on the basis of the required length of fence installed, computed in metres rounded to one decimal place.

### **816.07 BASIS OF PAYMENT**

Payment at the contract unit price for silt fence shall be compensation in full for all materials, labour and use of equipment: to supply the filter fabric, posts and staples, to excavate the trench, to install the posts, to secure the fabric to the posts, to backfill and compact the trench, to maintain and clean out the fence, to replace any worn out filter fabric with new fabric provided by the Contractor at his own expense, to remove the silt fence and posts, dispose of waste materials and clean up the site.



# FORM 817



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 817 CHECK DAM SEDIMENT TRAP

### INDEX

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#### 817.02 MATERIALS

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#### 817.04 MAINTENANCE AND CLEAN OUT

#### 817.05 DISPOSAL

#### 817.06 MEASUREMENT FOR PAYMENT

#### 817.07 BASIS OF PAYMENT

#### 817.01 SCOPE

This specification deals with the requirements for the provision, maintenance, and eventual disposal of a check dam sediment trap. Check dam sediment traps are intended for reducing the amount of silt present in run off from highway cuts during the construction process.

#### 817.02 MATERIALS

The check dam sediment trap shall consist of rock fill with filter fabric on the upstream face held in place with small shot rock.

The filter fabric, and shall be of a weight of at least 200g/m<sup>2</sup>.

The rock fill shall be clean rock, with rock fragments sized between 100 and 150mm.

The small shot rock shall be clean rock, with fragments no larger than 120mm.

#### 817.03 CONSTRUCTION

The check dam sediment trap shall be constructed as shown on Form 1239 "Typical Check Dam Sediment Trap". The silty water storage area shall be excavated, and the check dam constructed, at the location as required by the Engineer.

#### 817.04 MAINTENANCE AND CLEAN OUT

The Contractor shall maintain the checkdam, until such time as the Engineer requires that the check dam be removed.

The Contractor shall carry out such silt and debris clean outs as are required, in order that the check dam continue to perform its function of reducing the amount of silt present in the run-off.

#### 817.05 DISPOSAL

The Contractor shall remove the check dam sediment trap, when required to do so by the Engineer.

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## **FORM 817**

On removal of the check dam, the fabric shall be disposed of in an approved waste disposal area provided by the Contractor. The ditch shall be cleaned up and graded to the required ditch cross section.

### **817.06 MEASUREMENT FOR PAYMENT**

Measurement for payment will be based on the number of required check dam sediment traps constructed.

### **817.07 BASIS OF PAYMENT**

Payment at the contract unit price for each check dam sediment trap shall be compensation in full for all labour, materials and use of equipment to: excavate the silty water storage area, load the rock fill and small shot rock at the source and haul to the check dam site, supply the filter fabric, construct the check dam as required, maintain and clean out the check dam sediment trap as required, and finally remove the check dam, dispose of the waste materials, clean up and grade the site.

The rock fill and small shot rock shall be paid for under: "Excavation hauled 1km or under - Solid Rock", "Excavation hauled 1km or under - Ditching Solid Rock", or "Excavation hauled 1km or under - Quarried Rock", as applicable. However, any additional hand work required to sort the rock fill and the small shot rock to obtain the required size of fragments, and to grade the rock to the required check dam dimensions, shall be included in the payment for the check dam sediment trap.

# FORM 818



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 818

### FLOATING SILT CURTAIN/TURBIDITY BARRIER

#### INDEX

#### 818.01 SCOPE

##### 818.01.01 General

#### 818.02 MEASUREMENT FOR PAYMENT

#### 818.03 BASIS FOR PAYMENT

#### 818.01 SCOPE

This specification covers the supply, installation, and operation of a floating silt curtain or turbidity barrier.

Specific locations the Silt Curtain is to be used shall be designated by the Engineer.

##### 818.01.01 General

The Contractor and Subcontractor(s) are required to comply with environmental protection measures contained in this section and all applicable environmental protection regulations of Federal, Provincial, and Municipal Authorities.

This specification is to be used in applications where a floating silt curtain/turbidity barrier is specified to be used around the leading edge of the advancing fill for construction operations to control any silt that may be generated from the bottom of the fill or other materials that may be used in construction of the road or other structure in a submerged portion of a water body. The turbidity barrier is to be a floating silt curtain (such as Brockton Equipment/Spilldam, Inc. Silt-dam Type I) meeting the requirements of the Federal Department of Fisheries and Oceans. This item may be designed locally but must adequately control and prevent the migration of silt or other deleterious substances from the work area to the main water body. The turbidity barrier system must be approved with shop drawings/literature stamped by a professional engineer registered in the province of Newfoundland and Labrador submitted prior to its use.

The turbidity curtain is to consist of the following elements or approved equivalents: 304mm diameter flotation, 22oz polyvinylchloride (PVC) float cover, 8mm PVC coated top tension cable, silt film skirt to required depth to reach from water surface to the water body bottom, 9.5mm galvanized ballast chain, polyplate/lacing grommets (ends).

The turbidity barrier is to be anchored at 15m intervals. The anchoring system will consist of Mushroom style anchors or other suitable type anchors for the bottom condition present, yellow inflatable cautionary mooring buoys, and nylon mooring line or approved equivalents. Where navigation conditions are present in the area of the turbidity curtain the cautionary buoys shall be lighted and a plan will be required to be submitted for approval showing where the buoys are to be located.

The turbidity barrier shall be a minimum of 100m in length but may be otherwise specified in the Unit Price Table. The barrier will form a long arc extending from the shoreline approximately 35m, across the work zone (parallel to the shore) approximately 30m, and back to the shoreline for approximately 35m. The barrier is to be installed to reach the bottom of the water body from the water surface. Installation plan can be seen on the drawing titled "Silt and Bubble Curtain", as shown on Form 1223 of the Specifications.

As the leading edge of the fill advances, and the work site changes, the turbidity barrier will have to be moved and reinstalled. Movement of the turbidity barrier shall be considered incidental to the work and should be included in the price for the turbidity barrier.

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In addition to these requirements for use of the turbidity curtain for permanent works in the contract the contractor will be required to use a turbidity barrier for any temporary works requiring installation or removal of fill in the construction in the water body. The contractor may reuse the turbidity barrier required for use for the permanent works installation in the water body for a contract, but at all times during installation or removal of fill in the water a turbidity barrier may be required to be used.

### **818.02 MEASUREMENT FOR PAYMENT**

Measurement will be based on a per contract basis for the Floating Silt Curtain/Turbidity Barrier by the Engineer. Fifty percent of the total of the item will be paid on the progress estimate after which the silt curtain has been deployed for its intended use, and fifty percent will be paid on the last progress estimate where the in water body construction operation has been completed.

### **818.03 BASIS OF PAYMENT**

Payment for the turbidity barrier will be lump sum. Payment shall be for compensation in full for engineering, design, transportation to site, installation, removal, reinstallation, equipment, labour, and all other materials necessary to complete the above, at the locations indicated to be used on the contract.

## FORM 820



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 820

#### STORAGE AND HANDLING OF FUELS AND OTHER HAZARDOUS, TOXIC, OR DANGEROUS MATERIAL

##### INDEX

##### 820.01 STORAGE TANK REGISTRATION, INSPECTION, AND REMOVAL

##### 820.02 SPILL REPORTING AND CLEANUP PROCEDURES

##### 820.03 FUEL STORAGE AND HANDLING PROCEDURES

##### 820.04 EQUIPMENT SERVICING PROCEDURES

##### 820.05 USE OF HAZARDOUS, TOXIC OR DANGEROUS MATERIAL

##### 820.01 STORAGE TANK REGISTRATION, INSPECTION, AND REMOVAL

All storage tank systems must be registered under and in compliance with Newfoundland Regulation 58/03, The Storage and Handling of Gasoline and Associated Products Regulations, 2003 before commencing operation. Registration does not apply to storage tank systems of a capacity less than 2500 litres that are connected to a heating appliance. Contractors shall supply verification of storage tank registration to the Engineer prior to the commencement of work.

Storage tank systems shall be operated as per Section 18 of Newfoundland Regulation 58/03 Storage and Handling of Gasoline and Associated Products. This involves, but is not limited to, gauging or dipping, reconciliation of records and the proper maintenance of reconciliation records for a period of two years. Records shall be maintained for inspection by the Engineer, ESO and/or Government Service Centre Inspectors.

The operator of a storage tank system shall, within 30 days of known abandonment, empty the system of all products, remove the tank and associated piping from the ground, remove any contaminated soil, clean the area and restore the site to the satisfaction of the Engineer and in accordance with the criteria of the Government Services Centre.

##### 820.02 SPILL REPORTING & CLEANUP PROCEDURES

The Contractor, Subcontractors, and their personnel shall take all necessary precautions to prevent the spillage, misplacement, or loss of fuels and other hazardous material.

The Contractor and Subcontractors shall abide by the following measures in the event of the detection of a fuel or hazardous material spill of **70** litres or more:

- (i) make every effort to stop leakage and contain contaminant flow;
- (ii) **immediately** upon detection, report spill location and size to the Canadian Coast Guard spill report number **772-2083**, Pesticides Control Section 729-3395 and to the Owner; follow up with a full written report containing information on the cause of the spill, remedial action taken, damage or contamination estimate, and any further action to be taken;
- (iii) remove contaminant from spill site by absorbent, pumping, burning, or whatever method is appropriate and acceptable to Owner. Clean-up the affected area in accordance with the requirements of the Government Services Centre and then dispose of contaminated debris at an approved waste disposal site.
- (iv) take all necessary action to ensure the incident does not recur.

The Contractor shall apply the following criteria in reaching decisions on contaminant and clean-up procedures:

- (i) minimize danger to persons;
- (ii) minimize pollution to watercourses and wetlands;

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- (iii) minimize the size of the area affected by a spill; and
- (iv) minimize the degree of disturbance to the area and watercourses during clean-up. Contractor and reported promptly to the Engineer.

The Contractor shall dispose of any soil contaminated by small leaks of oil or lubricating fluids from equipment in a manner approved by the Engineer and in accordance with the criteria of the Government Services Centre. The Contractor shall have on site a suitable quantity of absorbent material such as "Oclansorb" or similar product which can be accessed quickly and effectively in the event of **any** hydrocarbon spill. The contractor shall advise fuel handling staff of its location and application.

### 820.03 FUEL STORAGE & HANDLING PROCEDURES

Contractor shall ensure that fuels and hazardous materials are handled only by personnel who are trained and qualified in handling these materials in accordance with manufacturers' instructions and government regulations. The Contractor will be required to verify personnel qualifications as they pertain to this item and provide written confirmation of same to the Engineer. The Contractor shall supply a copy of the product safety data sheet to the Engineer of all hazardous, toxic or dangerous materials or substances which will be used during the course of the contract. Refuelling operations shall be supervised at all times. Under no circumstances shall any refuelling procedure be left unattended by the operator.

Handling and fueling procedures shall be carried out to prevent the contamination of soil or water. Smoking shall be prohibited within **10 m** of a fuel storage area or during refuelling operations. Fuelling or servicing of mobile equipment shall not be allowed within **100 m** of a watercourse, water body, or designated wetlands. Oils, greases, gasoline, diesel, hydraulic and transmission fluids or other fuels shall be stored at least **100m** (horizontal distance) from any water course, water body, or designated wetland unless otherwise approved by the Engineer.

Any above ground fuel containers, with the exception of those exempted under Newfoundland Regulation 58/03, shall be self dyked units that are in compliance with the terms and conditions of the approval of the Government Services Center. Fuel storage areas and non-portable transfer lines shall be clearly marked or barricaded to ensure that they are not damaged by moving vehicles. The markers shall be visible under all weather conditions. The storage, handling and disposal of **used oils** shall be in accordance with the Used Oil Control Regulations (82-02) under the NL Environmental Protection Act.

### 820.04 EQUIPMENT SERVICING PROCEDURES

All heavy equipment maintenance shall be carried out by using suitable fluid collection equipment and in a manner which ensures all waste material is collected and suitably disposed of. The Contractor shall ensure that all equipment is mechanically sound to avoid leaks of grease, oil, diesel, gasoline, and hydraulic and transmission fluids. The Contractor shall ensure that no servicing or washing of heavy equipment occurs adjacent to watercourses and designated wetlands. Fueling, servicing or washing of equipment shall not be allowed within **100 m** of a watercourse except within a refueling site approved by the Engineer where conditions allow for containment of accidentally spilled fuels. The Contractor shall remove from the work area and properly dispose of all waste oil, filters, containers or other such debris at an approved waste disposal site.

### 820.05 USE OF HAZARDOUS TOXIC OR DANGEROUS MATERIAL

Toxic construction material e.g., creosote treated timber, shall be stored at least **100 m** away from all areas where drainage is directed into any watercourse or wetlands.

Toxic or dangerous substances such as form release agents, fuels, concrete additives (including superplasticisers), and other such substances, shall be transported, stored, and handled with all necessary precautions so as to prevent any spillage from occurring. Drip pans shall be used at locations where such liquids are being drawn off in order to contain any minor spills, and as a safety measure for containment of a significant spillage.

# FORM 825



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 825 WASTE MANAGEMENT

### INDEX

#### 825.01 SOLID WASTE DISPOSAL

#### 825.02 SANITARY FACILITIES/SEWAGE DISPOSAL

#### 825.01 SOLID WASTE DISPOSAL

The Contractor shall collect and dispose of all waste produced by its employees and those of its Subcontractors in a manner approved by the Engineer, and in accordance with the Newfoundland and Labrador Environmental Protection Act, 2002. Through the placement of suitable containers at the site, the Contractor shall collect and dispose of rubbish and domestic garbage generated by employees. During the progress of the work, the Contractor shall keep the areas occupied by it and access to such areas in a neat, clean, and safe condition, and free from the accumulation of all waste materials including crating materials, rubbish, drink containers, cigarette cartons, and all other waste. All solid waste shall be removed from the job site and recycled or disposed of at an Approved Waste Disposal Site, with the permission of the municipal authority. No waste material shall be deposited in any watercourse or wetland.

Upon completion of the work the Contractor shall, at its own expense, and to the satisfaction of the Engineer, dispose of or remove from the job site all construction plant, rubbish, unused material, including concrete forms, filter fabric material, sediment fencing, sand bags, and other equipment and materials belonging to it or used under its direction during the performance of the work. The site shall be left in a neat and clean condition.

In the event of the Contractor's failure to comply with any of the foregoing, the same may be accomplished by the owner within **30 days** of the completion of the work and the cost of same may be deducted from any money due or owing to the Contractor whether under this or any other contract.

#### 825.02 SANITARY FACILITIES/ SEWAGE DISPOSAL

The Contractor shall maintain portable latrines on site or systems approved by the Government Services Center. The sanitary facilities shall be used by all Contractor employees and those of subcontractors. The Contractor shall transport the waste from these units, using a collection company (whenever possible) licensed by Government Services Center. Otherwise, transportation and disposal shall be by a means and at a facility or location as approved by the Government Services Center.

## FORM 830



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 830

#### MARSHALING YARDS & TEMPORARY WORK CAMPS

##### MARSHALING YARDS & TEMPORARY WORK CAMPS

Equipment or material storage yards and temporary work camps shall be located at least **100 m** from any watercourse or designated wetland.

The Contractor is responsible for obtaining **all** appropriate permits from government agencies with legislation and regulations relevant to camp facilities. These permits include, but are not necessarily limited to, those related to: solid and liquid waste disposal, water supply, sewage treatment, development control, Crown Lands, and any Municipal Authority having jurisdiction over the area.

Any site proposed for a marshaling yard or work camp should be of low value with respect to its potential for other uses when compared to other lands in the area. Abandoned gravel pits, abandoned commercial enterprises, or other previously disturbed areas are preferred locations. Any site must be located so as to minimize potential traffic hazards. Incoming and outgoing vehicles should be able to merge safely with other traffic. Prior to the commencement of construction the Contractor will submit a list of candidate sites, which will be reviewed and approved by the Engineer and any other relevant agency.



## FORM 835



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 835 FOREST FIRE PREVENTION

#### FOREST FIRE PREVENTION

The Contractor shall obtain a burning permit as may be required by the Forestry Division of the Department of Natural Resources, where burning is to be conducted, and shall abide by the terms and conditions of the permit.

The Contractor shall take all precautions necessary to prevent fire hazards when working at the job site and shall keep the job site free of all flammable waste.

Fires shall be located a minimum of **10m** from the existing tree line or adjacent piles of slash. Fires and slash piles will be kept to small manageable sizes to prevent igniting or scorching of adjacent vegetation.

The Contractor shall have available, in proper operating condition, sufficient fire fighting equipment, as recommended by the Forestry Division of the Department of Natural Resources, to suit its location, labour force, and construction plant. Such equipment shall comply with the standards of, and have approvals of, Underwriters Laboratories of Canada Limited and shall be maintained in accordance with National Fire Prevention Association Codes.

The Contractor shall ensure that specific employees are assigned to and trained in the use of fire fighting equipment. A list of these personnel shall be available on request by the Owner.

Rubber tires, waste oil, or similar material shall not be used to ignite slash or used to maintain the burning operation.

## **FORM 840**



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and works  
Highway Design Division

### **SECTION 840 DUST CONTROL**

#### **DUST CONTROL**

The Contractor shall ensure that dust does not become a problem for adjacent property owners or construction site personnel or a hazard to vehicular traffic. When required, or as directed by the Engineer, water or an acceptable dust suppressant such as calcium chloride shall be used by the Contractor on haul routes or other locations on the project to control dust.

**SECTION 845**

**EQUIPMENT OPERATION AND PREVENTION OF EROSION AND SILTATION**

**INDEX**

**845.01 STORM WATER MANAGEMENT**

**845.02 TEMPORARY TRAVEL ROUTES**

**845.03 EROSION CONTROL MEASURES**

**845.04 LIMITATION OF OPERATIONS**

**845.01 STORM WATER MANAGEMENT**

The Contractor is responsible for storm water and drainage management during the period of the contract. This includes the collection, channeling, containment, settling, discharge and any other operation to effectively control storm runoff and prevent problems of erosion or siltation of adjacent or downstream areas. ( See Section 815.07 Control and Treatment of Silted Water).

**845.02 TEMPORARY TRAVEL ROUTES**

Linear travel along the right of way by vehicles and equipment shall be restricted to one track or travel route, particularly during the early stages of opening access along the route, unless otherwise approved by the Engineer. The route shall be maintained by the Contractor free of standing water. Surface drainage will not be permitted to run along the route which can generate extensive mud and silt, and adversely affect materials to be excavated such as grubbing, unsuitable material, and overburden. Surface drainage shall be vented off the route at frequent intervals. Where drainage courses are encountered, and frequent crossings are required, temporary pipes (CSP or iron) shall be installed to permit passage of equipment and vehicles in the dry, without causing erosion and siltation. At certain locations fording may be permitted by the Engineer. ( See Section 815.03 Fording of Watercourses ).

**845.03 EROSION & SILT CONTROL MEASURES**

**845.03.01 GENERAL PROTECTION MEASURES**

The Contractor shall minimize terrain disturbance and erosion resulting from its activities. The Contractor shall, as part of its work, implement erosion and silt control measures where its activities result in a blockage of natural drainage, the diversion of natural drainage, or the exposure of soil or subsoil to potential erosion. Particular measures which may be required include:

- (i) using an erosion control blanket;
- (ii) using an appropriate hydraulic mulch;
- (iii) spreading hay over exposed soils;
- (iv) spreading a thin layer of brush or slash over disturbed areas;
- (v) the installation of baffles or sediment traps at appropriate intervals within the area of disturbance;
- (vi) the installation of drainage collectors across the disturbed area to channel drainage into vegetated areas;
- (vii) the re-routing of disturbed drainage courses back into the natural course;
- (viii) the stabilization of exposed soils at drainage locations with appropriate rip-rap;
- (ix) where so directed by the Engineer, to construct check dams to confine mud or slurry at such locations as unsodded ditch lines, catch-basins and culvert inlets.
- (x) the pumping of silted water to settling or designated vegetated areas;
- (xi) the installation of sedimentation basins of adequate size at run-off locations from exposed areas to contain heavy silt and mud as directed by the Engineer.

## **FORM 845**

### **845.04 LIMITATION OF OPERATION**

During periods of heavy rain, where in the opinion of the Engineer, the movement of excavated material and equipment may give rise to extensive mud conditions, or the potential to seriously impact watercourses, or adjacent land, the Contractor may be required to suspend operations until such time as site conditions allow operations to resume. The Contractor shall not be paid for such downtime.

# FORM 850



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 850

### PROTECTION OF VEGETATION AND WETLANDS

#### INDEX

#### 850.01 MAINTAIN NATURAL DRAINAGE PATTERN

#### 850.02 PROTECTION OF TREES AND SHRUBS

#### 850.03 OFF RIGHT OF WAY TRAVEL

#### 850.04 BOGS AND WETLANDS

#### 850.01 MAINTAIN NATURAL DRAINAGE PATTERN

Drainage is to be maintained in its natural state wherever possible, with provision being made for spring flooding. Where existing drainage patterns cannot be maintained, alternate drainage will be installed to approximate normal conditions with the approval of the Engineer.

#### 850.02 PROTECTION OF TREES & SHRUBS

Some trees, shrubs and plants within the clearing limits may be required for use by the Owner or other groups. Where necessary, and as directed by the Engineer, such trees, shrubs and plants shall be flagged for removal. Also see Section 855.02 (Planting of Trees and Shrubs).

Where branches of trees are to be removed as a result of damage or where roots **2.5 cm** in diameter or larger are exposed as a result of contractors excavation work, the stumps shall be cut cleanly using a saw or lopping tool. The roots shall be cut back level to the surface of the cut slope within 24 hours following their exposure.

The Contractor shall adhere to the following protection measures:

- (i) No unnecessary cutting of trees is to be conducted. Care will be taken during construction to prevent damage to trees and shrubs adjacent to the flagged clearing limits which are to remain after construction.
- (ii) Care shall be taken when sloping embankments not to expose roots of trees, or put the soil at the base of such trees in danger of future erosion or extensive downslope drainage.
- (iii) The Contractor shall not use living trees as survey marks and shall not cut blazes or otherwise mark live trees except with removable surveyor's tape and/or tags.
- (iv) Where cutting is necessitated, the Contractor shall stockpile and remove all merchantable timber not required by the Owner. Other wood waste and slash remaining near the uncut zone shall be disposed of by chipping, burning, or removal, as acceptable to the Engineer.

#### 850.03 OFF RIGHT OF WAY TRAVEL

The Contractor shall limit equipment travel to the surveyed right-of-way and existing municipal and provincial roads. Use of equipment of any type is not permitted outside the clearing limits of the right of way without prior approval. To obtain approval for additional or new travel routes, the Contractor shall notify the Engineer a minimum of five working days in advance of such requirements and not commence work until written approval is given by the Engineer.

March 2011

## **FORM 850**

### **850.04 BOGS AND WETLANDS**

Bogs and wetlands are considered sensitive terrain because of their high disturbance potential. Travel by machinery across bogs and wetlands shall be avoided whenever possible. When such travel is necessary, it shall be carried out as directed by the Engineer. Bog excavation shall conform with good construction practices and be carried out in accordance with other relevant sections of these specifications.

# FORM 855



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 855 REVEGETATION

### INDEX

855.01	REVEGETATION FOR SURFACE STABILIZATION
855.02	PLANTING OF TREES AND SHRUBS
855.02.01	GENERAL INSTRUCTION
855.02.02	PLANTING METHODS AND MAINTENANCE
855.02.03	PAYMENT AND WARRANTY

### 855.01 REVEGETATION FOR SURFACE STABILIZATION

Immediately following and during some construction activities, the Engineer will identify areas requiring seeding/sodding or stabilization by a method to prevent erosion. These will include:

- (i) Extensive cuts in overburden material. These areas shall be hydro seeded within **three** calendar days of a cut being prepared and the work shall be carried out as directed by the Engineer;
- (ii) Stream crossing sites. Topsoil placement, sodding, and shrub or tree plantings may be required as directed by the Resident Engineer.
- (iii) All remaining disturbed areas, designated, will be hydro seeded or sodded as soon as possible in accordance with the DWST Specification Book - Section 632- Hydroseeding, Section 634 - Soil for Hydroseeding, Section 635- Lime for Hydroseeding, and Section 633- Sodding.

Where the potential for erosion exists, as on steep slopes, long slopes, or soft erodible type material, an appropriate erosion control material shall be applied to the surface. This can be in the form of an erosion control fabric or a sprayed on erosion control product which is approved by the Engineer and which will be in addition to hydroseeding as indicated in the contract documents or as directed by the Resident Engineer. Also see Section 845.03 (Erosion and Silt Control Measures).

The Engineer will inspect all revegetated areas periodically to ensure that adequate results have been achieved. During adverse dry conditions watering of revegetated areas shall be carried out as directed by the Engineer. Additional REVEGETATION work will be undertaken upon direction from the Engineer if the desired results are not achieved.

### 855.02 PLANTING OF TREES AND SHRUBS

#### 855.02.01 GENERAL INSTRUCTIONS

The planting of trees will be carried out in those areas identified in the contract documents. The types of species, quantity, size, and exact location will be specified in the contract documents or otherwise the Contractor will be advised by the Engineer. **Nursery stock**, (purchased trees and shrubs in pots), or **site stock**, (trees and shrubs removed from a site and held over or planted out directly), may be used as specified in the contract documents or as directed by the Engineer.

Native species of trees and shrubs are generally preferred, however, non-native species may be specified where, for example, a faster growing species or a disease resistant species or variety is needed.

The following species of trees are recommended:

## FORM 855

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
PICEA	SPRUCE	ACER SPICATUM	MOUNTAIN MAPLE
ABIES BALSAMEA	FIR	ACER RUBRUM	RED MAPLE
BETULA PAPYRIFERA	BIRCH	ACER PLATANOIDES	NORWEGIAN MAPLE
SORBUS	DOG BERRY	SALIX DISCOLOR	WILLOW
LARIX LARICINA	LARCH, JUNIPER	SALIX BEBBIANA	WILLOW
LARIX KAEMPFERI	JAPANESE LARCH	POPULUS TREMULOIDES	TREMBLING ASPEN, POPLAR, APS
PRUNUS PENNSYLVANICA	PIN CHERRY	POPULUS BALSAMEA	COTTONWOOD, BALSAM POPLAR

The following species of large shrubs are recommended:

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
AMELANCHIER	CHUCKLEY PEAR	CORYLUS CORNUTA	HAZELNUT
VIBURNUM CASSINOIDES	NORTHERN WILD RAISON	ARONIA MELANOCARPA	EASTERN CHOKEBERRY, CHOKECHERRY
ALNUS CRISPA	ALDER	ARONIA PRUNIFOLIA	EASTERN CHOKEBERRY, CHOKECHERRY
CORNUS STOLONIFERA	RED OSIER DOGWOOD		

The following species of small shrubs are recommended:

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
MYRICA GALE	SWEET GALE, BOG MYRTLE	SAMBUCUS PATENS	RED ELDERBERRY
RHODODENDRON CANADENSE	RODORA	ROSA NITIDA	WILD ROSE
NEMOPANTHUS MUCRONATA	MOUNTAIN HOLLY	ROSA VIRGINIANA	WILD ROSE
VIBERNUM EDULE	SQUASHBERRY	RUBUS IDAEUS	RED RASPBERRY
CHAMAEDAPHNE CALICULATA	LEATHERLEAF	SPIRAEA LATIFOLIA	MEADOWSWEET

### 855.02.02 PLANTING METHODS AND MAINTENANCE

The Contractor is referred to the **Manual for Native Plant Material Recovery**, available from the Department of Transportation and Works, for general information and recommended practices for the removal of trees and shrubs for either planting out directly or holding over for subsequent planting, and other aspects of care and maintenance.

All trees and shrubs do best when planted in early spring prior to the buds opening, but may also be successfully planted in late fall during their dormancy period. While it is possible to plant trees and shrubs at any time of the year, a regular watering program prepared by the Contractor and approved by the Resident Engineer to reduce or prevent mortalities is required during the active growing period. A watering program is required for all planted stock (nursery stock or site stock) in the first year. This should commence as soon as active growth begins, and as determined by the prevailing weather conditions and dryness of the soil throughout the growth season. Watering and other necessary maintenance such as the provision of staking or supports, pruning, mulching, etc. is the responsibility of the Contractor and no extra compensation will be paid for these items.

### 855.02.03 PAYMENT AND WARRANTY

Measurement for payment shall be by the number of individual trees of the specified species and size planted. The Contractor is responsible for preventing mortalities in planted stock. Trees and shrubs which die within 18 months of being planted shall be replaced by the Contractor at no additional cost to the Owner.



## FORM 860



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 860 PROTECTION OF HISTORIC RESOURCES

#### PROTECTION OF HISTORIC RESOURCES

The Contractor shall be aware that the Historic Resources Act (1985) requires the protection of archaeological sites and artifacts, and sets forth procedures to be followed in the event that either are found. The Contractor shall be aware of the following sections of the Act:

- Section 10(1) - A person who discovers an archaeological object in, on, or forming part of the land within the province shall report the discovery forthwith to the Minister stating the nature of the object, the location where it was discovered and the date of the discovery.
- Section 10(2) - No person, other than the one to whom a permit has been issued under this Act, who discovers an archaeological object shall move, destroy, damage, deface or obliterate, alter, add to, mark or in any other way interfere with, remove or cause to be removed from the province that object.
- Section 11(1) - The property in all archaeological objects found in, on or taken from the land within the province, whether or not these objects are in the possession of Her Majesty is vested in Her Majesty.

Should any archaeological remains be encountered, such as stone, bone or iron tools, concentrations of bone, fireplaces, house pits and/or foundations, work in the area of the find shall cease immediately. The Contractor shall immediately notify the Owner through the Engineer, or the Senior Environmental Planner, or the Environmental Surveillance Officer immediately upon discovery of any historic resources. The Owner shall immediately notify the Historic Resources Division.

## FORM 865



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 865

#### OTHER ENVIRONMENTAL REQUIREMENTS

The Contractor shall be aware that other environmental requirements are contained in other sections. The attention of the Contractor is directed to:

- SECTION 180 UNWATERING INCIDENTAL TO WORK
- SECTION 201 CLEARING AND GRUBBING
- SECTION 202 CLEARING
- SECTION 203 GRUBBING
- SECTION 204 GRADING OF FILL
- SECTION 207 BORROW
- SECTION 208 EXCAVATION OF DITCHES
- SECTION 305 APPLICATION OF CALCIUM CHLORIDE
- SECTION 310 USE OF PITS, QUARRIES, AND STOCKPILES FOR PRODUCTION OF MATERIALS SUPPLIED BY CONTRACTOR
- SECTION 317 WINTER SAND
- SECTION 320 TACK COAT
- SECTION 330 HOT MIX ASPHALTIC CONCRETE
- SECTION 401 DITCHING FOR OF STREAMS
- SECTION 402 PERMANENT DIVERSION OF STREAMS
- SECTION 403 EXCAVATION FOR FOUNDATIONS
- SECTION 405 TEMPORARY DIVERSION OF STREAMS
- SECTION 421 INSTALLATION OF PIPE CULVERTS
- SECTION 423 SUPPLY AND INSTALLATION OF STRUCTURAL PLATE PIPE
- SECTION 424 SUPPLY AND INSTALLATION OF STRUCTURAL PLATE ARCH
- SECTION 426 DESIGN, SUPPLY, AND INSTALLATION OF LONG SPAN STRUCTURAL PLATE ARCH
- SECTION 520 STORAGE OR DISPOSAL OF OLD ASPHALTIC PAVEMENT
- SECTION 521 DEMOLITION AND REMOVAL OF SIDEWALKS, CURB AND GUTTER, MANHOLES, CATCH BASINS, DITCH INLETS, FENCES, GUIDE RAIL AND GUIDE POSTS
- SECTION 522 DISPOSAL OR SALVAGE OF CULVERT OR PIPE
- SECTION 634 SOIL FOR HYDROSEEDING
- SECTION 635 LIME FOR HYDROSEEDING
- SECTION 632 HYDROSEEDING
- SECTION 902 EXCAVATION FOR FOUNDATION, UNWATERING AND EXTRA BACKFILL FOR STRUCTURES
- SECTION 914 BRIDGE DECK WATERPROOFING

March 2011

**DIVISION 9**  
**SPECIFICATIONS FOR STRUCTURES**

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## **SECTION 901**

### **REMOVAL OF EXISTING STRUCTURE**

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#### **901.01 SCOPE**

#### **901.02 GENERAL**

#### **901.03 DEMOLITION, REMOVAL, SALVAGE AND DISPOSAL**

#### **901.04 SALVAGE**

#### **901.05 MEASUREMENT FOR PAYMENT**

#### **901.06 BASIS OF PAYMENT**

#### **901.01 SCOPE**

The scope of the work involves the demolition, removal, salvage and disposal of an existing structure, structural components and debris.

The intention of this specification is to cover both rehabilitation and complete removal and disposal works. For rehabilitation type projects, a supplementary general condition shall describe which structural components are to be removed, salvaged and disposed of.

Debris shall be defined as pieces of timber, concrete, steel, wood, sticks, branches, bushes, garbage and the like including that above and below the water level. Also included is the accumulation of debris from the time of tender closing up to and including the date of substantial completion.

Structural components and related debris shall include that related to the superstructure, railings, bearings, abutments, piers, footings and wing walls.

All work shall be carried out in accordance with CSA S350-M1980 "Code of Practice for Safety in Demolition of Structures".

#### **901.02 GENERAL**

The demolition, removal, disposal and salvage of an existing structure shall be carried out under the following conditions:

Division 8 General Environmental Requirements.

The structure shall be removed to 0.6 metres below grade or stream bed with as little disturbance to the area or river bed as possible. The bending down of reinforcing steel to meet the above 0.6 metre criteria shall not be permitted. Reinforcing steel shall be cut off flush with the concrete remaining in the works. The area or stream bed will be restored to as near original condition as possible and to the satisfaction of the Engineer.

Where unwatering is required, it shall be provided for under Section 180 of the Specifications Book.

When all activity is complete, the affected work area must be restored to its natural condition acceptable to the Engineer. This shall include the backfilling of holes left after the existing foundation has been removed with material compatible with the natural environment.

The Contractor is advised the indiscriminate disturbance of the general area or stream bed will not be permitted.

### **901.03 DEMOLITION, REMOVAL, SALVAGE AND DISPOSAL**

The Contractor shall provide a disposal site satisfactory to all municipal, provincial and federal agencies having jurisdiction. Such disposal site shall be specifically approved by the Engineer.

Demolition, removal, salvage and disposal shall include the excavation, disassembly, breaking into pieces, handling, transportation from the job to disposal or storage site, and disposal or storage of bridge components and debris including burial and trimming of the disposal site to neat contours as required.

Demolition, salvage and removal operations shall be conducted in a workmanlike manner as approved by the Engineer. Debris which moves downstream during the work shall be recovered. Debris with a larger dimension of 500 mm shall be removed from streams and rivers.

The use of explosives will only be permitted where they are authorized for use by the Engineer. The use of explosives will not be permitted where any part of the structure is intended for salvage or to remain in future work.

### **901.04 SALVAGE**

Where structural components, regardless of material type are destined to be salvaged, the contract shall contain a supplementary general condition indicating which components are to be salvaged, how and where they are to be stored and whatever other pertinent requirements must be fulfilled by the Contractor.

Where the removal of aluminum railing, steel guiderail and any related components is required, it shall be salvaged by the Contractor. This shall include loading, transportation to the nearest maintenance Depot, off-loading and storage in a manner acceptable to the Engineer. Storage shall include the provision for wooden spacers to separate the various items from the ground and from each other. Provision for suitable water tight containers necessary to store components which may become lost or scattered is also required.

### **901.05 MEASUREMENT FOR PAYMENT**

Measurement for payment purposes shall be lump sum for the demolition, removal, disposal and salvage if so required, of the existing structure, structural components and debris as outlined above.

### **901.06 BASIS OF PAYMENT**

Payment at the contract price for "Removal of Existing Structure" shall be full compensation for all labour, materials and equipment-use to demolish, remove, salvage and dispose of an existing structure, structural components and related debris as outlined above.

Also included in the basis of payment is the cost to the Contractor of selecting and providing the disposal site, cost of all permits, fees and royalties in addition to all necessary backfilling, grading and trimming of both the job and disposal site to neat and slightly contours.

**SECTION 902**

**EXCAVATION FOR FOUNDATION,  
UNWATERING AND EXTRA BACKFILL FOR STRUCTURES**

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  - 902.09.05 Over excavation**

**902.01 DESCRIPTION OF EXCAVATION**

Excavation shall include the removal of all material necessary for the construction of foundations, substructures and the backfilling of the same in accordance with the plans or as directed by the Engineer.

All rock or other hard foundations shall have all loose or soft material removed to present a clean firm surface.

When a footing is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation. This shall include excavation by hand where so required or the use of excavator attachments which do not project below the final footing elevation. Alternatively, for footings excavated in the dry where the soil at or below the foundation elevation is disturbed as a result of construction operations; the foundation soil must be recompact to yield a bearing capacity equal to or greater than that specified for the footing as approved by the Engineer.

In soft conditions, the final removal of material to foundation level shall not be made until the Contractor is ready to proceed with the construction of the footing. When material at the founding elevation is Other Material and has been over excavated, the elevation shall be re-established by replacing with suitable material and compacting it to the bearing capacity indicated on the contract drawings as approved by the Engineer. When the founding material is Solid Rock and has been over excavated, the foundation elevation shall be re-established to the original elevation with mass concrete. First, all loose and compressible material shall be removed from the excavation to the satisfaction of the Engineer. Next, concrete shall be placed to the foundation elevation and shall fill the entire volume of the over excavation. Concrete shall be of a quality compatible with that used in the footing.

## Form 902

Footing elevation shall be considered as approximate only and may be ordered to be changed by the Engineer on evaluation of conditions as the excavation proceeds.

Unless otherwise specified no excavation shall be made outside of that required for constructing substructure and the natural stream bed adjacent to the structure shall not be disturbed without permission from the Engineer. The Contractor shall ensure that the channel is brought back to its original condition unless otherwise authorized.

After each excavation is completed, the Contractor shall notify the Engineer and no concrete or other backfill shall be placed until the depths of excavation and the nature of the foundation material has been affirmed as satisfactory.

Materials excavated as excavation for foundations will be used for backfill if the material is deemed suitable by the Engineer.

Suitable excavated material beyond the requirements for backfilling the excavation will be incorporated into fill construction in accordance with Section 204 "Grading of Fill" and will include hauling up to 1km. Excavation for foundation materials not required or unsuitable for backfilling excavation or for fill construction will become the property of the Contractor. No overhaul will be paid for the removal and disposal of these materials. The use and classification of all excavation foundation materials will be as directed by the Engineer.

### 902.02 CLASSIFICATION

Excavation shall be measured and classified as solid rock and other material. Provided that whenever the classes of material excavated cannot be separately measured on an accurate basis, the material will be classified on a percentage basis.

(a) Solid Rock - shall include all rock in masses or ledges in their original or stratified bed or position and all boulders and detached pieces of rock exceeding 0.50m<sup>3</sup>.

(b) Other Material - shall include all solid material other than solid rock as defined above including boulders less than 0.50m<sup>3</sup>.

### 902.03 PROTECTION

All substructure work shall be adequately shored, braced or otherwise adequately protected in a rigid fashion in accordance with Section 907 "Formwork and Falsework".

Where the stability, safety or function of an existing roadway, railway or other works can be impaired by an excavation or temporary slope, the Contractor shall provide such protection as may be required including sheeting, shoring and driving of piles where necessary to prevent damage to such works.

Where any excavation may endanger physical facilities, public safety or that of workmen, or the face of the excavation is less than two (2.0) metres from the edge of travelled lane or asphaltic pavement, whichever is nearest, or the excavation is more than one (1.0) metre deep, the Contractor shall submit scaled drawings detailing the method of protection, physical dimensions and grades of sub sheeting, shoring, bracing and piling. These drawings shall be prepared, signed and stamped by a Professional Engineer licensed to practise in the Province of Newfoundland.

All work must conform to the latest revision of the Occupational Health and Safety Act, including all amendments.

Unless otherwise specified, any materials used for protection shall remain the property of the Contractor and shall be removed from the job site when no longer required.

### 902.04 UNWATERING FOR BRIDGE FOUNDATIONS

The Contractor shall carry out all work necessary to prevent disturbance to the foundation and unless otherwise specified, he shall place all the concrete in the dry.

Where the term "unwatering" is used in this specification, it shall mean the removal of all water that would impede the placing of concrete for the foundations of the permanent structures by means of temporary water-tight structures and pumps.

## Form 902

The Contractor shall submit plans and descriptions outlining the methods of unwatering that he intends to use. These plans shall be approved by the Engineer before construction is started; approval will not relieve the Contractor of his responsibility for unwatering the foundations to the satisfaction of the Engineer.

Any damage to the permanent structure due to any failure of the temporary structure used in the unwatering operations shall be remedied at the expense of the Contractor to the satisfaction of the Engineer, even to the extent of removal and reconstruction of said permanent structure.

Unwatering for bridge foundations shall include the supply of all equipment, materials and labour for the construction of the necessary water-tight temporary structures, their pumping out and subsequent removal.

Earth fill cofferdams shall be faced with a layer of plastic sheeting followed by sand bags. The purpose is to produce a dam that permits the least amount of infiltration and therefore requires the minimum amount of unwatering.

Effluent from an unwatering operation shall not be disposed of directly into a watercourse or water body. Effluent shall be discharged to a vegetated area or to a sedimentation basin for silt removal before being returned to a watercourse. Where possible, the vegetated area shall be not less than 60m from a water course or water body unless otherwise directed by the Engineer.

If for any reason, all water cannot be removed from the forms so as to permit concrete to be placed in the dry, the Engineer may authorize upon receipt of a written request from the Contractor, the placing of a concrete seal by means of a tremie pipe or some other method. When a concrete seal is so authorized, the Contractor shall supply at his own expense all equipment, materials and labour necessary for such tremie concrete and no payment will be made for tremie concrete so placed other than under the lump sum bid for "Unwatering".

Unless otherwise specified, all temporary unwatering and support structures shall remain the property of the Contractor and shall be removed from the job site when no longer required.

### **902.05 EXTRA BACKFILL**

All backfilling and compaction work shall be conducted in the dry and under controlled conditions as approved by the Engineer.

The use of large vibratory compactors of the type used in roadway projects is prohibited adjacent to wingwall legs and abutments.

#### **902.05.01 Select Material Compacted**

The grubbing and excavation of all unsuitable material, and unwatering operations shall be completed before any select material is placed.

The quality of select material compacted shall be non-frost-susceptible free-draining granular material complying with the Department of Works, Services and Transportation specifications for Select Granular Base Course, Granular "A", Section 315, with the following exception:

The percentage of crushed materials is to be a minimum of 70% . This will be determined by examining the fraction retained on the 4.76 mm sieve and dividing the weight of the crushed particles by the total weight retained on the 4.76 mm sieve. Only pieces having one or more freshly fractured faces will be counted as crushed material. Pieces with only small chips removed will not be considered as crushed.

Other physical and gradation requirements shall be in accordance with Section 315.02 of the Department's specification for the select Granular Base Course.

French drains comprised of washed well-graded stone including filter fabric and perforated pipe if indicated shall be placed at weep holes and wherever else required on the contract drawings.

The limits for placing select material compacted shall be as defined on the contract drawings or in the tender documents. Where select material is to be placed below abutment or pier footings, the limits shall be defined as that extending 1.0 metre beyond all sides and ends of the footing(s) and extending to the original ground elevation or bottom of excavation whichever is more pertinent from the bottom of the footing elevation at a side slope of 1.5:1(min.). The limits of placing shall be staked on the ground before placing operations begin.



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Select material placed below abutment and pier footings, behind abutments, retaining walls, wing walls, type "C" curb and gutter and similar structural components shall be placed in horizontal layers having a maximum loose thickness of 250 mm before compaction. Where permission is given in writing by the Design Engineer or so indicated on the contract drawings, the maximum lift thickness can be increased to 500 mm where select material is being placed in non-structural applications. The backfill can be spread with a bull dozer and after each layer is spread, a vibratory compactor must be used as directed by the Engineer.

The Contractor shall compact the backfill behind abutments to a minimum of 95% of the maximum Standard Proctor Dry Density and to a minimum of 100% of the maximum Standard Proctor Dry Density below all footings, i.e. as per (ASTM D698-78). When directed by the Engineer, water may be added to assist the compaction effort but the amount of water added should not bring the moisture content above the optimum for the compactive effort used.

The contractor shall provide the Engineer with sufficient notice to perform Proctor and density testing. Acceptance shall be determined based upon samples taken from the point of final acceptance. The bottom layer must be spread, thoroughly compacted and tested before the next layer is placed.

No backfill shall be placed below a footing, against an abutment, wingwall or retaining wall until permission has been obtained from the Engineer.

Backfilling around arches, rigid frames, abutments and piers shall proceed simultaneously and evenly on both sides so as to avoid differential surface elevation in excess of 500 mm.

### **902.05.02 Compacted Ordinary Fill**

All material and placing shall be in accordance with Section 204. However, location of the source will be the responsibility of the Contractor.

### **902.08 MEASUREMENT FOR PAYMENT**

Excavation shall be measured in cubic metres in the original position of material excavated in conformity with the plans or as directed by the Engineer. Ordinarily no volume shall be included in the measurement for payment which is outside the volume bounded by vertical planes parallel to and beyond the neat lines of the footings unless such excavation is indicated on the contract drawings or specifically requested by the Engineer. The volume measured shall not include water or other liquids but shall include mud. The top limit for payment volume is original ground or new road subgrade elevation. Material removed above road subgrade elevation will be paid under Section 206 Grading of cuts of the General Specifications. The bottom limit is the completed bottom of footing.

The volume of boulders in excavation shall be determined on the basis of the three maximum rectilinear dimensions.

Unwatering shall be paid as lump sum as bid in the Unit Price Table.

Compacted ordinary fill and select material compacted shall be paid by the number of cubic metres in place to the nearest one decimal place and the volume measured shall be that between the theoretical or final grades and the original grades or lines as shown on the drawings, or as indicated herein.

### **902.09 BASIS OF PAYMENT**

#### **902.09.01 Excavation For Foundations**

Payment at the contract price for "Excavation for Foundations" (a) Solid Rock and (b) Other Material, will be full compensation for all labour, services, equipment and materials for all excavation required, protection of excavation, protection of adjacent works, stockpiling of excavated material for backfilling, hauling of excavated material up to 1km, placing and compaction of excavated material and disposal of any surplus or unsuitable excavated material.

Where the Engineer requires Excavation for Foundation material be hauled in excess of 1km, additional payment for overhaul will be made in accordance with Section 215 "Overhaul on Excavation".

**902.09.02 Unwatering**

Payment at the contract price for the item "Unwatering" in the Structure Unit Price Table shall be full compensation for all labour, services equipment and material to do the work according to the specifications.

**902.09.03 Extra Backfill Select Material Compacted**

Payment at the contract price for Extra Backfill Select Material Compacted shall be full compensation for all labour, equipment, plant and material involved in the cost of locating, obtaining approval, providing a pit or quarry, sampling, clearing, grubbing, producing, loading, hauling, placing of granular backfill to the structure, the granular material at weep hole drains, french drains, perforated subdrain, weeping tile and filter fabric where so indicated on the contract drawings, for compacting the material and all other work required to place, spread and ensure compaction of the material according to the specifications including the payment of royalties.

**902.09.04 Extra Backfill Compacted Ordinary Fill**

Payment at the contract price for Extra Backfill Compacted Ordinary Fill shall be full compensation for all labour, equipment and material, locating, obtaining approvals, clearing, grubbing, hauling, loading, placing and compacting the fill and all other work necessary to comply with specifications in Section 204.

**902.09.05 Over excavation**

Payment will not be made for over excavating due either to the Contractor's method of operation or his negligence. Neither will compensation be provided for the cost of remedial measures required by the Engineer as a result of over excavation by the Contractor.



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CONSTRUCTION SPECIFICATION FOR PILING**

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### 903.01 SCOPE

The scope of this specification is to cover the supply and driving of piles, sheet piles and associated work, in steel or timber. Piles to be "Supplied By The Contractor" or "Supplied By The Department".

### 903.02 MATERIALS

All materials shall be new and previously unused. The Contractor shall provide Mill Certificates and a Letter of Compliance for all piling and piling related materials used in the project.

#### 903.02.01 Timber - Round Piles

Timber piles shall be clean peeled and shall comply to the standards of CSA Standard CAN3-056. Piles shall be pressure treated with creosote in conformance with CSA Standard 080 at a rate of retention of 130 to 260 kg/m<sup>3</sup>, any cuts or breaks in the surface of treated piling shall be given three brush coats of hot creosote oil.

#### 903.02.02 Steel Sheet Piles And H-Piles

Steel sheet piles and steel H-piles shall comply with the requirements of CSA G40.21-M 300W or ASTM A328. The straightness tolerance shall be 25mm in 20 metres.

#### 903.02.03 Steel Tube Piles

Steel tube piles shall be welded or seamless tube piles and shall comply with the requirements of ASTM Specification A252 Grade 2 or Grade 3. If welded, they shall be welded by the Electric Arc method in accordance with CSA Standard W59.

The straightness tolerance shall be 25mm in 20 metres.

#### 903.02.04 Pile Tips

As per contract specifications.

#### 903.02.05 Concrete And Reinforcement For Steel Tube Piles

Concrete and reinforcement shall be in accordance with Section 904 and Section 905 respectively.

#### 903.02.06 Storage And Handling

All piles shall be stored and handled in such a manner that damage is prevented and that design strengths will not be affected by deterioration or deformation.

### 903.03 PILE DRIVING

#### 903.03.01 General Requirements And Restrictions

Piles shall not be driven until other excavation is completed to below cut-off level. Any material forced up between the piles shall be removed to the correct elevation. Any fill material shall be placed to the underside of the footing before driving piles.

Piles shall not be driven within 15m of concrete placed during the preceding seven days.

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The Contractor shall not drive piles in such a manner that the piles are subjected to excessive or undue abuse. Forcing piles into their proper position by the use of excessive manipulation is prohibited.

The Contractor's driving operations shall not cause vibration sufficient to harm the construction or adjacent property.

### 903.03.02 Tolerances

Piles shall be driven as nearly as possible in the exact position specified on the drawings. After driving, piles at the cut-off elevation shall not be more than 75mm from the location shown on the drawings.

Deviation from the vertical or required batter shall not be more than 20mm per lineal metre of pile. Any pile so out of line or plumb as to impair its usefulness shall be pulled and redriven or an additional pile shall be driven as required by the Engineer. The piles shall not be jacked or pulled laterally to bring their tops into correct location.

### 903.03.03 Driving Equipment

All piles shall be driven with a hammer developing an energy per blow of not less than that shown in the contract document. The energy should be capable of remote regulation to prevent damage to the piles. The piles and hammer shall be held securely in the correct alignment by rigid leads extending down to the lowest point the hammer must reach.

The use of vibratory hammers to drive or partially drive either H-piles or pipe piles must be approved by the engineer.

### 903.03.04 Jetting

Jetting shall not be used unless written permission has been given by the Engineer. Appropriate special conditions will be given should jetting be authorized.

### 903.03.05 Helmets

Pile heads shall be protected by helmets having adequate cushioning material next to the pile head. The helmet shall distribute the blow of the hammer evenly throughout the pile cross-section.

Timber piles shall be prevented from splitting by collars.

### 903.03.06 Records

The Contractor shall not commence driving piles in the absence of the Engineer.

Blows per 300mm for each 300mm shall be recorded. For the final 300mm the blows per 25mm shall be recorded.

When driving is interrupted before final penetration is reached, the final record of penetration shall not be taken until, on resumption of driving, a further penetration of 300mm has been obtained.

### 903.03.07 Redriving

Piles pushed up by driving or loosened by jetting of adjacent piles shall be redriven to comply with the requirements of the contract. Similarly, if a pile(s) is suspected to have hung up on a boulder, the Contractor shall re-drive the pile(s) in question as well as others in the immediate vicinity.

After all piling is complete and all piles are driven to meet project criteria, the contractor shall return to each footing and re-drive at least ten (10) percent of the piles in each footing rounded to the next highest number of piles plus one. The piles selected for re-driving shall be randomly selected by the Engineer. If movement exists on one or more piles, additional piles shall be re-driven until the Engineer is satisfied that all piles have met the design criteria as established on the contract drawings or in the specifications.

The contractor is advised that piling shall not be cut-off until all re-driving is complete.

**903.03.08 Driving Of Tube And H-Piles When Boulders Are Anticipated Or Driving To Bedrock**

When boulders are anticipated, pile tips should be fitted. Driving shall be carried out until the pile tips make contact with rock. Driving energy shall be decreased to about a quarter and the pile shall be subjected to twenty blows. Energy can be increased with approval from the Engineer by about a quarter at twenty blows for each interval until the Engineer is satisfied that the requirements of the contract are complied with. Adjacent piles should then be redriven.

When steel tube and H-piles are to be driven to and chipped or socketed into bedrock, rock injector pile tips shall be fitted to the ends of the piles. The piles shall be chipped into the bedrock using low energy. When the piles are firmly seated, the energy shall be increased in stages or intervals and eventually driven to refusal at the rated energy as stipulated in the contract documents.

**903.04 SPLICES**

**903.04.01 Timber Piles**

No splices will be permitted for timber piles.

**903.04.02 Steel Piles**

No splices will be permitted for steel piles except where allowed for in the contract or as authorized by the Engineer in exceptional circumstances. In no event will more than two splices per pile be allowed.

Welding shall meet the requirements of CSA Standard W59 and shall be done by a welder qualified according to CSA Standard W47.1. Welding details shall be submitted to and approved by the Engineer.

**903.05 CONCRETE FILL IN TUBULAR STEEL PILES**

After acceptance by the Engineer, the pile shells including rejected shells left in the ground shall be cut off at the required elevation and shall be filled with concrete.

Prior to filling each pile, the inside shall be inspected with an electric lamp attached to a drop cord of sufficient length to reach the bottom of the pile. Any debris and water shall be removed before placing the concrete.

Reinforcing steel shall be installed in the concrete fill at the top of all the piles as shown on the drawings.

No concrete shall be placed until all driving within a radius of 15m has been completed. If this cannot be done, driving within these limits shall be stopped until the concrete in the last pile has set for at least seven days.

Concrete shall be placed continuously until the shell is filled.

The concrete shall be worked thoroughly down into place and compacted with a vibrator to the lowest extent of the reinforcement.

After placing, the concrete shall be protected from frost for at least three days.

**903.08 MEASUREMENT FOR PAYMENT**

**903.08.01 Sheet Piles Supplied**

The measurement for sheet piles supplied will be in square metres to the nearest one decimal place. For payment purposes the measurement for sheet piles supplied will be based upon the actual quantity installed provided this quantity equals or exceeds the quantity estimated in the Structure Unit Price Table. If the actual quantity installed is less than the quantity estimated then payment will be made for supplying the quantity installed plus the total area of unused sheet piles but not exceeding the estimated quantity. Unused sheet piles will include only uncut sheet piles in lengths originally supplied to the Contractor and, if necessary, cut-off sections of sheet pile whose lengths are 3 m or longer. For payment purposes the length of cut off sections will be calculated based upon the difference between the estimated pile toe elevation as shown on the contract drawings and the actual pile toe elevation.

**903.08.02 Piles Other Than Sheet Piles Supplied**

The measurement for piles supplied other than sheet piles will be in linear metres to the nearest one decimal place. For payment purposes the measurement for piles supplied other than sheet piles will be based upon the actual quantity installed provided this quantity equals or exceeds the quantity estimated in the Structure Unit Price Table. If the actual quantity installed is less than the quantity estimated then payment will be made for supplying the quantity installed plus the total length of unused piles but not exceeding the estimated quantity. Unused piles will include only uncut piles in lengths originally supplied to the Contractor and, if necessary, cut-off sections of piles whose lengths are 3 m or longer. For payment purposes the length of cut off sections will be calculated based upon the difference between estimated pile toe elevation as shown on the contract drawings and the actual pile toe elevation.

**903.08.03 Sheet Piles Installed**

The measurement for sheet piles installed will be in square metres to the nearest one decimal place based upon the actual quantity of pile installed and left in place after cut off as approved by the engineer.

**903.08.04 Piles Other Than Sheet Piles Installed**

The measurement for piles other than sheet piles installed will be in linear metres to the nearest one decimal place based upon the actual quantity of pile installed and left in place after cut off as approved by the engineer.

**903.08.05 Pile Tips And Splices**

These will be measured according to the actual number used, authorized and accepted by the Engineer.

**903.08.06 Rejection**

Any piles or tips which are rejected for reasons of improper driving, positioning or damage shall not be included in the above measurements.

**903.08.07 Vertical Piles**

All piles shown on the plans vertically will be considered and paid for as vertical piles.

**903.08.08 Battered Piles**

All piles shown on the plans with a batter angle will be considered and paid for as battered piles.

**903.09 BASIS OF PAYMENT**

**903.09.01 Sheet Piles Supplied**

Payment at the contract price for sheet piles supplied shall be full compensation for all labour, materials, supplies and equipment required to complete the work associated with the supply of piling, loading and transportation to the jobsite, unloading, handling and storage of piling materials.

Unused sheet piles shall be loaded, transported and off-loaded by the Contractor to a designated area at the nearest maintenance depot as part of the demobilization item as per section 157 of the Specifications Book. When the Contractor transports the unused piles he shall present a receipt for the piles, signed by the Depot Foreman, to the Engineer.

The quantity of wastage (defined as the quantity supplied to the site less the pay quantity) shall be the Contractor's responsibility and payment will not be made for such. The Engineer shall determine the quantity of wastage.

**903.09.02 Piles Other Than Sheet Piles Supplied**

Payment at the contract price for piles other than sheet piles supplied shall be full compensation for all labour, materials, supplies and equipment required to complete the work associated with the supply of piling, loading and transportation to the jobsite, unloading, handling and storage of piling materials.

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Unused piles shall be loaded, transported and off-loaded by the Contractor to a designated area at the nearest maintenance depot as part of the demobilization item as per section 157 of the Specifications Book. When the Contractor transports the unused piles he shall present a receipt for the piles, signed by the Depot Foreman, to the Engineer.

The quantity of wastage (defined as the quantity supplied to the site less the pay quantity) shall be the Contractor's responsibility and payment will not be made for such. The Engineer shall determine the quantity of wastage to the Engineer.

### **903.09.03 Piles Installed**

Payment at the contract price per square meter for sheet piles installed and per linear meter for piles other than sheet piles installed shall be full compensation for positioning, driving, cleaning, painting, protecting and pile cut-off.

The re-driving of piles shall be considered incidental to the work and extra payment will not be made for the same. However, where the contractor succeeds in increasing the length of piling in the works he shall be compensated for supply and installation in accordance with the contract specifications.

Where pile capacity is established by dynamic analysis and relaxation occurs the Contractor shall have the pile capacity re-evaluated. Piles are defined to have relaxed when more than 125 mm average movement occurs in those piles subject to re-driving as defined in Section 903.03.07 above. Dynamic analysis re-evaluation shall be conducted by an agency approved by the Engineer. The cost of the dynamic analysis re-evaluation shall be paid for by the Department. All other costs including but not limited to the cost of delay shall be considered incidental to the tendered price for piles driven.

No payment will be made for falsework piling.

All costs involved in filling tube piles with concrete and reinforcing shall be included in the contract price for piles installed.

Payment for pile template(s) shall be considered incidental to the work and payment will not be made for such.

### **903.09.04 Pile Splices**

Payment at the contract price shall be full compensation for all labour, equipment, materials and services necessary to install pile splices where approved.

### **903.09.05 Pile Tips, Supply And Install**

Payment at the contract price shall be full compensation for all labour, equipment and materials necessary to supply, deliver and install the pile tips.

### **903.09.06 Jetting**

No additional payment shall be made for jetting, if authorized.



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**904.01 SCOPE**

The scope of this specification is to cover the supply of materials for concrete structures, production, delivery, placement, sampling and testing of concrete, curing, and the subsequent protection. All work, plant, equipment and materials shall be in strict accordance with CSA Standard CAN/CSA A23.1-M.

The plant from which the ready mix concrete is supplied shall be certified in accordance with the requirements for certification as published by the Atlantic Provinces Ready Mix Concrete Association or equivalent. A copy of the certification of conformance shall be provided to the Engineer prior to the start of delivery under the proposed contract.

In the event that the contractor selects a ready mixed concrete supplier not certified by APRMCA, approval must be obtained from the Materials Engineering Division at least 14 days prior to concrete supply.

A job meeting shall be held prior to the deck concrete placement to discuss all aspects of the concrete work including production, supply, delivery, placing, curing and any other related items. This meeting is to be called by the Engineer; the Contractor and all others deemed necessary by the Engineer shall be in attendance.

**904.02 MATERIALS**

All concrete materials shall be in accordance with CSA Standard CAN/CSA-A23.1-M.

**904.02.01 Cement**

All cementing materials shall be in accordance with CAN/CSA A3000.

Cement for Superstructure, Substructure, MSE Panels and Reinforced Wharf Deck Concrete (with the exception of Pile, Mass and Tremie Concrete) shall be a blended Portland, fly ash, silica fume cement, Type GUbf/SF. Contractors are advised that the minimum proportion by mass of the total cementing materials for silica fume

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shall be 6% and a maximum of 8%. Contractors are advised that the maximum proportion by mass of the total cementing materials for fly ash is 25%.

Cement for deck and curb resurfacing in Section 919 Rehabilitation of Concrete Structures shall be Portland cement Type GU unless otherwise specified.

Cement for all other concrete shall be Portland cement Type GU, a portion of which may be replaced by fly ash up to 25% by mass of the total cementing material.

### 904.02.02 Aggregate

The source of the aggregate will be determined by the Contractor but all aggregate shall meet the requirements of CSA Standard CAN/CSA-A23.1-M. The maximum petrographic number will be 135.

Concrete aggregate shall consist of natural sands and gravels, crushed rock or other inert materials having clean, uncoated grains of strong and durable minerals.

Fine and coarse aggregate shall be stored in separate stock piles sufficiently removed from each other to prevent the materials at the edges of the piles from becoming intermixed.

Aggregate shall be free from alkali, organic matter or other deleterious substances and shall not contain soft, friable, thin, flaky, elongated or laminated particles totalling more than 3% nor contain shale in excess of 1½%, nor silt and crusher dust finer than 75µm sieve size, in excess of 2%. The percentages shall be based on the weight of the combined aggregate as used in the concrete. When all three groups of these deleterious materials are present, the combined amounts shall not exceed 5% by weight of the combined aggregate.

The maximum size of stone to be used for the different thickness of concrete shall be 20mm unless otherwise ordered by the Engineer. In no case shall the maximum size of stone used be greater than either 2/3 the clear distance between the reinforcement or 2/3 the clear distance between the exterior bars and the face of the structure except for girders where the latter criteria shall be 0.8 times the clear distance between the exterior bars and the face of the structure.

Stock piles of approved fine and coarse aggregate, in amounts of one quarter to one half of that required for the job, shall be placed on the site of the work at least one month previous to concrete placing operations. The stockpiles shall be protected by tarpaulins or plastic sheeting against formations of ice and accumulation of snow.

The Contractor shall provide with the concrete mix design relevant test data for all aggregate materials indicating conformance to the requirements of CSA-A23.1 and this specification. The sources and test results of all aggregate materials shall be clearly identified. The aggregate tests shall be conducted by a testing laboratory CCIL or CSA Certified in accordance with CSA Standard A-283-06 or latest edition. Test results are only considered valid for up to two years in advance of the date of the project mix design submission. The test data required but not be limited to shall include:

- Sieve Analysis of Fine and Coarse aggregate CSA-A23.2-2A
- Amount of Material Finer than 75 µm in Aggregate CSA-A23.2-5A
- Bulk Relative Density and Absorption of Fine and Coarse Aggregate (SSD basis) CSA-A23.2-6A
- Fineness Modulus of Fine Aggregate CSA-A23.2-2A
- Clay Lumps and Light Weight Pieces CSA-A23.2-3A
- Test for Organic Impurities in Fine Aggregate CSA-A23.2-7A
- Flat and Elongated Particles in Coarse Aggregates CSA-A23.2-13A
- Petrographic Analysis of Coarse Aggregate CSA-A23.2-15A
- Resistance to Degradation of Coarse Aggregate by Abrasion and Impact in the Los Angeles machine CSA-A23.2-16A
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- Test for Detection of Alkali-Aggregate Reactivity (AAR) on Coarse and Fine Aggregate CSA-A23.2-25A
- Unconfined Freeze Thaw test CSA-A23.2-24A

**904.02.03 Water**

All water shall be clear and free from injurious substances and shall be potable.

All water used for curing shall be clean and free of any material which would cause staining or discoloration of the concrete. The contractor shall not use water from shallow, stagnant or marshy sources.

**904.02.04 Air Entraining Agent**

All concrete shall be air entrained with the air entraining agent conforming to CSA Standard CAN3-A266.1-M.

**904.02.05 Admixtures**

Any other admixture must be approved by the Engineer and shall conform to CSA Standard CAN3-A266.2-M.

**904.02.06 Reinforcement**

Reinforcement shall conform to Section 905, "Concrete Reinforcement".

**904.02.07 Form work and Falsework**

Form work and falsework shall conform to Section 907, "Form work and Falsework".

**904.02.08 Burlap**

Burlap shall conform to AASHO M182 "Specification for Burlap Cloth made from Jute or Kenaf".

**904.02.09 Filter Fabric**

Filter fabric shall be a, non woven geotextile with a minimum mass of 340gm/m<sup>2</sup> and a minimum thickness of 3.3mm; all properties tested in accordance with C.G.S.B. CAN 24.2-M77 test methods.

Filter fabric or non-woven geotextile may be used for curing on flat horizontal surfaces but not on vertical surfaces. Vertical surfaces, i.e. abutments shall be cured using saturated burlap only.

**904.02.10 Moisture Barrier**

Moisture barrier shall conform to ASTM C171, "Sheeting Materials for Curing Concrete".

**904.02.11 Miscellaneous Materials**

The supply and installation of miscellaneous materials shown on the drawings or mentioned in the Supplementary General Conditions but which have not been listed on the Unit Price Table, are considered incidental to the work and no separate payment will be made.

This shall include, but not necessarily limited to, all miscellaneous concrete accessories, conforming evaporation retardant, abutment weep holes, drip grooves and guide rail modified end shoes.

**904.02.12 Membrane Curing Compounds**

Membrane curing compounds shall meet the requirements of ASTM C309, and shall only be used with the approval of the Engineer.

**904.03 EQUIPMENT**

The Contractor shall supply the Engineer before commencement of the project with adequate details of all equipment to be used. The intention is not to limit the Contractor's operation but to ensure adequate planning is undertaken.

The Contractor shall maintain all equipment used for handling, mixing, transporting, depositing, compacting, curing and finishing the concrete in a clean condition and in proper working order.

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Pumping equipment may be utilized by the Contractor. Details of the pumping equipment and operation must be approved by the Engineer. The Contractor shall submit to the Engineer, manufacturer's specifications detailing pumping capacity and pressure at the required elevations. Aluminum pipelines shall not be used. The Contractor shall be prepared in the event of a breakdown in pumping operations. These emergency preparations shall be discussed with and approved by the Engineer prior to the commencement of concrete placement utilizing pumping equipment.

Compaction equipment shall be capable of giving dense concrete in accordance with specification requirements. Internal vibrators shall have a frequency of 160 Hz.

An approved self-propelled mechanical bridge deck finisher shall be used to strike off and finish concrete decks as per specifications. The approved machine shall travel on guides or rails supported so that they are completely clear of the finished surface. The guide or rail supports that extend through the roadway areas of the deck shall be such that they can be removed to at least 50mm below the top of concrete. Two work platforms shall be used for finishing and curing operations.

Batching equipment shall be as defined in Section 904.04.03, "Mixing Concrete".

The equipment required for heating materials for Cold Weather Concreting shall be of adequate capacity and be approved by the Engineer; it shall be available, installed and tested ready for use before it is proposed to place concrete. Heating equipment shall be ready for use between September 1 and April 30 when so required by the Engineer. Alternative methods of keeping concrete temperatures at acceptable levels may be approved. Where the heating equipment is to be used for heating the housing as well as the materials at the same time, the term adequate capacity means that the equipment shall have adequate capacity to heat both materials and housing simultaneously to the required temperature.

Boilers used for heating materials or housing shall meet the inspection requirements and operating conditions laid down by Provincial Acts and Regulations.

### **904.04 CONCRETE PRODUCTION, DELIVERY AND PLACING**

#### **904.04.01 Measurement of Materials**

Materials shall be measured by weighing. Other methods shall be used only if specifically authorized, in writing, by the Engineer.

The apparatus provided for weighing the aggregate shall be suitably designed and constructed for this purpose. Each size of aggregate shall be weighed separately with a required accuracy of two per cent.

Cement in standard bags need not be weighed.

The mixing water **shall be measured** by volume or by weight.

All measuring devices shall be subject to approval of the Engineer.

**904.04.02 Concrete Quality**

Concrete strength shall be as shown on the drawings unless particular specifications require higher strength.

Concrete mixes shall be designed in accordance with CSA Standard CAN/CSA-A23.1 latest edition. Note that ACI standard 211.1 should be used as a guide for determining mix proportions for normal and mass concrete. Verification of the following specified properties through trial batching will be a requirement as a prerequisite to approval of the mix design. In addition, test cylinders may be requested by the Engineer prior to approval of the concrete mix design.

PARAMETER	SUPERSTRUCTURE 45MPa (1,4)	SUBSTRUCTURE 40MPa (1,4)	REINFORCED WHARF DECK CONCRETE	PILE CONCRETE	MASS & TREMIE CONCRETE (2)
WATER/CEMENT RATIO	0.35 MAX.	0.37 MAX.	0.39 MAX.	0.45 MAX.	0.55 MAX.
SLUMP	AS PER APPROVED MIX DESIGN	AS PER APPROVED MIX DESIGN	AS PER APPROVED MIX DESIGN	100 ± 30 mm*	100 ± 30 mm*
COMPRESSIVE STRENGTH AT 28 DAYS	45 MPA	40 MPA	35 MPA	25 MPA	20 MPA
RAPID CHLORIDE PERMEABILITY(ASTM C1202)	<1000 COULOMBS	<1000 COULOMBS	<1000 COULOMBS	N/A	N/A
AIR CONTENT	6 ± 1%*	6 ± 1%*	6 ± 1%*	4 ± 1%*	4 ± 1%*
AIR VOID SPACING FACTOR (AVERAGE)	230 µM MAX.	230 µM MAX.	230 µM MAX.	N/A	N/A
SPECIFIC SURFACE (AVERAGE)	25 mm <sup>2</sup> /mm <sup>3</sup> MIN.	25 mm <sup>2</sup> /mm <sup>3</sup> MIN.	25 mm <sup>2</sup> /mm <sup>3</sup> MIN.	N/A	N/A

\* The above specified tolerances apply to concrete mix production and not to concrete mix design.

## NOTES:

1. The cementing materials content for 40 and 45 MPa concrete is 480 kg/m<sup>3</sup> maximum.
2. Tremie concrete shall require an additional 10% cement and slump shall be 180+30mm.
3. Concrete for severe exposure conditions (decks, curbs, sidewalks, end blocks, barriers and grade separation columns) which contains superplasticizer as an admixture to produce flowable concrete, shall have an air content 7 + 1%.
4. The above mix parameters do not include required adjustments for prestressed girder concrete.
5. N/A - Not applicable

The Contractor will be responsible for the mix design and quality control of concrete production.

The Department will review and approve mix designs and provide quality assurance with regard to concrete testing. All concrete mix design proportioning including the mix quality control operations shall be performed by a Laboratory CCIL or CSA Certified in accordance with CSA Standard A-283 latest edition. All testing shall be as conducted as stated in CAN/CSA-A23.1 and A23.2 latest edition. The proposed mixture design shall be signed by a Professional Engineer registered to practice in Newfoundland and Labrador. The Professional Engineer shall attest to the validity of the material test data. Proposed mix designs and test results are only considered valid for up to two years in advance of the date of the project mix design submission. The Contractor shall provide with the proposed mix design the following information based on actual trial mixes at least two weeks in advance of concrete placement:

- Slump CSA A23.2-5C
- Air Content of Plastic Concrete by Pressure Method CSA A23.2-4C
- Mass Density and Yield CSA A23.2-6C
- Compressive Strength Testing CSA A23.2-9C
- Air Void Analysis on Hardened Concrete tested at 7 days ASTM C457
- Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration tested at 56 days ASTM C1202

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- Alkali Reactivity Test Results A23.2-25A

Also to be included with each mix design submission is the following necessary information:

- Project number and title description
- Contractor company name with contact information
- Ready mix supplier
- Certifying laboratory with signing engineer
- Type of concrete, intended use, approximate quantity and method of placement
- Mix slump and air entraining agent range plus all admixtures with dosage rates
- Aggregate test information as per requirements of 904.02.02 Aggregates

No concrete shall be placed until approval of the mix design has been obtained from the Engineer. The Contractor shall submit copies of the concrete mix design 14 days in advance of any concrete placement operation.

Once approved, no adjustments shall be made to the concrete mix design without the approval of the Engineer. If material characteristics change after the original mix design approval a revised mix design shall be submitted for approval.

Acceptance by the Engineer of the Contractor's concrete mix design does not relieve the Contractor of the responsibility for providing concrete which meets the specifications.

High range water reducing agents (superplasticizers) may be used at the Contractor's request, if so indicated when the mix design is submitted. The Contractor must demonstrate competence and experience in their use and specific approval must be obtained. The Contractor shall state his method of concrete placement when submitting his concrete mix design.

Where 40 and 45 MPa concrete is specified on the contract drawings, a trial batch consisting of a minimum of 20 m<sup>3</sup> of superstructure concrete shall be placed in the substructure, i.e. abutments and footings, at least 28 days prior to the placement of any 40 or 45 MPa superstructure concrete. The purpose of this exercise is to allow for fine tuning of the mix to achieve proper air and slump, and to obtain an early indication of the expected compressive strength. The additional cost of this trial batch and fine tuning of the mix design shall be considered incidental to the works.

If superplasticizers are used, the maximum concrete slump in a superplasticized condition shall be limited to 230 mm. The mix design shall state the design slump before and after the addition of superplasticizers along with the appropriate tolerances. Note that the slump in the above table may not be applicable when using superplasticizers.

Samples for concrete testing quality assurance purposes will normally be taken from concrete as delivered to the site (at the point of discharge from the delivery equipment). However, depending on the method of placement, random sampling of the concrete as incorporated into the structure may also be performed to verify the above specified properties. This process shall entail the sampling of fresh concrete as close to the point of deposit in the structure as is practicable. Coring of the in-place hardened concrete may also be performed to verify the specified air void system. The Department reserves the right to designate the point of acceptance, with prior notice given to the Contractor.

### **904.04.03 Mixing Concrete**

Dry batching will not normally be permitted!

The use of ready mix concrete is encouraged. Where ready mix concrete is to be used, details of scheduling and procedure must be approved by the Engineer.

The Contractor will be given permission to add cement on site if it is not feasible to have the concrete deposited in the forms within 120 minutes after charging the mixer at the plant. When cement is being added at the site, the total volume of concrete being batched or mixed shall not exceed 85% of the manufacturer's rated drum capacity. Cement shall be added in four equal increments with mixing to be carried out after the addition of each portion of cement added. All equipment, materials and procedure must be approved by the Engineer.

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The mixing of concrete, unless otherwise authorized by the Engineer, shall be done in a batch mixer of an approved type. The mixer shall be equipped with a suitable charging hopper, water storage and water measuring device. It shall be cleaned at frequent intervals when in use and maintained in such a condition that the mixing will be unimpaired.

The mixing of each batch shall continue not less than one minute after all the materials are in the mixer, during which time the mixer shall rotate at a speed from 14 to 20 revolutions per minute, unless otherwise rated by the manufacturer or directed by the Engineer. The Contractor may mix small quantities of concrete by hand when and as directed by the Engineer.

Concrete transported in a truck mixer, agitator, or other transportation device shall be discharged at the job and placed in its final position in the forms within 120 minutes of the introduction of the mixing water to the cement and aggregate, or the cement to the aggregate, except in hot weather or under other conditions contributing to quick stiffening of the concrete. The maximum volume of mixed concrete transported in an agitator shall be in accordance with the specified rating. Time of charging the truck shall be clearly indicated and excess time in the mixer shall be cause for rejection of a load. Each batch slip shall have the time of batching clearly clock stamped onto each such slip.

Aggregates shall be separated into fine and coarse. The coarse aggregates shall be graded for mass concrete from 40mm to 5mm and for reinforced sections from 20mm to 5mm. The equipment for batching on site shall have the capacity to produce at such a rate as to preclude cold joints in the concrete placement. It shall be capable of being charged to the operating capacity of a 16S mixer with one discharge of the batcher. In any event, the equipment is subject to the approval of the Engineer.

The water and approved admixture(s) shall be proportioned separately by weight or by volume (i.e. metering devices(s) to an accuracy of one percent at the mixer). Metering devices which measure the volume of water discharged into the truck shall be in place both at the batch plant and on the truck if water is to be added on site. Alternatively, the water must be manually weighed or measured by volume before being placed into the mixer.

The Contractor shall provide standard certified test weights and/or devices for checking the accuracy of the controls. Checks shall be made just prior to the first concrete placement and at 150 m<sup>3</sup> intervals thereafter. If the batching plant is moved, a check shall be made prior to batching any more concrete. The Contractor shall carry out all tests in the presence of the Engineer and shall supply him with results of all tests and make any and all alterations, repairs or replacements required to the equipment before authorization will be given to place concrete.

### **904.04.04 Placing Concrete**

Concrete shall not be placed if the temperature is less than 5oC or greater than 25oC without the written permission of the Engineer.

The pumping of concrete from the delivery vehicle to its place of final deposition will be permitted as approved by the Engineer.

Before concrete is placed, forms, reinforcement and placing procedure shall be approved by the Engineer. The Contractor shall give 24 hours notice (not including Sundays or holidays) of his intention to place concrete. In preparation for the placing of concrete all sawdust, chips, and other construction debris and extraneous matter shall be removed from the interior of the forms. Struts, stays, and braces shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These temporary members shall be entirely removed from the forms and not buried in the concrete.

Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. The use of long troughs, chutes and pipes for conveying from the mixer to the forms shall be permitted only on written authority of the Engineer. In case an inferior quality of concrete is produced by the use of such conveyers, the Engineer may order discontinuance of their use and the substitutions of a satisfactory method of placing.

Dewatering will not be permitted during the placing of concrete or for a period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a watertight wall or other effective



means.

Pumping to unwater a sealed cofferdam shall not commence until the seal has set sufficiently to withstand the hydrostatic pressure.

Concrete shall not be placed with a free fall greater than 1500mm.

When placing operations would involve dropping the concrete more than 1500mm, it shall be deposited through sheet metal or other approved pipes. The pipes shall be kept full of concrete during placing and their lower ends shall be kept buried in the newly placed concrete. After initial set of the concrete the forms shall not be jarred and no strain shall be placed on the ends of reinforcing bars which project.

Concrete, during and immediately after depositing, shall be thoroughly compacted by mechanical vibration.

The vibration shall be internal and the intensity of vibration shall visibly affect concrete over a radius of 500mm.

The Contractor shall provide a sufficient number of vibrators and they shall be manipulated so as to thoroughly work the concrete around the reinforcement, embedded fixtures and into the corners and angles of the forms.

Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The vibrators shall be inserted vertically and withdrawn out of the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete, until the air bubbles stop breaking on the surface. Vibration shall not be continued at any one point to the extent that localized areas of grout are formed.

Vibration shall not be used to make concrete flow into place. Application of vibrators shall be at points uniformly spaced and not farther apart than twice the radius over which vibration is visible.

Vibration shall not be applied directly or through the reinforcement to concrete which has hardened. Vibration shall be supplemented by such spading as is necessary to ensure smooth surfaces and dense concrete along form surfaces. Concrete shall be placed in horizontal layers not more than 300mm thick except as hereinafter provided. When less than a complete layer is placed in one operation it shall be terminated in a vertical bulkhead. Each layer shall be placed and compacted before the preceding batch has set to protect green concrete and avoid surfaces of separation. Vibrators shall project into preceding layer to avoid construction joint formation.

When the placing of concrete is temporarily discontinued, the concrete, after becoming firm enough to retain its form, shall be cleaned of laitance and other objectionable material to a sufficient depth to expose sound concrete.

In the construction of box culverts more than 1200mm in height, the concrete in the walls shall be placed and allowed to set before the top slab is placed. In this case, appropriate keys shall be left in the sidewall for anchoring the cover slab.

Concrete for beams and girders shall be deposited uniformly for the full length of the beam (or between vertical construction joints authorized by the Engineer) and brought up evenly in horizontal layers. Efforts shall be made to eliminate segregation as may be evident by flow lines. In this regard, concrete must be deposited in place and thoroughly consolidated rather than be permitted to flow in place.

Concrete in beams and slabs shall be placed in one continuous operation.

Beams, girders and haunches shall be placed monolithically.

During wet weather, concrete must not be placed unless suitable means, approved by the Engineer, have been provided to prevent washing of freshly deposited concrete or marring of the exposed surface.

#### **904.04.05 Depositing Concrete Under Water**

Concrete shall not be deposited in water except with the approval of the Engineer and under his immediate supervision. Concrete deposited in water shall contain 10% excess cement prepared with a mix design approved as if concrete was not under water. Slump for tremie concrete shall be  $180 \pm 30$ mm. To prevent segregation, it shall be carefully placed in a compact mass, in its final position, by means of a tremie tube or other approved

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method. Still water shall be maintained at the point of deposit and the forms underwater shall be watertight.

The tremie tube shall have a minimum diameter of 250mm, constructed in sections having flanged couplings fitted with gaskets.

The discharge end shall be closed at the start of the work to prevent water entering. The tremie tube shall be filled to the bottom of the hopper and the flow of concrete shall be induced by slightly raising the discharge end, always keeping it in the deposited concrete. The flow shall be continuous until the work is completed.

No concrete shall be spread at any greater distance than 3m from the discharge end of the tremie tube. When large areas are to be covered tremie tubes at maximum 6m centres shall be used and concrete placed simultaneously.

If the tremie operation is unavoidably interrupted below water level, the surface laitance shall be removed by jetting one day after placing and removed by pumping.

### **904.04.06 Mass Concrete**

Mass concrete shall conform to the specifications outlined herein and be placed where indicated on the contract drawings as approved by the Engineer. Where mass concrete exceeds 300 mm thickness at any footing edge, the design authority shall be contacted. Mass concrete shall be placed after all unwatering operations have been made effective in maintaining dry and controlled conditions as approved by the Engineer.

### **904.04.07 Construction Joints**

Construction joints in concrete shall be positioned at the location shown on the drawings or where otherwise approved by the Engineer.

The Contractor shall attach the appropriate horizontal and/or vertical strips to the face(s) of the formwork where all construction joints are planned or occur for reasons beyond the Contractor's control. The concrete shall be worked such that the finished appearance will resemble narrow, neat and straight horizontal and/or vertical line(s) at all construction and cold joints. Forms shall be kept tight throughout the entire concrete placing operation.

At the bottom of curb - top of deck interface along the longitudinal sides of all decks, construction joints shall be neat, straight and properly formed as a 20 mm Vee groove and shall be straight and true to line and grade.

Where construction or cold joints are planned or occur for reasons beyond the Contractor's control, the concrete interface shall be rough, clean and free of laitance, with a full roughness amplitude of 6 mm or more. One exception to this would be at prestress steel box out locations, see Section 906, "Prestressed Concrete Members".

Prior to butting the new concrete against previously hardened concrete the joint face shall be cleaned of all debris and dirt.

In addition, the surface film of laitance and mortar shall be removed from the joint face to present a clean sound concrete face that has the aggregate particles exposed.

### **904.04.08 Contraction Joints**

A contraction joint is a control joint to control volume change mainly (shrinkage). Bonding of the new and existing concrete is not required but provisions to make the joint watertight are necessary.

Joints in concrete members shall be formed in location as shown on the plans.

Contraction joints shall extend to a depth equal to one-quarter of the member thickness. As soon as feasible the joint shall be thoroughly flushed out with compressed air and an approved flexible joint filler compound utilized to fill the joint. The joint filler compound shall be flexible over the extreme temperature conditions in the local area and must be approved by the Engineer.

#### **904.04.09 Concrete Beam Seats and Bearing Surfaces**

Concrete beam seats shall be magnesium floated to a level plane varying not more than 2mm from a straight edge placed in any direction across the area. The finished level plane shall not vary more than 3mm from the elevation given by the Engineer in the field.

Concrete surfaces which are used as bearing surfaces are to be finished in accordance with the bearing manufacturer's recommendations.

#### **904.04.10 Tolerances**

All tolerances shall conform to Clause 10 "Tolerances" of CSA Standard CAN/CSA-A23.1-M.

#### **904.04.11 Confilm**

Immediately after the straight edge requirements have been met for the deck and curb concrete and the broom finish applied, the fresh concrete shall be coated with an evaporation retardant "Confilm" to preclude rapid evaporation of the bleed water. When all bleed water is gone, the concrete shall be cured as per Section 904.05, "Curing". The supply and application of "Confilm" is deemed incidental to the placement of the deck concrete and as such, no separate payment will be made by the Department.

#### **904.04.12 Caulking of Joints**

Caulking shall be applied to all control and expansion joint locations.

The caulking or sealant and the substrate material must have a temperature greater than 5° C. Under no circumstances should sealant be applied to any surface which contains moisture, condensation or frost. Joint surfaces are to be clean, dry and free of foreign matter before application of primer and sealant.

The work shall be performed by an approved caulking applicator. Otherwise, the contractor must designate a person for the caulking operation and that person should receive training acceptable to the Manufacturer and Engineer.

The Contractor shall supply a written guarantee of all workmanship and materials for a period of two (2) years following the date of final completion.

Sealant shall be a three component Type 1-Dymeric (epoxidized polyurethane terpolymer) sealant as manufactured by Tremco (Canada) Limited or an approved equal, selected to most closely match the concrete colour. Primers are to be those specified by Tremco (Canada) Limited, specifically Primer#1 or an approved equal. Joint backing shall be a closed-cell non gaseous backer rod, such as Softrod specified by Tremco (Canada) Limited or an approved equal.

All work shall be in strict accordance with the Manufacturer's recommendations.

Payment shall be considered incidental to the works associated with concrete work pay items.

### **904.05 CURING**

#### **904.05.01 Fog Misting of Bridge Decks**

Prior to the commencement of curing operations a fog mist shall be applied to bridge decks. Misting shall be conducted through the use of a pressure washer capable of sustaining a minimum 14 MPa pressure. A continuous fog mist shall commence immediately behind the screeding operation until concrete has hardened sufficiently to permit covering with burlap. The fog mist will maintain a high relative humidity above the concrete and prevent surface drying prior to curing operations. Water shall not be allowed to drip, flow or puddle on the concrete surface during fog misting at any time before concrete has reached final set.

### **PAYMENT**

Payment shall be considered incidental to the placement of Concrete in Superstructures.

### 904.05.02 Moist Curing

Proper curing will be considered 15% of the associated unit price bid for concrete payment purposes.

Concrete shall be continuously kept in a damp moist condition for at least seven days after placing and the temperature of the concrete shall not be less than 10°C, during this period. If ambient temperatures are at or anticipated to be:

(a) Greater than 25°C, then the provision of Section 904.06, "Hot Weather Concreting", shall be followed.

(b) Less than 5°C, then the provision of Section 904.07, "Cold Weather Concreting", shall be followed.

Curing shall be applied to all surfaces.

Curing shall take place as soon as possible after the finishing operation without damaging the surface.

Concrete in the deck portion of all superstructure concrete, including barriers, approach slabs, expansion joint dams, end blocks, curbs and sidewalks must be cured by means of burlap and water.

All burlap must be pre-soaked by immersing it in water for a period of at least 24 hours immediately prior to placing. Two layers of burlap must be applied to the surface of the concrete. Strips must overlap by 150 mm and must be held in place without marring the surface of the concrete.

The bridge decks burlap must be applied immediately after finishing of the concrete surface within 2 meters to 4 meters of the pan or screed of the finishing machine.

Curing with burlap and water must be maintained for a minimum period of 7 days. The burlap must be maintained in a continuously wet condition throughout the curing period by means of a soaker hose. The burlap must be covered with a layer of moisture vapour barrier within 12 hours of placing the concrete, in a manner which will prevent deformation of the surface of the concrete.

Air flow in the space between the moisture vapour barrier and the burlap must be prevented.

Regardless of ambient temperature, moist curing with burlap and water must be provided at all times. During cold weather, burlap must be prevented from freezing.

In addition to the burlap and water method as described above certain other concretes may be cured by either:

#### (a) Continuous Steam Curing

Continuous steam shall not exceed 80°C and shall follow CSA Standard CAN-A23-4 Precast Concrete-Materials and Construction.

#### (b) Curing with Filter Fabric and Water

One layer of filter fabric shall be laid on the surface of the concrete. Sheets or strips of filter fabric shall overlap by a minimum of 150 mm and shall be held down, as required, against displacement by wind, etc. The fabric shall be kept wet at all times. Filter fabric shall conform to Section 904.02.09, "Filter Fabric". Filter fabric or non-woven geotextile may be used for curing on flat horizontal surfaces but not on vertical surfaces. Vertical surfaces, i.e. abutments shall be cured using two saturated layers of burlap only.

### 904.05.03 Air Drying

Under normal circumstances curing time required for deck concrete is moist curing for seven (7) days in accordance with this specification and a further thirty (30) days for air drying. Also, the specified design strength must be obtained. Until the above conditions are satisfied, the application of waterproofing and the opening of the bridge to traffic will not be permitted.

It is not practical to achieve this, the above curing times may be reduced only at the discretion of the Engineer but in no case will the application of waterproofing and opening of the bridge to traffic be permitted until seven (7)

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days of wet curing and an additional seven (7) days of air drying have elapsed.

### 904.05.04 Plastic Shrinkage

Where excessive plastic shrinkage may occur, e.g. in a large expanse of concrete such as a bridge deck, more than one method of curing may be required.

If shrinkage cracks occur the Contractor shall grout any cracks and repair by an approved method at his own expense.

All methods and materials employed in concrete curing must be approved by the Engineer.

### 904.05.05 Liquid Membrane Curing

At the discretion of the Engineer, liquid membrane curing compounds meeting the requirements of Clause 904.02.11, may be used in place of moist curing on pier columns only. Liquid membrane curing shall not be permitted on other areas including bridge decks.

### 904.06 HOT WEATHER CONCRETING

When the air temperature is at 25°C or greater or is expected to rise to this limit, according to meteorological forecasts, then special measures shall be taken by the Contractor to protect the concrete. Surface moisture evaporation must not exceed 0.75kg/m<sup>2</sup>/hr.

Concrete placed in the forms shall be maintained at or below 27°C and the Contractor shall obtain from the Engineer approval for his measures to ensure this.

Curing shall be by moisture and with the exception of pier columns as per Clause 904.05.02, curing compounds will not be permitted.

### 904.07 COLD WEATHER CONCRETING

#### 904.07.01 General

When the air temperature is at or below +5°C or when, according to meteorological forecasts, it is likely to fall below this limit within the next 24 hours, then the Contractor shall take special precautions to protect the concrete placed. The Contractor shall obtain approval from the Engineer for this method of protection.

Under normal circumstances no concrete for the superstructure (or approach slabs) shall be placed between November 1 and April 1.

The following table shall apply for determining degree of protection requested by the Engineer:

PROTECTIVE CLASS	PROTECTIVE MEASURE	OUTSIDE AIR TEMPERATURE FOR LEAST DIMENSION OF SECTION	
		LESS THAN 1M	MORE THAN 1M
A	SUITABLE HOUSING PLUS SUPPLEMENTARY HEAT OR ADEQUATE INSULATION	BELOW 0°C	BELOW -5°C
B	SUITABLE COVERING PLUS ADEQUATE INSULATION	0°C TO 5°C	0°C TO -5°C
C	NORMAL CURING NO TEMPERATURE PROTECTION REQUIRED	5°C TO 25°C	5°C TO 20°C

Any concrete damaged by freezing or by inadequate protection or curing shall be removed and replaced by the Contractor at no cost to the Department.

For guidance on adequate insulation, refer to the Canadian Portland Cement Association publication "Design and Control of Concrete Mixtures", Chapter 11.

**904.07.02 Placing**

Concrete to be placed during cold weather shall be within the following temperature limits.

LEAST DIMENSION OF SECTION	CONCRETE TEMPERATURE MINIMUM °C	°C MAXIMUM
LESS THAN 0.3 M	10	27
0.3 M TO 1 M	10	27
1 TO 2 M	10	25
MORE THAN 2 M	5	20

This temperature can be obtained by heating the water or the aggregate or both; water and aggregate shall then be combined in the mixer first and the temperature of the mixture shall not exceed 38°C when the cement is added.

When the air temperature is below 0oC the water shall be heated to not greater than 66oC. The aggregates shall be uniformly heated in the stockpiles and/or bins by steam, either injected live or circulated in coils, or by using dry heat before the aggregates are placed in the mixer. Whatever system is used, it shall be designed to give uniform heating that will avoid local overheating which may be injurious to the materials.

No frozen lump of aggregate will be allowed in the concrete mix and shall be discarded before batching.

The use of salt, calcium chloride or other chemicals to lower the freezing point or accelerate the set is prohibited.

The ground, formwork, existing concrete and steel against which concrete is to be placed shall be free from ice and snow before the Engineer will authorize placing to commence. The Contractor shall preheat the area in which the concrete is to be placed, with live steam or moist hot air, this shall also remove snow and ice and heat the contact material to prevent the formation of a cold joint.

Concrete shall not be placed on a frozen subgrade or against frozen ground. The Contractor shall protect excavations prepared for footings, etc., with covers prior to opening for placing concrete.

The concrete shall be placed rapidly and evenly, as near to its final position as possible to reduce the risk of segregation, flow lines and cold joints.

The concrete shall be covered, as quickly as possible after placing.

Surface moisture evaporation must be kept below 0.75 kg/m<sup>2</sup>/h. Concrete surfaces shall be protected by housing. Protective housing must be wind and weather tight and constructed of suitable materials on a substantial framework. The framework must be such as to keep the housing at all points 300mm from the concrete and forms. The housing must have suitable openings to let the concrete be placed and these openings shall be so designed that they may be fully covered and closed as soon as the concrete is placed. The use of "roll back" sheeting or tarpaulins supported on stools is permitted on horizontal surfaces, such as a bridge deck provided the concrete is covered progressively as soon as placed. The housing must be so constructed as to allow a uniform circulation of heat to all parts of the work. This shall include the underside of the bridge deck and beams unless the Engineer has authorized the protection of these areas by fully insulated formwork.

When mineral fibre is used as insulation, a layer of polyethylene having a minimum thickness of 6 mils shall be placed between the surface of the concrete or formwork and the insulation. This insulation is to be protected from moisture at all times.

**904.07.03 Protecting Placed Concrete**

For concrete to be placed between September 1 and April 30, the Contractor shall supply a steam jenny, fully operational and fully capable of adequately protecting all concrete to be placed, when specifically requested by

the Engineer.

#### **904.07.04 Heating the Protective Housing**

The Contractor shall have available, tested and approved, adequate equipment for the heating of the protective housing. Heating will be used to establish and maintain the required curing conditions.

For decks and curbs, sidewalks, parapet walks, the Contractor shall on the day prior to placing concrete, conduct a trial run to verify his equipment, methods and workmanship to meet the specifications.

Live wet steam shall be used for heating unless other methods are permitted in writing by the Engineer. Hot air blowers and the like may be used to supplement the steam heating as long as fine water or steam spray into the stream of hot air is provided. The humidity as measured by a wet and dry bulb thermometer shall at no time be less than 95% and the air temperature shall be not less than 13°C.

The use of salamanders, coke stoves, oil or gas burners and similar spot heaters which have an open flame and intense local heat are prohibited. In the event of any fire of the formwork or housing, the Engineer must be immediately notified.

The system of heating and positioning of steam outlets so as to give the most uniform distribution possible of the heat is subject to the approval of the Engineer. The Contractor shall make suitable arrangements to stoke boilers outside normal working hours where required. A breakdown in heating is regarded as very serious especially in the early life of the concrete.

The concrete must be cured in a moist condition and its temperature shall be at least 10°C for seven days after the day of placing.

Protection shall be withdrawn in such a manner as not to introduce thermal shock stresses in the concrete.

The temperature of the concrete shall be gradually reduced at a rate not exceeding 17°C per day to that of the surrounding air. To achieve this in a heated housing, the heat shall be slowly reduced and then shut off and the whole housing allowed to cool to within 12°C of the air temperature before the housing itself for the formwork is removed. Where work is to proceed within the same housing on the next stage of the work, the formwork may be removed as soon as the prescribed curing period is over. With fully insulated formwork, the forms themselves maybe slackened and some insulation removed if needed. The forms themselves shall not be removed until the temperature of the concrete has fallen to within 12°C of the outside air temperature.

#### **904.08 SURFACE FINISHING**

##### **General**

All concrete surfaces that will be visible on completion of the work shall conform to surface finish Class 2, with the exception of the deck, curbs and/or sidewalks which shall be Class 6 finish.

The Contractor shall take special care during the planning, forming, concrete placing, curing and stripping phases to ensure defect-free surfaces. Should remedial measures be required, they shall be carried out by personnel expert in this aspect of concrete work. The surfaces shall be uniform in colour and texture when viewed from a distance of 15m and shall be attained as follows.

##### **Class 2 Rubbed Finish**

Immediately following the removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed or are not to be waterproofed. On all surfaces, the cavities produced by form ties and all other holes, honeycombs spots, broken corners or edges and other defects shall be cut back to sound concrete and thoroughly cleaned. No feather edging is permissible. If reinforcing steel is exposed, concrete shall be cut back for at least 50mm around the reinforcement.

After having been kept saturated with water for a period of not less than three hours, the cavities shall be carefully pointed and trued with a mortar of cement and fine aggregate mixed in the proportions used in the grade of the concrete being finished. Mortar used in pointing shall be not more than one hour old. The mortar patches shall be cured as specified under Section 904.05 "Concrete Curing". No mortar shall be placed when the air temperature is forecasted to fall below 5°C within 24 hours. All construction and expansion joints in the completed work shall be left carefully tooled and free of all mortar and concrete. The joint filler shall be left

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exposed for its full length with clean and true edges. The resulting surfaces shall be true and uniform.

After removal of forms, the rubbing of concrete shall be started as soon as its condition will permit. However, before starting this work the concrete shall be kept thoroughly saturated with water for a minimum period of three hours but sufficient time shall have elapsed before the wetting down to allow the mortar used in the pointing of rod holes and defects to thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse carborundum stone, using a small amount of mortar on its face.

The mortar shall be composed of extra cement and fine sand mixed in proportions such as to match existing concrete verified by a test patch. Rubbing shall be continued until all form marks, projections and irregularities have been removed, all voids filled, and a uniform surface has been obtained. The paste produced by this rubbing shall be left in place at this time.

After all concrete above the surface being treated has been cast, the final finish shall be obtained by rubbing with a fine carborundum stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform colour. After the final rubbing is completed and the surface has dried, it shall be rubbed with burlap to remove loose powder and shall be left free from all unsound patches, paste, powder and objectionable marks.

### **Class 6 Floated Surface Finish**

The provision of an approved self-propelled Bridge Deck Finishing Machine capable of striking off and providing the required surface finish is mandatory for all structures not covered by fill.

For new bridge decks and rehabilitated bridge decks where the total deck length is greater than fifteen (15.0) metres, the deck shall be finished with a GOMACO 450 bridge deck finishing machine with a vibrating screed and movable work bridge or approved equal.

For (a) decks less than fifteen (15.0) metres in length, (b) thin overlay strips wider than two (2.0) metres and (c) wharf decks, finishing shall be achieved with a Razorback 12HD Air Operated Vibrating Allen Screed or approved equal.

All finishing equipment shall be utilized as outlined above, shall be equipped and operated in accordance with the manufacturer's literature for the particular concrete and work being performed.

For thin overlays less than two (2.0) metres wide, spotty or patchy deck repairs and corners of decks, a hand float finish is adequate.

A dry run of the finishing machine covering the entire area requiring finishing shall be made to insure the design deck thicknesses and profiles will be attained. The run shall be completed at least 24 hours prior to commencing the deck concrete placement.

The finishing machine must be accompanied by a working platform with two (2) qualified cement finishers assigned to the platform at all times. The Contractor shall submit letters to the Engineer for his approval stating the qualifications of the finisher. The Contractor shall supply sufficient quantities of double railing to support the finishing machine equal to the overall length of the deck. This will enable the Engineer to check the adjustment of the railing and the finishing machine prior to any concrete being placed.

Proper allowance shall be made for camber of pre-stressed channels or girders. Concrete placement shall be at a rate to provide satisfactory progress with the finishing machine or the cement finisher.

After the deck surface has been floated and any bleed water evaporated, but while the concrete is still plastic, the Contractor shall furnish and use a 3m straight edge swung from handles half the width of the slab.

The straight edge shall be held in successive positions parallel to the road centre line and in contact with the surface and the whole area gone over from one side of the slab to the other as necessary. Advancement along the deck shall be in successive stages of not more than one-half the length of the straight edge. Any depressions found shall be immediately filled with freshly mixed concrete, struck off, consolidated and refinished. The straight edge testing and refloating shall continue until the entire surface is found to be free from observable departures from the straight edge and the slab has the required grade and contour, until there are no deviations of more than 8mm under the 3m straight edge.

The concrete deck surface shall be given a broom finish when the concrete has hardened sufficiently. Exposed



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concrete bridge decks shall be given a coarse broom finish. Treated or waterproofed bridge decks shall be given a fine broom finish. The broom shall be of an approved type. The strikes shall be square across the slab, from edge to edge, with adjacent strokes slightly overlapped and shall be made by drawing the broom without tearing the concrete but so as to produce regular corrugations not over 3mm in depth for the coarse broom finish. The fine broom finish shall have corrugations not exceeding 1mm in depth. The surface as thus finished shall be free from porous spots, irregularities, depressions and small pockets or rough spots such as may be caused by accidental disturbance during the final brooming of particles of coarse aggregate embedded near the surface. The Engineer may decide to delete the broom finish requirements but tolerances previously stated will still apply.

### 904.09 SAMPLING AND TESTING

Normal field quality control testing will be carried out by the Engineer in accordance with current Department requirements. These will normally be in accordance with CAN/CSA-A23.2 "Methods of Test for Concrete". Normal quality control tests carried out by the Department shall conform to the following requirements.

#### SUPERSTRUCTURE

AIR & SLUMP TESTS	EACH LOAD UNTIL SATISFACTORY CONTROL IS ESTABLISHED. THEN TEST EVERY SECOND LOAD THEREAFTER.
STRENGTH & TEMPERATURE TESTS	AT LEAST ONE SET OF LAB CYLINDERS PER 100 CUBIC METERS, MINIMUM ONE SET PER DAY PLUS ONE SET OF FIELD CURES PER CATEGORY OF CONCRETE. A SET IS DEFINED AS THREE CYLINDERS.
AVERAGE AIR VOID SPACING FACTOR & SPECIFIC SURFACE	ONE TEST PER CATEGORY OF CONCRETE.

#### SUBSTRUCTURE, REINFORCED WHARF DECK CONCRETE, PILE, MASS AND TREMIE CONCRETE

AIR & SLUMP TESTS	EACH LOAD UNTIL SATISFACTORY CONTROL IS ESTABLISHED. THEN TEST EVERY THIRD LOAD THEREAFTER.
STRENGTH & TEMPERATURE TESTS	AT LEAST ONE SET OF LAB CYLINDERS PER 100 CUBIC METERS, MINIMUM ONE SET PER DAY PER CATEGORY OF CONCRETE. FIELD CURES GENERALLY ONLY REQUIRED WHEN COLD WEATHER CONCRETING REQUIREMENTS ARE IN PLACE. A SET IS DEFINED AS THREE CYLINDERS.
AVERAGE AIR VOILD SPACING FACTOR & SPECIFIC SURFACE	ONE TEST PER CATEGORY OF CONCRETE. THIS TEST IS NOT REQUIRED FOR PILE, MASS, AND TREMIE CONCRETE.

A category of concrete shall be defined as concrete pertaining to one specific design strength, e.g. 35 MPa concrete.

Satisfactory control is considered to have been established when tests on five (5) consecutive truck loads or batches of concrete are within specification requirements. If either the measured slump, air content or temperature fall outside the limits specified, a repeat test shall be made. Failure to meet the contract requirements shall result in rejection of the concrete.

Additional strength tests will be required when early indications of strength are required such as before prestressing, girder transport, removal of falsework, backfilling structure, etc.

The Contractor shall co-operate fully with the Engineer in enabling quality control and quality assurance tests to be carried out. Samples for quality testing purposes will normally be taken from concrete as delivered to the site (at the point of discharge from the delivery equipment). However, depending on the method of placement, random sampling of the concrete as incorporated into the structure shall also be performed to verify the above specified properties. This process shall entail the sampling of fresh concrete as close to the point of deposit in the structure as is practicable. Coring of the in-place hardened concrete may also be performed to verify the specified air void system. The Department reserves the right to designate the point of acceptance, with prior notice given to the Contractor.

Acceptance of the concrete will depend on the results and consistency of all of the above tests results being satisfactory.

**904.10 MEASUREMENT FOR PAYMENT**

**904.10.01 Measurement for Payment for concrete work where the Unit Price Table states the unit to be cubic metres**

For those concrete work contract items, except mass and tremie concrete, where the unit of measurement on the Unit Price Table is stated as m<sup>3</sup>, then measurement for payment will be by the volume of concrete placed, measured in cubic metres rounded to two decimal places, based on the neat lines called for in the plans.

Measurement for payment purposes for mass concrete shall be based upon cross sections measured in cubic metres to the nearest one decimal place. Prior to concrete placing and forming operations, the Engineer shall establish the lateral and vertical limits for mass concrete.

Measurement for payment purposes for tremie concrete shall be made based upon the number of cubic metres of batched concrete rounded to the nearest one decimal place and incorporated into the works as approved by the Engineer. Every precaution must be taken to prevent waste of concrete, i.e. carelessness resulting in the escape of concrete from within the confines of the forms or inaccuracy in placing. In the event of such occurrence(s) an estimate of the wastage will be made by the Engineer and an appropriate deduction from the batch quantity will be made. All additional concrete required to be placed above the estimated quantity, must be approved by the Engineer.

No deductions will be made from the volume of concrete for:

- (1) Volume of reinforcement, prestressing steel or prestressing ducts.
- (2) Inserts of cross-sectional area of less than 0.1 m<sup>2</sup>.

When it is specified that concrete is to be placed against undisturbed soil or set in rock, and where the excavation is made wider than the neat lines of the footings, the excess amount of concrete will not be measured for payment quantities.

Where the concrete footings are placed lower than that authorized by the Engineer, any excess amount of concrete will not be measured for payment quantities.

Unless otherwise defined by the Contract Documents, the following will be the definitions for the structure and Unit Price Table:

Substructure concrete shall be that concrete used for slope paving, footings, abutments, back walls, bearing seats and pedestals, wing walls and piers. Wingwall concrete shall be all concrete behind the back face of the abutment, i.e. including the cleat excluding curb (superstructure) concrete.

Where integral curbs and wing walls exist, a horizontal surface at the bottom of the curb including the bevelled portion thereof if any and the horizontal surface at the top of the vertical portion of the wingwall shall constitute the dividing line between substructure and superstructure concrete.

Retaining wall concrete shall be all concrete used in retaining walls and footings which are not cast integrally with the abutments.

Superstructure concrete will be all concrete used in columns, sidewalks, barriers, expansion joint dams, beams, diaphragms, decks, curbs, end blocks, including curbs and end blocks integral with the wing walls.

All concrete in rigid frames used in deck, curbs, barriers, sidewalks, end blocks, vertical or inclined legs and wing walls shall be classified as superstructure concrete.

All concrete for rigid frame footings shall be classified as substructure concrete. All approach slab concrete shall be classified as superstructure concrete.

Not included are AASHTO or CPCI girders, double tees, and any other superstructure work paid for separately. Not more than 90% of the units will be certified until such time as the surface finish meets the specifications and is completed to the satisfaction of the Engineer.

**904.10.02 Measurement for Payment for concrete work where the Unit Price Table states the unit to be a unit other than cubic metres**

For those concrete work contract items where the unit of measurement on the Unit Price Table is stated in some unit other than m<sup>3</sup>, then the measurement for payment shall be in accordance with that stated in the appropriate specification for the item.

Not more than 90% of the units will be certified until such time as the surface finish meets the specifications and is completed to the satisfaction of the Engineer.

**904.11 BASIS OF PAYMENT**

**904.11.01 Basis of Payment for concrete work where the Unit Price Table states the unit to be cubic metres**

For those concrete work items where the unit of measurement in the Unit Price Table is stated as m<sup>3</sup>, then payment at the contract price shall be full compensation for all materials, labour, equipment, plant and services necessary to complete the concrete work as outlined herein. This applies to "Concrete in Substructure", "Concrete in Retaining Walls", "Concrete in Superstructures", "Reinforced Wharf Deck Concrete", "Concrete in Rigid Frames", "Concrete in Approach Slabs", "Mass Concrete" and "Tremie Concrete".

In particular no separate payment will be made for:

- (a) supply of cement, aggregates and other materials, plant and equipment-use required for producing the concrete
- (b) Mix design, production, mixing, transportation, placing, consolidation, curing and quality control during production
- (c) Formwork and falsework
- (d) Precautions to be taken for hot weather
- (e) Precautions to be taken for cold weather
- (f) Provisions of shipping crates for concrete test specimens

No payment shall be made for any concrete required for normal testing procedures. Where excessive camber in girders is permitted by the Engineer, the extra concrete due to the camber in excess of the specifications will not be paid for.

Concrete not placed in accordance with the provisions of Section 904.07, "Cold Weather Concreting", when the appropriate weather conditions prevail will not be paid for unless and until it can be established to the satisfaction of the Engineer that there has been no harmful effect to the concrete. The onus for establishing this will belong to the Contractor.

**904.11.02 Basis of Payment for concrete work where the Unit Price Table states the unit to be a unit other than cubic metres**

For those concrete work contract items where the unit of measurement in the Unit Price Table is stated in some unit other than m<sup>3</sup>, then the basis of payment shall be in accordance with that stated in the appropriate specification for the item.

Concrete not placed in accordance with the provisions of Section 904.07, "Cold Weather Concreting", when the appropriate weather conditions prevail will not be paid for unless and until it can be established to the satisfaction of the Engineer that there has been no harmful effect to the concrete. The onus for establishing this will belong to the Contractor.

**904.11.03 Concrete Acceptance and Reduced Payment Criteria on Concrete Located in New Structures**

Concrete on a project of a certain class, as defined by its specified strength at 28 days, must have an average tested strength at 28 days equal to or greater than that specified for payment at the bid price.

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Concrete of a certain class having an average strength of less than that specified will be accepted into the job at a reduced payment, provided the difference between specified strength and tested strength is no greater than 5 MPa. If the average of tests in a particular predefined portion of concrete is less than that specified by more than 5 MPa then that concrete shall be rejected.

When concrete is rejected, those provisions outlined in CSA-A23.1-94 shall be followed to determine whether or not the concrete may remain in the work. Such work will be done at the Contractors cost. Notwithstanding the above, should the concrete remain in the work it will be subject to a reduction, as outlined below, for having a strength less than that specified.

Concrete of a specific class and otherwise acceptable but having an average strength deficiency as tested of less than 5 MPa compared with that specified, will be accepted but the bid price for all concrete in the predefined portion will be reduced according to the following procedure:

For concrete work where the Unit Price Table states the unit to be in cubic metres, the adjusted concrete price shall be calculated as follows:

$$\$(\text{Adjusted Concrete Unit Price}) = \text{Tested Strength} / \text{Specified Strength} * \$(\text{Bid Concrete Unit Price})$$

Division of the structure into predefined portions will be done by the Engineer when the concrete placement sequence is outlined by the Contractor at the pre-job meeting. A predefined portion shall generally be established as that concrete placed within one operation.

There will be no bonus payment under the contract when the average strength is in excess of the specified strength.

### **904.11.04 Concrete Acceptance and Reduced Payment Criteria on Concrete Located in Rehabilitated Structures**

Concrete on a rehabilitation project in a certain repair class, as defined by its specified strength at 28 days, must have an average tested strength at 28 days equal to or greater than that specified for payment at the bid price.

Concrete of a certain repair class having an average strength of less than that specified will be accepted into the job at a reduced payment, provided the difference between specified strength and tested strength is no greater than 5MPa. If the average of tests in a particular predefined portion of concrete is less than that specified by more than 5M Pa then that concrete shall be rejected.

When concrete is rejected, those provisions outlined in CSA-A23.1-94 shall be followed to determine whether or not the concrete may remain in the work. Such work will be done at the Contractors cost. Notwithstanding the above, should the concrete remain in the work it will be subject to a reduction, as outlined below, for having a strength less than that specified.

Concrete of a specific class of repair and otherwise acceptable but having an average strength deficiency as tested of less than 5 MPa compared with that specified, will be accepted but the bid price for **all concrete** in the predefined portion will be reduced according to the following procedure:

For concrete work where the Unit Price Table states the unit to be square metres or cubic metres the adjusted price shall be calculated as follows:

$$\$(\text{Adjusted Concrete Price}) = (\text{Tested Strength} / \text{Specified Strength}) \times \$(\text{Bid Concrete Unit Price})$$

Division of the structure into predefined portions will be done by the Engineer when the concrete placement sequence is outlined by the Contractor at the pre-job meeting. A predefined portion shall generally be established as that concrete placed within one operation.

There will be no bonus payment under the contract when the average strength is in excess of the specified strength.

**SECTION 905**

**CONCRETE REINFORCEMENT**

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**905.09 BASIS OF PAYMENT**

**905.01 SCOPE**

The scope of this section is to cover the supply, material, fabrication and placement of all reinforcing steel in concrete structures.

**905.02 MATERIAL**

The Contractor shall supply all the reinforcing steel to be incorporated in the work.

All reinforcing steel supplied shall be new and previously unused billet deformed bars having a yield point of 400 MPa and shall conform to CSA Standard CAN/CSA-A23.1-M90 and CSA Standard G30.18-M.

Where the contractor utilizes concrete blocks to support the reinforcing steel, the quality of the concrete blocks shall conform to Section 904, "Concrete Structures", and be of a quality similar to that being used in the member. The Contractor shall supply test results to verify the same.

Alternative reinforcing supports for reinforcing steel shall be continuous, plastic coated or stainless steel chairs. Richmond BB bolster shall be utilized for the lower mat steel support and Richmond BBY beam bolster shall be utilized for the upper mat steel support. Equivalent types of reinforcing steel supports may be approved by the Engineer. Reinforcing accessories such as chairs shall be corrosion resistant within 25mm of all exposed surfaces.

Reinforcing steel shall be free of excessive rust and any reinforcing steel reduced in cross section area due to rust shall be rejected.

**905.03 FABRICATION, TRANSPORT AND STORAGE**

All properties including laps, splices, hooks and bends in reinforcement, etc. shall be as per CSA-S6-06; Canadian Highway Bridge Design Code.

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The Contractor shall submit six copies of a detailed reinforcing steel bar schedule to the Engineer. The schedule shall show all dimensions and bending diagrams for all the reinforcing steel in accordance with ACI315-99 Manual of Standard Practise for Detailing Reinforced Concrete Structures. The Contractor retains responsibility for correctly detailing reinforcement but the schedule must be approved for conformity with the design. Fabrication of reinforcing steel should not proceed until approval of the schedule has been obtained. The Contractor shall transport the reinforcing steel to the site and shall store it on racks or platforms with adequate identification.

All dirt, grease or other foreign materials shall be removed from the steel prior to the placement.

### 905.04 PLACING OF REINFORCING STEEL

Field bending shall not be carried out unless authorized by the Engineer and heat shall not be used for this purpose. Any bends developing cracks or splits shall be rejected.

No welding shall be carried out unless specifically authorized by the Engineer and if authorized, it shall be carried out in accordance with CSA Standard W186-M1990, Welding Of Reinforcing Bars.

Substitutions of different size bars must have the approval of the Engineer. Splicing at locations other than those specified on the drawings must be approved by the Engineer. All Contractor's requests for splices other than those detailed on the contract drawings will be at the Contractors' expense.

Reinforcing steel shall be supported and firmly held in the required positions at all times. Only approved supports and chairs of strong durable and non-corrodible material shall be used.

Stainless steel, plastic, or corrosion resistant chairs, concrete blocks or other devices may be used if they satisfy the above requirements.

If reinforcement is in position for a considerable time prior to concrete being placed, then the reinforcing steel shall be reinspected and, where necessary, cleaned.

Bursting and spalling reinforcement shall be placed at nominal cover.

All reinforcement to be placed at nominal cover as per CSA-S6-06 unless otherwise stated on the contract drawings.

### 905.08 MEASUREMENT FOR PAYMENT

#### 905.08.01 Measurement For Payment For Reinforcing Steel Used In Those Contract Items Where The Unit Of Measurement Is Stated In Tonnes.

For those contract items where the unit of measurement on the Unit Price Table is stated in tonnes, then the total length of reinforcing steel used in the construction will be measured for payment. The payment quantity shall be determined by multiplying the lengths of reinforcing bars actually placed in the structure by its weight per metre according to the following table:

BAR DESIGNATION	MASS WEIGHT KG/M
10M	0.785
15M	1.570
20M	2.355
25M	3.925
30M	5.495
35M	7.850

The total value will be converted to tonnes, calculated to three decimal places. Where substitution has occurred, the theoretical value will apply. Only that steel required by the contract drawings will be measured.

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No allowance will be made for clips, wire, chairs, or other material used to fasten reinforcing steel in place. Measurement for payment purposes shall not be made for diaphragm inserts.

That reinforcing steel placed in AASHTO or CPCI girders and double tees shall not be included in the measurement for payment. Payment for this steel will be included with supply of prestressed girders. Measurement for payment purposes will not be made for lap lengths if the bars are less than 15 metres long unless the lap is specifically indicated on the contract drawings or it is not physically possible to use the 15 metre lengths.

### **905.08.02 Measurement For Payment For Reinforcing Steel Used In Conjunction With Those Contract Items Where Reinforcement Is Considered Incidental To The Work.**

Where reinforcement is considered incidental to the work, no reinforcing steel will be measured for payment purposes. Items where reinforcing steel is considered incidental are catch basins, manholes, toe walls, head walls for culverts not greater than 1,500 mm diameter, footings for stairs, encasements for pipes not greater than 600 mm diameter, collars for pipes or other items as defined in the contract.

### **905.09 BASIS OF PAYMENT**

Payment at the contract price per tonne for "Supply and Place Reinforcing Steel Except in Prestressed Girders", shall be full compensation for supplying all materials at the work site, for storing, protecting and cleaning the reinforcing steel as required, for bending, cutting and welding the reinforcing steel, for placing the reinforcing steel in the work; for supporting the reinforcing steel during the placing, compacting and setting of concrete, and for such other work as may be required to complete the supply and placing of reinforcing steel.

The supply of reinforcing steel at the work site properly stored and protected and in proper condition for incorporation into the work shall be deemed for progress payment purposes to constitute 75% of the work to be carried out under the Item "Supply And Place Reinforcing Steel, Except In Prestressed Girders".

## **SECTION 906**

### **PRESTRESSED CONCRETE MEMBERS**

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**906.01 SCOPE**

The Contractor shall furnish all labour, materials, equipment, plant and services specified, indicated or required to manufacture, transport, store and install the prestressed concrete and/or prestressed steel components in accordance with the plans and specifications.

**906.02 GENERAL**

Post-tensioning in general, post-tensioning materials, grouting, preparations for post-tensioning, application and measurement of prestressing force shall conform with CSA Standard CAN/CSA-A23.1-M09. Cast in place concrete or optionally precast at the site is normally covered by CSA Standard CAN/CSA-A23.1-M09. Precast concrete and pre-tensioning operations should conform to CSA Standard CAN3-A23.4-M latest edition.

Welding will not be permitted within 3.0 metres of any tendon without adequate protection of the prestressing steel from welding sparks. Under no circumstances shall prestressing steel be used to ground welding equipment.

**906.02.01 Approvals and Casting**

The Contractor shall clearly indicate in his bid his intention with regard to casting the prestressed concrete members on site or at an approved plant. Prior to construction, the Contractor shall submit to the Engineer for approval the name of the plant from which it is intended to order the members. Only members supplied from an approved plant will be accepted.

**906.02.02 Prestressing Method**

The method of prestressing to be used shall be either pre-tensioning or post-tensioning as detailed on the drawings unless otherwise approved.

Prior to casting any concrete to be prestressed, the Contractor shall submit to the Engineer for approval six (6) complete sets of metric drawings and one (1) set of metric design calculations. These details shall outline the method and sequence of stressing and shall include complete specifications and details of the prestressing steel and anchoring devices, e.g. anchorage blockout dimensions and angles, anchoring stresses, elongation calculations, type of enclosures, and all other data pertaining to the prestressing steel in the members, pressure grouting materials and equipment, size and spacing of diaphragm and end block reinforcement, where applicable.

The prestress supplier shall determine through design or experience the prestress anchorage bearing plate/casting as well as the spiral steel directly behind and adjacent to the same.

**906.02.03 Inspection And Testing**

At all times the Engineer shall have the right to inspect and approve all methods, plant and materials involved. This shall include the right to momentarily stop jacking in order to measure the elongation and jacking pressure from initial to final load on as many cables as deemed appropriate by the Engineer.

**906.02.04 Member Top Flanges**

Members whose top flanges become the bottom form for the deck slab shall have the flange designed to safely accommodate all temporary construction loads.

**906.02.05 False work**

Sound, adjustable false work in accordance with Section 907, "Form work And Falsework", shall be required to compensate for any settlement such that the structure, particularly the soffit, is constructed true to line and grade. The prestressed concrete is not self supporting until stressing, anchoring, grouting and proper curing have been carried out. Except as noted on the contract drawings and as outlined in the Specifications, false work may be

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removed after these operations have been completed. The prestressing ducts, strands and anchorages must be accurately and rigidly fixed in position before any concrete is placed.

### 906.03 MATERIALS

#### 906.03.01 Concrete

All concrete work shall conform to the requirements of the Section 904, "Concrete Structures", unless otherwise stated herein.

The minimum ultimate compressive strength of the concrete shall be as shown on the plans and at the time of tensioning shall be verified by the Engineer from the results of the field cured test cylinders.

Care must be taken to ensure that the test cylinders are compacted and cured under conditions similar to the conditions acting on the concrete in place. At least three specimens shall be tested from each batch prior to tensioning the cables and at least three specimens at 28 days.

No concrete shall be deposited in the forms until the placing of reinforcing steel, enclosures, anchorages and prestressing steel has been inspected and approved by the Engineer.

An inspection and testing company may be appointed by the Engineer to inspect and control quality of materials. If so, separate payment will be arranged for by the Department. The Contractor shall provide, without charge, all materials required for test purposes and give all necessary co-operation.

#### 906.03.02 Prestressing Steel

All prestressing steel shall be protected against damage, rust and other corrosion and shall be free of all dirt, oil, grease and other deleterious substances when finally grouted in the deck. Splicing of prestressing steel bars only shall be permitted to manufacturers' specifications. Splicing of strands or wire is not permitted.

All prestressing steel from each manufactured reel of wire, strand or mill heat of bar to be shipped to the site, shall be assigned an individual lot number and shall be tagged in such a manner that each such lot can be accurately identified at the job site. All unidentified prestressing steel received at the site will be rejected.

The Contractor shall furnish one sample, 1500 mm long from each manufactured reel of wire, strand or mill heat of bar prestressing steel for testing purposes. The Engineer will select the samples of prestressing steel from the job site and all materials for testing shall be furnished by the Contractor at his own expense.

The Contractor shall have no claim for additional compensation in the event his work is delayed awaiting approval of the materials.

The approval of any material by the Engineer shall not preclude subsequent rejection if the material is damaged in transit or later damaged or found to be defective. Storage of the material on site shall be in accordance with Prestressing steel shall be high tensile strength 7-wire strand or bar as shown on the contract drawings, fabricated, sampled and tested in accordance with the requirements of ASTM A 416/A 416M-02 and ASTM A 421/A 421M-02 and to the satisfaction of the Engineer. Longer term storage of prestress steel and components, i.e. storage over the winter, shall be in accordance with ASTM A 416/A 416M-02 and ASTM A 421/A 421M-02 and the environment shall not be wet, humid or subject to the accumulation of moisture.

Two copies of the mill certificate and two copies of the stress-strain curves representative of the actual lots to be used shall be submitted to the Engineer with samples.

Prestressing steel shall be high tensile strength 7-wire strand or bar as shown on the contract drawings, fabricated, sampled and tested in accordance with the requirements of 416/A 416M-02 and A 421/A 421M-02.

Tendons shall consist of parallel wires or strands composed of the required number of high tensile, cold-drawn, low-relaxation (stabilized) strands. Positive end anchorage shall be provided on each end of the tendon after threading through the terminal hardware. The tendon shall be enclosed in mortar-tight flexible metal conduit.

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The pre-assembled connection between the conduit and the end bearing assemblies shall be adequate to ensure a mortar tight enclosure from terminal to terminal. The anchor shall provide for grout passage into the tendon. The supplier of the tendons shall furnish grout fittings for attachment to the terminal hardware.

High tensile strength steel shall be from steel made by the open hearth, electric furnace or basic oxygen process to produce the desired high tensile strength. Strand shall have a nominal diameter of 15.24 mm, minimum ultimate tensile strength of 260.6 kN and a nominal end area of 140.0 mm<sup>2</sup> per strand, or as otherwise indicated on the contract drawings.

Steel grade shall be 1860 MPa unless otherwise specified on the contract drawings.  
Oil tempered steel shall not be employed for use in prestressed concrete construction.

The complete stress-strain curve for the steel shall be obtained for each heat or lot of steel used in the entire project and shall be used as data for stressing of the steel of that particular heat or lot. Care shall be taken that the steel so defined is correctly identified.

The Contractor shall furnish one entire tendon complete with anchorages, one complete coupling device and all hardware for testing and evaluation purposes, if so indicated in the Contract Documents. If the tendon and/or associated hardware has not been previously used in Newfoundland, the Engineer may request a sample for evaluation and testing purposes. Any components which in the opinion of the Engineer, fall below the quality of the sample provided shall not be used in the works.

### 906.03.03 Ducts

Ducts for prestressing steel shall be made of approved bright metal rigid or semi-rigid corrugated steel tubing with mechanical joint connections of the diameter as shown on the drawings. Rigid ducts shall have a minimum wall thickness of 0.60 mm and be capable of being bent to a minimum inside radius of 9 metres without distress. Semi-rigid ducts shall have a minimum wall thickness of 0.25 mm and be capable of being bent to a minimum inside radius of 3.5 metres without distress. The wobble friction coefficient (k) shall not exceed 0.0023 per metre and 0.0033 per metre for rigid and semi-rigid ducts respectively. The curvature friction coefficient ( $\mu$ ) shall not exceed 0.20 for both duct types. Rigid ducts shall be used for longitudinal tendons and semi-rigid ducts used for transverse tendons unless otherwise specified in the contract documents.

Ducts shall be watertight and of sufficient strength to withstand all forces imposed upon them during placing of concrete without denting, sagging or leaking. All ducts and anchorage assemblies shall be provided with any necessary air vents and pipes for the injection of grout after prestressing. Grouting ducts and vents shall be located at all high points and at both ends of all longitudinal tendons. For transverse tendons, grouting ducts and vents shall be located at both ends of all tendons and at all high points when the vertical distance between the lowest and highest point in the duct exceeds 400 mm.

### 906.03.04 Anchorage Assemblies

The anchorages shall be of an approved type as indicated on the contract drawings for the size of tendons shown on the drawings complete with all required spiral reinforcement.

Anchoring hardware shall meet the minimum requirements set forth in CAN/CSA-A23.1-M09. Moreover, the anchorage components, i.e. the bearing plate, wedges, anchor head and/or casting to develop at least 100% of the ultimate tendon capacity but the prestressing steel as anchored is permitted to fail at 95% of the ultimate tendon capacity.

All reinforcement, duct work, cones and/or anchorages shall be fastened firmly so that no movement can occur when concrete is placed. Anchorages shall be held tight to the end forms so that no laitance can leak down the face of the cone or bearing plates. Enclosures shall be protected against the entrance of foreign matter prior to grouting particularly in cold weather.

The anchorages shall be placed in the position shown on the contract drawings. The axis of the anchorage must coincide with the axis of the cable passing through it. Details of end anchorages, i.e. block out dimensions and angles shall be determined by the prestress supplier in coordination with the Engineer.

**906.03.05 Round Void Forms**

When required the type of round void form used shall be in accordance with the following table:

OUTSIDE DIAMETER OF VOID	TYPE OF ROUND VOID FORM
OVER 930 MM	1.2 MM CORRUGATED METAL PIPE
630 MM - 930 MM	1.0 MM CORRUGATED METAL PIPE
UNDER 630 MM	1.0 MM CORRUGATED METAL PIPE OR SONOVOID TUBES, TYPE D, 100% DUROBOARD OR APPROVED EQUAL

Metal void forms shall have outside diameter (top of corrugations to top of corrugation) equal to the diameter of the voids shown on the drawings.

Void tubes made of fibrous material shall be protected against damage during storage and handling and shall be protected from moisture and water at all times. Adequate ventilation shall be provided to prevent damage due to humidity. The void tubes shall not be stored on the site for more than seven days before installation.

The void tubes shall be designed to withstand the forces imposed on them during concreting and until the concrete has set up, without deformation such as bulging, sagging or collapse.

Damaged tubes shall not be used.

All void tubes must be accurately placed and rigidly fixed in position before any concrete is placed. The Contractor shall pay particular attention to the buoyancy of the voids and adequate measures shall be taken to counteract the same. No concrete shall be placed until the installation of the tubes has been inspected and approved by the Engineer.

**906.04 DIMENSIONAL TOLERANCES**

The following dimensional tolerances will be allowed:

LENGTH	= ± 10 MM
CROSS SECTION	= ± 3 MM FROM EACH DIM. (NOT CUMULATIVE)
ALIGNMENT	= ± 3 MM MAX. IN ANY 3 M LENGTH
CAMBER DIFERENTIAL BETWEEN ADJACENT PRESTRESSED MEMBERS	= 20 MM MAX.

In addition, camber in the prestressed members immediately after stressing or de-tensioning shall not vary more than 50% of the calculated value. Camber due to member dead load only, at the time of placing the deck slab, shall not be more than 20 mm greater than the initial camber.

Deck slab surface under full dead load shall be to the grades indicated on the drawings. The deck slab thickness shall be constant between the top flanges of adjacent members. In order to meet these criteria the Contractor shall haunch the deck slab over the member or protrude the member a maximum of 20 mm into the deck slab or both, as indicated on the drawings.

For prestressed slab superstructures the deck slab surface and soffit shall be to the grades indicated on the drawings immediately after stressing, unless otherwise indicated in the contract documents.

**906.05 PLACING CONCRETE, STRESSING AND GROUTING TENDONS**

The minimum concrete strength at stressing shall be 30 MPa unless otherwise specified on the contract drawings.

**906.05.01 Placing**

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Concrete must not be deposited in the forms until the Engineer has inspected the placing of the reinforcement, ducts, anchorages, prestressing steel and has given his approval thereof.

Bar reinforcing steel and prestressing steel shall be placed accurately at the locations shown on the drawings or approved by the Engineer. The distance from the forms shall be maintained by plastic bar chairs, spacers, hangers or hold down devices. Within a 5.0 metre longitudinal distance from support locations i.e. piers and abutments, a tolerance of  $\pm 6\text{mm}$  will be permitted in the placing of prestressing ducts. At all other locations a tolerance of  $\pm 12\text{mm}$  will be permitted.

Post-tensioning ducts must be held securely at intervals of 500 mm or less against vertical or horizontal displacement from true alignment during the placing of concrete.

Holes shall be provided for anchor dowels and for diaphragm dowels which pass through the member, openings for connection rods, recesses for grout and holes for railing bolts in the members shall be provided in accordance with the details shown on the drawings.

Where diaphragm dowels do not pass through the member, the dowels shall be anchored in the member by embedment in the concrete or by means of approved threaded inserts.

Where openings for diaphragm dowels are provided, these dowels shall be grouted in place after the installation of the member in the structure.

Where continuous prestressed concrete slab type construction is required, the deck shall be cast in one continuous concrete placing operation commencing at the lower end of the structure.

The concrete must be vibrated internally or externally or both as required to consolidate the concrete. The vibrating shall be done with care and in such a manner that reinforcing steel, ducts and prestressing steel will not be displaced. Vibrators shall operate at a minimum frequency of 160 Hz for the internal type and 60 Hz for the external type.

The Contractor shall pay particular attention to concrete placement details, external vibration shall be used when casting CPCI girders.

All curing methods shall be subject to the Engineer's approval. Curing shall be in accordance with Section 904.05, "Curing", of the Specifications Book.

### 906.05.02 Prestressing Technician

The Contractor shall provide at his own expense a technician familiar with the type of prestressing involved, approved by the Engineer, to supervise all prestressing work. This technician shall be present at the completion of the steel installation and just prior to concreting operations, at stressing and grouting operations.

The prestressing supplier shall formally certify in writing that the stressing technician being employed on the works has sufficient knowledge and experience to undertake and successfully complete the prestressing, grouting and associated work.

### 906.05.03 Stressing

All prestressing steel shall be stressed by means of hydraulic jacks which shall be equipped with accurately calibrated hydraulic pressure gauges, damped from vibration, with a dial not less than 150 mm in diameter, to permit the stress to be computed at any time. A certified calibration curve shall accompany each jack, showing the relationship between gauge readings and stress in the ram for both ascending and descending movements of the ram. In general monostrand jacks shall not be used for stressing multi-strand tendons unless specifically approved by the Designer. A monostrand jack shall be present on site during stressing operations or be available to the Contractor within a 48 hour delivery period should the need arise

A load cell attached to the jack will be accepted, as an alternative to the above, as a means of obtaining the force in the tendon provided the accuracy of the load cell is attested to by an authority acceptable to the Engineer.

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The stressing operation shall be conducted in a manner recommended by the manufacturer of prestressing material and only in the presence of the Engineer or designated representative.

The supervisor in charge of the tensioning shall be provided with the required extension of the tendons and the jack pressure. The extension shall be carried out at an even rate, jack pressure and extension shall coincide with the required extension and pressure at the time of anchoring, due allowance being made for anchorage slippage at both ends of the tendons. The permissible variation in specified prestress shall not be more than 95% to 100% of the theoretical jacking force or pressure for both longitudinal and transverse tendons. Moreover, the permissible variation in specified elongation shall not be more than  $\pm 5\%$  of the theoretical elongation for longitudinal tendons. For transverse tendons the permissible variation in specified elongation shall not be more than  $\pm 5\%$  of the theoretical elongation or  $\pm 10$  mm whichever is greater.

The stress in the tendons shall be measured by means of the extension of the tendons and shall be continuously checked by means of the pressure gauge on the jack. The accuracy of the jack pressure gauge shall be checked periodically. The zero error in the jack pressure shall be determined by plotting a few straight pressure readings against jack extension and extending the straight line back to determine the zero intercept.

The stressing shall be carried out as shown on the contract drawings. The tensioning shall not be commenced until the tests on the concrete cylinders, manufactured and cured under the same conditions as the prestressed member, indicate that the concrete of the member has attained the required compressive strength as shown on the contract drawings.

After the concrete is placed, no tensioning will be permitted until it is demonstrated, to the satisfaction of the Engineer, that the prestressing steel is free and unbounded in the enclosure.

Any tendon in which the accuracy of the extension is doubted shall be de-stressed and restressed in the presence of the Engineer.

Records of elongation, calibrated jack force readings and slip shall be kept by the Engineer. Until such approval is obtained in writing, no tendons shall be grouted.

The prestressed steel shall be anchored at a stress that will result in the ultimate retention of working forces or stresses of not less than those shown on the plans, but in no case shall the steel be tensioned above 80% of the ultimate strength. Losses in stress due to creep, plastic flow, elastic flow and shrinkage of concrete plus creep of steel and sequence stressing, shall be computed in accordance with CSA-S6-06 latest edition.

Prestressed strands which have been stressed and meet project criteria shall be cut off with a saw; a torch is not acceptable. The Contractor shall leave 25-50 mm of strand protruding beyond the visible end of the wedge.

### **906.05.04 Bonding And Grouting**

The Contractor shall sandblast all concrete surfaces in anchorage boxout areas and fill the boxout with concrete of a quality similar to that used in the member. For anchorages without the tendon end cap, anchorage recesses or boxouts are to be sandblasted and filled with concrete before grouting operations commence.

All post-tensioned prestressing steel shall be bonded to the concrete by pressure grouting the ducts or openings. All stressing shall be completed before grouting begins. All areas around post-tensioned cables, strands, tendons or rods shall be completely filled with high early strength non-shrink grout.

The grouting procedure shall be approved by the Engineer.

Generally this work shall be done as soon as the prestressing steel has been stressed and approved and in no case shall any tensioned prestressing steel be left ungrouted for more than seven (7) days after prestressing.

In the case of post-tensioned slabs which contain both longitudinal and transverse prestressing steel, the maximum time permitted between the beginning of the stressing sequence and the grouting of the last cable shall not exceed two weeks.

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Stressing and grouting sequences of longitudinal and transverse tendons shall be as outlined in the contract documents. The maximum time permitted between the beginning of stressing and grouting of the last cable shall not exceed two weeks.

All ducts or openings shall be clean and free of all foreign materials that would impair bonding of the grout. Each duct or opening shall be thoroughly blown out with compressed air immediately prior to grouting. Where it is found necessary, in the opinion of the Engineer, the duct or opening shall be flushed out with water, prior to use of compressed air. The concrete shall have a temperature of at least 5°C at the time of grouting and shall be maintained at this temperature or higher for a period of at least 48 hours. If necessary this may include preheating the structure and maintaining protection for a period of three days after the grout is placed. The temperature of the grout at the time of injection shall be not less than 16°C nor more than 27°C.

Grout shall have a maximum water: cement ratio of not more than 0.36, not contain any trace amounts of chlorides, contain at least 6% of silica fume by weight, contain an approved superplasticizer and an approved expansive agent. Masterflow 816 Cable and Anchor grout manufactured by Master Builders Inc. and In-Pakt Standard SF grout manufactured by CC Chemicals are two grouts which meet the above criteria. Approved equivalent grouts as determined by the Engineer may also be utilized.

The grout mix design and representative samples shall be submitted for approval at least 14 days in advance of anticipated use. The mix design must be approved by the Engineer prior to grouting. The grout shall be mixed and placed as per the manufacturer's instructions and under the supervision of the Engineer. The compressive strength of the grout shall be at least 40 MPa in four (4) days. Strength tests shall be performed on 50 mm cubes, stored and tested in accordance with ASTM Specification C109.

The Contractor shall be responsible for all mix design and quality control of grout production and placing. Quality control and assurance of the grout from a testing viewpoint shall be provided by the Department.

When allowed to stand for 15 minutes, the grout shall not bleed or segregate. At the time of initial set, the grout shall exhibit an expansion of 8% ( $\pm 2\%$ ) of its original volume.

Grouting equipment shall be capable of grouting to a pressure of at least 1.5 MPa with a 19 mm minimum inside diameter grout hose, maximum pressure 1.7 MPa.

Alternatively, the grouting equipment shall be specifically designed for the job and approved by the Engineer.

Grout shall be mixed in an approved mechanical mixer, that provides for straining and re-agitating the grout before it is used. Time between mixing and pumping the grout shall not exceed 40 minutes.

Retempering the grout will be prohibited.

The grout shall completely fill the duct or opening and shall be allowed to flow continuously and freely for 5 seconds at the outlet end of the duct or opening. In case the continuity of grouting is interrupted, the duct or opening shall be immediately cleaned out. A dependable high pressure air and water supply shall be on hand during grouting.

After grout has set, all exposed vents and hoses, in finished concrete surfaces are to be removed 50mm from the finished surface. The resulting void or cavity must have all debris removed and be thoroughly cleaned. The void or cavity should be filled with SET 45, manufactured by Master Builders or an approved equal. The Contractor shall follow the Manufacturer's recommendations and specifications in the mixing and placing of SET 45.

### **906.06 HANDLING AND INSTALLATION OF PRESTRESSED MEMBERS**

At least seven (7) days before starting work, the Engineer shall be fully informed as to the method of handling, installation and the amount and kind of equipment proposed for use. The Contractor shall comply with the provisions of the Highway Traffic Act and make all necessary arrangements with the authorities for permission to transport.

The Contractor shall exercise extreme care in handling, storing, moving and erecting precast prestressed concrete members to avoid twisting, racking or other distortion that would result in cracking or damage to the members. The Contractor shall handle, transport and erect precast prestressed members in an upright position and keep the points of support during lifting, storing, transportation and erection within 600 mm of the points of

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support in the final structure. The Contractor shall not permit the reactions of the lifting devices to be inclined to the vertical at an angle greater than thirty degrees. Holes provided for lifting shall be filled with mortar when members have been placed.

The Contractor must decide upon the method by which he plans to lift the prestressed girders and submit design calculations signed and stamped by a Professional Engineer licensed to practice in the Province of Newfoundland.

The Contractor is responsible for the stability of the prestressed girders during placing and until the diaphragms are in place regardless of the loading conditions.

Prestressed concrete girders shall not be moved or transported until the grout has attained 30 MPa. False work shall not be removed from continuous prestressed concrete structures until the grout has attained 30 MPa. Loads in addition to member self-weight shall not be placed on the prestressed concrete members until the grout has attained 30 MPa. Grout samples shall be taken, field cured and tested to establish the appropriate time to move or transport girders, remove false work or apply loads to prestressed concrete structures. Grout samples shall also be obtained and tested for acceptance purposes.

### **906.09 MEASUREMENT FOR PAYMENT**

#### **906.09.01 Prestressed Concrete Members**

The quantity of prestressed members supplied and erected for which payment shall be made shall be the total number of members required as shown on the plans.

##### **906.09.01.01 Supply of Prestressing Steel and Accessories**

Prestressing tendons including anchorages will be measured as a lump sum for the total number required by the contract. Payment for the Supply of Prestressing Steel and Accessories will not be made where the prestress steel and/or components are held in longer term storage, i.e. over the winter.

#### **906.09.02 Prestressed Concrete In Post-Tensioned Slab Superstructures**

##### **906.09.02.01 Concrete**

Measurement for payment will be by cubic metres of concrete placed based on neat lines shown on the plans. No deductions will be made from the volume of concrete for reinforcing or prestressing steel, anchorages or inserts. Deductions for any design voids will be made. The quantity shall include the volume of concrete in curbs, sidewalks, medians, parapets, including those on the wingwalls or as otherwise shown on the plans.

##### **906.09.02.02 Supply of Prestressing Steel and Accessories**

The quantity of prestressing tendons including anchorages for which payment shall be made shall be the total number of tendons required as shown on the plans. This will be considered as a lump sum and includes both transverse and longitudinal tendons as indicated on the contract drawings.

##### **906.09.02.03 Concrete Surface Finish**

Measurement for payment for surface finish shall be in accordance with Section 904, "Concrete Structures".

### **906.10 BASIS OF PAYMENT**

#### **906.10.01 Prestressed Concrete Members and Post-Tensioned Slabs**

Payment at the contract price shall be full compensation for all materials, labour, equipment, plant and services necessary to complete the

prestressed concrete work in accordance with the plans and as described herein.

In particular, no separate payment will be made for:



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- a) Supply of cement, aggregates and other materials, plant or equipment for producing the concrete.
- b) Supply and placement of grout.
- c) Form work and false work.
- d) Supply and installation of void tubes including all drain tubes, air vents, bracing, non-corrosive chair supports, splices and end closures.
- e) Sandblasting the construction joints.
- f) Supply and apply approved bonding adhesive.
- g) Supply and installation for reinforcing steel except that in post-tensioned slabs.
- h) Transporting and storing prestressed concrete members.
- i) Any post construction jacking of the superstructure.

Payment for post-tensioned slab concrete will be under Section 904, "Concrete In Superstructures".

Payment for prestressed concrete members, such as AASHTO or CPCI Girders and double tees, will be under "Prestressed Girders" (a) supplied, (b) installed as appropriate.

### **906.10.02 Supply of Prestressing Steel and Accessories**

Payment at the contract unit price for "Supply Of Prestressing Steel And Accessories" shall be full compensation for all materials, labour, services, plant and equipment necessary for the supply, delivery, installation and stressing of the tendons including all anchorages, bursting and spalling or end block steel and grouting as required in accordance with the contract drawings and this specification.

For post-tensioned slab structures, the materials, fabrication and placing, cost of bursting and spalling or end block steel shall be paid for under Section 905, "Concrete Reinforcement".

### **906.10.03 Concrete Surface Finish**

Payment for concrete surface finish shall be in accordance with Section 904, "Concrete Structures".

### **906.10.04 Rejection**

Excessive honeycombing, distortion, warping, cracking, improper grouting or other evidence of inferior workmanship or failure to meet the requirements of these specifications shall be cause for rejection of any member.

Minor surface cavities or irregularities which are satisfactorily repaired shall not constitute cause for rejection. Repairs shall not be made until the Engineer has inspected the extent of the irregularities and has determined whether or not the concrete will be rejected.

Final acceptance of members will not be made until they have been installed in the structure. Members that have been tentatively accepted at the manufacturing plant but are damaged in transit shall be replaced by the Contractor at his own expense.

Erection by a non approved method may be cause for rejection.

**SECTION 907**

**FORMWORK AND FALSEWORK**

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**907.09 BASIS OF PAYMENT**

**907.01 SCOPE**

The scope of this section is to cover the design and construction of formwork and falsework used in connection with the work.

Falsework is defined as structural supports, load carrying members and the necessary bracing required for the support of temporary loads during construction.

Formwork is defined as the mould into which concrete is placed.

Other definitions are as per CSA Standard S269.1-1975, Falsework For Construction Purposes.

**907.02 SUBMISSION OF SHOP DRAWINGS**

The Contractor shall prepare and submit to the Engineer for approval copies of detailed shop drawings and calculations for all falsework in the project. Falsework drawings shall be signed and sealed by a licensed member of the Association of Professional Engineers of Newfoundland.

Six copies of drawings will be required and four weeks will be required for approval. No falsework shall be placed prior to the design being approved by the Engineer.

Approval of these drawings will be for conformance with the design and shall not relieve the Contractor of any responsibility for the safe design and installation of the falsework.

Shop drawings for formwork shall be submitted if required by the Engineer.

Falsework drawings shall indicate:

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1	DESIGN TO BE IN ACCORDANCE WITH "LIMIT STATES" PRINCIPLES.	7	CONNECTION DETAILS
2	LONGITUDINAL, LATERAL & VERTICAL, DEAD, LIVE & IMPACT LOADS USED IN DESIGN. HORIZONTAL LOADS SHALL BE DESIGNED FOR CLAUSE 5.2.2 OF CSA STANDARD S269.1-1975; SPECIFICALLY, THE GREATER OF PART (A)(I) OR (A)(II), PLUS (B) PLUS (C). FRESH CONCRETE SHALL NORMALLY BE TAKEN AS A DEAD LOAD WITH A MINIMUM LOAD FACTOR EQUAL TO 1.25 UNLESS UNUSUAL CONDITIONS REQUIRE A HIGHER VALUE.	8	TYPE AND WEIGHT OF EQUIPMENT TO BE SUPPORTED
3	BEARING CAPACITY OF SOIL BENEATH MUDSILL & FALSEWORK SUPPORT REACTIONS	9	SEQUENCE, METHOD AND RATE OF CONCRETE PLACEMENT
4	DEFLECTIONS	10	FOR PRESTRESS CONCRETE SLAB TYPE STRUCTURES, THE FALSEWORK SUBMISSION SHALL HAVE A SIDE FALSEWORK DESIGN PROVIDED, THE EFFECTS OF THE SAME SHALL BE CONSIDERED IN THE EXTERIOR LEG LOAD & LOAD ON EXTERIOR STRINGERS.
5	GRADE OF STEEL OR CONCRETE, SIZE AND SHAPE	11	ANY PROPRIETY EQUIPMENT (WITH SPECIFICATION)
6	SPECIES, GRADING, SIZE OF TIMBER		

For prestressed concrete decks, the Contractor must submit deck falsework drawings including mudsills, side and end falsework for approval. He shall obtain approved drawings before the construction of deck superstructure falsework is permitted. Submission of these drawings will not necessarily exclude the requirement to provide falsework drawings for other structural components.

The Contractor shall supply, erect and maintain standard guide rail as per Form 1280-1 of the Specifications Book at all traffic openings in the falsework. The Contractor shall place additional posts at mid-span. The minimum length of installation before and after the opening is at least five and one standard lengths respectively. Guide rail shall be continuous from beginning to end with the minimum installed length at least 34 metres per installed section. The supply and installation of guide rail shall conform to section 923 of the Specifications Book, "Supply and Installation of Guide Rail".

### 907.03 DESIGN

#### 907.03.01 General

All Falsework and form work shall be designed to give the necessary rigidity and to support loads without appreciable settlement or deformation.

#### 907.03.02 Stresses

All falsework to be designed to CSA Standard S269.1, falsework for Construction Purposes.

All timber design shall be in accordance with CSA Standard 086.1-M09, Engineering Design in Wood.

Where structural steel or concrete is used, the design shall be in accordance with CSA-S6-06.

Any scaffolding, fabricated shoring or patented accessories, shall be used in accordance with manufacturers' recommendations.

#### 907.03.03 Loadings And Deflections

Normal concrete shall be considered as a liquid of mass 2400 kg/m<sup>3</sup> with an additional construction loading of 2.4 kPa.

Horizontal loadings shall take into account environmental factors, the rate of placing, the temperature of the concrete, the effect and type of vibration and impact.

Deflection shall be limited to span/360 but final tolerances for concrete members shall also be conformed with.

#### 907.04 MATERIALS

Wood used in forms and FALSEWORK shall comply with CSA 086.1-M09 and shall be sound wood and free of strength reducing defects.

Steel shall meet the requirements of CSA G40.21 and be in good condition.

Other materials may be used as long as manufacturer's recommendations are strictly complied with and their suitability can be confirmed by previous satisfactory use elsewhere.

Void tubes made of fibrous material shall be protected from damage and water attack at all times.

Materials rejected shall be removed from the job site immediately, as directed by the Engineer.

#### 907.05 FORM WORK CONSTRUCTION

For concrete pours above 3.0 metres in height or if so requested by the Engineer, Shop Drawings of form work shall be provided. Form Work drawings shall be signed and sealed by a licenced member of the Association of Professional Engineers of Newfoundland.

Form Work Shop drawings shall account for the following:

1. Design to be in accordance with limit state principles;
2. Pour pressures exerted by the liquid head of concrete;
3. Sequence method and rate of concrete placement;
4. Species and grade of timber;
5. Concrete admixtures and dosage rates (i.e. plasticizers and set retarders).

Forms shall be smooth, clean, free from warps, splits, holes and bulges and shall be constructed and maintained mortar tight. Plywood shall be used on all exposed faces.

Non-staining form release oil shall be applied to the faces of forms prior to reinforcement placement.

For buried non-exposed surfaces and for all substructure concrete surfaces on bridge structures form work ties, tie wire, bolts and rods shall have no metal within 25 mm of the concrete surface after form removal. The 25mm cover shall be provided by means of plastic cones adjacent to the exposed concrete surface. In no case will the cutting back of metal ties or tie wire be permitted after the concrete has cured. In no case will the use of tubing be permitted to allow the recovery of ties. Cavities left as a result of ties shall be filled with a cement mortar and the surface left sound, smooth, even and uniform in color.

As practical fibreglass ties shall be used on all superstructure concrete surfaces and for all exposed substructure concrete surfaces on overpass/underpass structures.

On concrete Jersey barriers where form liner has been attached to one side, a tapered rod system may be utilized. The void remaining after the tapered rod has been removed from the concrete shall be filled with grout.

The grout and grouting procedure must be consistent throughout the project and be approved by the Engineer. The grout shall blend in with the finished concrete surface and the finished appearance shall be uniform.

All exposed corners on concrete work shall be chamfered 25 mm.

Stay in place forms shall be used only when detailed in the contract or if approved by the Engineer.

Void tubes shall be accurately and rigidly fixed in position and carefully restrained from floatation.

Studs and joints shall be at centres not exceeding 400 mm. Edges of abutting sheets shall be nailed to the same stud or joint with 50 mm nails at centres not exceeding 200 mm. Jointing shall be regular and flush.

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### 907.05.01 Supply and Installation of Form Liner

Where indicated in contract documents the Contractor shall supply and install a form liner, the form liner pattern shall be as identified in the Contract drawings.

The material type may be SPS or ABS plastic depending upon how the Contractor schedules the work, as approved by the Engineer and anticipated future requirements.

The form liner shall be approximately 610mm high and be located such that approximately 140mm of untextured concrete barrier wall surface is located above and below the form liner. The horizontal distance from the end of the barrier to the beginning of the form liner shall be 150mm. The 150mm dimension shall also be applied at expansion joint locations.

The Contractor shall verify lines, levels and centres before proceeding with the form work and ensure that dimensions agree with drawings. The form liner shall be strictly installed in accordance with the Manufacturer's application guide to achieve design requirements. The Contractor shall arrange and assemble form work to permit dismantling and stripping. No damage is permitted to concrete surfaces during stripping. The form release agent shall be applied on the liner in accordance with the manufacturer's recommendations. The form release agent shall be applied prior to placing reinforcing steel, anchoring devices and embedded items. The forms are to be loosened carefully. The Contractor shall not wedge pry bars, hammers, or tools against concrete surfaces scheduled for exposure to view.

The Contractor shall plan ahead for details such as: concrete mix design, concrete placing practices, attaching liners and sealing the joints, tie selection and tie-hole treatment, reinforcing positioning, release agents and stripping in addition to cleaning and storage of form liners and forms.

The Contractor shall use one concrete supplier, one source of aggregates and cement. An elephant trunk shall be used to prevent spattered concrete if the form is not completely filled in the first concrete operation. Falling concrete shall not be permitted to cause abrasion to the form liner. The rate of concrete placing shall not exceed the allowable pressure on the form liner.

The Contractor is reminded to use adequate vibration to avoid lift lines and reduce bugholes. Extra vibration is needed when using plastic liners because they have two or three times as much surface area as flat form panels. Vibrators shall be inserted vertically, penetrating at least 150 mm into the previous lift. Vibrators shall not touch the liner surfaces.

The Contractor shall consider temperature effects when cutting and installing liner materials. Form liner should not be exposed to direct sun in order to reduce buckling effects.

The Contractor shall give close attention to tight-fitting tie holes, reinforcing bar supports and spacers. Bar supports should be coordinated with the repeat pattern of the liner.

Cover shall be measured from the deepest indentation in the concrete surface to the nearest face of the bar.

Release agents and form liners shall be checked for compatibility before use.

Form liner stripping shall be recommended by the Manufacturer and approved by the Engineer. Stripping shall be kept uniform throughout the entire job. Form liners shall be clean and should be stored in shaded or covered areas.

Construction practice and materials must be consistent throughout the entire concrete placing operation where form liners are utilized.

#### **Measurement for Payment**

Measurement for Payment shall be in square metres rounded to the nearest one (1) decimal place.

Measurement for payment shall be surface length treated or covered with form liner times the nominal height of 0.610 metres. Deductions will not be made for trimming the form liner in order to conform to the ends of the barrier wall but deductions will be made for the length not treated with form liner such as at expansion joint locations.

### **Basis of Payment**

The basis of payment shall be full compensation for all plant, labour, materials and equipment to supply, transport to the job site and install and remove form liner as described above.

### **907.06 FALSEWORK CONSTRUCTION**

The Contractor shall build sound adjustable falsework to enable a structure true to line and grade to be built.

Foundation material shall either be piled or mudsills depending on bearing capacity. Mudsills shall be of minimum dimension 235 mm x 89 mm.

Care shall be taken to prevent reduction of bearing capacity due to environmental, construction or any other reason.

Should, despite every precaution, reduction of bearing capacity occur, the Contractor shall take appropriate measures to eliminate subsidence or collapse.

All shoring shall conform to CSA S269.1

All wood posts shall be of solid material, free from splits, warps, chips and any other defects that will impair strength. Splicing will not normally be permitted. Bracing material shall be at least 38 mm x 89 mm lumber and a minimum of two 100 mm nails will be required for connecting bracing to posts.

### **907.07 REMOVAL OF FORMWORK AND FALSEWORK**

All formwork and falsework shall be removed from the job unless specified otherwise.

If authorized by the Engineer, piles used for falsework may be cut off to 1.2 m below finished grade or ground level or to 0.6 m below stream bed.

Method and sequence of removal of form work and falsework shall be subject to the approval of the Engineer and shall be such that it will permit the concrete to take up the stresses gradually.

The Engineer's approval shall be obtained prior to removal of any form work or falsework. Timing for form work and falsework removal will be determined by strength and curing requirements.

The minimum time required before the removal of form work and falsework excluding those days when the temperature is below +5°C, shall be 24 hours for girders and 48 hours for all other concrete provided all stipulations with regard to casting and curing have been and continue to be complied with in both the letter and intent of Sections 904.05 and 904.07, "Curing" and "Cold Weather Concreting", of the Specifications Book, respectively. Concrete directly exposed to moving freshwater will require a minimum 7 days and 70 percent of the 28 day design strength prior to form work removal. Concrete directly exposed to seawater will require a minimum 14 days and 70 percent of the 28 day design strength prior to form work removal.

The Contractor will also be required to comply with 906.06, "Handling And Installation of Prestressed Members".

The wingwalls are to remain propped during construction until backfill has been placed and compacted.

### **907.08 HANDRAIL END BLOCK RECESSES**

The Department shall supply two (2) 800x450x19 plywood panels, complete with numerals attached, at the nearest District Office.

The Contractor shall install the panels on diagonally opposite handrail end blocks, as directed by the Engineer.

The Contractor shall supply and install two (2) 800x450x19 plywood panels without numerals on the remaining two (2) handrail end blocks.

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The panels shall be secured to the form work and when removed, surface finishing shall be as per Specifications Book.

Installation of plywood panels supplied by this Department and supply and installation of the plywood panels by the Contractor shall be considered incidental to the work and no separate payment shall be made.

### **907.09 BASIS OF PAYMENT**

All costs for formwork and falsework shall be included in the contract price for the appropriate concrete or other appropriate item in the Unit Price Table. No separate payment shall be made for formwork or falsework.

The supply, installation and removal of guide rail including the excavation and backfilling of post holes as per Sections 640 and 902.05.01 of the Specifications Book, "Supply and Installation of Guide Rail" and "Select Material Compacted", respectively, to the approval of the Engineer is considered incidental to the works.

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

### SECTION 908

#### DOWELS

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##### 908.01 SCOPE

The scope of this section is to cover the supply, material, fabrication and placement of dowels in substructure and superstructure where drilling and grouting of rock or existing structure is required.

##### 908.02 MATERIAL

The Contractor shall supply all the reinforcing steel used as dowels and dowel pins to be incorporated in the work. All reinforcing steel for dowels shall be in accordance with Section 905, "Concrete Reinforcement".

##### 908.03 FABRICATION, TRANSPORTATION AND STORAGE

All steel shall be fabricated to sizes and shapes as shown on the drawings.

The Contractor shall transport the reinforcing steel and dowel pins to the site and shall store in an accessible place where identification checking can take place prior to placement.

All dirt, grease or other foreign materials shall be removed from the steel prior to placement.

##### 908.04 PLACEMENT

Diaphragm dowels shall be placed in locations as shown on the contract drawings.

Where dowels are to be placed in rock, holes shall be drilled to the required depth and size. Hole diameter shall be two times the nominal diameter of the dowel. Each hole shall be cleaned out, grouted and the dowel set in place. The grout shall be a low slump, expansive type neat grout with a minimum compressive strength of 25 MPa in 28 days.

If the hole contains water, the contractor shall remove the water otherwise a tremie procedure approved by the Engineer shall be used to completely fill the hole with grout. The dowel shall be forced into the hole after the grout has been placed and while it is still fresh.

Where dowels are to be grouted into structures or structural components, all the holes may be drilled before any grouting is done if approved by the Engineer. Hole diameter shall be two times the nominal diameter of the dowel. The holes shall be flushed out, saturated with water and blown out with oil free compressed air



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immediately before the grout is injected. The grout shall be a low slump, expansive type neat grout with a minimum compressive strength of 30 MPa in 28 days.

### **908.06 MEASUREMENT FOR PAYMENT**

The quantity of dowels for which payment shall be made shall be the total number of dowels in the (a) substructure and the (b) superstructure which require drilling and grouting as shown on the drawings.

### **908.07 BASIS OF PAYMENT**

Payment at the contract unit price for dowels in the (a) substructure and the (b) superstructure shall be full compensation for furnishing all labour, tools, equipment, materials and incidental items required to supply, install, drill holes, and grouting the dowels as shown on the drawings or as indicated herein.

Where dowel pins are projecting through elastomeric bearing pads, the cost associated with these dowels shall be considered incidental to the supply and installation of bearing pads and separate payment will not be made for the same.

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**909.08 MEASUREMENT FOR PAYMENT**

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**909.01 SCOPE**

The scope of the work includes, (a) the supply of timber and all necessary fastenings, fabrication, placing, and ballasting of timber cribwork (b) the supply and placing of ballast stone, filter fabric, granular fill, and wharf deck concrete, (c) the supply and installation of hardwood sheathing, wheel guards, chocks, ladders, ramp barrier, fendering and mooring cleats.

The Contractor is advised that the ferry terminal will normally be operational during construction and that all work shall be scheduled so as to ensure a minimum of disruption to service.

A total work schedule shall be submitted to the Engineer for approval at least one (1) week prior to the commencement of any work and subsequent partially revised work schedules will be submitted for the approval of the Engineer on a weekly basis for the week following. The Contractor is again advised that all work schedules shall be approved by the Engineer.

The ferry boat(s) shall normally be in continuous operation during the construction period and the Contractor is to consider this when determining prices and schedules for his tender.

**909.02 GENERAL**

**909.02.01 Dimensions**

The Contractor shall construct and install timber cribs to dimensions indicated on the drawings. All dimensions at site shall be checked before commencing work and any discrepancies shall be reported to the Engineer, in writing.

**909.02.02 Protection**

The Contractor shall protect completed work from damage resulting from work on other sections, from damage resulting from environmental conditions and shall repair or replace portions or entire crib(s) at no extra cost.

The Contractor shall be responsible for his work and for consequences resulting therefrom during construction, including floating, towing, setting, and ballasting until final acceptance.

**909.03 MATERIALS**

**909.03.01 Timber**

Timber shall be used which has been graded and stamped in accordance with applicable grading rules and standards of associations or agencies which have been approved to grade timber by the Canadian Lumber Standards Administration Board of CSA. All lumber and timber shall be sawn.

Only Douglas Fir, Pacific Coast Hemlock, or Eastern Hemlock shall be used; grade shall be number one (1) structural.

**909.03.02 Hardwood**

Hardwood shall be construction grade treated birch, maple, or other species as approved by the Engineer.

**909.03.03 Grading Authority**

National Lumber Grades Authority (N.L.G.A.)

**909.03.04 Miscellaneous Steel**

All steel shall be medium structural steel conforming to CAN/CSA-G40.21-M87, "Structural Quality Steels", or the latest edition thereof.

**909.03.04.01 Connections**

A	NAILS AND SPIKES SHALL CONFORM TO THE CSA SPECIFICATION B111-1974, "WIRE NAILS, SPIKES, AND STAPLES".	C	DRIFT BOLTS SHALL BE MADE FROM ROUND STOCK, DIAMOND OR WEDGE POINTED, AND HAVE A BUTTON HEAD. THE LENGTH OF DRIFT BOLTS SHALL EQUAL THE SUM OF TIMBER FASTENED LESS 50MM.
B	BOLTS AND NUTS SHALL CONFORM TO THE CSA SPECIFICATION B33.1-1961, "SQUARE AND HEXAGON BOLTS AND NUTS, STUDS AND WRENCH OPENINGS".	D	LAG SCREWS SHALL CONFORM TO THE CSA STANDARD B34-1967, "MISCELLANEOUS BOLTS AND SCREWS", TABLE 18.
		E	WASHERS SHALL CONFORM TO THE FOLLOWING STANDARDS:-

All lag screw washers shall conform to the CSA Specification B19.1-1971, "Plain Washers", for Class 2 - Common Punched Washers with wide rims.

Round plate washers for 13mm and 16mm diameter machine bolts shall be 6.4mm thick x 76.2mm diameter and have a hole diameter of 15mm and 18mm respectively.

Round plate washers for 19mm, 22mm and 25mm diameter machine bolts shall be 7.9mm thick x 76.2mm diameter and have a hole diameter of 21mm, 24mm and 27mm respectively.

Washers shall conform to G40.21-M1978, latest edition	The use of square washers shall not be permitted.
Two (2) washers shall be used with each machine bolt.	All hardware for cribwork shall be galvanized

**909.03.05 Galvanizing**

Galvanizing shall conform to CSA Standard G164-M1981 "Hot Dip Galvanizing of Irregularly Shaped Articles". Unless otherwise specified, the minimum weight of zinc coating shall be as stated in Table 1 of this Standard. The fabricator is to adhere to the recommendations of Appendix A and Appendix B of the Standard.

**909.03.06 Ballast Stone**

Ballast used for filling cribs shall have a minimum dry bulk density in place of 2600 kg/m<sup>3</sup> (SSD). Ballast shall consist of hard, durable quarry stone or natural rock pieces, free of organic material, silt or foreign substances. Ballast shall be a maximum size not exceeding 400mm on any side and minimum size of not less than 300mm on any side.

The rock material, if subjected to the Los Angeles Abrasion Test (ASTM C131-81), shall have a loss not greater than 40%. When tested for soundness, five cycles of magnesium sulphate, ASTM C88-76, the rock material shall have a loss not greater than 15%.

**909.03.07 Filter Fabric**

Non-woven geotextile filter fabric shall have the following minimum mechanical properties: thickness 3.0mm, mass of 270 gm/m<sup>2</sup>, tensile strength of 550 Newtons, 100 percent elongation at rupture, Mullen Burst strength of 1700 KPa, Ball Burst strength of 1350 Newtons, tear strength of 290 Newtons. These typical properties shall be as defined by CGSB Standard CAN2-4.2 M77 or the latest edition thereof.

**909.03.08 Granular Fill**

Granular fill shall be in accordance with Section 902 of the Specifications Book, "Extra Backfill Select Material Compacted". However, the gradation shall comply with Granular "B" for selected Granular Base Course Material.

**909.03.09 Wood Preservation**

All timber shall be treated in conformance with Section 590 of the Specifications Book, "Wood Preservation".

**909.03.10 Wharf Concrete**

Concrete and all component materials shall conform to Section 904 of the Specifications Book for "Concrete Structures".

**909.03.11 Reinforcing Steel**

Reinforcing steel shall conform to Section 905 of the Specifications Book for "Concrete Reinforcement".

**909.03.12 Ramp Barrier**

The posts shall be cut from 115mm outside diameter galvanized steel pipe, schedule 40, 6.0mm wall thickness and fitted with a galvanized steel cap. The barrier chain shall be 9.5mm, galvanized steel. The caution marker shall be painted aluminum, and can be purchased at the Department of Works, Services, and Transportation Depot, White Hills, St. John's. The lockset shall be top quality brass, pad-lock type, equivalent to Viro No. 303, or approved equal.

**909.03.13 Mooring Cleats**

The cast iron mooring cleat shall have an approximate minimum weight of 209kg and shall be as manufactured by I.M.P. Group Limited, or approved equal. The exact details for the mooring cleat and cleat block are shown on the drawings. Anchors for mooring cleats shall be 1000mm long, 25mm diameter machine bolts, complete with 6mm flat washers and nuts.

**909.03.14 Rubber Fendering**

**909.03.14.01 Rubber Blasting Mat Type Fendering**

Materials used in the fabrication of new rubber blasting mat type fendering shall be sections of used rubber tires; new 20mm diameter galvanized fibre core wire rope and 6mm thick steel bars

Williams NEB-100, E-1 galvanized eyes, 25mm Williams Super high tensile steel, solid, all thread, anchor bolts complete with hex nuts and plates shall be utilized in the fendering system. All wire rope clips, 20mm diameter shackles with screw pins, clamps and hardware shall be galvanized. All materials shall be subject to the approval of the Engineer and conform to that shown on the contract drawings.

**909.03.14.02 Rubber Tire Type Fendering**

The 14:00 x 24 or larger rubber tires, if indicated on contract drawings, used for fendering shall be of reasonable quality and shall be approved by the Engineer.

New 20mm diameter, galvanized, fibrecore wire rope of the appropriate length as determined by the Engineer shall be utilized to hang the fender in place. All hardware shall be galvanized and as shown on the contract drawings.

**909.04 CONSTRUCTION AND FABRICATION**

**909.04.01 Preparation For Timber Cribwork Construction**

The Contractor shall take closely spaced accurate soundings, 1500mm centre to centre or less, precisely located by a template to determine actual slope of sea bed over the base area of crib and construct crib bottom to match sea bed slope.

The Contractor shall have on hand, prior to sinking of a crib, sufficient ballast stone to completely fill the crib. The Contractor shall also provide suitable plant and equipment to keep the crib in proper position and alignment during the sinking operation.

If a crib is out of alignment or not in the correct location, the Contractor will be required to refloat the crib and replace the crib in its correct position.

**909.04.02 Treated Timber Crib Work Construction**

The timber cribs shall be constructed as shown on the contract drawings and to at least 500mm above LNT and the Engineer's approval obtained prior to sinking in final position in the work. In general, the following procedure shall be adhered to:-

- a) **Levelling Pieces:** Place levelling pieces beneath bottom timbers in such a manner that they will conform to the shape of the ground. Place levelling pieces horizontally so that succeeding pieces will be solidly secured at intersections of bottom timbers and vertical posts and other levelling pieces by means of machine bolts of proper lengths.
- b) **Bottom Timbers:** Place bottom timbers lengthwise and crosswise to form the bottom three courses of the cribs. Crosswise and lengthwise bottom timbers shall be of one piece and spaced as shown on the drawings. Secure three courses of bottom timbers together with machine bolts at every intersection with each other and vertical posts.
- c) **Ballast Floor:** Place ballast floor on all pockets of the bottom or middle course of bottom timbers. Secure each ballast floor timber to bottom timbers with drift bolts so that adjacent ballast floor timbers are not secured to same bottom timber.
- d) **Longitudinals:** All longitudinals for individual cribs shall be in one length below elevation 500mm. Above this elevation, where the cribs are married, the longitudinals shall be of sufficient length to span one bay of one crib and one half bay of the adjacent crib. Where they are joined, they shall be butt joined by mid bay in the middle of a 1200mm block, the block being secured to the timber below by a drift bolt in the

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centre and the longitudinal to the block by drift bolts in the ends of the longitudinal, for all longitudinals, butt joints shall form a staggered pattern and adjacent longitudinals directly above or below shall not be joined in the same bay. All longitudinals shall be secured to the crossties at every intersection by a drift bolt and to the vertical post by a machine bolt every third course of longitudinals.

- e) **Crossties:** Crossties to be in one length across cribs. Secure crossties to intersection of longitudinals by a drift bolt and to intersection of vertical posts by a machine bolt every third course of crossties. The top course shall be machine bolted as well. All machine bolts on the exterior face from elevation 300mm below LNT to the deck elevation shall be countersunk.
- f) **Vertical Posts:** Vertical posts are to be in one length from the bottom of the cribwork to the underside of the concrete deck. One vertical post shall be located at each corner of each crib and at the intersection of the crossties with the longitudinals. Vertical posts shall be secured to the crossties and longitudinals at every third course with machine bolts of adequate length. Where two cribs are married together, one of the adjacent vertical posts may be eliminated 500mm above LNT.
- g) **Fillers:** Blocking shall be placed in the cribwork as indicated on the drawings, and as directed by the Engineer. It shall be the exact length to completely fill the proper spaces and shall be placed under all crossties and longitudinals which are carrying the bearing weight of the deck. It shall be of the same size and material as the crossties or longitudinals, full length, and shall be drift-bolted with two bolts into the timber immediately below it.
- h) **Holing:** Bore holes for drift bolts 1.5mm smaller than the bolt diameter and for full length of bolt. Bore holes for machine bolts to same diameter as bolt. The inside of all drilled holes shall be thoroughly treated with one coat of wood preservative.
- i) **Ballast Stone:** Place ballast stone in such a manner not to damage timber cribwork. The Engineer will be the sole judge as to the acceptability of the placing method. Place ballast so that differential height of fill between adjacent cells will be less than 1000mm.  
Hand place final items of ballast stone to fill voids and depressions so as to hold gravel in place.
- j) After the final items of ballast stone are in place and before any granular fill is put in place, a layer of filter fabric shall be loosely spread over the ballast stone. All joins in the filter fabric shall be lapped 200mm. The filter fabric shall be securely held in place until the granular fill is placed on top of the fabric. Vehicular traffic will not be permitted to operate directly on the fabric.
- k) A 150mm thick layer of granular fill shall be placed over the top of the ballast and filter fabric in the crib to form a base for the wharf concrete deck. Install gravel to the grade required and compact to 100% of the maximum Standard Proctor Dry Density (ASTM D698-78) in preparation for concrete slab work.

### 909.04.03 Treated Dimension Timber

Treated dimension timber wheel guard and wheel guard blocking shall be installed on the exterior faces of the wharf, as shown on the drawings.

The treated timber wheel guard and coping shall be in lengths of at least 6000mm, unless otherwise specified.

Butt joints shall be made over blocks 600mm long. Similar blocks shall be used as supports under the wheel guard spaced at 1500mm on centres. The wheel guard shall be secured through the blocking to the material below by means of galvanized hardware as shown on the drawings.

The wheel guard and wheel guard blocks shall be given two coats of best quality marine alkyd base paint, colour red. The first coat shall be applied when the wood is dry, and the second coat shall be applied when the first coat is dry; all painting being done when weather conditions are suitable for painting. A treated timber coping shall be installed around the perimeter of the wharf structure, as shown on the drawings.

The coping shall be fastened to the underlying timber using 16mm diameter drift bolts spaced at 1500mm centres and secured to the concrete deck with 16mm diameter galvanized machine bolts on 1500mm centres, complete with nuts and washers.

#### **909.04.04 Treated Hardwood Sheathing, Fenders, Chocks, and Ladders**

Treated hardwood sheathing, fenders, chocks, and ladders shall be placed on the exterior faces of the wharf, as shown on the drawings.

The fenders shall be installed at 600mm centres and the lengths shall be as shown on the drawings. Each fender shall be fastened with three (3) 13mm diameter galvanized lag screws, complete with washers and shall be counter sunk. Fenders shall be bevelled 40°, top and bottom. Chocks of the same material as the fenders shall be fitted and fastened in three (3) rows between the fenders. Each chock shall be fastened with two (2) 13mm diameter galvanized lag screws complete with washers and countersunk.

The treated hardwood sheathing shall be installed to the lengths shown on the drawings. The sheathing shall have a minimum width of 150mm and a maximum width of 250mm. Each member shall be fitted tight to the adjacent sheathing and fastened with three (3) 13mm diameter galvanized lag screws. Sheathing more than 150mm in width shall be fastened with five (5) galvanized lag screws, staggered. The top and bottom of each member shall be bevelled 45°.

The ladders shall be located as shown on the drawings or as directed by the Engineer. The ladder rungs shall be 25mm diameter galvanized steel rods, 1000mm long at 300mm centres. A handhold consisting of a 25mm diameter galvanized steel rod 1500mm long, bent as shown and embedded 150mm into the wheel guard, shall be provided for each ladder. The ladder uprights shall consist of four (4) pieces of 150mm by 150mm treated hardwood and shall be secured to the cribwork by four (4) equally spaced 13mm diameter galvanized lag screws, complete with washers and countersunk. The top and bottom of each ladder upright shall be bevelled 45°.

#### **909.04.05 Rubber Fendering**

##### **909.04.05.01 Rubber Blasting Mat Type Fendering**

Fenders shall be specially fabricated for use in a marine environment to absorb energy when impacted by marine traffic. Single purpose blasting mats are not acceptable.

New quality blasting mat type fendering shall be from 250mm to 300mm thick. The horizontal and vertical dimensions shall be as stated on the contract drawings.

The mat shall be fabricated from rubber tire sections and secured together with 20mm diameter galvanized wire rope spaced at 400mm on centre running in one direction and 6mm thick steel bars spaced at 400mm on centre running in the perpendicular direction. Additional steel bars shall be added along one side and parallel to the cables so that when hung in place they run along the top of the mats but still permit it to bend around the corner.

Galvanized wire rope shall extend from the top of the mat(s) and shall be secured to Williams NEB-100, E-1 galvanized eyes. The eyes are to be fastened to 25mm Williams super high tensile steel, solid all thread anchor bolts c/w Hex nuts and plates. Other arrangements may be required if so indicated on the contract drawings.

The new blasting mat type fender shall be hung in position so that the galvanized wire ropes lie in a horizontal position with the rubber tire section hanging vertically. In this regard, the manufacturer shall clearly mark on the mat the correct position in which it is to be hung.

All ends of wire rope shall be connected to eye bolts and ring bolts using a minimum of three wire rope clips and 20mm shackles with screw pins.

Rubber tire blasting mat type fenders shall be fabricated, suspended and secured in place as indicated on the contract drawings.

##### **909.04.05.02 Rubber Tire Type Fendering**

The fendering unit shall be fabricated, suspended from the concrete deck and held in place at the bottom of the fender as indicated on the contract drawings. All wire rope utilized to hang and secure the fender shall be 20mm galvanized steel wire rope.



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Rubber tire type fenders shall be held together and suspended in a vertical plane using a single wire rope, passed through a hanger or fastening device at each end, looped, and secured to itself with suitable clamps. In addition, these fendering units may be secured in the horizontal plane using rope suitably clamped around and through each fendering unit and secured at each end if so indicated on the contract drawings.

### 909.04.06 Ramp Barrier

The barrier shall consist of foundations, two posts, chain, padlock, and caution marker.

Ramp barrier, posts, chain, concrete foundations, hardware, and caution marker shall be fabricated and erected as indicated herein or as shown and detailed on the contract drawings. The contractor shall completely fill the ramp barrier posts with concrete.

The foundations for the ramp barrier posts shall be excavated to a depth as shown on the contract drawings. The posts shall be set in concrete. The concrete foundation block shall be 30 MPa in 28 days and shall measure 500mm on each side. The excavation shall be backfilled with clean, granular backfill conforming to Granular "B" gradation. The backfill shall be compacted in 250mm lifts to 95% of the maximum Standard Proctor Dry Density (ASTM D698-78).

### 909.04.07 Mooring Cleats

The mooring cleat shall be secured to the concrete cleat block by six (6) machine bolts complete with flat washers and nuts. After installation, the bolt holes in the cleat shall be filled with an approved sealing compound.

Submit shop drawings of mooring cleat for approval by the Engineer.

### 909.04.08 Wharf Concrete

Construction of the wharf concrete shall consist of three concrete types; (a) "Mass Concrete" required to fill specified voids within the crib, (b) "Reinforced Wharf Deck Concrete" which includes the wharf deck, fendering blocks, cleat blocks and the vehicular loading ramp and (c) "Tremie Concrete" where specified.

Construction of the wharf concrete shall be as outlined on the contract drawings and as specified herein. The construction procedure, the supply, mixing, transportation, placing, finishing and curing of the (a) "Mass Concrete", (b) "Reinforced Wharf Deck Concrete" and (c) "Tremie Concrete" shall be as outlined in Sections 904 and 905 of the Specifications Book for "Concrete Structures" and "Concrete Reinforcement" as appropriate.

## 909.05 UNASSIGNED

## 909.06 UNASSIGNED

## 909.07 UNASSIGNED

## 909.08 MEASUREMENT FOR PAYMENT

### 909.08.01 Treated Timber Cribwork

Treated timber cribwork shall be measured in cubic metres of completed work in place to the nearest one decimal place. Cubic measurements of the cribwork shall be determined by the product of the following dimensions, measured in place.

1. The height of each crib shall be the average of the measurements taken at each vertical from the bottom of the lowest timber to the underside of the concrete deck.
2. The width of each crib shall be the average width as measured between the outside faces of the exterior longitudinals, each width being measured on the top tier of each row of crossties.
3. The length of each crib shall be measured close to low water level along the centre line of the crib parallel to a level water surface between outside faces of exterior crossties.

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Measurement for payment for ballast stone, filter fabric, and granular fill will not be made.

### **909.08.02 Treated Dimension Timber**

The treated dimension timber wheel guard and wheel guard blocking and coping shall be measured by the cubic metre (m<sup>3</sup>) in place to the nearest two decimal places.

### **909.08.03 Treated Hardwood Sheathing, Fenders, Chock, and Ladders**

Treated hardwood sheathing, fenders, chocks, and ladders shall be measured by the number of cubic metres (m<sup>3</sup>) accepted in place to the nearest two decimal places.

### **909.08.04 Rubber Fendering**

#### **909.08.04.01 Rubber Blasting Mat Type Fendering**

Measurement for payment for "Supply and Installation of Rubber Blasting Mat Type Fendering" shall be per each unit.

#### **909.08.04.02 Rubber Tire Fendering**

Measurement for payment for "Supply and Installation of Rubber Tire Type Fendering" shall be per unit. Each unit shall consist of two tires mounted in a vertical position.

### **909.08.05 Ramp Barrier**

Measurement for payment for "Supply and Installation of Ramp Barrier" shall be lump sum. Measurement for individual components shall not be made.

### **909.08.06 Mooring Cleats**

Measurement for payment for "Supply and Installation of Mooring Cleats" shall be by the number of units in place. Measurement for payment of concrete in cleat block, cleat block anchors, steel reinforcement and sealant will not be made and are considered incidental to the work.

### **909.08.07 Wharf Concrete**

Measurement for payment for wharf concrete for the specific type described in the unit price table shall be the number of cubic metres of concrete placed as approved by the Engineer, rounded to one decimal place.

For (a) "Mass Concrete" the measurement for payment shall be based upon outside crib dimensions or interior of finished form work as appropriate.

For (b) "Reinforced Wharf Deck Concrete" which includes the reinforced concrete in the wharf deck, fendering blocks, cleat blocks and the vehicular loading ramp, measurement for payment shall be based upon the neat lines called for in the plans.

For (c) "Tremie Concrete" the measurement for payment shall be based upon the batch quantity as described in Section 904.10.01, "Measurement for Payment", of the Specifications Book.

Measurement for payment will not be made for form work, concrete reinforcement, mooring cleat anchors or the various other components or materials which comprise the work.

## **909.09 BASIS OF PAYMENT**

### **909.09.01 Treated Timber Cribwork**

Payment at the contract unit price for treated timber cribwork in place shall be compensation in full for all preparation, filter fabric, ballast stone, granular fill, treated timber, fasteners, all plant, equipment, materials, and labour necessary to perform the work as outlined herein or as shown on the contract drawings.

**909.09.02 Treated Dimension Timber**

Payment at the contracted unit price for treated dimension timber secured in place shall be compensation in full for all labour, equipment-use, plant, fasteners, galvanizing, and materials to perform the work as outlined herein or as shown on the contract drawings.

**909.09.03 Treated Sheathing, Fenders, Chocks and Ladders**

Payment at the contract unit price for treated hardwood sheathing, fenders, chocks, and ladders secured in place, shall be compensation in full for all treated hardwoods, fastenings, ladder rungs, handholds, galvanizing, labour, plant, equipment-use, and materials to perform the work as outlined herein or as indicated on the contract drawings.

**909.09.04 Rubber Fendering**

**909.09.04.01 Rubber Blasting Mat Type Fendering**

The basis of payment for "Supply and installation of Rubber Blasting Mat Type Fendering" shall be full compensation for all equipment, labour, materials and plant necessary to supply, fabricate, transport to the job site, store, handle and install the fendering including all eye bolts, anchors, steel plate if required plus all other fastenings, associated hardware and associated work as described herein or as shown on the contract drawings.

**909.09.04.02 Rubber Tire Type Fendering**

The basis of payment for "Supply and Installation of Rubber Tire Type Fendering" shall be full compensation for all equipment, labour, materials and plant to supply, fabricate, transport to the job site, store, handle and install the fendering including all anchors, fastenings, other associated hardware and associated work as described herein or as shown on the contract drawings.

**909.09.05 Ramp Barrier**

The basis of payment for "Supply and Installation of Ramp Barrier" shall be full compensation for all equipment, labour, materials, and plant to supply, fabricate, transport to the job site, store, handle and install the ramp barrier including all associated materials, fittings, hardware, excavation, backfilling and compaction, grouting into the concrete deck where so required and

the provision of concrete block foundations all as described herein or as shown on the contract drawings.

**909.09.06 Mooring Cleats**

The basis of payment for "Supply and Installation of Mooring Cleats" shall be full compensation for all equipment, labour, materials, and plant necessary to supply mooring cleats, anchors and sealing compound, fabricate, transport to the job site, store, handle, and install the mooring cleats together with anchors as described on the contract drawings or as described herein.

**909.09.07 Wharf Concrete**

The basis of payment at the contract price for: (a) "Mass Concrete", (b) "Reinforced Wharf Deck Concrete" and (c) "Tremie Concrete" shall be full compensation for all labour, equipment-use, plant, materials and services as outlined in Section 904, "Concrete Structures", of the Specifications Book and for all work described herein or as shown on the contract drawings.

The supply, fabrication, transportation to the jobsite, storage and placing of reinforcing steel shall be considered incidental to the work. The Contractor is advised that mass and tremie concrete will not contain reinforcing unless specifically indicated on the contract drawings.

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### SECTION 910 STRUCTURAL STEEL

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## 910.01 SCOPE

This specification covers the requirements for the supply, fabrication, delivery and erection of structural steel for highway bridges including the design of all connections. The works shall be carried out in accordance with CAN/CSA-S6-88, Design of Highway Bridges.

## 910.02 DEFINITIONS

For the purpose of this specification, the following definitions apply:

**Bearing Contact Area:** means two planes which are in contact or have a separation between them not exceeding 0.12mm.

**Erection Diagrams:** means drawings showing the dimensional layout of the steel structure, from which shop details are made, and which correlate to the fabricator's piece markings with the location in the structure.

**Flush:** means a profile of weld reinforcement in which there is a smooth gradual transition between base and weld metal involving grinding where necessary. Weld reinforcement not exceeding 1mm in height, may remain on each surface, unless the weld is part of a fraying surface when all reinforcement shall be removed.

**Fracture Critical Member:** means a member, including attachments, in a single load path structure, which is subject to tensile stress and whose failure could lead to collapse of the structure.

**Primary Tension Member:** means a member including attachments, which are subject to tension stress.

**Proposal:** means a Contractor's submission of changes, when engineering design is required, affecting either the original design or shipping, as stipulated in this specification.

**Smooth:** means a profile of weld reinforcement, in which the surface finish of weld reinforcement has a sufficiently smooth gradual transition, involving grinding where necessary. Weld reinforcement not exceeding the following limits, may remain on each surface:

For plate thicknesses  $\leq$  50mm, 2mm

For plate thicknesses > 50mm, 3mm

## 910.03 APPROVALS

### 910.03.01 General

Proposals by the Contractor, connection design, shop details, bolting procedure, welding procedures, erection diagrams, drawings and procedures shall bear the seal and signature of a Professional Engineer who is a member of, or is licensed by, the Association of Professional Engineers and Geoscientists of Newfoundland.

Work affected by these proposals, details, designs, procedures and drawings shall not proceed until the Contractor receives an approved copy of his submission(s).

### 910.03.02 Shop Details And Welding Procedures

Four weeks before the commencement of fabrication, the Contractor shall submit to the Engineer for approval, six (6) copies of shop details and welding procedures, which shall include the following:

- a) All necessary specifications for the materials to be used.
- b) The welding process to be used, the position of welding, filler metal, the proposed method of filling the welds, flux, shielding gas, if required, joint configurations, number and size of passes, preheat and interpass temperatures (if required) sequence of passes, current, rate of pass, electrode type, thickness or size, electrical stick-out and polarity and methods of storing consumables.
- c) The methods that will be used for the preparation of the edges and measures which will be taken to control the effects of distortion, shrinkage and residual stresses.

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- d) The proposed methods and sequence of assembling, welding, welding repair and welding equipment which will be used. The approval of the above must be obtained before commencing the work.

When all requirements are satisfied, two "approved" copies of the above will be returned to the Contractor.

### **910.03.03 Erection Diagrams And Procedures**

Four weeks before commencement of erection, the Contractor shall submit to the Engineer for approval, six (6) copies of the erection diagrams, drawings and procedures, including lifting point locations and details of all temporary supports.

Grouting materials, equipment and procedure shall be approved by the Engineer. The Contractor shall submit his grouting proposal to the Engineer at least two weeks in advance of required use.

When all requirements are satisfied, two "approved" copies of the erection diagrams and procedures will be returned to the Contractor.

### **910.03.04 Mill Certificates, Samples And Tests**

Prior to fabrication, three copies of mill test reports for all materials, certifying that the material meets the contract requirements, shall be submitted to the Engineer.

The Engineer shall have the right to call for any additional samples, specimens and tests that are, in his opinion, necessary to secure the proper quality of material and work.

## **910.04 MATERIALS**

### **910.04.01 Steel**

Structural steel shall conform to the requirements of CAN3-G40.21M and shall be as specified in the Contract documents. Structural steel shall be new and previously unused or unassembled.

### **910.04.02 Identification of Structural Steel**

Identification of structural steel shall be in accordance with the provisions of CAN3-S16.1-M. In addition, fracture critical and primary tension members shall be identified such that the pieces of each member are traceable to material test reports which indicate the required toughness properties.

### **910.04.03 High Strength Bolts, Nuts And Washers**

High strength bolts shall be supplied with heavy hex nuts and one hardened washer per bolt. The bolts shall have dimensions conforming to CSA B18; with chemistry and mechanical properties conforming to ASTM A325M or A490M. The nuts shall be of heavy hex type conforming to CSA B18 suitable for use with ASTM A325M or A490M bolts of the type specified. Hardened washers shall conform to ASTM F436M, suitable for use with ASTM A325M or A490M bolts of the type specified. Bolts, nuts and washers shall be new and previously unused.

### **910.04.04 Electrodes**

Electrodes shall conform to the latest edition of CSA W48.1-M, W48.3-M, W48.5-M and W48.6-M.

Filler metal shall be in accordance with Table 5-1, "Filler Metal Requirements for Exposed Bare Applications of CAN3-G40.21-M 350A, 350AT, 400A, 400AT, ASTM A242 and A588 Steels" of the CSA.W59-M1989 Specification.

Deposited weld metal shall have a minimum Charpy Impact Energy as specified on the contract drawings.

**910.04.05 Shear Connectors**

Shear connectors shall be of a headed stud type in accordance with the requirements of Appendix "H" of CSA W59-M. Grade to be specified on the contract drawings.

**910.05 FABRICATION AND ERECTION**

**910.05.01 Welded Fabrication**

**910.05.01.01 General Requirements**

All welding and all welding related items shall conform to the requirements of the following codes: CSA Standard W59-M1989 and ANSI/AASHTO/AWS D1.5-88.

**910.05.01.02 Qualifications Of The Contractor**

The company undertaking welded fabrication under Clause 910.05.01, shall be certified in Division 1 or Division 2.1 of CSA W47.1.

**910.05.01.03 Place Of Fabrication**

All fabrication shall be carried out in adequately covered and heated areas. The place of fabrication shall be approved by the Engineer.

**910.05.01.04 Web To Flange Fillet Welds**

Where practical, web to flange fillet welds shall be made continuously by machine or automatic welding. Welds, when corrected, shall blend smoothly into the adjacent welds. When corrected by welding, a semi-automatic or manual process may be used.

**910.05.01.05 Electrodes, Workmanship And Techniques**

**910.05.01.05.01 General**

Electrodes, workmanship and techniques shall be in accordance with the provisions of CSA W59-M.

**910.05.01.05.02 Preparation of Material**

- a) The preparation of edges by oxygen cutting shall be done by machine whenever practical.
- b) All cut edges which are not to be welded, shall have a roughness not greater than 1000 as defined by CSA B95. The provisions of CSA W59-M shall also apply.
- c) All surfaces and edges of materials to be welded shall be in accordance with the provisions of CSA W59-M.

**910.05.01.05.03 Inspection And Repair Of Planar Edge Discontinuities**

Inspection and repair of planar edge discontinuities shall be in accordance with the provisions of CSA W59-M. For fracture critical and primary tension members, the requirements of the Engineer shall apply.

**910.05.01.05.04 Workmanship And Finish**

- a) Workmanship and finish shall be of the best modern general practice in bridge fabrication and construction.
- b) Shearing, flame cutting and planing shall be done carefully and accurately.



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c) Particular attention shall be paid to the neatness and uniformity of finish of all parts of the work exposed to view.

### **910.05.01.05.05 Storage of Material**

Structural material, either plain or fabricated, shall be stored at the fabricating shop or elsewhere, above the ground upon platforms, skids, or other suitable supports, shall be kept free from dirt and other foreign matter and shall be protected as far as practicable from corrosion.

Long members shall be so supported as to prevent deflection.

### **910.05.01.05.06 Straightening Material**

All steel, before being marked off or worked, must be flat and straight. If any flattening or straightening is necessary, it shall be done by methods that will not, in the Engineer's opinion, injure the metal. Sharp kinks or bends in the material shall be cause for its rejection.

### **910.05.01.05.07 Re-Entrant Cuts**

A fillet of not less than 20mm radius shall be provided at the junctions of all re-entrant cuts and the fillet shall be formed before the cuts are made.

### **910.05.01.05.08 Flame Cutting**

Steel may be flame-cut, provided a smooth surface is secured by the use of a mechanical guide. Flame cutting by hand shall be done only when approved by the Engineer, and the surface shall be made smooth by planing, chipping or grinding.

### **910.05.01.05.09 Assembly**

Assembly shall be in accordance with the provision of CSA W59-M.

In addition, the following requirements for bearing and intermediate stiffeners in plate girder and box girder bridges, shall apply:

- a) Bearing stiffeners shall be vertical under full dead load.
- b) Intermediate stiffeners may be either vertical or perpendicular to fabrication worklines, depending on the fabricators practice.

### **910.05.01.05.10 Temporary Welds**

Temporary welds shall be in accordance with the provisions of CSA W59-M.

Temporary welds on fracture critical, primary tension members and flange material in compression shall not be used.

Extension bars, when attached to flanges, shall have the welds placed inside the joint, so that they can be welded over and fused into the final joint.

### **910.05.01.05.11 Groove Welds**

For groove welds in butt joints, extension bars shall be used.

### **910.05.01.05.12 Tack Welds**

Tack welds shall be in accordance with the provisions of CSA W59-M.

Tack welds shall not be used on fracture critical or primary tension members unless they are incorporated into the final weld.

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### 910.05.01.05.13 Attachments

Attachments making use of tack welds which are not part of the welds shown in the contract, shall not be allowed on any portion of the girders.

### 910.05.01.05.14 Profile of Welds

Groove welds in web splices shall have a flush weld reinforcement profile for a distance of 1/3 of the web depth from the tension flange, if the flange also requires a flush weld reinforcement profile.

### 910.05.01.05.15 Camber And Correction Of Shape

Webs shall be cut to the prescribed camber, with suitable allowance for shrinkage due to cutting and subsequent welding.

Mechanical means, or heat, may be used to correct the shape or straighten a welded member. If such a member is a fracture critical or primary tension member, the prior approval of the Engineer is necessary.

Steel members subject to such correction shall be allowed to cool in still air.

### 910.05.01.05.16 Stress Relief - Heat Treatment

Temperature shall be recorded using thermo-couples or other accepted methods. A record of the heat treating operation, showing temperature and time data, shall be maintained and made available to the Engineer upon request.

## 910.05.01.06 Obligations Of The Contractor

Prior to commencement of welding, the Contractor shall make available to the Inspector, the Canadian Welding Bureau's transferable or non-transferable identification cards for each tacker, welder or welding operator, to be employed on the work. Such identification cards shall be currently valid and shall indicate the welding process and the positions which the personnel are qualified to weld.

### 910.05.01.07 Welding Repairs

All welding repairs shall be pre-approved by the Engineer and generally conform with the requirements of the Ontario Highway Bridge Design Code.

### 910.05.01.08 Standards Of Acceptance

The standards of acceptance shall be in accordance with CSA W59-M1989.

## 910.05.02 Bolted Construction

### 910.05.02.01 General

This sub-section covers the requirements for bolted steel construction.

The design of bolted connections shall be performed by the Contractor. The design shall be in accordance with CAN/CSA-S6-88, Design of Highway Bridges.

### 910.05.02.02 Assembly And Inspection

The assembly and inspection of joints, using ASTM A325M or A490M bolts, shall be in accordance with the provisions of CAN/CSA-S6-88, Design of Highway Bridges.

### 910.05.02.03 Trial Assembly

All bolted splices shall be sub-punched or sub-drilled, put together in the shop and then reamed, unless put together and drilled from the solid.

**910.05.02.04 Bolt Holes**

All holes for bolts shall be punched or drilled. Where the thickness of the metal does not exceed 16mm, the metal may be punched or drilled 2mm larger than the nominal diameter of the fastener. Where the thickness of metal exceeds 16mm, or wherever required under Subsection 910.05.03, all the holes shall be subpunched or subdrilled 5mm smaller and after assembling shall be reamed 2mm larger than the nominal diameter of the fastener or, alternatively, shall be drilled from the solid 2mm larger than the nominal diameter of the fastener. Holes in welded members shall not be made before the welding of such member is completely finished.

**910.05.02.05 Punched Holes**

The diameter of the die shall not exceed the diameter of the punch by more than 2mm. If any holes must be enlarged to admit the fasteners, they shall be reamed. Holes must be clean cut, without torn or ragged edges. Poor matching of holes will be cause for rejection.

**910.05.02.06 Reamed Or Drilled Holes**

Reamed holes shall be cylindrical, perpendicular to the member, and not more than 2mm larger than the nominal diameter of the bolt. Whenever practicable, reamers shall be directed by mechanical means. Drilled holes shall be 2mm larger than the nominal diameter of the bolt. Burrs on the outside surfaces shall be removed. Reaming and drilling shall be done with twist drills.

If required by the Engineer, assembled parts shall be taken apart for removal of burrs caused by drilling.

Connecting parts requiring reamed or drilled holes shall be assembled and securely held while being reamed or drilled and shall be match-marked before disassembling.

**910.05.02.07 Holes For Field Connections**

The holes of those field connections which are assembled in the shop shall be reamed while assembled.

**910.05.03 Shop Assembly**

- a) All field connections in girder members (flanges and webs) shall be assembled in the shop, and there have their subsize holes reamed to specified size while assembled. The assembly, including camber, alignment and accuracy of holes, shall be approved by the Engineer before reaming is commenced.
- b) Surfaces of metal that will be in contact shall be cleaned before assembling. The parts of the member shall be assembled, well pinned and firmly drawn together with bolts, before reaming is commenced. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the reaming operation. The member shall be free from twists and bends or other distortion.
- c) Shop assembly of connections may be waived if the Contractor can demonstrate to the Engineer a method of assuring accurate matching of connections in the field, and that he has had past experience. Any alternative method of matching field connections shall be subject to approval by the Engineer.
- d) In addition, the following requirements for bearing and intermediate stiffeners shall apply:
  - (1) Bearing stiffeners shall be vertical under full dead load.
  - (2) The bearing ends of bearing stiffeners shall be flush and square with the web and shall have at least 75 percent of this area in contact with the flanges. When bearing against a steel base or seat, all components shall fit within .010 inch (.025mm) for 75 percent of the projected area of the web and stiffeners and with no gap of 1/32 inch (0.80mm) for the remaining 25 percent of the projected area.
  - (3) Intermediate stiffeners may be either vertical or perpendicular.

**910.05.03.01 Drifting Of Holes**

The drifting done during assembly shall be only such as to bring the parts into position and shall not be sufficient to enlarge the holes or distort the metal. If any holes must be enlarged to admit the fastener, they shall be reamed.

**910.05.03.02 Match-Marking**

Connecting parts assembled in the shop for the purpose of reaming holes in field connections shall be match-marked, and a diagram showing such marks shall be furnished to the Engineer.

**910.05.04 Transportation And Delivery**

**910.05.04.01 General**

The Contractor shall perform all work necessary to ensure safe delivery and storage at the site specified in the Contract.

Structural steel shall be so loaded for shipping that it may be transported and unloaded at its destination without being excessively stressed, deformed or otherwise damaged. Girders shall be transported with their webs in a vertical plane.

Structural steel, when stored, shall be stockpiled to avoid excessive stress deformation or other damage.

Not less than 7 days before any shipping begins, the Contractor shall provide the Engineer with the delivery schedule.

**910.05.04.02 Oversize-Overweight Restrictions**

Vehicles loaded with structural steel which are oversize or overweight are not permitted on the highways except by special permit which shall be obtained by the Contractor.

It is the Contractor's responsibility to ensure delivery of structural steel to the job site is feasible.

**910.05.05 Erection**

**910.05.05.01 General**

Structural steel erection shall not commence until all aspects of Section 910.05.06 Inspection and Testing have been fulfilled to the satisfaction of the Engineer. The Contractor shall notify the Engineer, in writing, of the starting date at least 2 weeks prior to the commencement of field operations and work shall not be carried out until the Inspector is on the site.

Repairs to erected material will only be permitted when the procedure is approved by the Engineer.

Welding shall not be used to fill misplaced holes.

The Contractor shall not use any of the material intended for use in the finished structure for erection or temporary purposes unless such use is provided for on the plans or authorized by the Engineer. Excessive hammering, pushing, pulling, twisting, bending and the like which will injure or distort the members will not be allowed. Surfaces to be in permanent contact shall be cleaned just prior to assembly.

The Contractor shall supply all materials, tools, equipment, plant and labour necessary for the erection of the steelwork. The Contractor shall erect the structural steel in accordance with the requirements of the latest edition of the A.A.S.H.T.O. Specifications.

**910.05.05.02 Methods And Equipment**

a) So that the Engineer may verify that the proposed method of erection conforms to the requirements of these specifications, the Contractor shall, before starting the work of erection, furnish the Engineer with erection procedure, erection drawings, together with complete calculations of stresses in the steelwork in the various stages of erection and shall inform the Engineer fully as to the method of erection he proposes to use. The whole of this information shall be submitted to the Engineer at least four (4) weeks before the work of erection is to

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commence and shall be stamped by a Professional Engineer who is registered or licensed to practice in the Province of Newfoundland.

- b) The Engineer shall have the right to inspect all equipment to be used for the erection to satisfy himself that such equipment is of good quality, and he may forbid the use of any equipment that is, in his opinion, in any way faulty.
- c) Under no condition may stresses occurring in the members of the structure exceed the basic allowable stresses, except with the express permission of the Engineer.
- d) Release of temporary supports or temporary members, etc. must be gradual, and under no circumstances will a sudden release be permissible.
- e) The method of erection proposed to be used shall be subject to the approval of the Engineer, but such approval shall not relieve the Contractor of any responsibility for the safety of the proposed method of work in full accordance with the Contract. The Contractor shall not start any erection operation before this approval is obtained.

### **910.05.05.03 Falsework**

The design of falsework shall be in accordance with CSA S269.1, Falsework For Construction Purposes.

Falsework shall conform to Section 907 of the Specifications Book, "Formwork and Falsework".

The Contractor shall furnish, construct, erect, maintain and subsequently remove and dispose of all falsework required for the erection of the work. Falsework will include all temporary supports and foundations and shall be properly designed and substantially constructed and maintained to sustain the loads which will come upon it. Falsework drawing(s) shall be stamped by a Professional Engineer registered or licensed to practice in the Province of Newfoundland.

### **910.05.05.04 Handling And Storing Materials**

Material delivered to the site shall be placed on skids above ground. It shall be kept clean and properly drained. Girders and beams shall be placed upright and shored. Long members shall be supported as to prevent injury from deflection.

### **910.05.05.05 Damaged Material**

Material which is bent, kinked, twisted or otherwise damaged shall be immediately removed from the job site and replaced with equivalent new and undamaged material.

### **910.05.05.06 High Tensile Bolts**

- a) Each bolt shall be tightened to provide, when all the bolts in the joint are tight, at least the minimum bolt tension shown in Table 24 of CAN/CSA-S6-88.
- b) Alternatively, the "turn-of-the-nut" method may be used for tightening bolts.
- c) The Contractor shall submit to the Engineer a detailed description of the tightening method he proposes to follow, which method shall be subject to approval by the Engineer. Tightening by torque control shall not be utilized.
- d) The proposed tightening procedure shall contain controls to prevent the "over tightening" of bolts.

### **910.05.05.07 Connections**

At the time of erection all splice plates shall be free of all contamination such as burrs, drillings, oil, dirt and paint.

Any error in shop fabrication, or any deformation resulting from handling or transportation, which prevents the proper assembly and fitting of parts shall be reported to the Engineer.

### **910.05.05.08 Drilling And Grouting Of Anchor Bolts**

When the Contract includes drilling and grouting of anchor bolts, this work shall be performed as follows:

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Holes shall be drilled in the concrete, and through reinforcing steel, where encountered, by means of a core drill. From the time of drilling and until the anchor bolts have been placed and grouted, the Contractor shall prevent the entry of water and any other foreign material into the holes.

The Contractor shall place the anchor bolts, supply all necessary materials, provide necessary heating, protection, and carry out all the work required to completely fill the space around the anchor bolts.

### **910.05.05.09 Field Assembly**

- a) The parts shall be accurately assembled as shown on the plans, and any match-marks shall be followed. The material shall be carefully handled so that no parts will be bent, broken, or otherwise damaged. Hammering which would injure or distort the members is prohibited. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.
- b) Insofar as the cantilever method of erection is followed, the procedure shall be approved by the Engineer.
- c) In all main girder field connections, 10% of the holes shall be filled with cylindrical erection pins before tightening high-strength bolts.
- d) Cylindrical erection pins for use in shop-reamed holes shall be machined to a push fit so as to obtain an accurate matching of corresponding holes.

### **910.05.06 Inspection and Testing**

#### **910.05.06.01 Responsibility**

It is the Contractor's responsibility to supply the material, execute, complete and maintain the works in strict accordance with the terms of the Contract. Inspection and testing of the materials and works by the Engineer or his representative or that performed by the Contractor and reviewed by the Engineer shall not be deemed to relieve the Contractor of any of his obligations.

#### **910.05.06.02 Non-Destructive Testing And Inspection**

Prior to commencement of fabrication the contractor shall designate, by way of written notification to the Engineer, an agent to perform the following inspections and testing services:

- (a) All welds shall be visually inspected.
- (b) Groove welding (splicing) of material for main girder members, other than splices shown on drawings, will not be permitted without express written consent of the Engineer. In the event that such splices are allowed, they shall receive 100 percent radiographic or ultrasonic inspection.
- (c) Web to flange fillet welds on main girder members shall be subject to magnetic particle inspection as follows:
  - (1) Submerged arc welds 25 percent of length
  - (2) Semiautomatic welds 50 percent of length
  - (3) Manual welds 100 percent of length
- (d) 25% of fillet welds for attaching gusset plates, diaphragm welds and bearing stiffeners shall be tested by magnetic particle inspection.
- (e) Gusset plates and stiffeners for attaching diaphragm bracing shall be tested for 100% of the length of the mid-depth of the web to the tension flange.
- (f) All transverse welds on tension flanges shall receive 100% magnetic particle inspection.
- (g) Periodic inspections shall also be conducted to ensure:
  - (1) Mill certificates and material identifications conform with the shop and contract drawings.
  - (2) Fabrication procedures/methods conform to the Department's and project's specifications.

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- (3) Weld procedures/methods conform with the contractors weld procedures approved for this project, the Department's and project's specifications and the requirements of CSA Standard W59-M1989 and ANSI/AASHTO/AWS D11.5-88.

The contractor's agent for performing the aforementioned tests shall be experienced in the type of inspection and non-destructive testing required and shall be subject to the approval of the Engineer.

In the event that welding defects or deficiencies are found, either by the Department's representative or by the personnel designated to perform testing for the contractor, then the Engineer must be notified within 48 hours by the contractor and a method of welding repair for correction of the deficiencies must be submitted in writing, for approval by the Engineer. Upon approval of any proposed corrective measures the contractor may proceed with the repair work, however, all repairs or corrective measures may be subject to 100% non-destructive testing and inspection, at the discretion of the Engineer, and at the expense of the contractor.

The personnel or organization performing non-destructive testing and inspection for the contractor shall keep a written record of all testing and inspection work performed, which shall include details of the item(s) inspected, type of inspection(s) performed, date, time and location where inspection was performed, and details of any items which did not conform with the shop or contract drawings or specifications.

The contractor shall submit to the Engineer, within one week of their execution, all inspection, testing/retesting results and records. In addition, from the time of commencement of fabrication, the contractor shall ensure that his inspecting agent submits to the Engineer a weekly progress report describing work completed, and inspections and testing conducted, including results thereof, since the previously submitted progress report.

One week after all fabrication work is complete the contractor's designated inspection agent shall submit to the Engineer, in writing, certification that all inspection and testing required under the Department's Specification and the project's supplementary conditions have been performed and all items inspected, including those requiring repair or rework and reinspection, fully conform to the shop and contract drawings as well as the Department and project specifications.

### **910.05.06.03 Inspection**

The Contractor shall perform all inspection as outlined in Section 910.05.06 of this specification, "Inspections and Testing". In all such inspections, the Contractor will be held strictly to the true intent and meaning of the specifications, drawings and other Contract Documents in regard to quality of materials, workmanship and diligent execution of the Contract. Any work done or materials used without supervision or inspection by the Engineer or his representatives may be ordered to be removed and replaced, at the Contractors' expense.

Inspection by the Engineer or his representative may extend to all or any part of the works and to the preparation, fabrication, manufacture or erection of any or all the materials. The Engineer or his representative shall be furnished by the Contractor with such information and facilities as is required to make a complete and detailed inspection and shall be allowed access to all parts and phases of the work.

### **910.05.06.04 Engineer's Representative**

- (a) A DEPARTMENT REPRESENTATIVE will be assigned to the project to report to the Engineer on the progress of the works as a whole and the manner in which they are being performed, to secure adherence to the requirement of the Contract, to report on any failure by the Contractor to fulfil the requirements of the Contract and to direct the Contractor's attention to such failure.
- (b) Testing Engineers and Inspectors may be appointed by the Engineer to fulfil duties similar to those of the DEPARTMENT REPRESENTATIVE in connection with various aspects of the works and to carry out the testing of material and work.
- (c) The Engineer's representatives shall, within the limits of the written authorization given them by the Engineer, have authority to reject material or work that is not in conformity with the requirements of the Contract, but no representative of the Engineer shall have authority to revoke, alter, enlarge, relax or release any requirement of the Contract.

## **910.06 SURFACE PREPARATION AND COATINGS**

The type of coating(s), the type of surface preparation, the method of application and drying or curing in addition to the measurement for and basis of payment shall be as defined in Section 921 of the Specifications Book, "Blast Cleaning And Painting Of Structural Steel".

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Surface touch up where necessary shall be done after the erection is complete and final.

### 910.07 CAMBER

Camber shall be as stated on the contract drawings.

### 910.08 MEASUREMENT FOR PAYMENT

Measurement for payment will be made on a lump sum basis for (a) Fabrication, Supply and Delivery of Structural Steel and (b) Erection of Structural Steel.

Measurement for payment will commence when the structural steel arrives on site.

Measurement for payment will not be made for the provision of samples, specimens and testing including those tests required to be carried out in accordance with Section 910.05.06 of this specification, "Inspection and Testing".

Measurement for payment for Surface Preparation And Coatings will be made in accordance with Section 921 of the Specifications Book for "Blast Cleaning And Painting Of Structural Steel".

### 910.09 BASIS OF PAYMENT

#### 910.09.01 Fabrication, Supply and Delivery of Structural Steel

Payment at the contract price for the tender item "Fabrication, Supply and Delivery of Structural Steel", shall be full compensation for all labour, equipment, materials, plant and services to fabricate, test and inspect as outlined above, supply, transport, deliver, handle and store the structural steel as outlined in this specification.

The basis of payment shall include full compensation for the provision of a storage site, the unloading, proper and orderly storage and identification of structural steel as outlined herein.

The Contractor shall bear all costs for the provision, preparation and testing of samples and specimens including those described in Section 910.05.06 of this specification, "Inspection and Testing".

All costs, including inspection and testing, associated with the correction or repair of rejectable defects shall be the responsibility of the Contractor.

At the discretion of the Engineer, the Department may withhold a sum equal to 15% of the total lump sum price for the tender item "Fabrication, Supply and Delivery of Structural Steel", if the contractor fails to comply with, or provide the documentation required under, Section 910.05.06 of this specification, "Inspection and Testing". This sum may be withheld until such time as the contractor, in the Engineer's opinion, meets the obligations set forth in the aforementioned specification.

The basis of payment shall include full compensation for the preparation of all proposals, shop details, bolting and welding design, bolting, welding and erection procedures, diagrams and drawings and submission of the same to the Engineer for approval.

The costs and fees of the testing Engineer and other representatives of the Engineer shall be borne by the Department; excepting costs of reinspection and retesting as associated with work not meeting these specifications, which shall be borne by the Contractor.

The basis of payment for Surface Preparation and Coatings will be made in accordance with Section 921 of the Specifications Book for "Blast Cleaning And Painting Of Structural Steel".

The basis of payment for false work shall be in accordance with Section 907 of the Specifications Book for "Formwork And Falsework".

#### 910.09.02 Other Inspection And Testing

If the Engineer decides additional testing is necessary, the costs for electric power, scaffolding, protection from the weather and access for testing and inspection shall be included with the appropriate tender items and be borne by the Contractor.



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The cost of the Engineer, his representative and all additional testing shall be borne by the Department.

### **910.09.03 Erection Of Structural Steel**

Payment at the contract price for the tender item "Erection of Structural Steel", shall be full compensation for all labour, equipment, materials, plant and services to handle and erect the structural steel, the drilling, setting and grouting of anchor bolts in addition to testing and inspection, all as outlined above.

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**ICE BREAKERS**

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**911.06 BASIS OF PAYMENT**

**911.01 SCOPE**

The scope of this specification is to cover the supply and erection of steel ice breakers on concrete piers.

**911.02 MATERIALS**

The ice breaker shall be fabricated in structural steel to G40-21M (300W). Fabrication shall be in accordance with the detailed drawings.

After fabrication the ice breaker shall be hot dip galvanized in accordance with CAN/CSA-G164.

**911.03 ERECTION**

The ice breaker shall be placed in the form work prior to concrete placement. Elevations shall be approved by the Engineer.

Any damage done to the galvanizing prior to installation shall be repaired in an acceptable manner and provide a galvanized coating comparable to that provided by CAN/CSA-G164.

**911.04 UNASSIGNED**

**911.05 MEASUREMENT FOR PAYMENT**

Each ice breaker on each pier will be considered a unit.

**911.06 BASIS OF PAYMENT**

Payment for each unit will be as per the tendered item "Supply and Install Steel Ice Breaker".

**SECTION 912**

**BEARINGS**

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**912.06 MEASUREMENT FOR PAYMENT**

**912.07 BASIS OF PAYMENT**

**912.01 SCOPE**

The scope of this specification is to cover the supply, fabrication and installation of all plain and steel reinforced elastomeric bearings and pot bearings in structures. Pot bearings shall be defined as free sliding, constrained sliding and/or fixed structural bearings consisting of a metal piston supported by a single moulded disc of unreinforced elastomer that is confined within a metal cylinder.

Bearing materials, manufacture, fabrication and installation shall comply with the latest edition of CAN/CSA-S6 or OPSS 1202/1203 for elastomeric and pot bearings respectively. In the event of a conflict between the two, the more severe criteria shall control.

**912.02 MATERIALS**

All materials shall be new and unused with no reclaimed material incorporated in the finished bearing.

**912.02.01 Elastomeric Bearings**

Bearings shall be fabricated from elastomeric materials. Virgin natural polyisoprene (natural rubber) or virgin polychloroprene (neoprene) shall be the only raw polymer permitted.

Internal steel plates shall be not less than 3mm thick nor greater than 5mm. Plates shall be mild steel and conform to CSA-G40.21-M87.

The elastomer compound shall exhibit grade 5 low temperature behaviour. Both natural rubber and neoprene shall be either  $50 \pm 5$  or  $60 \pm 5$  durometer as stated on the contract drawings. The shop drawings shall indicate the low temperature behaviour grade and durometer number.

**912.02.02 Pot Bearings**

The Contractor shall furnish a manufacturer's certification that materials proposed for use on the project have been pretested and will meet the requirements as set forth in the manufacturer's current literature.

Elastomer and rubber components shall meet Grade 5 classification as per CAN/CSA-S6-88.

Sliding pot bearings shall have a PTFE and stainless steel interface.

**912.03 MANUFACTURE AND APPROVAL**

**912.03.01 Elastomeric Bearings**

**912.03.01.01 Manufacture**

All pads shall have a smooth finish. Any steel plates shall be free from burrs and sharp edges; all laminations shall have a uniform thickness.

Steel laminated bearings shall be moulded as a single unit under pressure and heat, steel plates shall be completely bonded on all surfaces.

**912.03.01.02 Approval**

Bridge bearings shall be as designated in the contract or from an approved source. Bearings shall be approved by shop drawings and the manufacturer shall supply the Engineer with a catalogue.

Six copies of drawings shall be forwarded for approval and three weeks is necessary for this approval.

The following information is needed:

- 1) Dimensions
- 2) ULS/SLS load capacity in compression
- 3) Compression stiffness
- 4) Maximum movement capacity in shear
- 5) Shear stiffness
- 6) Rotation capacity

**912.03.01.03 Identification**

All bearings shall be indelibly marked with the name of the manufacturer, the part number, bearing identification number, elastomer type, elastomer grade and the date of manufacture on the side visible after erection.

**912.03.01.04 Quality Assurance**

The manufacturer shall submit a certificate of compliance to the Engineer prior to installation. The certificate of compliance shall contain

the material properties, grades and relevant standards of all bearing materials. The manufacturer shall certify the bearing(s) meet the design requirements.

**912.03.02 Pot Bearings**

**912.03.02.01 Fabrication and Manufacture**

This work shall consist of the fabrication, manufacture and finishing of pot type structural bearing devices of the type shown on the plans for the locations as shown on the plans. These structural bearings shall adequately provide for all movements, loads, forces and rotations of structural members where applicable.

Bearings shall be factory set and clamped for equal expansion and contraction and plant assembled. Temporary connections shall not be removed until the bearings are set in their final positions.

The stainless steel sliding surface interface sheet shall conform to ASTM A167 Type 304 with a bright annealed mirror Number 8 finish on one side and continuously welded to the top plate.

All pot bearings shall have a minimum rotational capacity of  $\pm 0.02$  radians. All elements shall be capable of maintaining its initial uniform contact at  $\pm 0.02$  radians rotation. The coefficient of friction between the PTFE and stainless steel plates at maximum permissible bearing load shall be 0.03 or less. Pot bearings are to be lubricated and unfilled. Exposed steel surface shall be coated with cold galvanizing compound (2 coats).

The bearing device manufacturer shall be pre-qualified with a five year proven history of successful product manufacture.

All welding shall be in accordance with CSA W59-M. The company undertaking welding fabrication shall be certified in Division 1 or Division 2.1 of CSA W47.1.

Unidirectional or constrained sliding bearings should be manufactured with a gap tolerance at the guides of 0.5 mm. All bearing surfaces of steel plates shall be finished flat within 0.25 mm. Overall manufacturing height tolerance shall be  $\pm 3$  mm.

Anchorage pins, studs and connections shall be designed and supplied by the fabricator for the maximum horizontal force and minimum/maximum vertical force indicated on the drawings.

**912.03.02.02 Approval**

The pot bearing manufacturer shall be as designated in the contract documents or an approved equal. Bearings shall be approved by shop drawings and the manufacturer shall supply the Engineer with a catalogue.

Six copies of drawings shall be forwarded for approval and three weeks is necessary for this approval.

The following information is needed:

- (1) Dimensions of each component including: top plate, sliding surface, bearing surface, piston, elastomeric disc, base pot, anchor pins, anchor studs and welds and the overall dimensions of the finished bearing. Dimensions refer to length, width, diameter and thickness.
- (2) Minimum and maximum horizontal and vertical load capacity, both SLS and ULS.
- (3) Longitudinal and transverse movement capacity.
- (4) Bearing rotation capacity in radians.
- (5) Sketch indicating bearing locations, orientation and movement.

- (6) The shop drawings shall contain a detailed bill of materials.

**912.03.02.03 Identification**

All bearings shall be indelibly marked with the name of the manufacturer, the part number, bearing identification number, elastomer type, elastomer grade and the date of manufacture on the side visible after erection.

**912.03.02.04 Quality Assurance**

The manufacturer shall submit a certificate of compliance to the Engineer prior to installation. The certificate of compliance shall contain the material properties, grades and relevant standards of all bearing materials. The manufacturer shall certify the bearing(s) meet the design requirements.

**912.04 INSTALLATION**

All welding within three (3) metres of any bearing shall be specifically prohibited unless written approval is obtained from the Engineer. Such approval will require specific measures to protect the bearings where so required by the Engineer.

**912.04.01 Elastomeric Bearings**

Bearings when received on site shall be stored in a location and under conditions approved by the Engineer.

The bearings shall be installed in the exact location as called for in the contract.

Tolerances of installation (including manufacturing tolerances) shall be  $\pm 5$ mm.

Variation from a dead level plane shall not exceed 1mm in 50mm.

Any abnormal appearance of the bearings shall be cause for rejection.

**912.04.02 Pot Bearings**

The manufacturer shall ship each bearing fully assembled. The bearings are not to be disassembled prior to final installation without the knowledge of the design authority and manufacturer.

Bearings when received on site shall be unloaded and stored in accordance with the manufacturers recommendations. The Engineer shall approve the same.

The bearings shall be installed in the location and orientation as indicated on the contract drawings. Constrained sliding or uni-directional bearings shall be properly aligned to allow for the movement of the structure as indicated on the contract drawings. The bearings shall not be installed in the field prior to the Engineer's approval.

Where the bearings are of a guided or constrained type, the Contractor shall establish the bearing alignment using surveying instruments. The tolerance for variation in alignment, i.e. plan view, is  $\pm 0.0067$  radians (0.382 degrees) where the bearing is required to move 75 mm or less. The bearings shall have dead level bearing surfaces, i.e. top and bottom plates. Dead level shall be defined as  $\pm 0.001745$  radians (0.10 degrees), i.e.  $\pm 1.745$  mm in 1000 mm.

In positioning, the bearing centre of the base should correspond to the centre of the support. Rotation of the bearing should not be permitted to occur during concrete placing operations. The top plate shall be supported on all sides to prevent deflection of the same during the concrete placing operations.

The base plate shall be bedded by the contractor on non-shrink grout. It is of extreme importance that the final bedding be free from high or hard spots, voids, etc. The Contractor shall supply durable load bearing wedges to support all bearings when they are placed on the non-shrink grout pad. Wooden wedges are not acceptable. The bearing base plate shall be set in position using a flowable non-shrink grout unless otherwise indicated on the shop drawings. For uni-directional and multi-directional bearings, adjust the upper plate to proper setting as

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instructed by the field Engineer prior to affixing to the structure. Ensure form work is well sealed to prevent concrete from flowing onto the bearing prior to placing deck concrete.

Installation requirements shall be written on the shop drawings. Bearings are to be installed as per the manufacturer's recommendations.

### **912.06 MEASUREMENT FOR PAYMENT**

Each individual bearing fully assembled shall be considered as one unit regardless of the bearing type, kind, size, capacity, function, location of installation in the structure or source of manufacture. Measurement for payment purposes shall be the total number of such units installed.

Bearings used against concrete creep blocks and concrete corbels shall not be included in measurement for payment and are incidental to the works.

### **912.07 BASIS OF PAYMENT**

Payment at the contract price for "Supply And Install Bearings" shall be full compensation for all labour, equipment, materials and services required to supply, fabricate, transport to the job site, store on site, handle and install the bearings in the specified locations. Any anchorages, grout and dowel pins required are considered incidental and no separate payments will be made.

The tendered price per each unit for "Supply and Install Bearings" shall be the average price per unit regardless of the bearing type, kind, size, capacity, function, location of installation in the structure or source of manufacture excluding bearings used against creep blocks and concrete corbels which are incidental to the works.

Any necessary engineering and adjustment shall be considered incidental to the work.

No payment will be made until a certificate of compliance has been received by the Engineer.

**SECTION 913  
EXPANSION JOINTS**

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**913.07 BASIS OF PAYMENT**

**913.01 SCOPE**

The scope of this specification is to cover the design, supply, material, fabrication and installation of expansion joint assemblies of the type as shown in the contract documents.

Expansion joint design, materials, fabrication and installation shall comply with the latest edition of CAN/CSA-S6: Design of Highway Bridges.

**913.02 MATERIALS**

**913.02.01 Seal**

The seal shall be a neoprene seal conforming to OPSS 1210.

**913.02.02 Lubricant**

The Contractor shall supply a suitable lubricant to facilitate the installation of the seal into the expansion joint rail. The lubricant shall be compatible with the neoprene seal.

**913.02.03 Steel**

All steel used in the expansion joint assembly shall conform to CSA Specification G40.21M. The steel grade shall be 300W.

**913.03 FABRICATION AND DRAWING APPROVAL**

**913.03.01 General**



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The expansion joint assembly shall be a mechanically locked joint of the type shown on the contract drawings or an approved equivalent. It shall be capable of satisfactory operation between -35oC and 40oC.

#### **913.03.02 Approval of Drawings**

Prior to any fabrication, shop drawings must be approved by the Engineer.

Normally six copies of drawings will be required and three weeks will be required for approval.

The shop drawings shall show:

- 1) Movement chart showing total rated movement.
- 2) The required setting width for temperatures in increments of 5oC within the normal setting range.
- 3) Grade, type and dimension of all material used.
- 4) Location and full details of all splices and welds.
- 5) Full details of anchors, clamping devices and curb details.
- 6) Preset shipping dimensions.
- 7) Site storage and installation procedures.
- 8) Relationship of expansion joint assembly to deck, approach slab, roadway and all adjacent reinforcement.

#### **913.03.03 Fabrication**

The steel extrusion shall be zinc metallized in accordance with CSA Standard G189M providing a minimum metallized coating of 200µm.

All cut edges shall be smooth, regular and free of slag.

All holes shall be drilled and bleed holes shall be 12mm diameter.

All welding shall be in accordance with CSA W59-M. The company undertaking welding fabrication shall be certified in Division 1 or Division 2.1 of CSA W47.1.

The neoprene seal shall be continuous.

The roadway part of the expansion joint shall be bent up 150mm at a 45 degree angle into the curb, the neoprene seal shall extend 25mm beyond the end of the joint.

Where the expansion joint being supplied contains snow plow deflection plates, the same shall be placed parallel to the centreline of the roadway.

#### **913.04 TRANSPORT AND STORAGE**

The joint assembly shall be shipped with the preset dimensions of 50mm for 10oC unless otherwise indicated on the drawings. Care shall be taken in the shipping to prevent bending, warping or other damage.

The joint assembly shall be stored such that it is protected from rusting, dirt and distortion.

#### **913.05 INSTALLATION**

The Contractor shall provide a technician, approved by the Engineer, familiar with the expansion joint assembly being installed, to supervise all works involved with its installation.

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Before the placement of the expansion joint assembly, all deck concrete shall have been placed and cured for a minimum period of three days with enough area for the proper placement of the expansion joint assembly "boxed-out" as per detail on contract drawings.

The expansion joint installation sequence is outlined as follows:

- (a) Install steel expansion joint assembly. Adjustment for the prevailing temperature shall be made and clamps re-tightened.
- (b) Erect form work, prepare concrete surfaces, place expansion joint and dam concrete; this concrete is to be cast separately from the deck concrete. Clamps shall be removed shortly after the concrete has set.
- (c) Remove form work, polystyrene and debris, request inspection and approval to install seal from the Engineer. The use of heat, fire, gasoline or the application of corrosive chemicals is not an acceptable means of polystyrene removal.
- (d) Install the seal in the expansion joint.

Concrete the same as that specified for the deck in accordance with Section 904, "Concrete Structures", shall be placed around the expansion joint in the previously boxed-out area with great care being taken during consolidation that no voids are left under the steel components.

The joint assembly shall be placed precisely as called for in the drawings and such that it will remain true to elevation and grade and remain firm after the concrete has hardened. Deviation from the grade or elevation shall be cause for rejection. Rejection would mean the complete removal of the expansion joint assembly and its subsequent replacement.

After the concrete has hardened, the exposed face of the seal and structural steel shapes shall be cleaned of deleterious material. Bleeder holes and bolt holes shall be cleaned and filled with an approved epoxy grout and any scratches in the metallizing shall be touched-up with zinc rich touch-up paint.

### 913.06 MEASUREMENT FOR PAYMENT

Measurement for payment will be made for each expansion joint assembly installed in the works as accepted by the Engineer. The assembly shall include the expansion joint and all related components within the boxed-out area or zone.

For new construction, measurement for payment for concrete and reinforcing steel shall be made in accordance with Sections 904 and 905 of the Specifications Book for "Concrete Structures" and "Concrete Reinforcement", respectively.

### 913.07 BASIS OF PAYMENT

#### 913.07.01 Basis of Payment for Supply and Install Expansion Joints

Payment at the contract price for "Supply and Install Expansion Joints" shall be full compensation for all labour, equipment, materials, plant and services required for the design, supply, fabrication, transportation to the job site, storage, handling, satisfactory preparation and installation for the expansion joint assembly of the type as indicated on the contract drawings.

The removal of all polystyrene, form work and debris between the back face of the deck and the front face of the stem shall be considered incidental to the works.

The supply and application of all lubricants, grouts, sealants, epoxy, Styrofoam or approved equal with adhesive and backer rods shall be considered incidental to the work and payment will not be made for such.

Expansion joints constructed where the average tested 28 day strength of the concrete in the expansion joint dam is less than the specified strength but otherwise meets the specifications will be accepted at a reduced payment provided the difference between the specified strength and the average tested 28 day strength is no

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greater than 10 MPa. If the difference is greater than 10 MPa than the expansion joint shall be rejected. The contractor shall remove the expansion joint dam and repour the concrete.

When concrete is rejected, those provisions outlined in CSA-A23.1-04 shall be followed to determine whether or not the concrete may remain in the work. Such work shall be done at the contractor's expense. Notwithstanding the above, should the concrete remain in the work it shall be subject to a reduction as outlined below, for having a strength less than that specified.

If the concrete in any portion of the expansion joint is found to have a strength deficiency of less than 10 MPa than the lump sum bid price for the expansion joint will be adjusted in accordance with the following:

$$\text{ALSP} = \text{BLSP} - \text{BLSP} * .02 * (\text{SS} - \text{TS}) * (\text{LJDC} / \text{LJ})$$

where:

ALSP = Adjusted Lump Sum Price for the Expansion Joint

BLSP = Bid Lump Sum Price per Expansion Joint

SS = Specified 28 day strength (MPa)

TS = Tested Average 28 day strength (MPa)

LJDC = Length of Joint with Deficient Concrete (m)

LJ = Length of Joint (m)

**SECTION 914**  
**BRIDGE DECK WATERPROOFING**

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**914.01 SCOPE**

The scope of this specification is the preparation and treatment of the concrete bridge deck, as shown on the plans and where designated by the Engineer, with a hot applied rubberized asphalt membrane such as Hydrotech No. 6125 flexible membrane waterproofing system or other approved equivalent.

**914.02 PROCEDURE**

The treatment procedure for bridge deck waterproofing is outlined as follows:

1. The Contractor shall submit for approval to the Engineer a list of the application rates of the following materials:

Surface Conditioner

Asphalt Membrane

SS-1h or RS-1K diluted emulsion

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The submission shall contain the project name and number, name of the product manufacturer, product identification, proposed date of application, specific gravity and the weight or mass per drum of the asphalt membrane and any special procedures required.

All waterproofing work shall be performed by an applicator approved by the membrane manufacturer. The applicator shall provide such evidence satisfactory to the Engineer.

2. Inspection, surface preparation and cleaning of the concrete bridge deck.
3. Application of surface conditioner for asphaltic membrane.
4. Application of rubber membrane, as required to the concrete bridge deck where cracks in the concrete are evident, at control or construction joints and at the interface of all horizontal and vertical surfaces such as curbs and expansion joint dams.
5. Where rubber membrane is applied, a thin layer of surface conditioner and asphaltic membrane respectively shall be applied below the rubber membrane. Then the rubber membrane shall be put in place.
6. Next, the layer of asphalt membrane shall be hot applied to the entire deck surface area including the rubber membrane placed previously, including all vertical faces at curbs and expansion joint dams.
7. Immediately following the application of the asphalt membrane, a layer of asphalt impregnated protection board shall be placed onto the hot applied rubberized asphalt membrane.
8. After the protection board is placed a layer of tack coat shall be applied to the protection board. The tack coat shall be SS-1h or RS-1K emulsion diluted with an equal volume of water. The protection board is not designed for exposure and should be tack coated and paved as soon as practical.
9. At the vertical faces of all curbs a 15mm by 20mm asphalt impregnated strip shall be placed such that the top of the strip is flush with the top of the proposed asphaltic pavement.
10. Paving of the bridge deck shall begin within 24 hours after the bridge deck waterproofing is complete.
11. After the paving and compacting operations are complete, the 15mm by 20mm asphalt impregnated strip shall be removed and the joint filled with a hot applied joint sealing compound.
12. Finally, the surface adjacent to curbs and dams shall be sealed with hot applied SS-1h or RS-1K undiluted asphalt emulsion. The sealant, shall overlay the concrete surface by 25mm.

All concrete surfaces shall be cured in accordance with Section 904.05 of the Specifications Book for "Curing" and be in a dry condition before waterproofing operations may begin. Waterproofing work shall not be performed during rainy or inclement weather or on frost covered surfaces.

The Contractor shall give the Engineer a minimum of 48 hours notice prior to commencing the waterproofing application; in addition, the prepared bridge deck shall be specifically approved by the Engineer.

The Contractor shall be aware of Section 820.02 "Spill Reporting" and the required procedures.

### **914.03 MATERIALS**

#### **914.03.01 Surface Conditioner For Asphalt Membrane**

The surface conditioner shall conform to the requirements of CGSB 37-GP-9Ma. Where the drying period will be only two (2) hours, Hydrotech No. 56170 Surface Conditioner or approved equivalent shall be used.

#### **914.03.02 Asphalt Membrane**

The asphalt membrane shall be Hydrotech No. 6125 hot applied rubberized asphalt or an approved equivalent.

**914.03.03 Rubber Membrane**

The rubber membrane shall be Elastosheet 6147 or an approved equivalent.

**914.03.04 Protection Board**

The protection boards shall be 3mm x 900mm x 1500mm asphalt impregnated waterproofing protection boards and shall be approved by the Engineer.

**914.03.05 Tack Coat For Protection Board**

The tack coat used in conjunction with the protection board shall be SS-1h or RS-1K emulsion diluted with an equal volume of water. The SS-1h/RS-1K emulsion shall meet the requirements of the Ontario Provincial Standard Specification 1103.

**914.03.06 Joint Sealing Compound**

Joint sealing compound shall be Hydrotech No. 6125 hot poured sealant or approved equivalent.

**914.03.07 Hot Mix Asphaltic Concrete Sealant**

The hot mix asphaltic concrete sealant shall be an undiluted SS-1H/RS-1K emulsion as in Section 914.03.05, "Tack Coat for Protection Board".

**914.04 INSTALLATION**

**914.04.01 Concrete Surface Preparation**

The existing surface of the concrete shall be treated by sandblasting, bush hammering or other such methods as the Engineer may approve, so as to expose solid, laitance-free concrete. All dirt and debris shall be swept off and disposed of to leave a prepared surface satisfactory to the Engineer before tack coating. Immediately prior to the application of the tack coat, the concrete surface shall be cleaned with a jet of oil-free compressed air to remove all dust and any other foreign material. Waterproofing shall not commence until the Engineer has approved all preparation work.

Without limiting the generality thereof, in the preparation of new concrete decks the following can be anticipated: removal of concrete and grout spills, small depressions must be filled with Portland cement mixture, areas of heavy laitance require removal, sharp projections must be ground off and honeycombed concrete requires patching.

Old decks will generally require the removal of larger expanses of old hot mix pavement and waterproofing which is not well bonded; scaled or spalled concrete must be removed and replaced with Portland cement concrete. This will generally be considered as rehabilitation work and will be paid for separately under Section 919 of the Specifications Book for "Rehabilitation Of Concrete Structures".

Never use hot mix asphaltic patching to level up a deck prior to waterproofing.

**914.04.02 Surface Conditioner For Asphalt Membrane**

Surface conditioner such as Hydrotech No. 56170 shall be applied at a rate of 0.1 to 0.2 litres/m<sup>2</sup>. Where acceptable alternatives are used, they shall be applied at a rate approved by the Engineer. Surface conditioner shall be applied with approved equipment which will provide a uniform application at the required rate. The surface conditioner shall be applied only when the concrete is dry, clean and when the air and concrete surface temperature are above 5°C. No traffic shall be permitted upon the surface conditioner until it has fully cured.

The surface conditioner shall be applied to the entire deck surface including those vertical surfaces which are to be treated with waterproofing such as the vertical faces at curbs and expansion joint dams.

Surface conditioner shall be applied in accordance with CGSB 37-GP-15M.

**914.04.03 Application Of Asphalt Membrane**

Application of hot applied, rubberized asphalt membrane for bridge deck waterproofing shall generally comply with CGSB 37-GP-51M.

Cakes of hot applied rubberized asphalt membrane shall be melted in an approved, indirect heating or double boiler type mechanically agitated heating and mixing until which shall keep the contents continuously agitated until the material can be drawn free flowing and lump free from the mixing unit at a temperature not exceeding that recommended by the manufacturer. The kettle shall be equipped with a thermometer to measure membrane temperature.

No membrane shall be applied until the surface conditioner has cured completely. The hot applied rubberized asphalt membrane shall be applied at the temperature recommended by the manufacturer, to the clean conditioner coated concrete deck, so as to form a uniform single coat having a minimum thickness of 4mm and a maximum thickness of 5mm. The average thickness shall not be less than 4.5mm.

The operation shall be such that discontinuities in the membrane are avoided and any joints lapped 150mm. The membrane shall extend up the face of curbs, dams at expansion joints and deck drains to the height of the top of the hot mix asphaltic surface course and into the chase where this has been provided.

Membrane application temperature shall be not less than 175oC and not greater than 212oC. Overheated material may gel or become stringy and shall be rejected. The membrane shall be applied in such a manner to eliminate entrapped air, be of uniform thickness and essentially free of pinholes and blisters.

**914.04.04 Application Of Rubber Membrane**

In the areas indicated on the drawings, at all cracks and construction joints the rubber membrane shall be placed directly over the hot applied rubberized asphalt membrane while it is still tacky. The rubber membrane shall extend up the face of the curbs or barrier walls to the top of the hot mix asphaltic pavement, or into the chase where this has been provided. The rubber membrane shall then be covered with a 3mm thick layer of hot applied rubberized asphalt membrane as shown on the plans. At the horizontal and vertical surfaces, the rubber membrane shall be shaped to fit the interface, ensuring that air is not entrapped, fishmouths shall be eliminated.

**914.04.05 Application Of Protection Board**

Protection boards shall be laid on the asphalt membrane while the surface is still warm and tacky. Materials or substances shall not be applied to either the membrane surface or the protection board to remove the tackiness prior to installation of the protection board. Protection boards may be butt jointed if the asphaltic paving immediately follows completion of waterproofing operations. Otherwise, protection boards shall be placed with edges overlapping a maximum of 25mm both longitudinally and transversely. The overlap pattern shall be consistently applied in one direction such that the quality of paving will not be reduced. The overlap pattern shall be such as to facilitate paving operations in the downgrade direction. The protection board edge shall be within 6mm of all curbs, drain verticals and expansion joint verticals.

No traffic or equipment shall be permitted upon the hot applied rubberized asphalt membrane until the protection board has been placed and the membrane has cooled to ambient temperature. The membrane, when wet, presents a surface which is hazardous to traffic.

**914.04.06 Application Of Protection Board Tack Coat**

The diluted SS-1h/RS-1K emulsion tack coat material shall be applied at the rate of 0.5 litre per square metre.

Tack coat material shall be applied to the protection board cover with approved equipment which will provide a uniform application at the required rate. The tack coat shall be applied only when the protection board cover is dry, clean and when the air temperature is above 5°C. The tack coat on the protection board cover shall be placed just sufficiently ahead of paving to allow for adequate curing.

#### **914.04.07 Paving Operations**

The Contractor shall schedule his operations so that hot mix paving shall be carried out as soon as the membrane has cooled to ambient temperature. Hot mix asphalt concrete shall be placed within 24 hours after waterproofing is complete. Paving equipment shall not be permitted upon the tack coat until it has fully cured. Asphaltic paving of bridge decks shall be in accordance with Section 922 of the Specifications Book, "Asphaltic Paving Of Bridge Decks".

#### **914.04.08 Forming And Filling Grooves With Joint Sealing Compound**

Along each curb and for the full length of each curb and barrier wall, or where indicated in the contract drawings, the Contractor shall form a rectangular groove 15mm wide and 20mm deep. This groove shall be made using 20mm asphalt impregnated strips placed against the curb prior to the placing of the hot mix asphaltic concrete.

The boards shall be coated with an approved bond breaker and shall be removed after the mix has been fully compacted. The Contractor may use an alternative method of forming the grooves with the approval of the Engineer.

Immediately prior to pouring the compound, the groove shall be dry and then cleaned of any dust or debris by an oil-free compressed air jet.

The joint sealing compound shall be poured in place after the asphaltic pavement reaches ambient air temperature.

The joint sealing compound shall be heated in a kettle of the indirect heating or double boiler type with a built-in agitator and equipped with an indicating thermometer to measure the temperature of the melted compound. The compound shall be cut into small pieces to facilitate uniform melting and shall be melted slowly with a constant stirring. The compound shall not be heated in excess of the pouring temperature recommended by the manufacturer. The Contractor may be required to demonstrate with the equipment proposed for use that it will consistently produce a joint sealing compound of proper pouring consistency.

Pouring shall be done by the use of hand pouring pots, mechanical methods, or any other method which will give satisfactory results. The pouring equipment shall be designed such that a minimum of time will elapse during pouring operations so the compound will be placed in a workmanlike manner. Shields shall be provided to prevent the compound from being spilled on the concrete curb and on the newly placed bituminous surface.

Sufficient compound shall be poured into the groove so that upon completion of the work the surface of the compound will be flush with the surface of the pavement when the air temperature at time of pouring is 27°C or over, or 5mm below the surface of the pavement when the temperature is below 27°C. If the compound subsides to a level below the surface of the pavement, a second pouring will be required. When more than one pouring is required to fill the groove, succeeding pours will be made immediately.

Damage such as stones embedded in the joint sealing compound by construction traffic and Contractor's operation shall be repaired by the Contractor at his expense.

Traffic will not be permitted upon the surface course during the operation of forming and filling the grooves.

#### **914.04.09 Sealing Surface Of Asphaltic Concrete Adjacent To Curbs**

After the grooves at curbs have been filled and before it has become contaminated with dirt or debris, the surface shall be spray or brush painted with a uniform continuous, liberal application of undiluted SS-1h/RS-1K emulsion at the rate as per manufacturer's instructions or as directed by the Engineer, for a width of 600mm adjacent to all curbs, or barrier walls or where otherwise specified, to completely seal the surface.

#### **914.05 SAMPLING**

The Department's representatives may at their discretion require that sufficient quantities of the surface conditioner, hot poured rubberized asphalt membrane, joint sealing compound, or SS-1h/RS-1K emulsion be obtained from the materials being used on the project as might be required for immediate analysis or future testing purposes.



**914.06 MEASUREMENT FOR PAYMENT**

The area treated with hot applied rubberized asphalt membrane will be measured in square metres to the nearest one decimal place and will for payment purposes be considered the product of the width of the bridge deck measured perpendicular to faces of curb and side walk and the length of the bridge measured in plan between centre lines of abutment bearings. No allowance will be made in the measurement for the turnup at the curb line or for any overlaps.

**914.07 BASIS OF PAYMENT**

Payment for bridge deck waterproofing with hot applied rubberized asphalt membrane shall be made at the contract unit price per square metre and shall be full compensation for the preparation of the concrete deck surface, the supply and application of surface conditioner, hot applied rubberized asphalt membrane, rubber membrane, protection boards, tack coat for protection boards, joint sealing compound, the forming and filling of the grooves, the supply and application of undiluted SS-1h/RS-1K emulsion seal coat, for the handling and controlling of traffic and for all other items incidental to the satisfactory completion of work as determined by the Engineer.

**SECTION 915**

**SUPPLY AND INSTALLATION OF ALUMINUM HANDRAIL**

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**915.06 BASIS OF PAYMENT**

**915.01 SCOPE**

The scope of this specification is related to the fabrication, supply and installation of aluminum bridge railing as shown on the plans.

**915.02 MATERIALS**

- (1) The posts shall be permanent-mould cast from Alcan Alloy A444.2-T4 or approved equal.
- (2) The rails shall be extruded from Alcan Alloy 6351-T6 or equal.
- (3) The rail plugs shall be cast from Alcan Alloy 356.0F or equal.
- (4) Type A307 or A325 connecting bolts, nuts and washers shall be of hot dipped galvanized steel in accordance with CSA Standard G164-M.
- (5) The set screws shall be of stainless steel.
- (6) Type A325 anchor bolts, nuts and washers shall be of hot dipped galvanized steel in accordance with CSA G164-M.
- (7) Miscellaneous materials shall be as noted on the contract drawings.

**915.03 FABRICATION**

The railing shall be fabricated strictly to the requirements given in the latest edition of the brochure "Alcan Highway Railings" published by the Extrusion Division of the Aluminum Company of Canada Limited. The type of railing shall be defined in the contract. Fabrication of the railing shall be to CSA Standard CAN/CSA-S6-88.

Before starting any work on the railing, the Contractor shall submit six copies of shop drawings including Bill of Materials to the Engineer for approval, showing full details of the fabrication and erection of the railing.

**915.04 INSTALLATION**

Rail and posts shall be erected true to line and levels as shown on the drawings or as directed by the Engineer. Rails are to be parallel to the top of the concrete, and the posts are to be perpendicular to the concrete. Where shims are required for the alignment of the posts, they shall be made from fully annealed alloy known commercially as Alcan AA1100 or equivalent.

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Surfaces of aluminum in contact with concrete shall be given a heavy coat of alkali-resistant bituminous paint prior to the installation. The paint shall be applied as it is received from the manufacturer without the addition of any thinner.

A neoprene gasket shall be placed between the aluminum post and concrete. The 4mm thick gasket shall have prepunched holes enabling it to properly fit over the anchors.

A prefabricated anchor insert of the type shown on the drawings or an approved equal, shall be used to secure the bridge railing posts to the concrete.

If chemical anchors are used to secure the bridge rail posts then the anchor is to be approved by the engineer. All chemical anchors shall be installed as per the manufactures specifications.

Nylon bushings shall be used to prevent any electro-chemical reaction occurring between the aluminum posts and the bolts. For accurately positioning the insert with the form, a setting template shall be furnished with the insert.

Railing shall be installed as indicated on the contract and shop drawings. Snug-tight bolts for slip joints shall be extra long and have double nuts which shall be torqued up against each other while still maintaining the slip joint.

The aluminum bridge railing shall be thoroughly cleaned of all discolouration by approved methods and all marks and scratches occurring during the fabrication shall be removed. The Contractor may at his own expense, apply a thin coat of clear non-yellowing lacquer to the cleaned surfaces, but he shall in any case ensure that the railings, when erected, have a clear surface of uniform appearance and texture.

### **915.05 MEASUREMENT FOR PAYMENT**

The quantity of aluminum bridge railing for which payment shall be made shall be all that railing as shown on the contract drawings as approved by the Engineer.

Measurement for payment shall be on a lump sum basis.

### **915.06 BASIS FOR PAYMENT**

Payment at the contract price for "Supply And Install Handrails" shall be full compensation for all labour, equipment and materials required to fabricate, supply, deliver and install the railings, including posts, rails, rail sleeves, rail plugs, anchor inserts, nuts, bolts and washers and any other incidental items.

Payment will be made on delivery of all materials in good condition and with adequate storage on site up to the cost of material supplied as substantiated by invoices.

The remaining payment will be made when the Engineer is satisfied that installation in accordance with the contract has been carried out.

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## SECTION 917 HYDRAULIC RIP RAP

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- 917.06 BASIS OF PAYMENT

### 917.01 SCOPE

This specification covers the construction of hydraulic rip rap protective covering placed to protect causeways and structures.

### 917.02 MATERIALS AND GRADING

The quality of rock shall be approved by the Engineer. Rock subject to deterioration by water or weather will not be accepted. Field stones and boulders may be used where acceptable to the Engineer.

Rip rap shall consist of clean hard durable rock having a density of not less than 2.6 t/m<sup>3</sup>. The rock material when subjected to the Los Angeles Abrasion Test CSA A23.2-17a shall have a loss not greater than 35%.

When tested for soundness according to CSA A23.2-9A, the rock material shall have a loss not greater than 15% after five cycles.

The following classes of hydraulic rip rap will be used graded as follows (Taken from "Guide to Bridge Hydraulics" published by RTAC):

<b>Class I</b>	<b>Class II</b>	<b>Class III</b>
NOMINAL 300 MM DIAMETER OR 40 KG MASS ALLOWABLE LOCAL VELOCITY UP TO 3 M/SEC. GRADING SPECIFICATION:	NOMINAL 500 MM DIAMETER OR 200 KG MASS ALLOWABLE LOCAL VELOCITY UP TO 4 M/SEC. GRADING SPECIFICATION:	NOMINAL 800 MM DIAMETER OR 700 KG MASS ALLOWABLE LOCAL VELOCITY UP TO 5 M/SEC. GRADING SPECIFICATION:
100% SMALLER THAN 450 MM OR 130 KG AT LEAST 20% LARGER THAN 350 MM OR 70 KG AT LEAST 50% LARGER THAN 300 MM OR 40 KG AT LEAST 80% LARGER THAN 200 MM OR 10 KG	100% SMALLER THAN 800 MM OR 700 KG AT LEAST 20% LARGER THAN 600 MM OR 300 KG AT LEAST 50% LARGER THAN 500 MM OR 200 KG AT LEAST 80% LARGER THAN 300 MM OR 40 KG	100% SMALLER THAN 1200 MM OR 2300 KG AT LEAST 20% LARGER THAN 900 MM OR 1100 KG AT LEAST 50% LARGER THAN 800 MM OR 700 KG AT LEAST 80% LARGER THAN 500 MM OR 200 KG

The class of rip rap to be used will be designated in the contract documents.

Location of a suitable source for the hydraulic rip rap shall be the responsibility of the Contractor.

**917.03 PLACING**

Where and as directed by the Engineer excavation shall be performed to provide a shelf or ledge to provide adequate foundation for the bottom of the hydraulic rip rap.

Material shall be placed as shown on the plans or as otherwise directed by the Engineer.

Material may be dumped into position to completely cover the area to be protected to the depth specified. In some locations it may be necessary to place the hydraulic rip rap by crane.

Placing shall be done in such a manner that the surface of the finished rip rap shall have a uniform appearance. The Engineer shall be the final and sole judge of the quantity of hydraulic rip rap required.

**917.05 MEASUREMENT FOR PAYMENT**

Rip rap shall be measured in cubic metres in place to the nearest one decimal place and only that material placed as directed by the Engineer shall be included.

Where measurement is impractical due to placement under water an estimate of that rip rap correctly placed will be made by converting the truck load into cubic metres.

Measurement for any excavation requested by the Engineer will be in accordance with Section 902, "Excavation for Foundation, Unwatering and Extra Backfill for Structures".

**917.06 BASIS OF PAYMENT**

Payment shall be made at the unit price per cubic metre as specified in the contract. Payment shall constitute full compensation for all labour, materials and equipment to supply and place hydraulic rip rap protection as required under the contract.

Where excavation for foundation is required, the basis of payment for the same shall be as per section 902.09 of the Specification Book; Excavation for Foundations.

**SECTION 918  
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**918.06 BASIS OF PAYMENT**

**918.01 SCOPE**

The scope of this specification is to cover the supply and installation of all deck drainage equipment.

**918.02 MATERIALS AND FABRICATION**

The catch basin shall be of material supplied in accordance with CSA Standard G40.21 M Grade 300W. The drains shall be hot dip galvanized after fabrication. Galvanizing shall be to CSA Standard G164.

The outlet pipe is to be supplied in accordance with ASTM Specification A120.

**918.03 INSTALLATION**

Drains are to be installed in the locations shown on the plans or as otherwise approved by the Engineer.

For new deck construction, the deck drain(s) where required shall be put in place before the deck concrete is cast.

For rehabilitation type project, the hole for the deck drain down spout shall be drilled through the concrete deck with a core bit. Breaking through the deck with a jackhammer is not permitted. The core bit shall be capable of drilling a hole of sufficient size to easily accommodate the outside diameter of the down spout. Any gap between the drilled hole and the outside of the drain down spout shall be grouted in a neat workmanlike manner.

Care shall be taken that the top of the drain is slightly below the surrounding finished surface.

Care shall also be taken that the bottom of the down spout extends below the adjacent structure.

Incorrectly placed drains shall be cause for rejection and shall be replaced in accordance with Engineers' instructions.

The grating shall be tack welded to the catch basin.

**918.05 MEASUREMENT FOR PAYMENT**

Each individual drain shall be considered one unit. Only deck drains will be measured for payment.

**918.06 BASIS OF PAYMENT**

Payment at the contract unit price for "Supply And Install Deck Drains" shall be considered full compensation for all labour, equipment, plant and materials required to supply and install deck drains, including both catch basins and drainage down spouts.

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All removal of concrete and asphalt and any additional concrete and asphalt required shall be considered as incidental to the work.

Any work associated with rectifying incorrectly placed drains shall not be paid for.



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**919.01 SCOPE**

The scope of this specification is to cover the supply of materials for concrete repair, methods of repair including concrete removal, surface preparation and the placement, finishing and curing of repair materials. All work, equipment and materials shall be in strict accordance with CSA Standard CAN/CSA-A23.1-M90 latest edition and Section 904, "Concrete Structures".

**919.02 CONTRACTOR'S OUTLINE OF REPAIR PROCEDURES**

The Contractor shall complete the form, "Contractor's Outline of Repair Procedures", and submit as part of the required contract documents with the tender. Failure to complete the form may constitute rejection of the tender. The Contractor must be specific when completing this form. The intention of the completed form is to determine details of the Contractor's proposed equipment, methods, materials and key personnel to ensure general acceptability and that important aspects of work have been fully understood.

**919.03 ACCESS TO WORK SITE**

**919.03.01 Access To Work Site**

The Contractor shall supply, erect, maintain and dismantle scaffolding, swing staging, barges and/or portable lifts at all repair locations. The scaffolding, staging, barges or lifts shall be erected in such a manner that all areas that require repairs are accessible. All equipment used for access shall conform to the latest edition of the Occupational Health and Safety Act including all amendments.

**919.03.02 Payment**

Measurement for payment for "access to work site" shall be made as lump sum under the appropriate item on the Unit Price Table.

Basis of payment shall cover all aspects of the work including full compensation for all labour, equipment and material considered necessary.

**919.04 MAINTENANCE OF TRAFFIC**

**919.04.01 General**

The Contractor shall pay particular attention to the flow of traffic through the construction zone. Any damage incurred to vehicles or their cargo or injury sustained to their occupants as direct or indirect result of the Contractor's actions, procedures or negligence, shall be the sole responsibility of the Contractor.

The Contractor shall indemnify and save harmless the Department with regard to claims arising from damages or injury.

The Contractor shall maintain at least one lane of traffic through the construction zone for the duration of the project.

The Contractor shall be responsible for the placement and maintenance of all traffic signs, barricades and other traffic control devices deemed necessary as per Division 7 "Temporary Conditions, Signs and Devices".

Three copies of a detailed drawing shall be submitted by the Contractor for approval showing the following:

1. The sign and barricade layout.
2. The structure across the river.

**919.04.02 Temporary By-pass**

For certain projects a temporary by-pass will be required, and it shall be stated in the Supplementary General Conditions detailing span and load carrying capacity.

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The Contractor shall be responsible for the location and route of the by-pass, the hydrological, hydraulic, and structural design of the river crossing, the maintenance and upkeep, and the placement and maintenance of all traffic control devices as stated above.

Section 140, "Environmental Requirements" shall be adhered to by the Contractor.

Three copies of a detailed drawing signed and sealed by a Professional Engineer licensed to practise in the Province of Newfoundland, shall be submitted by the Contractor for approval to the Engineer showing the following:

1. The proposed route of the by-pass.	3. The sign and barricade layout.
2. The structure.	4. Design and posted speed through the construction zone

All repairs to the by-pass deemed necessary by the Department shall be implemented by the Contractor immediately after written notification by the Engineer. If after notification the Contractor fails to initiate repairs, repairs will be done by others. The cost of such repairs will be deducted from progress payments.

### 919.04.03 Traffic Resumption

Under normal circumstances, curing time required for deck concrete is wet curing for seven (7) days and a further thirty (30) days for air drying. Also, the specified design strength must be obtained.

Until the above conditions are satisfied, no traffic will be permitted on a new deck or overlay.

If it is not practical to achieve this, as there is no temporary by-pass, the above curing times may be reduced only at the discretion of the Engineer but in no case will traffic be allowed onto a new deck or overlay until seven (7) days of wet curing and an additional seven (7) days of air drying have elapsed.

The area used as a route for the by-pass must be returned to its original condition.

### 919.04.04 Payment

Measurement for payment covering all aspects of the work shall be made lump sum under the appropriate item in the Unit Price Table, to cover the cost of maintenance of traffic. Basis of payment shall represent full compensation for all labour, equipment, and material necessary to carry out all the work described herein.

Payment covering the use of flagperson(s) shall be made as per Section 125, "Wages of Flagperson", of the Specifications Book.

## 919.05 UNASSIGNED

### 919.06 SUPPLY OF PORTLAND CEMENT, BONDING AGENTS AND OTHER SPECIALITY ITEMS

The Contractor is required to supply all cement, bonding agents, and other speciality items to be incorporated in the work.

All cement required shall be in accordance with Section 904 of Division 9, "Concrete Structures".

The supply and use of all speciality items shall conform to manufacturer's instructions and recommendations, applicable governing standards and shall be subject to approval by the Engineer. The Contractor shall also supply the Engineer with copies of the relevant specifications for the above items.

The supply of these materials shall be considered incidental to the performance of the work and no separate payment will be made for the same.

### 919.07 SUPPLY AND REPLACEMENT OF REINFORCING STEEL DUE TO DAMAGE OR DETERIORATION

The following shall be considered additions or exceptions to Section 905, "Concrete Reinforcement", of the Specifications Book.

All reinforcing steel bars which are damaged by jack hammering or have deteriorated and cannot be reused shall be replaced with an equivalent area of steel.

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The extent and exact nature of the work shall be determined by the Engineer in the field.

Payment for replacement of existing deteriorated or damaged steel shall be made in accordance with Section 150 "Force Account Payment".

Any reinforcing steel, which in the opinion of the Engineer, has been damaged due to negligence of the Contractor, shall not be paid for.

### 919.08 REHABILITATION OF ABUTMENTS AND PIERS

#### 919.08.01 General

The abutments, piers, creep blocks, and wingwalls have some degree of deterioration and may require reconstruction. Those parts to be repaired will be identified in the contract documents and are subject to review by the Engineer.

Any creep block dowels or reinforcement which is damaged through negligence and cannot be reused as determined by the Engineer, shall be reinstated at the Contractor's expense.

#### 919.08.02 Removal and Surface Preparation

All existing formwork remaining from previous work at the abutments along with any accumulated debris on the beam seats shall be removed and disposed of to the Engineer's satisfaction.

This work shall entail the removal of deteriorated concrete and surface preparation. All loose, deteriorated and chloride contaminated concrete shall be removed to a minimum depth of 50 mm beyond original lines or further until sound concrete as determined by the Engineer is encountered. If any rebar is corroded, presently exposed or exposed by concrete removal, then the concrete surrounding the rebar shall be removed to a clear distance of 25 mm beyond the steel. Concrete removal shall be as detailed on the drawings and as directed by the Engineer.

Prior to restoration of the deteriorated areas, all exposed reinforcing steel shall be satisfactorily sand-blasted until the steel is free of all rust. Fine particles of cement or sand shall be removed by vacuum or with jets of oil-free compressed air.

Where fresh concrete will meet hardened concrete, a 30 mm deep sawcut shall be used to obtain straight clean lines and to preclude feather-edging.

#### 919.08.03 Concrete Supply and Placement

The Contractor shall inform the Engineer of areas ready for new concrete or mortar placement at least 24 hours in advance of placement to allow for inspection and measurement. No concrete shall be placed until the prepared surface to be restored is inspected and approval in writing is given by the Engineer.

These areas shall then be restored to the original lines using a latex modified concrete, having a 28 day compressive strength of 35 MPa, maximum water:cement ratio of 0.37, 3% to 6% entrained air, 125 mm  $\pm$  30 mm slump and maximum size aggregate of 10 mm, or an approved equal repair mortar. The latex emulsion used in the mix shall have a 46% - 49% solids content and the latex content (solids) in the concrete shall be 15 percent by weight of cement.

All aspects of concrete supply and placement are subject to approval by the Engineer.

The use of superplasticizers to ensure the proper consolidation of concrete will be permitted subject to the Engineer's approval of the concrete mix design, however, the Contractor must demonstrate competence and experience in their use and specific approval must be obtained.

Latex modified concrete shall be mixed by mechanical mixer and placed within twenty minutes of batching.

Concrete for beam seats or bearing pad pedestals shall conform to section 904.04.09, "Concrete Beam Seats and Bearing Surfaces", of the Specifications Book.

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The employment of a pneumatically applied concrete "shotcrete" is considered to be a completely acceptable alternative. The work, using this method, will be performed in accordance with Section 919.16, "Rehabilitation With Shotcrete", of the Specifications Book.

### 919.08.04 Curing

All aspects of curing shall be in accordance with Section 904, "Concrete Structures", of the Specifications Book.

### 919.08.05 Payment

The unit upon which payment will be based shall be the volume in place measured in cubic metres of newly-built concrete bounded by lines pre-approved by the Engineer.

The volume shall be the difference between sections of the remaining sound concrete and the face of the new concrete or mortar. The volume shall be calculated by the average end area method. Sections shall be taken at regular intervals of not more than 500 mm apart. Readings at each section shall be taken to best describe the profile of the concrete surface at that particular section. Representatives of the Engineer and the Contractor shall be present when the section readings are taken.

Payment shall be made at the unit price bid per cubic metre as per the Structure Rehabilitation Unit Price Table. This shall represent full compensation for all labour, equipment and materials necessary to carry out all the work described herein.

## 919.09 SUPPLY AND REPLACE BEARING PADS

### 919.09.01 General

The existing bearing pads, at one or more of the abutments and piers, are to be replaced under this contract if so indicated within the unit price table of the Contract Documents. The work entails jacking up the superstructure, the removal of the existing bearing pads, the supply and placement of new bearing pads to the specifications herein and as shown on the drawings.

### 919.09.02 Procedure

The jacking procedure shall be such that all girders at a particular bearing seat location, i.e. abutment or pier, are raised simultaneously.

The Contractor shall submit detailed drawings supplemented by detailed calculations supporting his proposed method of jacking. Such drawings and calculations shall be stamped by a Professional Engineer licensed to practise in the Province of Newfoundland.

### 919.09.03 Supply and Installation

The supply and installation of bearing pads shall be in accordance with Section 912, "Bearings", of the Specifications Book and as shown on the drawings.

### 919.09.04 Payment

Both the measurement for and basis of payment shall be in accordance with Section 912, "Bearings", of the Specifications Book.

Jacking of the structure, removal and disposal of the existing bearings, setting the superstructure down on the new bearings and all other labour, equipment-use, materials and services required to successfully complete the work specified herein shall be considered incidental.

## 919.10 REPAIR OF CONCRETE DECK BY OVERLAY

### 919.10.01 General

The Engineer shall designate all areas to be repaired.

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The perimeter of the designated areas shall be saw-cut to a depth of 30 mm or to the level of the rebar if less than 30 mm or as shown on the drawings. Deteriorated concrete within the area shall be removed.

### 919.10.02 Removal

Concrete shall be removed to a minimum depth of 50 mm below the existing deck elevation or until sound concrete is encountered, whichever is greater. If concrete is to be removed by jackhammer, the maximum hammer mass permitted is 13 kg. A **higher hammer size** up to a maximum of 23 kg may be used if the concrete is extremely hard provided approval is given by the Engineer.

All tools used in concrete removal shall be pointed to avoid damage to the existing substrate. If any reinforcing steel is found to be exposed, the concrete shall be removed to a clear distance of 25mm below the underside of the reinforcement. If any concrete is required to be removed around reinforcing steel, then the maximum hammer size permitted shall be 7 kg. The Contractor shall take care not to damage any existing steel.

During the concrete removal and placing operations, care should be taken to keep contaminants off newly exposed surfaces.

All machinery that might leak oil should be kept off this area of deck when possible. If machinery such as a compressor has to be on this portion of the deck, plastic polyethylene sheets should be placed under it and extreme care should be taken when refuelling. Air compressors must be equipped with a functioning oil trap.

Forty eight (48) hours of good curing shall have elapsed prior to scarifying and/or chipping on adjacent concrete within 2 metres of a newly placed overlay.

If a spill does occur, the Contractor at his own expense shall have it wiped up and the contaminated concrete chipped away immediately. The deck shall be kept cleaned on a daily basis.

The exposed reinforcing steel and the remaining sound concrete must be protected when mixer trucks and other vehicles are routed over them.

### 919.10.03 Surface Preparation

Prior to restoration of the deck, all exposed reinforcing steel and concrete substrate shall be satisfactory sandblasted until the substrate and the steel is free of all rust and loose particles. If the steel is not exposed, the sandblasting may be waived provided that the surface is cleaned with **high pressure** water producing a minimum pressure of 13 MPa. Fine particles of concrete, sand or rust shall be removed by vacuum or jets of oil-free compressed air or water. If substrate is wet only high pressure water shall be used.

Joints shall be located as shown on the plans. If not shown on the plans, joints shall be located as approved and/or directed by the Engineer. Longitudinal joints shall be located so as to avoid as much as practical their placement in the wheel paths.

At transverse and longitudinal joints, the concrete overlay course previously placed shall be sawed to a straight and vertical edge to a depth of 30mm before the placement of the adjacent course.

At the discretion of the resident engineer the concrete overlay thickness may be increased beyond the thickness of the concrete which has been removed so as to maintain the required concrete cover on the reinforcing steel.

No concrete shall be placed until the prepared surface to be restored is inspected and approval in writing is given by the Engineer.

In areas where a substantial amount of concrete is removed in excess of 100mm, the excess space shall be filled with concrete as per specification prior to the placement of the overlay.

At the direction of the resident engineer concern

For a 24-hour period, the substrate including all vertical joints shall be kept damp. Any pools of water which have collected on the concrete shall be blown away with compressed air before application of the bond grout. The bond grout shall be a rich mixture of cement with only sufficient water added to give a consistency such that the imprint remains when indented by the finger. The maximum thickness of bond grout is limited to 3mm. It is

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important the mixture not be permitted to set before placing the new concrete. If the mixture has set before the concrete has been placed, it shall be mechanically removed and a fresh coat applied under the direction of the Engineer.

### 919.10.04 Concrete Supply And Placement

All aspects of concrete supply and placement are subject to approval by the Engineer. High range water reducing agents (superplasticizers) may be used at the Contractor's request if so indicated when the mix design is submitted. The Contractor must demonstrate competence and experience in their use and specific approval must be obtained.

Cement shall be Type 10 and the water/cement ratio shall not exceed 0.39. The concrete mix design shall be in accordance with Section 904.04.02, "Mix Design", of the Specifications Book.

Maximum aggregate size shall be 20mm and the aggregate must be sound with a Petrographic Number not greater than 135 and an abrasion loss not greater than 35%.

If superplasticizers are used the maximum slump permitted will be 90mm.

Concrete strength shall be minimum 20 MPa in 48 hours.

### 919.10.05 Finishing

Finishing with a vibrating bridge deck finishing machine is mandatory. The machine and its operator must receive approval prior to its use. The machine shall be of the vibrating screed type designed to consolidate the concrete by high frequency, low amplitude vibration. Vibration frequency shall be variable with positive control and shall be maintained at a frequency which will remove entrapped air without causing undue lateral flow, "pumping" of mortar or reduction of entrained air. The bottom face of the screeds shall not be less than 100mm wide and be metal. The screeds shall be provided with positive control of the vertical position. When more than one lane of overlay is being placed at one time, a moveable work bridge shall be supplied.

Ridges or depressions in the surface shall be removed by using a magnesium bullfloat. Areas around curbs, drains, and expansion joints shall be finished with a magnesium hand float. The surface shall not be overworked.

The Contractor shall supply a 3m straight edge and the surface shall not deviate from the design grade by more than 8mm. Two qualified concrete finishers approved by the Engineer shall be supplied to perform float and broom finishing operations.

All concrete must be broom finished. Exposed concrete bridge decks shall be given a coarse broom finish. Treated or waterproofed bridge decks shall be given a fine broom finish. The concrete deck surface shall be given a broom finish when the concrete has hardened sufficiently. The broom shall be of an approved type. The strokes shall be square across the slab, from edge to edge, with adjacent strokes slightly overlapped, and shall be made by drawing the broom without tearing the concrete but so as to produce regular corrugations not over 3mm in depth for the coarse broom finish. Fine broom finish shall have corrugations not exceeding 1mm in depth. The surface as thus finished shall be free from porous spots, irregularities, depressions and small pockets or rough spots such as may be caused by accidental disturbance during the final brooming of particles of coarse aggregate embedded near the surface. The Engineer may decide to delete the broom finish requirements but tolerances previously stated will still apply.

### 919.10.06 Curing

Immediately after the straight edge requirements have been met, the fresh concrete shall be coated with an evaporation retardant "Confilm" to preclude rapid evaporation of the bleed water.

All aspects of curing shall be in accordance with Section 904.05, "Curing", of the Specifications Book.

All traffic or loads of any kind must be kept off the new concrete for the entire curing period.

### 919.10.07 Payment

Measurement for payment for repair to the deck shall be made on a per square metre basis as per the appropriate item in the Unit Price Table.

Payment for supply and application of the evaporation retardant is considered incidental to the work and no separate payment shall be made for the same.

In all areas of over 0.5 m<sup>2</sup> where additional deteriorated concrete is to be removed below a depth of 50mm, written approval must be obtained from the Engineer before any work is carried out. If this is the case, then measurement for payment will be made on a prorated basis, e.g., if the removal of concrete over a certain area is required to be removed to a total average depth of 75mm, then the area for payment will be adjusted by a factor of 1.5.

If the resident engineer requires that the concrete overlay thickness be increased beyond the thickness of the concrete which has been removed then payment will be made for the additional concrete material as supported by invoices plus 10%. No extra payment will be made for labour, material or equipment associated with placing this additional concrete.

Any crack sealing required due to cracking occurring up to one month from pour date will be considered incidental to the work and no separate payment will be made. Method of sealing must receive prior approval by the Engineer.

The basis of payment shall be considered complete compensation for all labour, equipment, and material necessary to carry out all the work described herein.

Formwork required due to breaking through the deck shall be considered incidental to the works.

## **919.11 RESURFACING OF CURBS**

### **919.11.01 General**

The Engineer shall designate all areas to be repaired.

The perimeter of the designated areas shall be saw cut to a depth of 30mm or to the level of the rebar if less than 30 mm or as shown on the Contract Drawings. Deteriorated concrete shall be removed.

### **919.11.02 Removal**

All edges of concrete removal shall be saw cut to a depth of 30mm. Concrete shall be removed to a minimum depth of 50mm below original lines or further until sound concrete is encountered. If concrete is to be removed by a jackhammer, the maximum hammer mass permitted is 13 kg. All tools used in concrete removal shall be pointed. If any reinforcing steel is found to be exposed, the concrete shall be removed to a clear distance of 25mm below the underside of the reinforcement. If any concrete is required to be removed around reinforcing steel, then the maximum hammer size permitted shall be 7 kg. The Contractor shall take care not to damage any existing steel. The Engineer shall be the sole judge of the extent of removal required.

### **919.11.03 Surface Preparation**

The concrete substrate and all exposed reinforcing steel shall be satisfactorily sandblasted until the steel is free of all rust and all loose concrete particles have been dislodged. Fine particles of concrete and sand shall be removed using jets of oil-free compressed air or water producing a minimum pressure of 6 MPa. If the substrate is wet at the time of cleaning, then high pressure water jets shall be used to remove these particles. Air compressors must be equipped with a functional oil trap.

The curbs shall be restored as per the drawings. However, no concrete shall be placed until the prepared surface to be restored is inspected and approval in writing is given by the Engineer.

At the discretion of the resident engineer the curb resurfacing concrete thickness may be increased beyond the thickness of the concrete which has been removed so as to maintain the required concrete cover on the curb reinforcing steel or to provide a constant curb profile for rail mounting.

Concrete shall be kept damp for a minimum of 24 hours prior to placement of new material. Excess water shall be removed with compressed air. This shall be followed by a rich mixture of cement and water. The bonding mixture shall be cement with only sufficient water added to give a consistency such that the imprint remains when indented by the finger. The maximum thickness of bond grout is limited to 3mm. It is important that the mixture



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not be permitted to set before placing the new concrete. If the mixture has set before the concrete has been placed, it shall be mechanically removed and a fresh coat applied under the direction of the Engineer.

### 919.11.04 Supply And Placement Of Concrete

All aspects of concrete supply and placement are subject to approval by the Engineer. High range water reducing agents (superplasticizers) may be used at the Contractor's request if so indicated when the mix design is submitted. The Contractor must demonstrate competence and experience in their use and specific approval must be obtained.

Cement shall be Type 10 and the water/cement ratio shall not exceed 0.39. The concrete mix design shall be in accordance with Section 904.04.02, "Mix Design", of the Specifications Book.

Nominal maximum aggregate size shall be 20mm, and the aggregate must be sound with a Petrographic Number not greater than 135 and an abrasion loss not greater than 35%.

If superplasticizers are used, then the maximum slump shall be 90mm.

Concrete strength shall be at least 20 MPa in 48 hours.

### 919.11.05 Finishing

The concrete shall be finished immediately after strike off and before the appearance of bleed water using a magnesium float.

The surface shall not be overworked or sealed. All concrete shall be broom finished. The Contractor shall supply a 3m straight edge and the surface shall not deviate from the design grade by more than 8mm.

Two qualified concrete finishers approved by the Engineer shall be supplied to perform float and broom finishing.

### 919.11.06 Curing

Immediately after finishing, the Contractor shall apply an evaporation retardant and finishing aid called "Confilm" manufactured by Master Builders Company Ltd., or equivalent. The product shall be applied as per manufacturer's instructions and recommendations.

All aspects of curing shall be in accordance with Section 904.05, "Curing", of the Specifications Book.

### 919.11.07 Payment

Any crack sealing required due to cracking, occurring up to one month from pour date will be considered incidental to the work and no separate payment will be made. Method of sealing must receive prior approval.

In all areas of over 0.5 m<sup>2</sup> where additional deteriorated concrete is to be removed below a depth of 50mm, written approval must be obtained from the Engineer before any work is carried out. If this is the case, then the payment will be made on a reduced prorated basis (25% of bid price for each additional 25mm) eg., if concrete is required to be removed to a total average depth of 75mm, then the area for payment will be adjusted by a factor of 1.25.

Measurement for payment for repair to curbs shall be made per square metre, including both plan and vertical faces. In some cases the existing outside face of curb is an inclined surface and the rehabilitated curb has a vertical face. All measurements for payment will be on the inclined surface as indicated on the drawing. Additional concrete required to create a vertical outside face, anchors and additional reinforcing steel is considered incidental to the work. Payment shall be for a 50mm depth of overlay as per the appropriate item of the Structure Rehabilitation Unit Price Table.

If the resident engineer requires that the curb resurfacing concrete thickness be increased beyond the thickness of the concrete which has been removed then payment will be made for the additional concrete material as supported by invoices plus 10%. No extra payment will be made for labour, material or equipment associated with placing this additional concrete.

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Payment for supply and application of the evaporation retardant is considered incidental to the work and no separate payment shall be made for the same.

The basis of payment shall be considered complete compensation for all labour, equipment, plant and materials used to carry out this work.

### 919.12 REPLACEMENT OF EXPANSION JOINT SYSTEM AND ASSOCIATED WORK

#### 919.12.01 General

Where expansion joints on the structure(s) are to be replaced by new sealant system, the expansion joint shall be in accordance with Section 913 "Expansion Joints". Areas of deck adjacent to the expansion joints may have an undetermined degree of deterioration. It is also necessary to remove sections of the deck and backwall to accommodate the new joint system. All concrete to asphalt joints must be sawcut, a space provided and filled with an approved sealant, as described on the drawings.

It will be the Contractor's responsibility to ensure that exact dimensions of the replacement joint are correct.

All deck repairs adjacent to joints and overlays must be complete prior to the installation of concrete in expansion joint dams and asphaltic plug joints.

#### 919.12.02 Removal

The work shall entail the removal of concrete, existing sealants and joint fillers and water stops. The work shall be performed as detailed on the drawings. All existing formwork remaining from the original construction along with any accumulated debris on the beam seats shall be removed and disposed of to the Engineer's satisfaction.

Concrete shall be removed to 300mm each side of the joint in plan view and removal shall be to a depth of 200mm in the deck and 300mm in the backwall. If concrete is to be removed by jackhammer, the maximum hammer mass permitted is 13 kg. All tools used in concrete removal should be pointed.

If any reinforcing steel is found to be exposed, the concrete shall be removed to a clear distance of 25mm below the underside of the reinforcement.

If any concrete is required to be removed around reinforcing steel, then the maximum hammer size permitted shall be 7 kg. The Contractor shall take care not to damage any existing steel.

#### 919.12.03 Surface Preparation

At the edge of areas to be repaired, a neat line shall be sawcut, a minimum of 30mm, to preclude featheredges. Prior to restoration of these areas, the concrete substrate and all exposed reinforcing steel shall be satisfactorily sandblasted until the steel is free of all rust and all loose particles of concrete and sand shall be removed with oil-free jets of compressed air or water producing a minimum pressure of 6 MPa. If the substrate is wet at the time of cleaning, then it shall be cleaned with high pressure jets of water. A pressure gauge shall be installed in the water or air lines in order to verify the specified pressure.

The deck and backwall shall then be restored as per the drawings. However, no concrete shall be placed until the prepared surface to be restored is inspected and approval in writing is given by the Engineer.

Concrete substrate shall be kept damp for a minimum of 24 hours prior to placement of concrete.

Any excess water shall be removed with compressed air. This should be followed by a rich mixture of cement and water. The bonding mixture shall be cement with only sufficient water added to give a consistency such that the imprint remains when indented by the finger. The maximum thickness of bond grout is limited to 3 mm. It is important that the mixture not be permitted to set before placing the new concrete. If the mixture has set before the concrete has been placed, it shall be mechanically removed and a fresh coat applied under the direction of the Engineer.

#### **919.12.04 Supply And Placement Of Concrete**

All aspects of concrete supply and placement are subject to approval of the Engineer. High range water reducing agents (superplasticizers) may be used at the Contractor's request if so indicated when the mix design is submitted. The Contractor must demonstrate competence and experience in their use and specific approval must be obtained.

Concrete strength shall be 35 MPa in seven days and 40 MPa in 28 days. The water/cement ratio shall not exceed 0.39. The concrete mix design shall be in accordance with Section 904.04.02, "Mix Design", of the Specifications Book. Maximum aggregate size shall be 20 mm, and the aggregate must be sound with a Petrographic Number not greater than 135 and an abrasion loss not greater than 35%.

If superplasticizers are used, the maximum slump permitted will be 90 mm.

#### **919.12.05 Finishing**

Concrete must be finished immediately after strike off before the appearance of bleed water using a magnesium float. All concrete must be broom finished. The surface shall not be overworked. The Contractor shall supply a 3 m straight edge and the surface shall not deviate from the design grade by more than 8 mm.

#### **919.12.06 Curing**

Immediately after the concrete has been placed and finished, the Contractor shall apply an evaporation retardant and finishing aid called "Confilm" manufactured by Master Builders Company Ltd. or equivalent. The product shall be applied as per manufacturer's instructions and recommendations.

All aspects of curing shall be in accordance with Section 904.05, "Curing", of the Specifications Book.

#### **919.12.07 Payment**

Measurement for payment on a lump sum basis shall be made for each expansion joint system as bid in the appropriate item of the Structure Rehabilitation Unit Price Table.

An expansion joint system shall be defined as all items, materials and work within the physical bounds defined by the length of the expansion joint, 300mm on each side of the joint centerline, 200mm deep in the concrete deck and 300mm deep in the backwall.

The basis of payment for "Replacement of Expansion Joint System And Associated Work", shall represent full compensation for all labour, equipment, plant and materials necessary to remove existing concrete, expansion joint(s), sealant(s), joint filler(s) and waterstop(s), surface preparation, restoration of the deck and backwall, addition of a bonding mixture, supply and installation of a new expansion joints, supply, placement, finishing and curing of concrete in addition to all other items necessary to complete the work as outlined in this specification.

Any work required in the adjacent roadway surface to maintain grade, eg., asphalt saw cutting, replacement and sealing of joints shall be carried out neatly and its cost shall be considered incidental.

Expansion joints constructed where the average tested 28 day strength of the concrete in the expansion joint dam is less than the specified strength but otherwise meets the specifications will be accepted at a reduced payment provided the difference between the specified strength and the average tested 28 day strength is no greater than 10 MPa. If the difference is greater than 10 MPa than the expansion joint shall be rejected. The contractor shall remove the expansion joint dam and repour the concrete.

When concrete is rejected, those provisions outlines in CSA-A23.1-04 shall be followed to determine whether or not the concrete may remain in the work. Such work shall be done at the contractor's expense. Notwithstanding the above, should the concrete remain in the work it shall be subject to a reduction as outlined below, for having a strength less than that specified.

If the concrete in any portion of the expansion joint is found to have a strength deficiency of less than 10 MPa than the lump sum bid price for the expansion joint will be adjusted in accordance with the following:

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$$ALSP = BLSP - BLSP * .02 * (SS - TS) * (LJDC / LJ)$$

where:

ALSP = Adjusted Lump Sum Price for the Expansion Joint

BLSP = Bid Lump Sum Price per Expansion Joint

SS = Specified 28 day strength (MPa)

TS = Tested Average 28 day strength (MPa)

LJDC = Length of Joint with Deficient Concrete (m)

LJ = Length of Joint (m)

### 919.13 REMOVAL AND REPLACEMENT OF HANDRAIL AND ANCHOR BLOCKS

#### 919.13.01 General

The work will entail the complete removal of all existing handrail and anchor blocks, the removal and replacement of concrete in designated areas large enough to accommodate Richmond Anchors, the supply and installation of aluminum handrail system and the replacement of new anchor blocks. All handrail to be in accordance with Section 915, "Supply And Installation Of Aluminum Handrail".

#### 919.13.02 Removal

If concrete is to be removed by jackhammer, the maximum hammer mass permitted is 13 kg. If any reinforcing steel is found to be exposed, the concrete shall be removed to a clear distance of 25mm below the underside of the reinforcement. The Contractor shall take care not to damage any existing steel.

#### 919.13.03 Surface Preparation

The work shall be performed as per the drawings and under the direction of the Engineer. However, no concrete shall be placed until the prepared surface to be restored is inspected and approval in writing is given by the Engineer.

For a 24 hour period, the substrate shall be dampened followed by a rich mixture of cement and water. Excess and ponded water shall be removed before the application of the cement and water mixture.

#### 919.13.04 Supply And Placement Of Concrete

All aspects of concrete supply and placement are subject to approval by the Engineer. High range water reducing agents (superplasticizers) may be used at the Contractor's request if so indicated when the mix design is submitted. The Contractor must demonstrate competence and experience in their use and specific approval must be obtained.

Cement shall be Type 10 and the water/cement ratio shall not exceed 0.39. The concrete mix design shall be in accordance with Section 904.04.02, "Mix Design", of the Specifications Book.

Maximum aggregate size shall be 20mm, and the aggregate must be sound with a Petrographic Number not greater than 135 and an abrasion loss not greater than 35%.

#### 919.13.05 Curing

Immediately after the straight edge requirements have been met the fresh concrete shall be shielded from solar radiation and wind to preclude rapid evaporation of the bleed water.

All aspects of curing shall be in accordance with Section 904.05, "Curing", of the Specifications Book.

#### 919.13.06 Payment

Measurement for payment for this work shall be made lump sum as per the appropriate item of the Structure Rehabilitation Unit Price Table.

## FORM 919

The basis of payment shall represent full compensation for all labour, equipment, plant and materials necessary to carry out all the work described herein.

The supply and placement including drilling and grouting of rebar in anchor blocks is considered incidental. Payment for supply of aluminum rail shall be made upon receipt of invoice and material on site.

In the event that the Contractor does not receive delivery of the aluminum handrail by the scheduled completion date for the project, then he shall erect a suitable temporary protective railing, acceptable by the Engineer. This shall be considered incidental.

No payment for installation of rail or posts shall be made until all rail is in place and accepted by the Engineer.

### 919.14 REPLACEMENT OF DECK DRAINS AND ASSOCIATED WORK

#### 919.14.01 General

The work shall entail the removal of existing drains, the supply and installation of new drains at the location shown on the drawings and the reinstatement of concrete surrounding them. The holes left by the existing drains shall be filled with new concrete. All aspects of concrete work shall be as directed in Section 919.10, "Repair of Concrete Deck By Overlay".

For rehabilitation type projects, the hole for the deck drain down spout shall be drilled through the concrete deck with a core bit. Breaking through the deck with a jackhammer is not permitted. The core bit shall be capable of drilling a hole of sufficient size to easily accommodate the outside diameter of the down spout. Any gap between the drilled hole and the outside of the drain down spout shall be grouted to the satisfaction of the Engineer.

The new drains shall be fabricated and installed as per the drawings. The drains must be installed before placement of the surrounding deck and curb concrete. Drains shall be in accordance with Section 918, "Deck Drains".

#### 919.14.02 Payment

Measurement for payment shall be made for each deck drain replaced as per the appropriate item of the Structure Rehabilitation Unit Price Table.

The basis of payment shall represent full compensation for all labour, equipment and materials required to complete the work described herein.

### 919.15 REMOVAL AND DISPOSAL OF OLD ASPHALT

#### 919.15.01 General

The existing asphalt shall be saw cut transversely across the roadway at a point located 15 metres from each expansion joint on both approaches to the bridge as approved by the Engineer.

The old asphaltic pavement and granulars shall be excavated as required from within the limits as described above, removed, loaded, transported and disposed of at a site approved by the Engineer. Mechanical scarifiers or pneumatic hammers having maximum rating of 28 kg and equipped with chisel bits shall be used. The use of graders or backhoes for the removal of any bituminous materials from the bridge deck will **NOT** be permitted. Front end loaders may be permitted if approved by the Engineer.

The cutting of old asphaltic pavement to be excavated shall be as outlined in accordance with Section 510 of the Specifications Book, "Cutting Asphaltic Pavement".

Care shall be taken in excavating the pavement on the approaches so as not to contaminate or over excavate the underlying granular base course.

The waste disposal area shall be provided by the Contractor and approved by the Engineer. The Contractor shall be aware of Division 8, General Environmental Requirements of the Department's Specifications Book.

## FORM 919

The Contractor shall transport the pavement debris to the waste disposal area then place and trim the debris to slightly proportions.

When traffic is maintained on the structure during repair, only one lane of asphalt shall be removed at a time until the concrete in the adjoining lane has been satisfactorily restored and cured.

### 919.15.02 Payment

Measurement for payment for the removal and disposal of old asphaltic pavement shall be in cubic metres rounded to one decimal place. Measurements shall be made before the removal and shall be the plan area of the pavement surface multiplied by the measured thickness actually removed. Asphalt thickness shall be measured separately on the approaches and structure to account for different thickness. Measurement for payment regarding the cutting of old asphaltic pavement will not be made.

The basis of payment at the contract unit price for the removal and disposal of old asphaltic pavement under the appropriate item of the Structure Rehabilitation Unit Price Table shall be full compensation for all labour, materials and equipment use for: saw cutting, excavation, removal, loading, and transporting the old asphalt and waste from the job to disposal site, off loading, placing the debris and trimming to slightly proportions. Also included in the tendered unit price is the obtaining of an approved waste disposal area. The excavation, removal, transportation, disposal, and trimming of contaminated granular material shall be considered incidental to the work.

## 919.16 REHABILITATION WITH SHOTCRETE

### 919.16.01 General

The work will require the complete removal of old concrete, surface preparation, reinforcement, and the application of shotcrete. This work shall be carried out in accordance with ACI Standard 506.2-77 "Specifications for Materials Proportioning and Application of Shotcrete", except as modified by the requirements of this project.

### 919.16.02 Removal of Deteriorated Concrete

Existing concrete shall be removed to a minimum depth of 50mm beyond original lines or as shown on the drawings. If sound concrete is

not encountered, then the removal shall continue beyond the specified depth as determined by the Engineer.

Approval to proceed beyond the specified depth must be obtained from the Engineer.

If concrete is to be removed by jackhammer, the maximum hammer mass permitted will be 13 kg. All tools used in concrete removal shall be pointed. If any reinforcing steel is found to be exposed the concrete shall be removed to a clear distance of 25mm beyond the reinforcement. If any concrete is required to be removed around reinforcing steel, then the maximum hammer size permitted shall be 7 kg. The Contractor shall take care not to damage any existing steel. All edges of concrete removal should be tapered to a 1/1 slope, to the full depth of removal, to prevent the entrapment of rebound. The Engineer shall be the sole judge of the extent of removal required.

Reinforcing steel which is found to be deteriorated or damaged shall be removed and replaced as determined by the Engineer.

### 919.16.03 Surface Preparation

Prior to restoration of the sections, the concrete substrate and all exposed reinforcing steel shall be satisfactorily sandblasted until the steel is free of all rust and all loose particles of concrete have been dislodged. Fine particles of concrete and sand shall be removed with oil-free jets of water or compressed air producing a minimum pressure of 6 MPa. If the substrate is wet at the time of cleaning, then it shall be cleaned with high pressure jets of water. Air compressors must be equipped with a functioning oil trap.

The Contractor shall inform the Engineer of areas ready for shooting at least 24 hours in advance of shooting to allow for inspection and measurement.

The concrete substrate shall be kept damp for a minimum of 24 hours prior to shooting. Any excess water shall be removed with compressed air.

**919.16.04 Materials**

Materials shall comply with latest requirements of the following CSA Standards:

Cement CSA A5.1 Portland Cement - Type 10  
Sand CSA A23.1 Section 5.3 Fine Aggregate  
Water CSA A23.1 Clause 5.2 Water

The Engineer may require samples of the materials to be used before work starts and periodically during the work to ensure quality and consistency.

**919.16.05 Mix Design**

The proportion of cement to sand shall be based on dry and loose volumes and shall be one part of cement to not more than 3½ parts of sand. The sand shall contain not less than 3% and not more than 5% moisture by weight. The water content of the final mixture shall be maintained at a practical minimum, but not more than 0.35 kg of water per kg of cement. The moisture content of the sand will be checked from time to time during the course of the work. The shotcrete shall have a minimum compressive strength of 35 MPa at 28 days.

The dry mix process only is deemed to be acceptable as described in ACI 506-66.

Measurements of sand and cement by shovel, wheelbarrow or similar haphazard means will not be acceptable. No premixed material shall stand for more than 45 minutes prior to delivery through the hose.

**919.16.06 Welded Wire Mesh**

A welded, plain, WGW steel mesh with a wire spacing of 51mm (2") in each direction of 14 gauge wire shall be attached to the area to be repaired. This mesh shall be placed so that:

- (i) the cover to the mesh is 40mm minimum,
- (ii) the space between the mesh and existing concrete is not less than 10mm. The mesh shall be securely fastened by approved concrete anchors embedded in the concrete on a 450mm square grid with tie wire. Wire mesh shall be lapped 1½ squares in all directions.

**919.16.07 Application of Shotcrete**

No shotcrete shall be applied at an air temperature lower than 8°C. Prior to the application, a test panel shall be shot to ensure competency of the nozzle man.

The test panel will be approximately 3 square metres, with one half vertical and the other half horizontal, in order for the nozzle man to demonstrate horizontal and overhead shooting on the same panel unit. Short reinforcing bars and wire mesh will be attached to the test panel as directed by the Engineer. This requirement may be waived if reliable references who attest to the nozzle man's ability are supplied.

Before application of the shotcrete, the cleaned surfaces shall be washed down with water and all loose material such as rebound or over spray removed by a water or air blast. The concrete substrate at the time of shooting should be damp with no free moisture on the surface.

The shotcrete shall be pneumatically applied by a suitable apparatus, operated only by experienced and competent persons who fulfil the requirements as set out in Chapter 5 of ACI Standard "Recommended Practice For Shotcreting (ACI 506.66)". The Contractor shall submit letters to the Engineer stating the qualifications and experience of the nozzle man and the shotcrete pump operator. It is necessary to obtain approval from the Engineer before any nozzle man is employed on the site.

## FORM 919

The pressures applied to the materials shall be such that the water is thoroughly mixed with the sand-cement mixture with the water pressure being "0.1 MPa higher". The air and water pressures shall be uniform so that a steady continuous flow of shotcrete is applied with no surging.

The velocity of the shotcrete as it leaves the nozzle shall be maintained uniform at a rate determined for the given job conditions to produce the minimum rebound. The nozzle shall be held perpendicular to the surface at a distance between 600 and 1500mm. The rate of application and the depth of build-up of the shotcrete shall be adjusted to avoid sag or separation. In general, the maximum thickness of a single layer shall be 50mm on vertical surfaces and 25mm on overhead surfaces.

Rebound or accumulated loose material shall be removed from any surface prior to the placing of additional layers of mortar. This rebound or loose material shall not be used. The Contractor shall supply and install ground wires to control thickness and to assist the Engineer's and Contractor's representatives in making the necessary measurements for payment purposes. The maximum thickness of a single vertical or horizontal layer may be increased if sagging or separation can be avoided, with approval from the Engineer.

Forms shall be structurally sufficient and of such design that rebound or accumulated loose material can freely escape or can be readily removed. Shooting strips shall be used wherever necessary to form chamfers, corners, edges, and/or surfaces where it is necessary to obtain true lines, proper thickness and cover over steel. Cold joints shall be avoided wherever possible.

At the end of any period of placing shotcrete, the material shall be sloped to a thin edge. Before placing an adjacent section, this sloped portion shall be thoroughly cleaned by sandblasting or water blasting and wetting. This shall also apply when placing an additional lift atop a previously placed layer, where the shotcrete has taken final set.

For curing and subsequent testing purposes, the Contractor shall supply the Engineer with test panels of the shotcrete approximately 400mm x 400mm x 100mm in size. The panels shall be supplied whenever required by the Engineer throughout the project, with at least one panel supplied per 8 hour shift.

### **919.16.08 Finishing**

The shotcrete shall have a natural gun finish unless otherwise specified. Any roughness around the edges or over spray shall be removed with a trowel.

### **919.16.09 Curing**

All areas shall be cured first using a fog spray on the surface of the shotcrete.

After the shotcrete has set, curing with wet burlap or wet white non-woven filter fabric as per Specification 904.05.01, "Moist Curing", with a continuous sprinkling system shall begin and continue for seven (7) days.

### **919.16.10 Measurement For Payment**

Measurement for payment will be based upon the volume measured in place in cubic metres of newly built shotcrete as per the appropriate item in the Unit Price Table. No payment shall be made for concrete removed or replaced beyond the specified depth or lines, unless the Engineer has instructed the removal or replacement in writing.

If the Engineer has instructed further removal, the following shall apply.

The volume shall be the difference between sections of the remaining concrete and the face of the new shotcrete. The volume shall be calculated by the average end area method. Sections shall be taken at regular intervals of not more than 500mm apart, readings at each section shall be taken to best describe the profile of the concrete surface at that location.

Representatives of the Contractor and the Engineer shall be present when the section readings are taken.

### **919.16.11 Basis Of Payment**

The basis of payment shall represent full compensation for all labour, equipment, and materials necessary to carry out all the work described herein.



**FORM 919**

**919.17 SUPPLY AND PLACE TREMIE CONCRETE**

The supply of concrete materials, supply, mixing, transportation, placing and curing of concrete, measurement for and basis of payment shall be as outlined in Section 904, "Concrete Structures", of the Specifications Book.

**SECTION 920  
SLOPE PAVING**

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**920.02.02 Concrete Reinforcement**

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**920.01 SCOPE**

This specification covers the requirements for areas to be paved with concrete and adjacent areas or quadrants to be backfilled and graded as indicated herein.

**920.02 MATERIALS**

The materials for construction of slope paving and related work shall conform to this specification, the contract drawings and all relevant sections of the Specifications Book as outlined herein.

**920.02.01 Concrete**

Concrete shall be as specified on the drawings and shall meet the requirements of Section 904 of the Specifications Book, "Concrete Structures".

Concrete shall meet the criteria for substructure concrete and the slump shall be of such consistency that will permit placement, consolidation and finishing on a 1.5:1 slope.

**920.02.02 Concrete Reinforcement**

All reinforcing steel supplied shall conform to Section 905 of the Specification Book, "Concrete Reinforcement".

**920.02.03 Wood**

Material utilized for wood strips is not required to be preservative treated or structural grade. The material may be of second or third use providing it is reasonably straight, sound and meets with the approval of the Engineer.

**920.02.04 Selected Granular Base Course, GRANULAR "A"**

Granular bedding materials shall be Selected Granular Base Course, GRANULAR "A" and shall conform to Section 315 of the Specifications Book.

**920.02.05 Extra Backfill, Select Material Compacted**

Extra backfill select material compacted, shall conform to Section 902.05.01, "Select Material Compacted", of the Specifications Book.

**920.02.06 Extra Backfill, Compacted Ordinary Fill**

Extra backfill, compacted ordinary fill, shall conform to Section 902.05.02, "Compacted Ordinary Fill", of the Specifications Book.

**920.03 PREPARATION**

Preparation of the work site to receive concrete slope paving and erosion control blankets as well as the backfilling and grading of the balance of the quadrant at each corner of the structure shall be carried out as outlined below.

The Contractor shall supply, transport to site, handle, place, spread, trim and compact, compacted ordinary fill and select material compacted to the dimensions, elevations and slopes as indicated on the contract drawings and as stated herein. This shall include placing select material compacted and compacted ordinary fill below the area to be paved with concrete, covered with future erosion control blankets and the balance of the quadrant. The quadrant shall be defined as that sector or area at the corner of a structure radiating from the end of the wingwall and sweeping through 90 degrees more or less to the perpendicular from the wingwall. The prepared area shall extend from the top of the roadway fill to the bottom of the slope and blend with the natural topography. The balance of the quadrant shall be backfilled and graded to conform with the natural topography. Erosion control blankets shall be placed at the sides of the slope paving and extend from the back face of the Type C Curb and Gutter to the end of the wingwall. The erosion control blankets shall conform with the Contract Drawings.

Extra backfill, compacted ordinary fill and select material compacted, shall be compacted to at least 90% of the Standard Proctor Dry Density (ASTM D698-78).

Trimming shall be carried out to the satisfaction of the Engineer with all necessary hand and equipment work as required.

Also included in preparation is the excavation, removal and disposal of unsuitable, waste, or excess materials.

**920.04 CONSTRUCTION PROCEDURE**

The width of the slope paved with concrete shall equal the superstructure, i.e. deck, width in the case of a single structure. Normally, the concrete slope paving shall extend beyond the abutment stem to the limit of superstructure overhang.

For twin structures where the clear gap between the superstructures is seven (7) metres or less, the width of the slope paved with concrete shall extend from the near edge of one superstructure to the far edge of the adjacent superstructure and be continuous throughout its entirety. Where the concrete slope paving is continuous below twin superstructures, the gap between the wingwalls of twin structures shall be treated as an extension of the slope paved with concrete from the front face of the abutment stem to the end of the wingwalls. The top of the slope paving at the end of the wingwalls shall extend down into the median ditch. The paved reinforced concrete slope shall be continuous from bottom to top of slope and down into the median ditch.

The area paved with concrete shall be skewed as required.

After the surface to receive slope paving has been prepared, the slope paving shall be constructed. This consists of supply, placing and compaction of GRANULAR "A", wood strips, reinforcing steel and concrete.

### **Form 920**

Selected granular base course, GRANULAR "A", shall be placed in a uniform layer, spread, compacted and trimmed to the Engineer's satisfaction. Granular bedding, GRANULAR "A" shall be compacted to at least 90% of Standard Proctor Dry Density (ASTM D698-78).

The placing of wood strips shall be as outlined in the contract drawings.

Reinforcing steel shall be placed at mid-depth of the slope paving and shall be securely held in position. Rebar to be offset from Vee grooves and wood strips by  $\pm 50$  mm to increase cover where possible. Adequate rebar support chairs or concrete blocks shall be utilized to prevent displacement of the reinforcing steel mat. The supply, placing, consolidation, finishing and curing for concrete shall be as outlined in Section 904 of the Specifications Book, "Concrete Structures".

#### **920.05 MEASUREMENT FOR PAYMENT**

Measurement for payment purposes shall be in square metres rounded to the nearest zero decimal one (0.1) square metres.

The area to be measured for payment purposes shall be based upon the length and width of the area paved with concrete. The length is defined as the distance from the back face of the underlying roadway curb to the front face of the abutment stem parallel to the edge of the superstructure. If the length is different at each side of the slope paving, the average length shall be used. The length measurement shall be taken parallel to the inclined slope and the horizontal berm at the top of the slope. The width is defined as the perpendicular distance from one edge of the slope paving to the other edge. The width dimension shall be based upon the plan view without any allowance for inclined distances. For flared slope paving, the average width shall be used. The slope paving width is more or less defined as the distance from a point directly below the edge of the superstructure to a similar point below the far edge of the single or twin superstructure as the case may be.

Measurement of individual components comprising the slope paving as described herein or as indicated on the drawings will not be made for payment purposes. These items which are considered incidental to the works include, but are not limited to: excavation and trimming, extra backfill, select material compacted and compacted ordinary fill, selected granular base course GRANULAR "A", wood, concrete reinforcement and concrete, and erosion control blankets. Compacted ordinary fill underneath the area where slope paving is to be placed, will be paid as compacted fill as per appropriate item in the contract documents.

Measurement for payment purposes outside the area actually paved with concrete will not be made but shall be considered incidental to the work.

#### **920.06 BASIS OF PAYMENT**

Payment at the contract price for Slope Paving includes full compensation for all materials, labour, plant, equipment and services to complete the work as described above or so indicated on the contract drawings.

The Contractor shall place 10mm Styrofoam, or an approved equal, between slope paving concrete and concrete strut surfaces. This work is considered incidental and no additional payment will be made for same.



**SECTION 921**

**BLAST CLEANING AND PAINTING OF STRUCTURAL STEEL**

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**921.01 SCOPE**

This specification covers the supply of all labour, equipment and materials necessary to blast-clean and paint or repaint structural steel work.

The Department will not supply any material required for work under this contract.

Structural Steel to be cleaned and painted are all areas of steel either primed or painted previously. Alternatively, this shall include all superstructure and substructure steel exposed to the atmosphere unless stated otherwise in the contract documents.

**921.02 PROGRESS AND COMPLETION**

The whole of the work to be done under this contract shall be fully completed by September 30th.

## **921.03 MATERIALS**

### **921.03.01 Sand**

Sand shall be in accordance with CGSB 31-GP-421M and of a class that will yield a 65 micron or 1.5 - 3.5 mil steel profile.

### **921.03.02 Primer**

The primer shall be one coat of PPG Metalhide Inorganic Zinc Rich Primer supplied by Pittsburg Paints or an approved equal. Dry film thickness at 1.5 mils to 2.0 mils. (Product code # 97-673 and 97-675). The colour of the primer will be green.

### **921.03.03 Paint**

The intermediate coat shall be one coat of PITT-GUARD All - Weather Epoxy supplied by Pittsburg Paints or an approved equal. Dry film thickness at 5.0 mils to 7.0 mils. (Product code # 97-946 and 97-949). The colour of the intermediate coat will be white.

The finish coat shall be one coat of PPG Pitthane ultra urethane supplied by Pittsburg Paints or an approved equal. Dry film thickness at 3.0 mils to 4.0 mils. (Product code # 95-8000). The colour of the finish coat will be haze grey.

### **921.03.04 Solvent**

Solvents shall be compatible with the primer and paint being utilized.

## **921.04 SAFETY PRECAUTIONS AND DAMAGE PREVENTION**

All safety equipment and devices for the protection of the operation and personnel shall be supplied by the Contractor.

Any damage to abutting property, vehicles, utilities, pedestrians, animals or to any portion of the structure due to the cleaning or painting operations shall also be the responsibility of the Contractor.

No paint shall be allowed to smear the abutments or piers. If such happens, the paint stains shall be cleaned immediately with a proper solvent.

All work shall be performed in accordance with the Occupational Health and Safety Act; latest amendments.

## **921.05 BLAST CLEANING**

All areas to be painted shall first be blast-cleaned to a near white metal finish and in accordance with SSPC-SP-10, latest revision.

All accessible weld flux and spatter, rust, paint and mill scale shall be removed.

Loose paint, thick layers of rust, dried soil, and other loosely adhering foreign matter not efficiently removed by blast-cleaning shall be removed by hand or power tools and the underlying surface blast-cleaned.

The accessible portions of all partially enclosed steel members shall be blast-cleaned.

Rivet heads, cracks, crevices, lap-joints, fillet welds and re-entrant angles shall be blast-cleaned.

## **921.06 SURFACE CLEANING**

After the aforesaid blast-cleaning operations are completed, dust or other loose matter shall be removed from the surface. If detrimental amounts of grease or oil are present, these substances shall be removed with solvent.

## **921.07 PAINTING**

### **921.07.01 General**

All areas shall receive primer, intermediate and finish coat dry film thicknesses as defined in Section 921.03 of the specifications.

All thickness measurements are to be made when the coatings are dry.

Five separate spot measurements of the dry film shall be taken with a dry film thickness gauge; these readings shall be spaced evenly over each section of the structure 10 square metres in area. The average for the 5 spot measurements for each section shall not be less than the specified thickness. No single spot measurement in any section shall be less than 80% of the specified thickness.

As many applications as necessary shall be applied until the aforementioned dry thicknesses are obtained.

#### **921.07.02 Storage**

All paint and thinner should preferably be stored in a separate building or room that is well ventilated and free from excessive heat, sparks, flame or the direct rays of the sun. Paints susceptible to damage from freezing shall be kept in heated storage space when necessary.

All containers of paint should remain unopened until required for use; containers which have been opened shall be used first.

Paint which has livered, gelled or otherwise deteriorated during storage shall not be used.

The oldest paint of each kind shall be used first.

#### **921.07.03 Cleaning**

Any oil, grease, soil, dust or foreign matter deposited on the surface after the surface preparation is completed shall be removed prior to painting. In the event that rusting occurs after completion of the surface preparation, the surface shall be again cleaned in accordance with the specified method.

Particular care shall be taken to prevent the contamination of cleaned surfaces with salt before the primer is applied and between applications of the remaining paint. Such contaminants shall be removed from the surface. The primer paint shall be applied within one hours after the surface has been cleaned. The successive applications shall be applied before contamination of the under surface occurs.

If the under surface, after the application, becomes contaminated by salt, it shall be washed off with clear fresh water.

#### **921.07.04 Mixing And Thinning**

All ingredients in any container of paint shall be thoroughly mixed before use and shall be agitated often enough during application to keep the pigment in suspension.

Paint mixed in the original container shall not be transferred until all settled pigment is incorporated into the vehicle. This does not imply that part of the vehicle can not be poured off temporarily to simplify the mixing.

Paint shall not be mixed or kept in suspension by means of an air stream bubbling under the paint surface.

Where a skin has formed in the container, the skin shall be cut loose from the sides of the container, removed and discarded. If such skins are thick enough to have a practical effect on the composition and quality of the paint, the paint shall not be used.

The paint shall be mixed in a manner which will ensure breaking up of all lumps, complete dispersion of settled pigment and a uniform composition. If mixing is done by hand most of the vehicle shall be poured off into a clean container. The pigment in the paint shall be lifted from the bottom of the container with a broad, flat paddle, lumps shall be broken up and the pigment thoroughly mixed with the vehicle. The poured-off vehicle shall be returned to the paint with simultaneous stirring or pouring repeatedly from one container to another until the composition is uniform. The bottom of the container shall be inspected for unmixed pigment.

Paint which does not have a limited pot life or does not deteriorate on standing may be mixed at any time before using, but if settling has occurred it must be remixed immediately before using. Paint shall not remain in spray pots, painter's buckets, etc., overnight, but shall be gathered into a container and remixed before use.

No thinner shall be added to the paint unless necessary for proper application and conforms with the manufacturer's recommendations. Paints to be sprayed, if not specifically formulated for spraying, may require thinning when proper adjustment of the spray equipment and air pressure does not result in satisfactory paint application. In no case shall more than five percent of thinner be added unless the paint is intentionally formulated for greater thinning. This shall also apply when painting in cold weather.

The type of thinner shall comply with the paint specification or manufacturer's instructions.

When the use of thinner is permissible, thinner shall be added to paint during the mixing process. Painters shall not add thinner to paint after it has been thinned to the correct consistency. All thinning shall be done under the supervision of one acquainted with the correct amount and type of thinner to be added to the paint. Notwithstanding the foregoing, all mixing and thinning shall be done in accordance with the manufacturer's recommendations.

### **921.07.05 Application**

#### **921.07.05.01 General**

Paint shall be applied by brushing or spraying or a combination of these methods. Daubers or sheepskins may only be used when no other method is practicable for proper application in places of difficult access.

Paint shall not be applied when the surrounding air temperature is not within the maximum/minimum range recommended by the paint manufacturer. Paint shall not be applied to steel at a temperature that will cause blistering, porosity or otherwise will be detrimental to the life of the paint. When steel is painted in hot weather, precautions must be taken to ensure that the specified thickness of paint is obtained.

Paint shall not be applied in rain, snow, fog or mist or when the relative humidity exceeds 95 percent. Paint shall not be applied to wet or damp surfaces; paint shall not be applied on frosted or ice coated surfaces. Water or ice on the surface must be visible to prevent painting under this provision.

When paint must be applied in damp or cold weather, the steel must be painted under cover, protected, sheltered, or the surrounding air and the steel heated to a satisfactory temperature. In all such cases, the temperature and the humidity conditions specified above must be met. Such steel shall remain under cover or be protected until dry or until weather conditions permit its exposure.

Any paint exposed to freezing, excess humidity, rain, snow or condensation, shall be permitted to dry. Damaged areas of paint shall then be removed and the surface again prepared and then repainted to the specified thickness.

All outside corners, rivets, sharp edges and weld joints shall first be given a separate brushed on stripe coat before each complete coat of primer, intermediate and finish coat is applied.

To a maximum extent practical, each application of paint shall be applied as a continuous film of uniform thickness free of pores. Any thin spots or areas missed in the application shall be repainted and permitted to dry before the next application of paint is applied.

Each undercoat of paint shall be in a proper state of cure or dryness before the succeeding application is applied. Paint shall be considered dry for recoating when an additional coat can be applied without the development of any detrimental film irregularities, such as lifting or loss of the undercoat.

#### **921.07.05.02 Brush Application**

Brush application of paint shall be in accordance with the following:

Brushes shall be of a style and quality that will enable proper application of paint. Round or oval brushes are generally considered most suitable for rivets, bolts, irregular surfaces and rough or pitted steel. Wide, flat brushes are suitable for large flat areas but they should not have a width over 127mm.



The brushing shall be done so that a smooth coat, as nearly uniform in thickness as possible, is obtained. This usually may best be accomplished by applying the paint in short strokes, depositing uniform amounts of paint in each stroke, brushing the paint into all surface irregularities and finally smoothing or levelling the paint film with longer strokes at about right angles to the direction of the first strokes allowing only enough of the tip of the bristles to drag in the paint film to smoothen the film without leaving deep or detrimental brush marks.

Paint shall be worked into all crevices and corners.

Any runs or sags shall be brushed out.

There shall be a minimum of brush marks left in the applied paint.

Surfaces not accessible to brushes shall be painted by spray, or by daubers, or by sheepskins.

#### **921.07.05.03      Spray Application**

Spray application of paint shall be in accordance with the following:

The equipment used shall be suitable for the intended purpose, shall be capable of properly atomizing the paint to be applied and shall be equipped with suitable pressure regulators and gauges.

The air caps, nozzles and needles shall be those recommended by the manufacturer of the equipment for the material being sprayed. The equipment shall be kept in satisfactory condition to permit proper paint application.

Traps or separators shall be provided to remove oil and condensed water from the air. These traps or separators must be of adequate size and must be drained periodically during operations. The air from the spray gun impinging against the surface shall show no condensed water or oil.

Paint ingredients shall be kept properly mixed in the spray pots or containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

The pressure on the material in the pot and of the air at the gun shall be adjusted for optimum spraying effectiveness. The pressure on the material in the pot shall be adjusted when necessary for changes in elevation of the gun above the pot. The atomizing air pressure at the gun shall be high enough to properly atomize the paint but not so high as to cause excessive fogging of paint, excessive evaporation of solvent, or loss of over spray.

Spray equipment shall be kept sufficiently clean so that dirt, dried paint and other foreign materials are not deposited in the paint film. Any solvents left in the equipment shall be completely removed before applying paint to the surface being painted.

Paint shall be applied in a uniform layer, with overlapping at the edge of the spray pattern. The spray pattern shall be adjusted so that the paint is deposited uniformly. During application, the gun shall be held perpendicular to the surface and at a distance which will ensure that a wet layer of paint is deposited on the surface. The trigger of the gun should be released at the end of each stroke.

All runs and sags shall be brushed out immediately or the paint shall be removed and the surface repainted.

Areas inaccessible to the spray gun shall be painted by brush; if not accessible by brush, daubers or sheepskins shall be used. Brushes shall be used to work paint into cracks, crevices and blind spots which are not adequately painted by spray. The foregoing notwithstanding, the Contractor shall conform to the paint manufacturer's recommendations.

#### **921.07.06      Drying of Painted Steel**

No paint shall be force-dried under conditions which will cause cracking, wrinkling, blistering, formation of pores, or detrimentally affect the condition of the paint.

No drier shall be added to paint on the job unless specifically called for in the specification for the paint.

Paint shall be protected from rain, condensation, contamination, snow and freezing until dry to the fullest extent practicable or as recommended by the manufacturer.

#### **921.08 SUPERVISION**

The Department will have a qualified painting inspector on the site at all times when work is in progress. The Contractor shall supply all safety equipment (respirator, goggles, etc.) required by the Inspector.

**921.09 EXPERIENCE**

The bidder is required to complete the form "List of Projects Involving Blast Cleaning and Painting" and submit it with the tender.

**921.10 MEASUREMENT FOR PAYMENT**

Measurement for payment will be lump sum as tendered under the item "Blast Cleaning and Painting of Structural Steel" as listed in the Structure or Structure Rehabilitation Unit Price Table. Interim payments for the percentage of work done may be made at the discretion of the Engineer.

**921.11 BASIS OF PAYMENT**

The basis of payment shall include full compensation for all labour, materials and equipment required to complete all blast cleaning and painting or repainting of structural steel as outlined in this specification.

## SECTION 922

## ASPHALTIC PAVING OF BRIDGE DECKS AND APPROACHES

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## 922.07 BASIS OF PAYMENT

922.07.01 General

922.07.02 Treated Bridge Decks

922.07.03 Waterproofed Bridge Decks

## 922.01 SCOPE

This specification applies to both existing or rehabilitated and new concrete bridge decks where asphaltic paving is being undertaken.

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The scope of the work covers the Department's requirements for the asphaltic paving of both treated and waterproofed new concrete bridge decks and concrete approach slabs with hot mix asphaltic surface course concrete. The paving of rehabilitated bridges and their approaches, in addition to the supply, transportation, placing and compaction of selected granular base course is also part of this work.

If paving items are contained in a current or ongoing road contract, the approaches including the approach slab where appropriate will be paved under the road contract. Otherwise, granular and paving operations up to 15 metres from the abutment back wall shall be included in the bridge contract.

Treating of rehabilitated bridge decks and some new bridge decks is also included. Waterproofing of all remaining bridge decks is provided for elsewhere.

The paving of bridge decks is not permitted without the specific approval of the Bridge Office, Highway Design Division.

### 922.02 MATERIALS

#### 922.02.01 Tack Coat For Treated Bridge Decks

Type SS-1h or RS-1K emulsion tack coat shall conform to Section 320 of the Specifications Book, for Tack Coat.

#### 922.02.02 Selected Granular Base Course

Selected granular base course shall be of GRANULAR "A" or GRANULAR "B" gradation as required. This material shall conform to Section 315 of the Specifications Book for Selected Granular Base Course.

#### 922.02.03 Hot Mix Asphaltic Concrete

Materials which comprise hot mix asphaltic concrete for paving bridge decks shall be of surface course gradation and quality. Section 330 of the Specifications Book for Hot Mix Asphaltic Concrete shall govern.

#### 922.02.04 Joint Sealing Compound

Joint sealing compound shall conform to Section 914.03.06 of the Specifications Book for "Joint Sealing Compound".

#### 922.02.05 Hot Mix Asphaltic Concrete Sealant

This material shall conform to Section 914.03.07 of the Specifications Book, "Hot Mix Asphaltic Concrete Sealant".

### 922.03 EQUIPMENT

For treated bridge decks only, an approved pressure distributor may be utilized to place tack coat on the concrete deck. The distributor shall strictly conform to Section 320.03 of the Specifications Book. Over spray along curbs and expansion joint dams will not be permitted, soil or gravel will not be tracked onto the bridge and approval is required from the Engineer stating the conditions of use. Alternatively, the following equipment must be utilized if so required by the Engineer.

Equipment for applying tack coat on bridge decks to be waterproofed shall be limited to a manually operated spray rod which shall produce a uniform fog-type spray. The lower part of the spray rod shall be bent 30 degrees to form a section of rod parallel to the deck. The pressurized container which holds the tack coat shall be equipped with a thermometer and pressure gauge.

All plant and equipment required to supply, produce, transport, place, spread and compact granulars shall conform to Section 315 of the Specifications Book for Selected Granular Base Course.

All paving equipment and plant shall conform to Section 330 of the Specifications Book for Hot Mix Asphaltic Concrete.

The equipment used for filling the grooves and sealing the surface adjacent to the curbs and transverse joint filling with sealant at each expansion joint dam shall be approved by the Engineer.

**922.04 CONSTRUCTION PROCEDURES****922.04.01 General**

All concrete surfaces shall be cured in accordance with Section 904.05 of the Specifications Book for "Curing" and be in a dry condition before the work as described herein may commence. Work shall not be performed during rainy or inclement weather or on wet, snow or frost covered surfaces.

**922.04.02 Treated Bridge Decks**

Treated bridge deck construction procedures shall apply to all bridge decks where waterproofing is not carried out. The treatment procedure shall be as outlined herein. The process shall apply to both the suspended deck and the concrete approach slab.

**922.04.02.01 Deck Cleaning and Preparation**

First, the Contractor shall sweep the bridge deck and approach slabs either manually or with a power broom. This shall be followed by a cleaning of the deck and approach slabs with oil-free compressed air. Tack coat shall be applied in accordance with Section 320 of the Specifications Book for "Tack Coat".

Removal and disposal of old asphaltic pavement and deck rehabilitation shall be covered in Section 919 of the Specifications Book, "Rehabilitation of Concrete Structures".

**922.04.02.02 Granulars**

Work under this classification is generally related to selected granular base course operations or rehabilitation type projects.

Contaminated granular material shall be excavated and disposed of as directed by the Engineer.

Suitable existing selected granular base course shall be reshaped and recompact (100% maximum standard proctor dry density, ASTM D698-78) to grade as established by the Engineer.

Additional granular material shall be produced, supplied, transported, stored, placed, graded and compacted in accordance with Section 315 of the Specifications Book for selected Granular Base Course. The width and thickness of the granular base course and granular shoulders shall be in conformance with the bridge approaches and the standard of roadway to which it is being applied as per the typical cross section. The length shall be in accordance with the length of existing pavement removed and disposed of as determined by the Engineer, generally 15m from the abutment back wall.

**922.04.02.03 Paving**

All construction procedures related to paving shall conform to Section 300 of the Specifications Book for Hot Mix Asphalt Concrete except as outlined herein.

Paving shall proceed downgrade.

Paving shall commence as soon as practical when the tack coat has adequately cured.

Compaction using vibration is not permitted on bridge decks and approach slabs.

The deck, concrete approach slabs and bridge approaches where applicable on rehabilitation type projects shall be paved with hot mix, hot laid asphaltic surface course concrete.

On approaches to rehabilitation type projects, i.e. generally 15m from the abutment back walls, new asphaltic surface course concrete shall be placed in two 40mm lifts. The deck and concrete approach slabs shall be paved with one 50mm lift and the new asphalt grades shall match the elevations of the concrete expansion joint dams. The thickness of paving on new concrete decks and approach slabs shall be in accordance with the contact drawings.

The approaches to the bridge shall be paved first thus avoiding the transfer of foreign particles on the deck so as to preclude damage to the treated deck.

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Prior to commencing deck paving operations the Contractor shall cover all deck drains to prevent the entry of hot mix asphalt. The covers shall be secured to the deck drains. After breakdown rolling is complete and cover(s) shall be removed from all deck drains. In addition, the Contractor shall place a removable filler strip in each expansion joint gap and for the full length of each joint. The purpose of the expansion joint filler strip is to preclude the hot mix asphalt from entering the flexible expansion joint gap(s). After paving operations are complete, the filler strip shall be removed. The Contractor shall clean both the deck drains and expansion joints and dispose of waste material.

### **922.04.02.04 Forming and Filling Grooves With Joint Sealing Compound**

This operation applies to the joints created adjacent to and for the full length of each curb. The work shall be carried out in accordance with Section 914.04.08 of the Specifications Book for "Forming and Filling Grooves With Joint Sealing Compound".

### **922.04.02.05 Sealing Surface Of Asphaltic Concrete Adjacent To Curbs**

This work shall be carried out in accordance with Section 914.04.09 of the Specifications Book, "Sealing Surface Of Asphaltic Concrete Adjacent To Curbs".

### **922.04.02.06 Transverse Joint Filling**

The groove may be formed by placing a 10mm by 10mm vee shaped wooden strip across the width of the deck and against each concrete face at each expansion joint dam. The wooden strip shall be coated with an approved bond breaker. The strip shall be removed after the hot mix asphalt has been fully compacted. "The vee groove shall be blown out with oil-free compressed air and filled with a hot applied Joint Sealing Compound".

The application of sealant or compound shall be carried out when the temperature is at or above 5°C and the joint is dry. Traffic shall be kept off the transverse joint until the Sealant is set-up which should take from two (2) to five (5) hours for the cold applied sealant.

## **922.04.03 Waterproofed Bridge Decks**

### **922.04.03.01 Waterproofing**

The materials and treatment procedure for the concrete surface preparation, surface conditioner for asphaltic membrane, application of asphalt and rubber membranes, protection boards and protection board tack coat, the forming and filling of grooves with joint sealing compound and sealing of the asphaltic surface adjacent to the concrete curbs shall be as outlined in accordance with Section 914 of the Specifications Book for "Bridge Deck Waterproofing".

Bridge decks that are waterproofed shall have their concrete approach slabs treated as per Section 922.04.02 of this specification, "Treated Bridge Decks".

### **922.04.03.02 Paving**

All construction procedures relating to paving shall be as outlined in Section 922.04.02.03 for "Paving", except as outlined herein.

The thickness of paving on waterproofed decks and treated approach slabs shall be in accordance with the contract documents.

Paving of the bridge deck should commence as soon as practical after waterproofing operations described in Section 914 of the Specifications Book for "Bridge Deck Waterproofing" have been completed. Care should be taken so as to not damage the installed waterproofing system. Displacement or puncturing of the protection board is not acceptable. Turning of vehicles on the bridge deck is prohibited.

Paving operations shall be conducted downgrade in the direction of protection board overlap.

The trucks should dump part of their load into the paver and then move down the deck away from the paver, so that the paver does not have to push the truck. Care must be taken to remove any hot mix material from the deck that may have spilled in front of the paver tracks or tires so that it does not perforate the membrane.

The speed of the asphalt spreader should be kept down in the range of three (3) to four (4) metres per minute in order to provide maximum traction.

## FORM 922

The temperature of the asphalt placed on the waterproofed bridge deck should cool to 115°C before breakdown rolling begins with a suitable static steel wheel roller. The protection boards may squirm under the roller and crack the hot mix around the protection board perimeter if breakdown rolling is attempted too soon. The breakdown roller should make only one pass over the mat. The mat should then be rolled with a rubber-tired roller. Starting and stopping on the newly paved deck is not permitted.

### 922.04.03.03 Transverse Joint Filling

Transverse joint filling shall be carried out as described previously in this specification. However, only hot applied joint sealing compound is to be utilized.

## 922.06 MEASUREMENT FOR PAYMENT

### 922.06.01 Treated Bridge Decks

Measurement for payment for the asphaltic paving of bridge decks, shall be as outlined in Section 330 of the Specifications Book for Hot Mix Asphaltic Concrete.

Measurement for payment for the asphaltic paving of new bridge decks shall be confined to the actual tonnage of hot mix asphaltic concrete actually placed on the bridge deck and concrete approach slabs as directed by the Engineer. On rehabilitation type project, measurement for payment shall include the actual tonnage placed on the deck, concrete approach slabs and approaches within the limits as directed by the Engineer.

Measurement for payment for bridge deck and concrete approach slab sweeping, cleaning, preparation, tack coating, forming and filling grooves with cold applied sealant or joint sealing compound, sealing the surface of asphaltic concrete adjacent to curbs, transverse joint forming and filling, the provision for deck drain cover plates and expansion joint filler strips will not be made.

Payment for the production, supply, storage, transportation, placing, grading and compaction of Selected Granular Base Course will not be made for rehabilitation type projects. Should the Engineer require additional granular placement beyond the scope of restoring road to the original cross section it will be paid for separately.

Measurement for payment for the production, supply, storage, transportation, placing, grading and compaction of selected granular base course material on new construction projects shall be in accordance with Section 315 of the Specifications Book for Selected Granular Base Course.

Payment for cutting existing asphaltic pavement, removal, transportation and disposal of old asphaltic pavement will be made in accordance with Section 919 of the Specifications Book for "Rehabilitation of Concrete Structures".

### 922.06.02 Waterproofed Bridge Decks

Measurement for payment for deck waterproofing shall be paid for under Section 914 of the Specifications Book for "Bridge Deck Waterproofing".

Payment for concrete approach slab sweeping, cleaning, preparation, tack coating, forming and filling grooves with joint sealing compound, sealing the surface of asphaltic concrete adjacent to curbs, transverse joint forming and filling, the provision for deck drain cover plates and expansion joint filler strips will not be made.

Measurement for payment for the Asphaltic Paving Of Bridge Decks shall be as outlined in Section 330 of the Specifications Book for Hot Mix Asphaltic Concrete.

Measurement for payment of asphaltic paving on waterproofed bridge decks shall be confined to the actual tonnage of hot mix asphaltic concrete actually placed on the bridge deck and concrete approach slabs as directed by the Engineer. No separate payment will be made for liquid asphaltic cement or blending sand .

Measurement for payment for the production, supply, storage, transportation, placing, grading and compaction of selected granular base course material on new construction projects shall be in accordance with Section 315 of the Specifications Book for Selected Granular Base Course.

**922.07 BASIS OF PAYMENT****922.07.01 General**

The item in the Unit Price Table for "Asphaltic Paving of Bridge Decks" shall contain either one of the following two phrases, (a) "**Treated Bridge Decks**" or (b) "**Waterproofed Bridge Decks**" whichever is applicable to the project being tendered.

The basis of payment for the asphaltic paving of bridge decks shall be as outlined in Section 330 of the Specifications Book for Hot Mix Asphaltic Concrete.

**922.07.02 Treated Bridge Decks**

The basis of payment at the contract unit price for the asphaltic paving of bridge decks shall include full compensation for all equipment, labour, materials and plant necessary to prepare, sweep and clean the deck, supply and apply tack coat, pave the bridge deck, concrete approach slabs and approaches on rehabilitation type projects, form and fill grooves with joint sealing compound, sealing the surface of asphaltic concrete adjacent to curbs and transverse joint forming and filling as described above. Also included is the supply and transportation of all blending sand and asphaltic cement from the source to the mixing plant.

For rehabilitation type projects the excavation, removal, transportation and disposal of contaminated granulars, the reshaping and recompacting of suitable existing granulars and the production, supply, storage, transportation, placing, grading and compaction of additional selected granular base course shall be considered incidental to the work.

For new projects the production, supply, storage, transportation, placing, grading and compaction of selected granular base course shall be paid for separately under Section 315 of the Specifications Book for Selected Granular Base Course.

The basis of payment for cutting existing asphalt, removal, transportation and disposal of old asphaltic pavement on rehabilitation type projects shall be made in accordance with terms outlined elsewhere in the Section 919 of the Specifications Book for "Rehabilitation of Concrete Structures".

The covering of deck drains and expansion joints to prevent the entry of hot mix asphaltic concrete, the removal of the cover plates and filler strips, clean up and disposal of waste material shall be considered incidental to the work.

**922.07.03 Waterproofed Bridge Decks**

Payment for the waterproofing of bridge decks and all related work shall be as outlined in Section 914 of the Specifications Book for "Bridge Deck Waterproofing".

The basis of payment at the contract unit price for asphaltic paving of waterproofed bridge decks shall include full compensation for all equipment, labour, materials and plant necessary to prepare, sweep, clean and tack coat the concrete approach slabs, pave the bridge deck and concrete approach slabs. Included is the forming and filling of approach slab grooves with joint sealing compound and sealing the asphaltic surface adjacent to the concrete curbs, form and complete transverse joint filling as described above. Also included in the basis of payment is the supply and transportation of all blending sand and asphaltic cement from the source to the mixing plant.

The basis of payment for the production, supply, storage, transportation, placing, grading and compaction of selected granular base course shall be provided for separately under Section 315 of the Specifications Book for Selected Granular Base Course.

The covering of deck drains and expansion joints to prevent the entry of hot mix asphaltic concrete, the removal of the cover plates and filler strips, clean up and disposal of waste material shall be considered incidental to the work.



**SECTION 923**  
**SUPPLY AND INSTALLATION OF GUIDE RAIL - STRUCTURES**

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**923.02 MATERIALS**

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**923.01 SCOPE**

This specification covers the requirements for the supply and installation of "Guide Rail With Additional Posts", including all posts and hardware at the approach to and exit from a bridge, overpass and underpass type structure as per Form 1282-1 of the Specifications Book.

The supply, installation, measurement for and basis of payment for modified special end shoes is considered in Section 904.02.11, Miscellaneous Materials, of the Specifications Book.

**923.02 MATERIALS**

Materials shall be in accordance with Section 640.03, "Materials", of the Specifications Book except as outlined herein.

The Contractor shall pay particular attention that post bolts be of sufficient length to accommodate the offset block.

Posts shall be 150 mm x 150 mm or 200 mm x 200 mm as outlined herein, whichever is appropriate. Post length shall be at least 2400 mm long.

Standard hazard markers, two (2) each of WE-1 and WE-2, shall be supplied by the Department to the Contractor at no expense. The Contractor is responsible for posts, mounting hardware and the erection of hazard makers as per contract drawings. Posts for mounting the hazard markers shall be a nominal 100 mm x 100 mm, length as required.

**923.03 INSTALLATION**

Installation shall be in accordance with Section 640.03 and Form 1282-1 of the Specifications Book or details on the contract drawings, and as outlined herein. The correct Form to follow for installation will be indicated on the Contract drawings.

The minimum installed length of guide rail at the structure approach is three (3) horizontal plus two (2) sloped sections, and at the structure exit two (2) horizontal lengths plus the terminal section. The guide rail shall be attached to each end block with the modified special end shoes.

Galvanized Standard Buried Ends shall be identified and paid for as separate bid items. Galvanized Standard Buried Ends shall consist of an angle unit and one standard partially buried unit. Standard units shall include straight units and Standard Terminal Ends as may be required.

The below criteria shall apply where guide rail is installed as per Form 1282-1 and where it is a continuation of roadway guide rail. At structure approach and exit, one length of guide rail measuring 3.5

### **Form 923**

mm thickness shall be attached to the modified end shoes. At the structure approach and exit, posts within 7620 of the end block shall be 200 mm x 200 mm except as outlined herein. Offset blocks shall be used on all posts supporting horizontal rail sections. Posts beyond the 7620mm dimension from the end block shall be 150 mm x 150 mm. All posts spacing shall be spaced at 1905mm centre to centre, more or less up to five (5) and two (2) guide rail lengths at the structure approach and exit respectively.

The below criteria shall apply where guide rail is installed as per contract drawings and where it is a continuation of roadway guide rail. At structure approach and exit, one length of guide rail measuring 3.5 mm in thickness shall be attached to the modified end shoes. Within 11527mm structure approach and 7717mm of exit, posts shall be 200 mm x 200 mm except as outlined herein. Offset blocks shall be used on all posts supporting horizontal guide rail sections. Posts beyond the given dimensions shall be 150 mm x 150 mm. All post spacings shall be as indicated on contract drawings. There shall be a minimum of five (5) and two (2) lengths of horizontal guide rail at structure approach and exit respectively.

This specification is not intended to provide for guide rail installed in the permanent traffic opening of overpasses or underpasses.

Standard hazard markers shall be installed in accordance with the standard drawing.

#### **923.04 MEASUREMENT FOR PAYMENT**

Measurement for payment purposes shall be limited to that guide rail contained within five (5) rail lengths at the structure approach and two (2) rail lengths at the exit from a structure excluding modified special end shoes.

Measurement for payment regarding the Supply and Installation of Guide Rail - Structures for the work as described herein and as outlined in Form 1282-1 and/or details on the contract drawings shall be the length of guide rail measured in metres, rounded to one decimal place, measured end to end along the face of the railing and terminal sections regardless of the type and kind of installation excluding the modified special end shoe.

Measurement for payment for the supply and installation of standard hazard markers shall not be made.

#### **923.05 BASIS OF PAYMENT**

Payment at the contract price tendered for Supply and Installation of Guide Rail - Structures, shall be full compensation for all labour, materials, plant and equipment to: excavate post holes, supply and install all posts, anchors, rail sections, rail terminal sections, bolts, nuts, washers, spikes and nails, bend rail sections where required to a uniform radius, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative, install reflectors, clean, pre-treat, and coat steel rail with galvanizing compound where so required, all in accordance with this specification..

The supply and installation of standard hazard markers including all fasteners, attachments and posts shall be considered incidental to "Supply and Installation of Guide Rail - Structures".



**SECTION 924**

**APPLICATION OF CONCRETE SEALER**

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**924.04 MEASUREMENT FOR PAYMENT**

**924.05 BASIS OF PAYMENT**

**924.01 SCOPE**

Contractors are advised that all concrete which is placed after September 1st and before April 30th, and exposed to weather, water and/or de-icing chemicals shall receive at least one (1) application of concrete sealer prior to traffic opening or exposure to salt, whichever occurs first.

This shall apply to all superstructure concrete as defined in 904, "Concrete Structures", of the Specifications Book, Approach Slab Concrete, and those parts of the substructure included herein: (a) front and sides of abutment stem, (b) front, rear and sides of the back wall, (c) top, sides and bottom of the corbel, (d) bearing seat and pedestals, (e) parts of the wing wall concrete which is placed with the curb concrete, (f) pier or column concrete and (g) as directed by the Engineer. If part of a wingwall or abutment surface requires an application of concrete sealer and another part does not, the Contractor shall apply sealer to the additional visible portion thereof.

**924.02 MATERIALS**

The penetrating sealer shall be a clear siloxane solution designed to provide maximum protection of concrete surfaces. Silanes with at least 40% silanes by weight or concentration are considered acceptable.

The durability and abrasion resistance of penetrating sealer shall make it suitable for protecting horizontal and vertical surfaces. Penetrating sealer shall have excellent breath ability, i.e. be permeable to water vapour, and provide protection against chloride-laden water.

The material should not significantly darken or discolour concrete.

It should be suitable for application on new concrete which is 28 days old and existing concrete.

The material and application shall suit the requirements for severe/extreme environmental conditions where frequent exposure to de-icing salts is anticipated.

Penetrating sealer shall exceed the performance criteria of the National Cooperative Highway Research Program (NCHRP) Report # 244 for protection of concrete against the intrusion of chlorides. In accordance with NCHRP Report # 244, the concrete sealer should provide a minimum 75% reduction in weight gain and chloride ion content.

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Penetrating sealer shall comply with ASTM C-672 reflecting a rating of 0, i.e. no scaling after 50 cycles, the highest rating.

The VOC must comply with all federal and provincial regulations.

### **924.03 APPLICATION**

#### **924.03.01 Surface Preparation**

All surfaces to be treated with penetrating sealer must be clean and structurally sound. New concrete and/or restoration work should be allowed to reach full 28 day cure strength prior to application.

#### **924.03.02 Application Procedure**

Sealer shall be applied strictly in accordance with the manufacturer's instructions and guidelines as approved by the Engineer.

Surface cleanliness is critical to final appearance of penetrating sealer treated walls. All oil, grease, form release, parting agents, air pollution deposits and graffiti must be removed from substrate.

Any Dymeric sealant shall be put in place and cured before application of the penetrating sealer. The Dymeric sealant shall be covered during the application of the penetrating sealer.

Alternatively, where sealants or caulks must be installed following application of the concrete sealer, the sealant or caulk must be compatible with the concrete sealer used.

#### **924.03.03 Sealing of Concrete Barriers, Curbs and Pier Columns**

Concrete barriers, curbs and pier columns shall receive one application of concrete sealer. The columns shall be sealed before any backfill is placed against the concrete columns. The sealer shall be applied to all chamfered, textured, flat and cylindrical surfaces.

The Contractor shall overlap all adjoining concrete surfaces with a 50 mm wide application of sealer. Where holes are drilled, cuts are made, or the concrete surface is damaged after the sealer has been applied, these damaged areas shall receive a fresh coat of penetrating sealer. Application of sealer to textured surfaces shall be by means of a pressure spray unless the Contractor can demonstrate a superior method of application. The Contractor shall take special care to ensure all control and contraction joint locations are saturated with sealer and obvious runs or stains do not exist which would be noticeable at a distance of three (3) metres or more.

Measurement for payment purposes shall be the surface area treated as approved by the Engineer in square metres rounded to the nearest one (1) decimal place. For purposes of measurement for payment, textured surfaces shall be measured as flat surfaces. Inclined surfaces shall be measured on the incline. Measurements for overlap will not be made.

### **924.04 MEASUREMENT FOR PAYMENT**

Measurement for payment purposes will not be made.

### **924.05 BASIS OF PAYMENT**

The basis of payment for this work and items directly related thereto shall be considered incidental to the works and associated with concrete work pay items.

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### 925.01 SCOPE

These specifications cover the construction of Inextensible Mechanically Stabilized Earth (MSE) retaining walls and bridge abutments using precast concrete panels as facing elements. All MSE structures shall be selected from a list pre-approved by the Department. The MSE structure shall consist of a non-structural levelling pad, reinforced concrete face panels, inextensible soil reinforcement elements connecting to each facing panel and precast concrete coping caps. Panels shall be cruciform or rectangular shaped, and mechanically pinned to adjacent upper and lower panels. Soil reinforcement shall have sufficient strength, frictional resistance and length as required by the design and as outlined in these specifications. The structure shall have a design life of 100 years.

### 925.02 MATERIALS

All concrete materials shall comply with CAN/CSA-A23.1/CAN/CSA-A23.2.

All reinforcing bars, steel wires and welded wire fabric shall be as per standards specified in the CAN/CSA-S6-06.

All concrete work shall conform to the requirements of Section 904, "Concrete Structures", unless otherwise stated herein.

All materials shall conform to the requirements of CAN/CSA-S6-06, "Canadian Highway Bridge Design Code".

### 925.03 SUBMISSION OF SHOP DRAWINGS AND DESIGN REQUIREMENTS

Prior to work commencing the Contractor shall prepare and submit to the Engineer for approval six (6) copies of detailed shop, erection drawings and design calculations.

Normally four weeks will be required for shop drawings approval.

Shop drawings shall indicate:

- 1) Design to be in accordance with "Limit States" design approach of CAN/CSA-S6-M06 and AASHTO LRFD 2004 Bridge Design Specifications.;
- 2) Limits on backfilling, and compaction requirements, including gradation limits for engineered fill;
- 3) Submitted drawings shall bear signature and seal of a Professional Engineer registered or licenced to practice in Newfoundland and Labrador;
- 4) Accommodation made to prevent buildup of hydrostatic pressure behind the wall;
- 5) Surcharge created by bridge structure and highway live loads if applicable;
- 6) Levelling pad details;
- 7) Type of soil reinforcement and length for each section of the MSE structure;
- 8) Applied unfactored levelling pad and embankment pressures;
- 9) Precast concrete facing panel layout;
- 10) Precast concrete coping and top safety railing;
- 11) Representative typical details.

Wall panels will be laid out and sized so joints appear on a consistent multiple spacing. The Contractor must ensure all joints are visually continuous on the entire MSE wall face. The use of architectural strips may be required to give this appearance where necessary. (Nominal concrete cover to reinforcing to be maintained). Shop drawings will be rejected if the MSE panel joint grid does not give an aesthetically pleasing appearance.

The maximum panel dimension permitted by the Department in a MSE structure will be 2000mm. In addition to the service loads provided by the owner, mechanically stabilized earth structures are to be designed to support standard construction equipment. The use of heavy equipment, such as cranes or off road trucks used for construction, for which the structures are to serve as temporary support, shall be reviewed by MSE wall supplier and the Engineer.

The Contractor shall not proceed with fabrication until final approval of the Shop Drawings.

## **925.04 FABRICATION OF PRECAST CONCRETE PANEL FACING**

### **925.04.01 General Requirements**

The Contractor shall supply concrete panels constructed according to the MSE Supplier's specifications and recommendations, including all necessary hardware for the lifting and aligning of panels. All panels shall be built in accordance with the approved plans and shop drawings.

The fabricator for the concrete face panels must be certified as a precast yard, in accordance with CAN CSA A23.4 "Precast Concrete - Materials and Construction". Proof of certification, as well as a detailed Quality Control Procedure, shall be provided to the Engineer prior to the construction of panels. The Contractor shall submit a copy of test results upon completion of panel fabrication. Concrete shall conform to all relevant portions of Section 904 "Concrete Structures".

### **925.04.02 Concrete Quality**

Concrete shall be normal density and have a minimum compressive strength of 40 MPa at 28 days meeting all requirements for Substructure Concrete as per Section 904, "Concrete Structures". Cement used shall be a blended Portland, fly ash, silica fume cement, Type GUbF/SF. Contractors are advised that the minimum proportion by mass of the total cementing materials for silica fume shall be 6% and a maximum of 8%. Contractors are advised that the maximum proportion by mass of the total cementing materials for fly ash is 25%.

Concrete shall be of sufficient work ability, so the desired finish as specified in 925.04.03 can be achieved.

Precast units shall be considered acceptable for early placement in the wall when 7-day strengths exceed 75% of the 28 day requirements, unless local strength gain experience dictates otherwise.

### **925.04.03 Reinforcement**

Panel reinforcement shall be placed as shown on the approved shop drawings with great care take to ensure specified cover is maintained.

Reinforcement may be either reinforcing bars or welded wire fabric.

### **925.04.04 Forms**

Approved fabricated steel forms are to be used for precast panels. Forms will be set on a rigid foundation. Forms are to be smooth, mortar tight, true to the required lines and grades and of sufficient strength and rigidity to resist springing out of shape or alignment. All precast units shall be manufactured within the following tolerances

- All dimensions within 5 mm, including diagonals measured between opposite corners.
- Surface defects on formed surfaces shall not exceed 2.5 mm.

### **925.04.05 Concrete Finish**

For panels being used as bridge abutments, the colour shall match that of the superstructure. The front face of all panels shall have a smooth grey finish conforming to CAN CSA A23.4 Section 24.2.5 Grade A. Consistency of finish shall be maintained with the use of the same concrete mix and the same type of form oil for the entire project. The rear face of the panels shall be a unformed surface finish, roughly screeded with no open pockets or distortions in excess of 6 mm.

### **925.04.06 Handling, Storage and Shipping**

All panels shall be handled, stored, and shipped in such a manner as to eliminate the potential for damage such as chipping, cracks, fractures etc., as well as excessive bending stresses and damage to protruding or otherwise exposed components. Panels, when stacked, shall be supported on firm hardwood blocking located immediately adjacent to the tie strips to avoid bending them.

Panels shall be protected from discolouration and staining of the front face.

### **925.04.07 Rejection**

The Engineer shall be the sole judge of a panel's acceptability before it is placed. Panels shall be subject to rejection because of failure to meet the required specified strength and concrete quality requirements. In addition, any or all of the following defects shall be sufficient cause for rejection:

- Defects that indicate imperfect moulding;
- Defects indicating honeycombed or open texture concrete;
- Any structural crack as defined in Section 32.3.2 of CAN CSA A23.4
- Lifting inserts or connecting hardware improperly set;
- Cracking resulting from lifting and transport operations, and broken or cracked corners;
- Exposed reinforcing steel;
- Dimensions out of tolerance
- Non-uniform appearance;

### **925.05 SOIL REINFORCING SYSTEMS**

#### **925.05.01 General Requirements**

All soil reinforcing systems shall be inextensible and must be pre-approved by the Department.

#### **925.05.02 Inextensible Strip Type Soil Reinforcing Systems**

Where strip type reinforcing systems are used strips shall consist of hot rolled, shop fabricated ribbed structural steels conforming to CSA-G40.21 Grade 400 W or better or ASTM A 572 grade 65 as shown on the shop drawings. Galvanizing shall follow shop fabrication and shall be in accordance with CAN/CSA-G164. Strips shall be cut to length and tolerances as shown on the shop drawings.

Tie strips shall consist of shop fabricated structural steel conforming to ASTM A 36 or CSA-G40.21 Grade 300W and shall be galvanized in accordance with CAN/CSA-G164 after fabrication. Bolt hole alignment, dimensions, and end distances shall be within the tolerances shown on the shop drawings.

All bolted connections shall be made using hot dip galvanized ASTM A 325 bolts and nuts.

Any damage done to the galvanizing prior to installation shall be repaired in an acceptable manner and provide a galvanized coating comparable to that provided by CAN/CSA-G164.

#### **925.05.03 Inextensible Mesh Type Soil Reinforcing Systems**

Where mesh type reinforcing systems are used reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A 82 and shall be welded into the finished mesh fabric in accordance with ASTM A 185. Bars diameters shall be designed as stated in AASHTO LRFD 2004. Galvanization shall be applied after the mesh is fabricated and shall conform to CAN/CSA-G164.

All connection devices and connector bars shall be fabricated from cold drawn steel wire conforming to ASTM A82 and galvanized in accordance CAN/CSA-G164.

Any damage done to the galvanizing prior to installation shall be repaired in an acceptable manner and provide a galvanized coating comparable to that provided by CAN/CSA-G164.

### **925.06 RUBBER BEARING PADS**

Panels, except for the bottom course, shall be supported on rubber bearing pads. Bearing pads, where used, shall be secured into the panel below. The rubber shall be an elastomer with a Shore Hardness of 85 + 5, as measured in accordance with ASTM D-2240.



**925.07 FILTER FABRIC JOINT COVERS**

Filter fabric to be placed over the joints at the back of the panels shall be a non-woven geotextile. Filter fabric shall be attached using an adhesive approved by the Manufacturer. These strips shall have a nominal width of 500mm and be placed over the inside of all joints between precast panels. Strips shall have a minimum overlap of 100mm at all lap locations. The material shall have the following minimum average roll values:

Grab Tensile Strength	530 N	(ASTM D4632)
Mullen Burst	1665 <i>kPa</i>	(ASTM D3786)
ty	0.22 cm/sec	(ASTM D4491)
Resistance	70%	(ASTM D4355)

**925.08 PRECAST CORNER AND/OR COPING ELEMENTS**

Corner and/or coping elements are required on all structures. All coping elements shall be precast unless a cast in place construction has been approved in the tender documents. They shall be cast as shown on the Shop Drawings and in accordance with the specifications for concrete panels. Coping shall provide a continuous smooth appearance with no discontinuities or kinks visible. If they do not meet this criteria coping will be rejected. Concrete mix for face panels shall apply to the precast coping.

**925.09 FRICTIONAL BACKFILL (WITHIN THE MSE EARTH VOLUME) REQUIREMENTS**

It shall be the Contractor's responsibility to do the required testing and provide to the MSE Supplier prior to the design of the structure, exact values of unit mass and angles of friction for the material within the MSE Earth Volume. The angle of internal friction for backfill material shall not be less than 34 degrees as determined by the Standard Direct Shear Test according to ASTM D3080-90. A copy of this report shall be forwarded to the Engineer.

The Contractor will notify the Engineer a minimum of 7 days prior to the commencement of backfilling operations. The Department will carry out compaction tests on backfill material as per specifications provided by the MSE Supplier at no cost to the MSE Supplier or Contractor. The backfill will meet the gradation and all other requirements specified by the MSE Supplier.

Structures which have backfill material with more than 8% passing the .075 mm sieve require zones of well graded, free-draining, non-frost-susceptible fill with less than 8% passing. The zone dimensions are a width of 1500 mm immediately behind the panels and for bridge footings located close to panel facing, a depth of 1500 mm below the underside of the footing.

In addition to any testing done by the Contractor a 20 kg representative sample of the backfill proposed for construction shall be submitted to the Engineer for testing and approval two weeks prior to start of construction. The sample shall meet the geotechnical parameters as specified by the Supplier.

The Contractor shall furnish the Engineer a Certificate of Compliance certifying the backfill material for the MSE wall meets the above stated or referenced requirements and any additional requirements specified by the Engineer. All test results shall accompany the Certificate of Compliance.

Acceptance shall be based on the Certificate of Compliance, accompanying test reports, testing by the Materials Engineering Division, and visual inspection by the Engineer.

**925.10 CONSTRUCTION REQUIREMENTS**

**925.10.01 General Requirements**

The MSE structure shall be constructed in conformity with the lines, grades, details and dimensions as shown on the Contract drawings or established by the Department. Poor conformance with respect to this criteria is subject to rejection.

**925.10.02 Structure Excavation**

All necessary excavation for the MSE structure shall be in accordance with Section 902 of the General Specifications "Excavation for Foundation ". Excavation shall be in close conformity to the lines and grades shown on the Drawings.

**25.10.03 Foundation Preparation**

The structure foundation shall be graded level for a width equal to the length of reinforcing elements plus approximately 500 mm or as shown on the Shop Drawings. Prior to wall construction, the foundation shall be proof rolled and/or compacted to the satisfaction of the Engineer. Any foundation soils found to be unsuitable shall be removed and replaced with Engineered Fill. The foundation conditions shall be approved by the MSE wall designer and the Engineer prior to MSE wall erection.

**925.10.04 Levelling Pad**

Concrete footings shall be formed and poured as per relevant portions of the General Specifications Section 904 "Concrete Structures". Cast-in-place concrete for the unreinforced concrete levelling pad shall have a 28 day design strength of 35 MPa or better and shall be screeded uniformly smooth with a variation of not more than 3 mm and without protrusions.

Elevation differences between steps shall not vary more than 5 mm from those shown on the drawings. Plan dimensions and step locations (if any) shall be in reasonable conformity with the drawings and shall be located such that panels will be positioned reasonably centred on the pad. The levelling pad shall be cured in accordance with CSA 23.1 or as directed by the Engineer.

**925.10.05 Backfill and Soil Reinforcing System Placement**

Backfill placement shall closely follow the erection of each row of panels. At each soil reinforcing level, backfill shall be roughly levelled and compacted before placing and connecting reinforcing elements to the panels. Unless otherwise shown on the Erection Drawings, reinforcing elements shall be placed approximately perpendicular to the face of the wall.

The maximum backfill lift thickness shall not exceed 250 mm (compacted). Backfill shall be compacted to a minimum of 95% Standard Proctor Maximum Dry Density unless otherwise specified by the Engineer or on the drawings. The Contractor shall decrease this lift thickness if necessary to obtain the specified density. The moisture content of the backfill during placement shall be such that temporary pore water pressure buildup during compaction is avoided. A moisture content of about 2% below optimum is recommended. Backfill compaction shall be accomplished without disturbance or distortion of reinforcing system and panels. Compaction in a zone 1.5 metres wide adjacent to the wall facing shall be achieved using light mechanical tampers. For bridge abutments, backfill beneath the bridge seat shall be compacted to 100% Standard Proctor Maximum Dry Density within the zone outlined on the Shop Drawings.

**925.10.06 Panel Erection**

The Contractor shall make use of the guidance services provided by the supplier and provide adequate notice to the supplier of the intended date for start of erection.

Precast concrete panels shall be placed with the aid of a light crane. Panels are lifted by means of inserts (minimum of two per panel) set into the upper edge of the panels. Panels shall be placed level in successive lifts, staggered as shown on the drawings, as backfill placement proceeds. A minimum of two alignment pins per panel will be required to keep the panels in line.

During backfilling operations each panel will rotate away from the fill about its lower edge as fill is placed to the top of the panel. The rotation results from initial stressing of the reinforcing elements. The amount of rotation typically ranges from 2 to 25 mm in 1200 mm depending on the type of backfill used, its moisture content and the compaction energy applied. To allow for this rotation each panel shall be inclined inward (towards the fill) by an amount equivalent to the outward rotation observed for the previously placed and completely backfilled panels.

## Form 925

The first panels erected shall be inclined inward by 5 mm in 1200 mm, or as directed by the suppliers representative, as a first assumption. All subsequently placed panels shall be inclined inward based on the continuously monitored actual rotation. External bracing of the first level of panels will be required and shall be maintained during placement of the initial 1500 mm of fill.

Vertical (or sloped, as shown on the drawings) tolerances and horizontal alignment tolerance shall not exceed 18 mm when measured along a 3000 mm long straight edge. The overall vertical (or sloped) tolerance of the wall (measured from top to bottom) shall not exceed 12 mm per 3000 mm of wall height. If Supplier tolerances are not maintained the Contractor shall disassemble and reinstall the structure at no cost to the Department.

The Contractor will arrange for the mechanically stabilized earth company to provide experienced construction staff during commencement of the project. This technical staff will provide instruction both to the Contractor and the Engineer for as long a period as required by the Engineer.

The construction and erection work shall be executed under the continuous supervision and direction of a competent foreman/superintendent approved in writing by the MSE wall supplier. This person must have experience in the construction and erection of MSE wall structures. The contractor shall provide suitable written evidence of tradesmen/supervisor qualifications if required by the Engineer.

### **925.10.07 Drainage Pipe Installation**

Perforated drainage pipe wrapped in filter fabric shall be installed to the lines and grades shown on the drawings and in accordance with the General Specifications or as directed by the Engineer.

### **925.10.08 Traffic Barrier or Coping Placement**

Precast traffic barrier or coping, on top of the concrete face panels, requires a smooth transition concrete/grout filler between the panel top and the underside of the barrier/coping. This concrete/grout filler shall be cured as per Section 3 and installed in accordance with the lines and grades as shown on the Drawings and General Specifications.

Ensure a uniform top of wall alignment. Traffic barrier or coping, placed on top of the concrete face panels, shall have construction/expansion joints to be spaced no greater than 2000 mm on centre or coincident with the panel joints, whichever is less. Coping shall be installed in accordance with the General Specifications and have evenly spaced joints positioned as shown on the drawings.

## **925.11. MEASUREMENT FOR PAYMENT**

The unit of measurement for Mechanically Stabilized Earth (MSE) structures will be the square metre of total wall face area from top of levelling pad to top of panels (excluding levelling pad and coping heights), based on the approved panel areas given in the Shop Drawings.

## **925.12 BASIS FOR PAYMENT**

Payment of the contract price for "Design, Supply and Install Mechanically Stabilized Earth Retaining Walls" shall include full compensation for all labour equipment and materials required to construct the wall in accordance with the plans and specifications. Included will be all costs associated with the wall foundation, levelling pad, concrete panels, bearing pads, soil reinforcing system, frictional backfill, zones of non-frost-susceptible fill, geotextiles and adhesive over joints, perforated drainage pipe and precast coping.

Excavation - Other Material as required by the mechanically stabilized earth retaining wall designer for the installation of the mechanically stabilized earth retaining wall (panels, soil reinforcement, levelling slab, coping and frictional backfill) will be considered incidental to the work. If Excavation of rock is necessary to install the MSE Structure it will be paid for as Excavation for Foundations - Solid Rock. Actual quantity of rock to be removed is to be approved by the Engineer.

If sub-excavation is required beneath the reinforced earth soil mass then it will be paid for as Excavation for Foundations - Other Material.

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Placement of material behind the reinforced soil block will be paid for separately either as "Rock Fill in Place" or "Other Material In Place" in accordance with Section 204, "Grading of Fill".

All work associated with soil testing by the contractor and the preparation of shop drawings, erection drawings, erection procedures, calculations, etc. shall be considered incidental to the work.

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
 Department of Transportation and Works  
 Highway Design Division

## DIVISION 10 NEWFOUNDLAND EQUIPMENT RENTAL SCHEDULE

### FORWARD

Rental rates in this schedule include: depreciation, interest, liability insurance, repairs, maintenance, supplies, fuels, lubricants, overhead and profit.

Rates for equipment sizes not shown will be interpolated.

The rental rates stated in this Schedule are Hourly Rates unless indicated otherwise. These rates do not include the operator's wages.

When equipment is rented on an operated basis, the operator's wages will be added to the rental cost. Operator's wages shall be interpreted to mean the basic wage paid the operator plus 35% burden.

The cost of fuel and lubricants supplied by the Department will be deducted from the rental charge at the commercial rate applying in the area.

Rental rates in this Schedule are maximum hourly rates allowed. When equipment is rented for weekly or monthly periods, the Department reserves the right to negotiate rates lower than the hourly rates shown.

Rentals are to be paid for working time only. Lunch hour is not paid as working time. Down time of less than one hour in one shift will not be deducted.

The rental period commences when the unit leaves the owner's premises and shall end on the date of the actual delivery of the unit at the owner's premises or at any other equidistant point, provided transportation conditions are equal and such delivery is requested by the owner. In the case of water transport, the owner will be required to negotiate a rate less than that shown for the period of transport.

Insurance for the unit or units being rented will be the responsibility of the owner.

Machines that may not be represented in this schedule will be subject to rate calculation by the Department.

All rates for equipment rented in Labrador will be increased by 5.8%. This will recognize the different operating conditions associated with work in Labrador.

METRIC CONVERSION			
net flywheel horsepower	X 0.746	- kilowatts	kw
weight (mass)	X 0.45	- kilograms	kg
cubic yards	X 0.7646	- cubic metres	m <sup>3</sup>
cubic feet	X 0.028	- cubic metres	m <sup>3</sup>
cubic feet per minute (CFM)	X 28.31	- litres/minute	
foot pounds	X 1.355818	- joule	j
feet	X 0.305	- metres	m
inches	X 25.40	- millimetres	mm
ton	X 0.907	- tonne	t
inches	X 2.54	- centimetres	cm
amperes	X NC	- amperes	A
kilowatts (Electric 1,000 watts)	X NC	- kilowatts	kw
gallons - Imperial	X 4.546	- litres	l
NOTE: Model and Specification References are located in the Appendix.			

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## SECTION 1

### AIR EQUIPMENT AND TOOLS

#### 1-1 Compressor (Portable or Self-Propelled)

Rated Litre/Minute	Rated C.F.M.	Rate Per Hour
1700 - 2400	60 - 85	\$ 9.00
2450 - 3550	86 - 125	\$11.00
3600 - 5000	126 - 180	\$14.00
5100 - 7000	181 - 250	\$19.00
7140 - 7900	252 - 280	\$26.50

Rated Litre/Minute	Rated C.F.M.	Rate Per Hour
17000	600	\$45.00
21200	750	\$55.00
24000	850	\$60.00
25400	900	\$63.00

#### 1-2 Pneumatic Tools and Accessories

**Rock Drills** NOTE: (1) Schedule of rates not including steels or bits. Crawler mounted with hammer off:

Bore - Millimetres	Bore - Inches	Rates Per Hour
82.6 - 101.6	3¼" - 4"	\$42.00
108.0 - 127.0	4¼" - 5"	\$50.00

Bore - Millimetres	Bore - Inches	Rates Per Hour
133.4 - 152.4	5¼" - 6"	\$57.00

#### 1-3 Jackhammer

SIZE - Kilograms	SIZE - Pounds	Rate Per Hour
Up to 27 kg	Up to 60 lbs	\$3.75
36 kg	80 lbs.	\$4.24

#### 1-4 Pavement Breakers

SIZE - Kilograms	SIZE - Pounds	Rate Per Hour
14 - 18	30 - 40	\$3.12
23 - 27	50 - 60	\$3.75

SIZE - Kilograms	SIZE - Pounds	Rate Per Hour
32 - 36	70 - 80	\$4.25

#### 1-5 Grinders

	Rate Per Hour
Bit Grinders - Bench Type	\$2.50
- Pedestal Type	\$4.98

	Rate Per Hour
Surface Grinders - 152.4 mm or 6" diameter stone	\$2.00

#### 1-6 Blasting Apparatus

	Millimetres	Inches	Rate Per Hour
50 Shot Blaster	10	0.40	\$0.49
1,000 Shot Blaster	27	1.06	\$1.19

	Millimetres	Inches	Rate Per Hour
Sequential Blaster	142	5.60	\$6.23

#### 1-7 Air Tracks, Crawler Mounted, Compressor, Drill Steel, Bits, Hose and Incidental Hardware Included in Rate

Bore		Rate Per Hour
Millimetres	Inches	
Up to 127.0	Up to 5	\$119.67
Over 127.0 to 165.1	Over 5 to 6.5	\$123.10

Bore		Rate Per Hour
Millimetres	Inches	
Over 165.1 to 177.8	Over 6.5 to 7	\$130.18
Over 177.8 to 203..2	Over 7 to 8	\$141.87

#### 1-8 Hydraulic Track Drill, Power Drill Steel and Bit Extra

Millimetres	Rate Per Hour
Up to 127.0 bore	\$120.00

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## SECTION 2

### ASPHALT AND BITUMINOUS EQUIPMENT

#### 2-1 Spreaders and Finishers - Crawler or Rubber Tire Mounted

Metres	Feet	Rate Per Hour
Small - basic 2.44m	Small - basic 8'	\$65.00
Medium - 3.05m - 4.27m	Medium - 10' - 14'	\$112.00

Metres	Feet	Rate Per Hour
Large - 3.05m - 4.88m	Large - 10' - 16'	\$150.00
With electric screed control		\$15.84

#### 2-2 Distributors - Truck mounted complete with power unit and spray bars

Litres	Imperial Gallons	Rate Per Hour
6819	1500	\$60.00
9092	2000	\$65.00
11365	2500	\$72.00

Litres	Imperial Gallons	Rate Per Hour
13638	3000	\$75.00
18184	4000	\$78.00

#### 2-3 Pavement Profilers/ Cold Planers (Including replacement teeth)

Cut Width - Centimetres	Cut Width - Inches	Rate Per Hour
Under 30	Under 12	\$120.00
30-45	12-18	\$150.00
76	30	\$238.50

Cut Width - Centimetres	Cut Width - Inches	Rate Per Hour
137	54	\$350.00
168	66	\$428.50

#### 2-4 Asphalt Recyclers

Capacity - tonnes per hour	Rate per Hour
4-9	\$33.30

#### 2-5 Asphalt Pulverizers - Reclaimers

Rated HP	Rate per Hour
335-350	\$170.00
435	\$200.00
500-590	\$250.00

## SECTION 3

### COMPACTION EQUIPMENT

#### 3-1 Rammer Type

Strokes/Minute	Mass Kilograms	Mass Pounds	Rate Per Hour
300 - 800	Up to 67.5	Up to 150	\$8.20
300 - 800	68 - 112.5	151 - 250	\$9.35

Strokes/Minute	Mass Kilograms	Mass Pounds	Rate Per Hour
300 - 800	113 - Over	251 - Over	\$9.80

#### 3-2 Vibratory Plate Type - Manually Guided

Mass (kilograms)	Plate Width (millimetres)	Mass (pounds)	Plate Width (inches)	Rate Per Hour
Up to 126	Up to 610	Up to 280	Up to 24"	\$8.00
126.5 - 225	457 - 914	281 - 500	18" - 36"	\$11.00
225.5 - 360	508 - 813	501 - 800	20" - 32"	\$12.50
360.5 & over	508 - 914	801 - over	20" - 36"	\$15.25



## FORM 1000

### 3-3 Vibratory Rollers - Manually Guided

Drum Length - Centimetres	Drum Length - inches	Rate Per Hour
71.1cm - 76.2cm single drum	28" - 30" single drum	\$8.00
38.1cm - 55.9cm tandem drum	15" - 22" tandem drum	\$9.50
61.0cm - 66.0cm tandem drum	24" - 26" tandem drum	\$11.50

Drum Length - Centimetres	Drum Length - inches	Rate Per Hour
71.1cm - 76.2cm tandem drum	28" - 30" tandem drum	\$13.75
81.3cm - 91.4cm tandem drum	32" - 36" tandem drum	\$19.50

### 3-4 Self-Propelled - Tandem Vibrating, Smooth Drums

Centimetres	Kilograms	Inches	Pounds	Rate Per Hour
Up to 106.7	Up to 3175	Up to 42	Up to 7000	\$19.50
109.0 - 139.7	3629 - 5670	43 - 55	8000 - 12500	\$58.00
142.0 - 185.0	6804 - 10433	56 - 73	15000 - 23000	\$76.00
188.0 - 216.0	Over 10886	74 - 85	Over 24000	\$93.40

### 3-5 Self-Propelled - Single Drum, Smooth, Single Drive

Centimetres	Kilograms	Inches	Pounds	Rate Per Hour
101.6 - 127	2722 - 3269	40 - 50	6000 - 8000	\$43.25
129.5 - 152	3856 - 5443	51 - 60	8500 - 12000	\$58.70
154.9 - 215	5670 - 9072	61 - 85	12500 - 20000	\$70.70
218.4 - 266	9526 - 13608	86 - 105	21000 - 30000	\$77.70

### 3-6 Self-Propelled - Multiple Drum, Smooth, for Asphalt or Soils

Centimetres	Kilograms	Inches	Pounds	Rate Per Hour
109.0 - 203	3628 - 5440	43 - 55	8000 - 12000	\$54.00
152.4 -	5443 - 7258	60 - 80	12000 - 16000	\$73.30

### 3-7 Pneumatic Tired

No of Wheels	Operating Mass - Tonne	Operating Mass - Ton	Rate Per Hour
9 wheel	Up to 8.7	Up to 10	\$33.00
9 wheel	8.7 - 13	10 - 15	\$40.00
7 - 9 wheel	14 - 22	16 - 25	\$52.00

No of Wheels	Operating Mass - Tonne	Operating Mass - Ton	Rate Per Hour
7 - 9 wheel	23 - 27	26 - 30	\$57.00
7 wheel	28 - 32	31 - 35	\$60.00

### 3-8 Steel Wheel - Tandem Smooth Drums, for Asphalt, 2 Axles

Working Mass - Tonne	Working Mass - Ton	Rate Per Hour
2.7 - 4.5	3.1 - 5	\$30.20
4.6 - 7.2	5.1 - 8	\$36.90

Working Mass - Tonne	Working Mass - Ton	Rate Per Hour
7.3 - 10.8	8.1 - 12	\$42.90
10.9 - 14.5	12.1 - 16	\$48.00

### 3-9 Self-Propelled, Vibratory, Single Drum, Smooth Drum, Drum Drive

Centimetres	Kilograms	Inches	Pounds	Rates Per Hour
154.9 - 177.8	4990 - 6804	61 - 70	11000 - 15000	\$58.50
180.5 - 215.9	6350 - 9752	71 - 85	14000 - 21500	\$71.30
180.5 - 215.9	9752 - 11340	71 - 85	21500 - 25000	\$83.50

# FORM 1000

## SECTION 4

### CONCRETE PLACING EQUIPMENT

#### 4-1 Concrete Saws - Self-Propelled - Single Blade

Kilowatts	Horsepower	Rate Per Hour
13	18	\$11.50
22	30	\$14.80

Kilowatts	Horsepower	Rate Per Hour
28	37	\$15.55
45	60	\$20.71

#### 4-2 Curb Machines

	Rate Per Hour
Slip form Curb and Gutter Machine - Fully Automatic	\$100.00

#### 4-3 Concrete Vibrators

	Rate Per Hour
Electric	\$4.40
Gas	\$4.30
Buggy Engine	\$7.25

#### 4-4 Concrete Mixers

Capacity – cubic foot	Rate per Hour
3.5	\$5.10
6	\$8.50
11	\$12.00
16	\$13.50

## SECTION 5

### CRANES & PILE DRIVING EQUIPMENT

#### 5-1 Mobile or Self-Propelled - Hydraulic

Tonne	Ton	Rate Per Hour
4.5 - 7.3	5 - 8	\$61.00
9.07 - 13.6	10 - 15	\$79.00
15.5 - 16.3	16 - 18	\$95.00
18.1 - 27.2	20 - 30	\$123.00

Tonne	Ton	Rate Per Hour
36.3 - 40.8	40 - 45	\$140.00
45.3 - 49.9	50 - 55	\$165.00
54.4 - 58.9	60 - 65	\$200.00

#### 5-2 Truck Mounted - Cable

Tonne	Ton	Rate Per Hour
9.07 - 13.6	10 - 15	\$76.00
14.5 - 18.1	16 - 20	\$105.00
19.1 - 27.2	21 - 30	\$125.00
28.1 - 36.3	31 - 40	\$145.00

Tonne	Ton	Rate Per Hour
37.2 - 45.4	41 - 50	\$175.00
46.3 - 59.0	51 - 65	\$230.00
59.9 - 72.6	66 - 80	\$265.00

#### 5-3 Crawler Mounted - Cable

Tonne	Ton	Rate Per Hour
10.9 - 13.6	12 - 15	\$75.00
14.5 - 22.7	16 - 25	\$95.00
23.6 - 27.2	26 - 30	\$120.00
18.1 - 27.2	31 - 40	\$145.00
37.2 - 45.4	41 - 50	\$165.00
46.3 - 54.4	51 - 60	\$200.00

Tonne	Ton	Rate Per Hour
55.3 - 63.5	61 - 70	\$220.00
64.4 - 72.6	71 - 80	\$240.00
73.5 - 86.2	81 - 95	\$270.00
87.1 - 90.7	96 - 100	\$280.00
91.6 - 127.0	101 - 140	\$320.00
127.9 - 136.1	141 - 150	\$345.00

## FORM 1000

### 5-4 Boom Trucks - Hydraulic

Tonnes	Rate per Hour
< 8.0	\$35.00
8.0 to 11.99	\$57.00
12.0 to 17.99	\$67.00

Tonnes	Rate per Hour
18.0 to 23.99	\$92.00
24.0 and over	\$119.00

### 5-5 Pile Driving Equipment – Diesel Hammer – Open Head

Ft-lbs force	Rate per Hour
9000 -16 000	\$30.00
17 000 - 19 000	\$36.00
22 000 – 26 000	\$38.00
27 000 – 30 000	\$50.00

Ft-lbs force	Rate per Hour
31 000 – 39 000	\$60.00
40 000 – 59 000	\$80.00
60 000 – 82 999	\$100.00
84 000 – 100 000	\$125.00

### 5-6 Pile Driving Equipment – Diesel Hammer – Closed Head

Ft-lbs force	Rate per Hour
8000 -10 000	\$27.00
15 000 – 21 000	\$40.00
26 000 – 31 000	\$45.00

Ft-lbs force	Rate per Hour
32 000 – 40 000	\$65.00
45 000 – 50 000	\$80.00

### 5-7 Pile Driving Equipment – Driver/Extractor, Vibratory Centrifugal, Including Power Excluding Crane

Driving Force, KN	Rate per Hour
245	\$57.15
392	\$89.85
637	\$118.30

Driving Force, KN	Rate per Hour
980	\$171.75
1471	\$210.65

## SECTION 6

### GENERATORS

#### 6-1 Engine Driven - Gasoline or Diesel - Air or Water Cooled

Description	Rate Per Hour
Less than 3 KW	\$4.25
3kW to 3.99kW	\$5.25
4kW to 4.99kW	\$6.25
5kW to 5.99kW	\$7.25
6kW to 6.99kW	\$8.15
7kW to 9.99 kW	\$10.15

Description	Rate Per Hour
10kW to 14.99kW	\$11.80
15kW to 24.99kW	\$13.75
25kW to 34.99kW	\$16.00
35kW to 39.99kW	\$18.45
40kW to 49.99kW	\$22.15
50kW to 129.99kW	\$24.30

Description	Rate Per Hour
130kW to 149.99kW	\$37.20
150kW to 174.99kW	\$44.50
175kW and Greater	\$61.75

## SECTION 7

### FLOATS

#### 7-1 Floats with Tractor - Rigid Gooseneck

Tonnes	Tons	Rate Per Hour
14.5-18.1 tonnes single axle trailer	16-25 tons single axle trailer	\$55.85
23.6-31.7 tonnes tandem axle trailer	26-35 tons tandem axle trailer	\$79.20
32.7-40.8 tonnes tandem axle trailer	36-45 tons tandem axle trailer	\$93.00
41.7-49.9 tonnes tandem axle trailer	46-55 tons tandem axle trailer and up	\$105.21

# FORM 1000

## 7-2 Detachable Gooseneck

Tonnes	Rate Per Hour
Up to - 36 tonnes	\$93.00
42 - 50 tonnes	\$109.00

Tonnes	Rate Per Hour
54 tonnes and up	\$115.00

## SECTION 8 EXCAVATORS

### 8-1 Hydraulically Operated, Rubber Tired, Four Wheel Drive, Capacity Heaped

Cubic Metres	Cubic Yards	Rate Per Hour
0.38 - 0.56	1/2 - 5/8	\$79.60
0.57 - 0.67	3/4 - 7/8	\$91.90

### 8-2 Hydraulically Operated, Crawler Mounted, Capacity Heaped

Cubic Metres	Cubic Yards	Rate Per Hour
.38 - .56	1/2 - 5/8	\$72.35
.57 - .75	3/4 - 7/8	\$85.80
.76 - 1.13	1 - 1 1/4	\$100.50
1.14 - 1.52	1 1/2 - 1 7/8	\$133.10
1.53 - 1.89	2 - 2 1/4	\$163.80

Cubic Metres	Cubic Yards	Rate Per Hour
1.90 - 2.28	2 1/2 - 2 7/8	\$217.00
2.29 - 3.05	3 - 3 7/8	\$274.00
3.06 - 3.81	4 - 4 7/8	\$337.00
3.82 -	5 -	\$367.00

Add 15% for Long Reach & Super Long Reach Boom applications when authorized (rated digging depth over 11.5 meters)

### 8-3 Telescopic Boom Excavators, Truck Mounted, Capacity Heaped

Cubic Metres	Cubic Yards	Rate Per Hour
to .38	to 1/2	\$64.00
.38 - .44	1/2 - 5/8	\$95.00
.44 - .57	5/8 - 3/4	\$115.00

Cubic Metres	Cubic Yards	Rate Per Hour
.57 - .67	3/4 - 7/8	\$130.00
.67 - .76	7/8 - 1	\$145.00
.76 - 1.15	1 - 1.5	\$160.00

### 8-4 Hydraulic Excavator Attachments

#### Hydraulic Breakers

Impact Energy (ft-lb)		Rate Per Hour
Joules	Foot Pounds	
205 - 675	150 - 499	\$15.72
676 - 1355	500 - 999	\$20.63
1356 - 2710	1000 - 1999	\$58.14
2711 - 4065	2000 - 2999	\$80.05
4066 - 5422	3000 - 3999	\$93.87

Impact Energy (ft-lb)		Rate Per Hour
Joules	Foot Pounds	
5423 - 6778	4000 - 4999	\$95.97
6779 - 8134	5000 - 5999	\$117.97
8135 - 9490	6000 - 6999	\$129.44
>9490	>7000	\$140.44

#### Hydraulic Brush Cutters

Cutting Swath		Rate Per Hour
Millimetres	Inches	
1321	54	\$21.35
1676	66	\$33.81

#### Hydraulic Concrete Crushers/Shears

Crushing Force in Tonnes	Rate Per Hour
15 - 30	\$26.24
31 - 50	\$55.34
51 - 100	\$86.11

Crushing Force in Tonnes	Rate Per Hour
101 - 150	\$90.75
151 - 200	\$109.31

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### Hydraulic Tamper

Maximum Impulse Force - Kilograms	Rate per Hour
1000 - 2500	\$8.41
2501 - 5000	11.14
5001 - 7500	\$19.56

Maximum Impulse Force - Kilograms	Rate per Hour
7501 - 10000	\$24.26
10001 - 12500	\$29.04

### 8-4 Mini Excavators - Tracked

Operating Weight (kg)	Rate per Hour
Up to 1999	\$26.15
2000 to 2999	\$36.44

Operating Weight (kg)	Rate per Hour
3000 to 3999	\$46.25
4000 and Over	\$54.00

## SECTION 9 MOTOR GRADERS

### 9-1 Rigid Frame

Net Engine HP	Rate per Hour
70 to 79	\$42.15
80 - 99	\$47.37
100 - 125	\$63.00
126 - 150	\$66.00
151 - 180	\$78.34

Net Engine HP	Rate per Hour
181 - 210	\$87.66
211 - 245	\$90.00
246 - 269	\$93.67
270 and Up	\$100.63

### 9-2 Articulated

Net Engine HP	Rate per Hour
Up to 59	\$50.00
60 - 79	\$55.25
80 - 99	\$57.00
100 - 125	\$67.75

Net Engine HP	Rate per Hour
126 - 150	\$76.25
151 - 180	\$84.50
181 - 210	\$90.75
211 - 245	\$101.25

Net Engine HP	Rate per Hour
246 - 269	\$118.00
270 and Up	\$170.75

### 9-3 With Scarifier

Kilograms	Rate per Hour
Up to 10999	\$4.53
11 000 - 12 999	\$7.50

Kilograms	Rate per Hour
13 000 - 18999	\$14.50
19 000 and Over	\$20.50

With Vee Plow Add \$5.60 Per Hour - With Wing Add \$4.40 Per Hour

## SECTION 10

### RUBBER TIRED FRONT END LOADER (FOUR WHEEL DRIVE)

#### 10-1 Minimum S.A.E. Operating Weight Rating

Minimum Operating Weight kgs	S.A.E. Bucket Sizes (m <sup>3</sup> )	Rate Per Hour
Less than 6570	Up to 1.14	\$48.25
6570 to 8069	1.15 - 1.52	\$52.25
8070 to 9519	1.53 - 1.90	\$54.75
9520 to 10879	1.91 - 2.28	\$66.75
10880 to 13483	2.29 - 2.67	\$86.75
13484 to 14959	2.68 - 3.05	\$90.00

Minimum Operating Weight kgs	S.A.E. Bucket Sizes (m <sup>3</sup> )	Rate Per Hour
14960 to 18589	3.06 - 3.43	\$103.80
18590 to 23119	3.44 - 3.81	\$117.15
23120 to 24929	3.82 - 4.19	\$137.35
24930 to 26290	4.20 - 4.58	\$159.71
More than 26290	4.59 -	\$184.95

**Attachments** - wing add \$4.40 per hour

NOTE: "Operating weights will be the final authority on rates to be charged. Additional weight caused by the usage of any form of counter weight devices will not change the rate classification."

# FORM 1000

## SECTION 11 CRAWLER TYPE LOADERS

### 11-1 Crawler Type Loaders Minimum S.A.E. Operating Weight Rating

Kilograms	Pounds	Rate Per Hour
4536 - 6123	10000 - 13500	\$39.83
7484	16500	\$48.88
9526	21000	\$55.78

Kilograms	Pounds	Rate Per Hour
13608	30000	\$75.15
16782	37000	\$84.77
19505	43000	\$107.89

## SECTION 12 FRONT END LOADER / BACKHOE COMBINATION

### 12-1 Rubber Tired

Kilowatts	Horsepower	Rate Per Hour
23 - 33	31 - 44	\$33.57
34 - 48	45 - 65	\$39.86
49 - 63	66 - 85	\$53.70

Kilowatts	Horsepower	Rate Per Hour
64 - 82	86 - 110	\$70.95
83 - 112	111 - 150	\$100.15

If backhoe bucket is not required, reduce appropriate loader backhoe rate by 33 1/3%.

### 12-2 Skid Steer Loaders Rubber Tired

Rated Operating Capacity	Horsepower	Rate Per Hour
Up to 320 kg	Up to 44	\$23.00
321 - 650 kg	49 - 52	\$25.00
651 - 850 kg	55 - 65	\$27.00

Kilowatts	Horsepower	Rate Per Hour
851 - 1100 kg	57 - 73	\$29.00
1101 - 1400 kg	82 - 85	\$34.35
1401 kg and up	90 - 94	\$41.20

## SECTION 13 PUMPS

### 13-1 Centrifugal

Including 6.1m - 20' Suction Hose, 7.6m - 25' Discharge Hose

Millimetres	Inches	Rate Per Hour
50.8mm - gasoline	2" - gasoline	\$ 3.60
76.2mm - gasoline	3" - gasoline	\$5.15
101.6mm - gasoline	4" - gasoline	\$8.70
152.4mm - gasoline	6" - gasoline	\$15.30
203.2mm - gasoline	8" - gasoline	\$19.75

Millimetres	Inches	Rate Per Hour
76.2mm - diesel	3" - diesel	\$5.15
101.6mm - diesel	4" - diesel	\$9.90
152.4mm - diesel	6" - diesel	\$17.00
203.2mm - diesel	8" - diesel	\$21.05
254.0mm - diesel	10" - diesel	\$25.85

### 13-2 Electric Submersible Including cable and 7.6 m - 25' discharge hose

Millimetres	Inches	Rate Per Hour
50.8 mm	2"	\$3.25
76.2 mm	3"	\$5.70
101.6 mm	4"	\$10.40

Millimetres	Inches	Rate Per Hour
152.4 mm	6"	\$14.65
203.2 mm	8"	\$25.90
254.0 mm	10"	\$29.40

### 13-3 Diaphragm - Gasoline portable including 6.1m - 20' suction, 7.6 - 25' discharge hose

Millimetres	Inches	Rate Per Hour
50.8mm	2"	\$4.38
76.2mm	3"	\$5.62

Millimetres	Inches	Rate Per Hour
101.6mm	4"	\$7.60

# FORM 1000

## 13-4 Pump Discharge Hoses - for each metre in excess of 7.6m

Millimetres	Inches	Rate Per Hour		Millimetres	Inches	Rate Per Hour
50.8mm	2"	\$0.02		152.4mm	6"	\$0.08
76.2mm	3"	\$0.03		203.2mm	8"	\$0.13
101.6mm	4"	\$0.04		254.0mm	10"	\$0.21

## 13-5 Test/Fire Pump - Gasoline with attachments

Millimetres	Inches	Rate Per Hour
50.8mm	2"	\$6.77

## SECTION 14 SNOW CLEARING EQUIPMENT

### 14-1 Snowblowers, Loader Mounted

NOTE:

- Hourly rate does not include Carrier

Model	Rate Per Hour
Vohl DV4000	\$131.77
SMI 3200	\$91.00
SnoGo MP-3D	\$91.00
RPM Tech RPM-227	\$131.77

### 14-2, Plow Trucks

NOTE:

- Plow trucks are to be complete with a front blade, side wing and a spreader capable of dispensing ice control materials
- Rate does not include operator

Model	Rate per Hour
Single Axle	\$85.00
Tandem Axle	\$90.00

## SECTION 15 TRACTOR - DOZERS

### 15-1

NOTE:

- Tractor-Dozers that have been discontinued or put out of production for 15 years are deleted from the current reference lists.
- Any crawler Tractor-Dozer not included in these lists will be rated by using a comparable Tractor-Dozer chosen by the Department.
- The owner shall supply the Department with proof of net kilowatt or net horsepower capacities.
- Power shift machines are rated by net engine kilowatt or net engine horsepower.

#### Rates for Tractor, Crawler - Complete with Blade

Kilowatt	Horsepower	Rate Per Hour
30 - 41	40 - 55	\$32.83
42 - 52	56 - 70	\$45.40
53 - 60	71 - 80	\$50.71
61 - 75	81 - 100	\$58.67
76 - 101	101 - 135	\$75.37

Kilowatt	Horsepower	Rate Per Hour
102 - 131	136 - 175	\$106.39
132 - 168	176 - 225	\$133.29
169 - 254	226 - 340	\$177.10
255 - 328	341 - 440	\$288.50

#### Hydraulic Ripper - Rear Mounted

Rating	Rate Per Hour
up to 135 Hp	\$14.10
136 to 175 Hp	\$18.90
176 to 225 Hp	\$24.35

Rating	Rate Per Hour
226 to 340 Hp	\$30.40
341 to 440 Hp	\$43.10

# FORM 1000

## SECTION 16 TRUCKS

### 16-1 Pickup Trucks - capacity shown is Gross Vehicle Mass Two Wheel Drive

Kilograms	Pounds	Rate Per Hour
2268 - 2812	5000 - 6200	\$16.58
2812 - 3810	6200 - 8400	\$17.88

Four Wheel Drive - Add \$0.45 per hour

Kilograms	Pounds	Rate Per Hour
3855 - 4175	8500 - 9200	\$18.18
4200 - 4536	9300 - 10000	\$18.56

### 16-2 OFF HIGHWAY TRUCKS

- diesel powered, rear dump, full cab  
- capacity shown is "Rated Payload Capacity"

Tonne	Ton	Rate Per Hour
19.0 - 22.7	21 - 25	\$113.86
23.6 - 27.2	26 - 30	\$142.33

Tonne	Ton	Rate Per Hour
28.1 - 31.8	31 - 35	\$170.78
32.7 - 40.8	36 - 45	\$196.71

### 16-3 ARTICULATED ROCK TRUCKS

- diesel powered, rear dump, full cab  
- capacity shown is "Rated Payload Capacity"

Tonne	Ton	Rate Per Hour
19.0 - 22.7	21 - 25	\$142.33
23.6 - 27.2	26 - 30	\$170.78

Tonne	Ton	Rate Per Hour
28.1 - 31.8	31 - 35	\$196.71
32.7 - 40.8	36 - 45	\$216.38

### 16-4 Water Trucks

Hourly truck rates will apply according to manufacturer's GVM rating plus the following: Tank, Water Pump and Spray Bar.

Tank Capacity - Litre	Tank Capacity - Gallons	Rate Per Hour
up to 4541	up to 999	\$30.61
4546 - 6814	1000 - 1499	\$32.78

Tank Capacity - Litre	Tank Capacity - Gallons	Rate Per Hour
6819 - 9087	1500 - 1999	\$36.45

### 16-5 Paint Strippers

Tank Capacity - Litre	Tank Capacity Gallons	Rate Per Hour
45 - 63 litre hand or self-propelled	10 - 14 gal.	\$30.83
67.5 - 81 litre self-propelled	15 - 18 gal.	\$53.94

### 16-6 Truck Mounted Strippers

Rating	Rate Per Hour
28,000 lb to 34,000 lb G V W R	\$120.00

### 16-7 Dump Trucks

Vehicle	Rate Per Hour (Operator Included)
Single Axle Vehicle	\$55.00
Tandem Axle Vehicle	\$70.00
Tandem - Tandem Vehicle	\$83.00

Vehicle	Rate Per Hour (Operator Included)
Tractor Dump Trailer ( including Belly Dump)	\$105.00
Tractor Only	\$75.00

### 16-8 Dump Truck / Tag Along Combinations

Equipment	Rate Per Hour (Operator Included)
Tandem Axle Dump Truck & Single Axle Tag-along	\$82.00
Tandem Axle Dump Truck & Tandem Axle Tag-along	\$94.00

Equipment	Rate Per Hour (Operator Included)
Tandem Axle Dump Truck & Tri-axle Tag-along	\$101.00
Tandem Axle Dump Truck & Hydroseeder	\$92.00



# FORM 1000

## 16-9 Stone Slingers

Equipment	Rate Per Hour
Stone Slinger	\$56.86

## 16-10 Stake Body Trucks

Manufacturers GVW - kilograms	Rate Per Hour
Up to 6803	\$21.60
6804 to 8844	\$31.13
8845 to 13607	\$32.50

Manufacturers GVW - kilograms	Rate Per Hour
13608 to 20411	\$35.05
Over 20412	\$40.25

Attachments Hydraulic boom up to 9t add \$15.00  
 Hydraulic boom over 9t add \$22.00

## SECTION 17

### WELDING EQUIPMENT

#### 17-1 Arc Welder

Portable Engine Driven (Diesel or Gasoline). Rods Extra.

Amperes	Rate Per Hour
100 - 200	\$5.62
200 - 300	\$7.38

Amperes	Rate Per Hour
260 - 500	\$11.75

#### 17-2 Torch including Acetylene and Oxygen (rods extra if required)

	Rate Per Day
Torch	\$21.66

## SECTION 18

### MISCELLANEOUS EQUIPMENT

#### 18-1 Air Benders and Cutters

Benders

Description	Rate Per Hour
Large Hand Operated	\$1.23
Power Operated	\$9.61

Cutters

Description	Rate Per Hour
Hand Operated	\$1.23
Power Operated	\$8.20

#### 18-2 Boilers - Oil fired, skid mounted

Kilowatts	Horsepower	Rate Per Hour
15	20	\$4.93
22	30	\$5.92
37	50	\$8.20

Kilowatts	Horsepower	Rate Per Hour
75	100	\$11.89
112	150	\$18.74

#### 18-3 Steam Cleaners

Litres	Imperial Gallons	Rate Per Hour
455 - 546	100 - 120	\$3.95
682 - 818	150 - 180	\$5.06

Litres	Imperial Gallons	Rate Per Hour
1023 - 1137	225 - 250	\$10.15

# FORM 1000

## 18-4 Portable Scales

Tonne	Metres	Ton	Feet	Rate Per Hour
22.7 - 27.2	7.6m - 2.7m	25 - 30	25' x 9' deck	\$12.45
27.2 - 36.3	9.1m - 3.1m	30 - 40	30' x 10' deck	\$14.56

Tonne	Metres	Ton	Feet	Rate Per Hour
36.3 - 45.4	12.2m - 3.1m	40 - 50	40' x 10' deck	\$16.46

## 18-5 Semi-portable Scales

Tonne	Metres	Rates Per Hour
22.7 - 27.1	7.6m x 2.7m	\$8.25
27.2 - 36.3	9.1m x 3.1m	\$10.02
36.4 - 45.4	12.2m x 3.1m	\$12.87

Tonne	Metres	Rates Per Hour
45.5 - 54.4	13.7m x 3.1m	\$16.34
54.5 and Greater	15.2m x 3.7m	\$17.74

## 18-6 Melting Kettle (includes propane)

	Rate Per Hour
Trailer Mounted 750 - 825 litres	\$24.66
Level and Equipment	\$2.71

## 18-7 Concrete Routers

	Rate Per Hour
Gas Powered 4.5 W	\$11.10
Gas Powered 18.5 W	\$22.20

## 18-8 Gas Powered Jackhammers

	Rate Per Hour
Gas Powered Jackhammers	\$1.77

## 18-9 Survey Equipment

	Rate Per Hour		Rate Per Hour
Sewer Lazer	\$4.49	Level and Equipment	\$2.50
Theodolite and Equipment	\$2.69	Total Station and Equipment	\$3.25

## 18-10 Tapping Gear

	Rate Per Hour
Up to 2"	\$4.58

## 18-11 Trench Box

	Rate Per Hour
Standard (4' x 8' x 16')	\$3.47

## 18-12 Butt Fusion Machine

	Rate Per Hour
Up to 14" Gen set N/I	\$8.67

## 18-13 Chain Saw

	Rate Per Day
All Sizes	\$30.00

## FORM 1000

### 18-14 Sweepers - Towed or Attachment

Description	Broom Width	Rate Per Hour
Towed - Traction Type	5 - 6 ft (152 - 183 cm)	\$9.75
	7 - 8 ft (213 - 244 cm)	\$11.05
Towed - Separate Engine	5 - 6ft (152 - 183 cm)	\$11.05
	7 - 8 ft (213 - 244 cm)	\$13.00
Attachment - Hydraulic Driven	5 - 6 ft (152 - 183 cm)	\$10.40
	7 - 8 ft (213 - 244 cm)	\$11.70
Attachment - PTO Driven	5 - 6 ft (152 - 183 cm)	\$9.75
	7 - 8 ft (213 - 244 cm)	\$11.05

### 18-15 Sweepers - Self Propelled

Description	Capacity	Rate Per Hour
Self Loading	0.8m <sup>3</sup> (1yd3)	\$37.91
	1.5m <sup>3</sup> (2yd3)	\$42.78
	2.5m <sup>3</sup> (3yd3)	\$48.46
	3.1m <sup>3</sup> (4yd3)	\$55.50
	3.8m <sup>3</sup> (5yd3)	\$67.15

### 18-16 Boats

Length	Rate Per Hour
Up to 4.57 m (15 foot)	\$3.63
4.88 m (16') to 5.48 m (18')	\$4.62
5.79 (19') to 6.40 (21')	\$5.44

Manufacturers GVW - kilograms	Rate Per Hour
6.71 m (22') to 7.32 m (24')	\$6.31
7.62 m (25') to 8.23 m (27')	\$6.96
8.53 m (28') and Over	\$7.40

Includes life jackets per each occupant, anchor and safety apparatus per Coast Guard requirements

### 18-17 Outboard Boat Motor

Horsepower	Rate Per Hour
Up to 10	\$4.51
11 to 15	\$5.12
16 to 25	\$ 5.95
26 to 40	\$6.69

Manufacturers GVW - kilograms	Rate Per Hour
41 to 50	\$12.20
51 to 70	\$12.88
71 to 100	\$14.00
101 to 130	\$15.40

Includes all special fuels and lubricants

## TRACTORS - BULLDOZERS - CRAWLERS

POWER RANGE Kw (Hp)	MAKE	MODEL	NET FLYWHEEL ENGINE POWER Kw (Hp)
30-41 (40-55)	KOMATSU	D20P-6	30 (40)
	KOMATSU	D20A-6	30 (40)
	KOMATSU	D20PL-6	30 (40)
	KOMATSU	D21A-6	30 (40)
	KOMATSU	D21P-6	30 (40)

POWER RANGE Kw (Hp)	MAKE	MODEL	NET FLYWHEEL ENGINE POWER Kw (Hp)
30-41 (40-55)	KOMATSU	D20PLL-6	30 (40)
	KOMATSU	D21PL-6	30 (40)
	J. DEERE	350C	31 (42)
	CASE	350	34(45)
	CASE	450	40 (53)

POWER RANGE Kw (Hp)	MAKE	MODEL	NET FLYWHEEL ENGINE POWER Kw (Hp)
42-52 (56-70)	J. DEERE	400 G	45 (60)
	CAT	D3	46 (62)
	CAT	D3B	48 (65)
	IHC	TD-7E	48 (65)
	CASE	550	50(67)
	CASE	550G/G LT/LGP	50(67)
	CAT	D3C	52 (70)
	DRESSER	TD-7G	52 (70)
	DRESSER	TD-7H	52 (70)

POWER RANGE Kw (Hp)	MAKE	MODEL	NET FLYWHEEL ENGINE POWER Kw (Hp)
42-52 (56-70)	J. DEERE	450G	52 (70)
	J. DEERE	450G LGP / LT	52 (70)
	KOMATSU	D31PLL-18	52 (70)
	KOMATSU	D31-18	52 (70)
	KOMATSU	D31PL-18	52 (70)
	KOMATSU	D31P-18	52 (70)
	KOMATSU	D31P-20	52 (70)
	KOMATSU	D31E-20	52 (70)

# FORM 1000

POWER RANGE Kw (Hp)	MAKE	MODEL	NET FLYWHEEL ENGINE POWER Kw (Hp)	POWER RANGE Kw (Hp)	MAKE	MODEL	NET FLYWHEEL ENGINE POWER Kw (Hp)		
53-60 (71-80)	CAT	D3C SERIES III	53 (71)	53-60 (71-80)	DRESSER	TD-8H	60 (80)		
	CASE	850B	54 (72)		DRESSER	TD-8H LGP	60 (80)		
	IHC	TD8E	58 (78)		J. DEERE	550G	60 (80)		
	CASE	650	60 (80)		J. DEERE	550G SERIES IV	60 (80)		
	CASE	650 G	60 (80)		KOMATSU	D37P-2	60 (80)		
	CAT	D4E	60 (80)		KOMATSU	D37E-2	60 (80)		
	CAT	D4C	60 (80)		KOMATSU	D37E-5	60 (80)		
	DRESSER	TD-8G	60 (80)		KOMATSU	D37P-5	60 (80)		
61-75 (81-100)	CAT	D4C SERIES III	61 (82)	61-75 (81-100)	KOMATSU	D41P-3	67 (90)		
	CASE	850D	61 (82)		KOMATSU	D41A-3	67 (90)		
	F-A	8	65 (87)		KOMATSU	D39E	67 (90)		
	F-A	8B	66 (88)		CAT	D5C	67 (90)		
	CASE	850 G	66 (89)		DRESSER	TD-9H	67 (90)		
	CASE	850 G LGP	66 (89)		DRESSER	TD-9H LGP	67 (90)		
	J. DEERE	650 G	67 (90)		CAT	D5C SERIES III XL	68 (91)		
	J. DEERE	650 G SERIES IV	67 (90)		CAT	D5C SERIES III LGP	68 (91)		
	J. DEERE	650 G LGP SERIES IV	67 (90)		CAT	D4H	71 (95)		
	KOMATSU	D40A-3	67 (90)		CAT	D4H SERIES II	71 (95)		
76-101 (101-135)	CASE	1150B	78 (105)	76-101 (101-135)	F-A	10C	91 (122)		
	CAT	D4H XL	78 (105)		KOMATSU	D53P-17	93 (124)		
	CAT	D4H LGP	78 (105)		KOMATSU	D53-A17	93 (124)		
	CAT	D4H SERIES III XL	78 (105)		DRESSER	TD-12C	93 (124)		
	CAT	D4H SERIES III LGP	78 (105)		DRESSER	TD-12C LGP	93 (124)		
	CAT	D5B	78 (105)		DRESSER	TD-12C LONG TRACK	93 (124)		
	CAT	D5	78 (105)		CAT	D5H XL	97 (130)		
	KOMATSU	D41E	78 (105)		CAT	D5H LGP	97 (130)		
	CAT	D5M	82 (110)		CAT	D5H SERIES II XL	97 (130)		
	CASE	1150E	84 (113)		CAT	D5H SERIES II LGP	97 (130)		
	CASE	1150G LGP	88 (118)		CASE	1450B	97 (130)		
	CASE	1150G	88 (118)		KOMATSU	D58P-1	97 (130)		
	CAT	D5H	90 (120)		KOMATSU	D58P-1B	97 (130)		
	J. DEERE	750B	90 (120)		KOMATSU	D58E-1	97 (130)		
	KOMATSU	D50A-17	90 (120)		KOMATSU	D68P-1	101 (135)		
	102-131 (136-175)	CAT	D6D/D6M		104(140)	102-131 (136-175)	KOMATSU	KBD65E-6	119(160)
		J. DEERE	750 C		104(140)		CAT	D6H	123(165)
J. DEERE		750 C LGP	104(140)	CAT	D6H SERIES II		123(165)		
J. DEERE		750 B LGP	104(140)	DRESSER	TD-15E LONG TRACK	123 (165)			
DRESSER		TD12C-XP LONG TK	104(140)	DRESSER	TD-15E LGP	123(165)			
DRESSER		TD 12C-XP LGP	104(140)		J. DEERE	850B	123(165)		
DRESSER		TD-15C	104(140)		J. DEERE	850B LGP	123(165)		
IHC		TD15C	104(140)		J. DEERE	850 B LONG TK	123(165)		
KOMATSU		D63E-1	104(140)		KOMATSU	D65P-8	123(165)		
CASE		1550	112(150)		KOMATSU	D65E-8	123(165)		
F-A		14-C	112(150)		KOMATSU	D60E-8	127(170)		
CAT		D6E	116(155)		CAT	D6H XL	130(175)		

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POWER RANGE Kw (Hp)	MAKE	MODEL	NET FLYWHEEL ENGINE POWER Kw (Hp)	POWER RANGE Kw (Hp)	MAKE	MODEL	NET FLYWHEEL ENGINE POWER Kw (Hp)
	KOMATSU	D65A-8	116(155)		CAT	D6H XR	130(175)
132-168 (176-225)	J. DEERE	850 C	132(180)	132-168 (176-225)	KOMATSU	D68E-1	153(205)
	J. DEERE	850 C LGP	132(180)		TEREX	82-20B	153(205)
	KOMATSU	D68E-1	134(180)		CAT	D7H	160(215)
	CAT	D6H LGP	134(180)		F-A	FD20	166(223)
	KOMATSU	D65EX-12	142(190)		DRESSER	TD-20G	168(225)
	KOMATSU	D65PX-12	142(190)		KOMATSU	D85A-21B	168(225)
	F-A	16-B	145(195)		KOMATSU	D85E-21	168(225)
	CAT	D7G	149(200)		KOMATSU	L85A-21	168(225)
	KOMATSU	D75A-1	149(200)		KOMATSU	K85P-21	168(225)
169-194 (226-260)	TEREX	82-30B	194(260)	169-194 (226-260)	CAT	D7R	171 (230)
	CAT	D7H - SERIES II	171(230)				

195-254 (261-340)	CAT	D8N	213(285)	195-254 (261-340)	CAT	D8R	228 (305)
	KOMATSU	D135A-2	213(285)		IHC	TD25C	231(310)
	CAT	D8K	224(300)		IHC	TD25E	231(310)
	F-A	FD30	224(300)		DRESSER	TD-25G	238(320)
	F-A	21-C	224(300)		KOMATSU	D155A-2	238(320)
	KOMATSU	D155AX3	225 (302)		CAT	D8L	250(335)
255-328 (341-440)	CAT	D9N	276(370)		KOMATSU	D355A-5	306(410)
	TEREX	82-50	276(370)		KOMATSU	D355A-3	306(410)
	CAT	D9R	302(405)		F-A	HD-31	317(425)
	CAT	D9H	306(410)				
329- (441- )	CAT	D10N	388(520)	329- (441- )	CAT	D10	522(700)
	F-A	41B	391(524)		CAT	D11N	574(770)
	KOMATSU	D375A-2			KOMATSU	D475A-2	574(770)

### EXCVATORS HYDRAULICALLY OPERATED, CRAWLER MOUNTED

OPERATING WEIGHTS kg	MAKE	MODEL	BUCKET SIZE RANGEm <sup>3</sup>	OPERATING WEIGHTS kg	MAKE	MODEL	BUCKET SIZE RANGEm <sup>3</sup>	
11 - 16,000	KOMATSU	PC100L-5	0.18-0.55	11 - 16,000	SAMSUNG	SE130LC-2	0.40-0.65	
	CAT	311	0.32-0.63		CAT	E140	0.29-0.75	
	KOMATSU	PC120-3	0.18-0.61		SAMSUNG	SE 130LCM-2	0.35-0.55	
	CAT	E110B	0.22-0.63		HITACHI	EX150	0.45-0.70	
	KOMATSU	PC120-5	0.18-0.60		JOHN-DEERE	590D	0.30-1.10	
	KOMATSU	PC120-6	0.37-0.76		CAT	315	0.28-0.74	
	LINK BELT	LS-2650C-II	0.37-0.48		KOMATSU	PC150-5	0.57-0.75	
	JOHN-DEERE	490E	0.23-0.83		LINK-BELT	LS2700	0.37-0.76	
	JOHN-DEERE	490D	0.40-0.60		CASE	9020	0.38-0.60	
	CAT	312	0.32-0.63		FIATALLIS	FX 150 LC	0.25-1.10	
		CASE	9010		0.38-0.70	KOMATSU	PC150NHD-5	0.18-0.65
		CASE	9010B		0.38-0.70	CASE	888	0.43-0.96

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OPERATING WEIGHTS kg	MAKE	MODEL	BUCKET SIZE RANGE <sup>m</sup> <sup>3</sup>
	LINK BELT	2650 QUANTUM	0.37-0.67
	CAT	E120B	0.22-0.71
	CAT	205B	0.28-0.79
	SAMSUNG	SE130-LC	0.40-0.65
	FIATALLIS	FX130LC	0.38-0.81
	CASE	688	0.38-0.76

OPERATING WEIGHTS kg	MAKE	MODEL	BUCKET SIZE RANGE <sup>m</sup> <sup>3</sup>
	CASE	880B	0.43-0.96
	KOMATSU	PC 150LC-5	0.41-0.75
	KOMATSU	PC150HD-5	0.18-0.65
	CAT	211BLC	0.34-0.86
	CAT	315L	0.28-0.74
	CASE	9020B	0.38-0.86

16 - 21,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m</sup> <sup>3</sup>
	DRESSER	6200LC	0.53-1.17
	KOMATSU	PC180NLC-3	0.57-1.00
	KOMATSU	PC180LC-3	0.57-1.00
	CAT	317	0.47-1.00
	CAT	215	0.57-1.00
	KOMATSU	PC180LLC-3	0.57-1.00
	KOMATSU	PC180LC-5	0.57-1.00
	KOMATSU	PC180NLC-5	0.57-1.00
	HITACHI	EX200	0.45-1.00
	HITACHI	UH081	0.76-0.95
	HITACHI	UH082	0.76-0.95
	HITACHI	UH083	0.76-0.95
	CAT	213BLC	0.45-0.98
	KOMATSU	PC210-3	0.36-1.40
	KOMATSU	PC180LLC-5	0.57-1.00
	CAT	E200B	0.67-1.10
	KOMATSU	PC200-5	0.36-1.17
	CAT	320	0.70-1.40

16 - 21,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m</sup> <sup>3</sup>
	JOHN DEERE	690DLC	0.46-1.15
	FIATALLIS	FX200 LC	0.25-1.30
	HITACHI	EX200LC	0.45-1.20
	LINKBELT	LS-2800C-II	0.48-0.96
	KOMATSU	PC200LC-5	0.36-1.17
	KOMATSU	PC210LC-3	0.36-1.40
	FIATALLIS	FX210 LC	0.27-1.31
	CAT	215DLC	0.44-1.04
	CASE	9030	0.56-1.06
	CAT	320N	0.70-1.40
	DRESSER	6150LC	0.43-0.75
	CAT	EL200B	0.67-1.10
	LINKBELT	2800 QUANTUM	0.48-1.15
	CASE	980B	0.70-1.40
	CAT	320L	0.73-1.17
	JOHN DEERE	690ELC	0.46-1.22
	KOMATSU	PC210-5	0.36-1.17
	SAMSUNG	SE210-LC	0.46-1.21

21 - 26,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m</sup> <sup>3</sup>
	AKERMAN	H10B	0.28-1.30
	LINK-BELT	LS2800LF	0.37-0.57
	LINK-BELT	2800 QUANTUM	0.37-0.57
	CASE	9030B LR	0.51-0.69
	CASE	9030 LR	0.51-0.69
	CAT	219D	0.44-1.04
	KOMATSU	PC210LC-5	0.36-0.71
	KOMATSU	PC220-5	0.44-1.26
	CAT	219DLC	0.44-1.04
	CAT	320S	0.70-1.40
	CAT	322N	0.90-1.40
	CAT	322	0.90-1.40
	KOMATSU	PC240-3	0.44-1.26
	KOMATSU	PC240-3	0.44-1.26
	CAT	E240B	0.58-1.44
	KOMATSU	PC220LC-5	0.44-1.26
	CAT	225	0.57-1.34
	DRESSER	6220LC	0.60-1.26
	JOHN DEERE	790ELC	0.73-1.55

21 - 26,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m</sup> <sup>3</sup>
	CAT	EL240B	0.58-1.44
	KOMATSU	PC240-5	0.44-1.26
	CAT	322LN	0.63-1.90
	HITACHI	EX220 LC-3	0.80-1.40
	KOMATSU	PC240LC-3	0.44-1.26
	KOMATSU	PC240LC-3	0.44-1.26
	CAT	322L	0.90-1.50
	LINK-BELT	LS3400C-II	0.57-1.00
	CASE	9040 B	0.73-1.39
	JOHN DEERE	790D	0.40-1.50
	LINK-BELT	3400 QUANTUM	0.57-1.34
	KOMATSU	PC240LC-6	0.57-1.34
	CASE	9040	0.73-1.39
	KOMATSU	PC240LC-5	0.44-1.26
	CAT	EL240C	0.50-0.76
	CAT	225D	0.56-1.60
	CAT	325	0.82-1.60
	HITACHI	UH123	1.14-1.33
	HITACHI	UH122	1.14-1.33

26 - 31,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m</sup> <sup>3</sup>
	HITACHI	EX270	0.80-1.40
	KOMATSU	PC280NLC-3	0.44-1.40
	CAT	325LN	0.70-1.70
	CASE	9040 LR	0.51-0.69
	LINK-BELT	LS3400CF	0.48-0.67
	CAT	225DLC	0.56-1.80

26 - 31,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m</sup> <sup>3</sup>
	HITACHI	EX300	0.40-0.59
	HITACHI	EX300LC	0.40-0.59
	KOMATSU	PC300-5	0.52-1.80
	SAMSUNG	SE280LC-2	0.65-1.50
	CAT	E300B	0.76-1.82
	HITACHI	SUPER EX300LC-3	1.15-1.86

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OPERATING WEIGHTS kg	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	KOMATSU	PC280LC-3	0.44-1.40
	CAT	325L	0.82-1.60
	LINK BELT(LONG REACH)	3400 QUANTUM	0.57-0.67
	HITACHI	EX270LC	0.80-1.70
	KOMATSU	PC250LC-6	0.76-1.52
	AKERMAN	H14B	0.52-1.70
	SAMSUNG	SE280-LC	0.65-1.70
	KOMATSU	PC300-3	0.50-1.80

OPERATING WEIGHTS kg	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	KOMATSU	PC300NLC-3	0.50-1.80
	FIAT ALLIS	FX300 LC	0.40-1.95
	JOHN DEERE	892E LC	0.92-2.10
	JOHN DEERE	892DLC	0.96-1.70
	KOMATSU	PC300LC-3	0.50-1.80
	LINK-BELT	LS4300	0.96-1.62
	LINK-BELT	LS4300C-II	0.96-1.62

31 - 39,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	KOMATSU	PC300LC-5	0.52-1.80
	CAT	EL300B	0.76-1.82
	DRESSER	6300LC	0.86-1.60
	CASE	9050	0.96-1.87
	CAT	330	0.70-2.10
	CASE	9050B	0.92-2.09
	CAT	330LN	1.10-2.10
	LINK-BELT	4300 QUANTUM	0.96-2.10

31 - 39,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	CAT	330L	0.70-2.10
	CAT	231D	1.20-2.00
	CAT	231DLC	1.10-1.60
	SAMSUNG	SE350-LC	1.00-1.92
	KOMATSU	PC300HD-5	0.86-1.44
	SAMSUNG	SE350LC-2	0.90-1.75
	KOMATSU	PC360LC-5	0.50-1.80
	CAT	235	0.80-2.10

39 - 49,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	KOMATSU	PC400-5	1.30-2.20
	HITACHI	EX400	1.20-2.00
	HITACHI	EX400H	1.20-2.00
	AKERMAN	H16D	1.14-2.40
	CAT	235C	1.00-2.30
	DRESSER	6400LC	1.15-2.20
	KOMATSU	PC400LC-5	1.30-2.20
	HITACHI	EX400LCH	1.20-2.00
	HITACHI	EX400LC	1.20-2.28

39 - 49,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	JOHN DEERE	992DLC	0.96-2.60
	JOHN DEERE	992E LC	1.36-2.28
	LINK-BELT	LS-5800 C II	1.43-3.06
	CASE	9060	1.27-2.52
	KOMATSU	PC400HD-5	1.15-1.62
	CASE	9060B	1.27-3.19
	SAMSUNG	SE450LC-2	1.70-2.10
	CAT	E450	1.15-2.35
	CAT	350	1.30-2.60

49 - 62,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	CAT	350L	1.30-2.60
	AKERMAN	H25D	1.95-3.06

49 - 62,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	LINK-BELT	LS6400	
	KOEHRING-BANTAM	866E	

62 - 71,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	CAT	245	1.52-2.87
	CAT	E650	1.80-3.00
	KOMATSU	PC650-3	2.40-3.70
	KOMATSU	PC650LC-3	2.40-3.70

62 - 71,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	HITACHI	EX700	1.80-3.60
	HITACHI	EX700H	1.80-3.60
	HITACHI	EX700BE	1.80-3.60

71 - 82,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	CAT	245B SERIES II	1.90-3.30
	CAT	375	1.50-4.40
	CAT	375L	1.50-4.40

71 - 82,000	MAKE	MODEL	BUCKET SIZE RANGE <sup>m<sup>3</sup></sup>
	LINK-BELT	LS7400A	
	KOEHRING-BANTAM	1066E	

**FORM 1000**

MACHINE SIZE RANGE, SAE RATED BUCKET M3(Yd3)	MAKE	MODEL	SAE RATED BUCKET SIZE M3(Yd3)	OPERATING WEIGHT Kg (Lbs)
0.0 - 1.14 (0.0 - 1.49)	KOMATSU	WA20-1	0.26 (0.34)	1730 (3810)
	KOMATSU	WA70-1	0.76 (1.00)	4510 (9940)
	JOHN DEERE	244 E	0.76 (1.00)	5327 (11746)
	MICHIGAN	L30	0.76 (1.00)	5940 (13100)
	JCB	409	0.91 (1.20)	5430 (11967)
	CASE	WIL	0.96 (1.25)	5440 (12000)

MACHINE SIZE RANGE, SAE RATED BUCKET M3(Yd3)	MAKE	MODEL	SAE RATED BUCKET SIZE M3(Yd3)	OPERATING WEIGHT Kg (Lbs)
0.0 - 1.14 (0.0 - 1.49)	IHC	H30B	0.96 (1.25)	5440 (12000)
	IHC	510	0.96 (1.25)	6280 (13850)
	CAT	910	0.96 (1.25)	6490 (14300)
	CAT	910F	1.00 (1.30)	7248 (15982)
	CAT	910E	1.10(1.40)	7320 (16130)

1.15 - 1.52 (1.50 - 1.99)	TEREX	22C	1.15 (1.50)	5950 (13120)
	F-A	345-B	1.15 (1.50)	7300 (16095)
	CAT	922B	1.15 (1.50)	7660 (16990)
	IHC	H50B	1.15 (1.50)	7940 (17500)
	IHC	H50C	1.15 (1.50)	7940 (17500)
	MICHIGAN	L50	1.15 (1.50)	8217 (18120)
	KOMATSU	WA100-1	1.20 (1.60)	7250 (15980)
	JOHN DEERE	344G	1.24 (1.63)	8103 (17865)
	CASE	W14	1.34 (1.75)	6700 (14765)
	IHC	515	1.34 (1.75)	7530 (16610)

1.15 - 1.52 (1.50 - 1.99)	CASE	W14C	1.34 (1.75)	8089 (17853)
	DRESSER	512	1.34 (1.75)	8150 (17970)
	CAT	920	1.34 (1.75)	8530 (18800)
	CAT	926	1.34 (1.75)	8800 (19404)
	JOHN DEERE	444G	1.34 (1.75)	9226 (20340)
	KOMATSU	WA120-1	1.40 (1.80)	8030 (17700)
	CAT	910F	1.40 (1.80)	6914 (15243)
	CAT	914G	1.40 (1.80)	7211(15864)
	CAT	916	1.40 (1.80)	8580 (18920)

1.53 - 1.90 (2.00 - 2.49)	VOLVO	BM L50C	1.53 (2.00)	8140 (17950)
	CAT	918F	1.53 (2.00)	9040(19933)
	CAT	944	1.53 (2.00)	10070 (22200)
	DRESSER	510C	1.53 (2.00)	7490 (16512)
	ALLIS	545	1.53 (2.00)	8110 (17890)
	ALLIS	545H	1.53 (2.00)	8800 (19410)
	IHC	H60B	1.53 (2.00)	9070 (20000)
	CASE	W18	1.53 (2.00)	9100 (19981)
	F-A	545B	1.53 (2.00)	9200 (20290)
	TEREX	72-21	1.53 (2.00)	9840 (21700)
	VOLVO	400	1.61 (2.10)	8990 (19820)
	CAT	924F	1.70(2.25)	9025(19900)

1.53 - 1.90 (2.00 - 2.49)	KOMATSU	WA180-1	1.70 (2.25)	9070 (20000)
	DRESSER	518	1.70 (2.25)	9360 (20639)
	CAT	926E	1.70 (2.25)	9480 (20900)
	MICHIGAN	L70	1.70 (2.25)	9774 (21550)
	TEREX	72-20	1.70 (2.25)	10070 (22210)
	TEREX	L-20	1.70 (2.25)	10990 (24240)
	IHC	H60E	1.70 (2.25)	9540 (21040)
	CAT	930	1.70 (2.25)	9660 (21300)
	JOHN DEERE	544G	1.70 (2.25)	10262 (22624)
	CASE	621 B XT	1.70 (2.25)	12415 (27374)
	JOHN DEERE	444E	1.80 (2.38)	9555 (21640)

1.91 - 2.28 (2.50 - 2.99)	JCB	418	1.91 (2.50)	10200 (22500)
	F-A	605B	1.91 (2.50)	10430 (23009)
	VME VOLVO	BM L70B	1.91 (2.50)	10340 (22796)
	VME VOLVO	BM L70C	1.91 (2.50)	10840 (23910)
	IHC	H65C	1.91 (2.50)	11110 (24500)
	CLARK	55H	1.91 (2.50)	11650 (25680)
	TEREX	72-31	1.91 (2.50)	11790 (26000)
	DRESSER	515C	1.91 (2.50)	8490 (18718)
	CASE	W20B	1.91 (2.50)	9830 (21683)

1.91 - 2.28 (2.50 - 2.99)	CASE	621 B	1.91 (2.50)	12025 (26511)
	CAT	928F	2.00(2.60)	10852(23874)
	KOMATSU	WA250-1	2.10 (2.75)	10785 (23775)
	TEREX	72-30	2.10 (2.75)	10980 (24210)
	DRESSER	525	2.10 (2.75)	11420 (25181)
	CASE	621	2.10 (2.75)	11158 (24600)
	TEREX	L-25	2.10 (2.75)	11730 (25860)
	CAT	936	2.10 (2.75)	11800 (26020)
	CAT	936E	2.10 (2.75)	12320 (27170)



# FORM 1000

	IHC	H70C	1.91 (2.50)	-		JOHN DEERE	544B	2.20 (2.88)	10730 (23660)
	IHC	H70F	1.91 (2.50)	-		JOHN DEERE	544G	2.20 (2.88)	10728 (23655)
<b>2.29 - 2.67</b> (3.00 - 3.49)	DRESSER	520C	2.29 (3.00)	10059 (22177)	<b>2.29 - 2.67</b> (3.00 - 3.49)	CAT	950B	2.47 (3.25)	14650 (34800)
	CAT	938F	2.29 (3.00)	12320 (27170)		DRESSER	532	2.48 (3.25)	13105 (28896)
	CAT	966B	2.29 (3.00)	14380 (31700)		TEREX	L-30	2.48 (3.25)	13630 (30050)
	IHC	H80A	2.29 (3.00)	14780 (32600)		TEREX	72-41	2.48 (3.25)	14150 (31200)
	CASE	W24B	2.29 (3.00)	10880 (24000)		TEREX	72-40	2.48 (3.25)	14630 (32255)
	CASE	W24C	2.29 (3.00)	10880 (24000)		CAT	936F	2.50(3.25)	12345(27220)
	VOLVO	4400	2.29 (3.00)	11250 (24800)		KOMATSU	WA320-1	2.50 (3.25)	12585 (27745)
	IHC	530	2.29 (3.00)	12560 (27700)		CAT	938F	2.50(3.25)	13030(28731)
	TEREX	72-31B	2.29 (3.00)	12570 (27710)		CASE	721	2.50 (3.25)	13161 (29014)
	F-A	645B	2.29 (3.00)	12790 (28210)		CASE	721 B	2.50 (3.25)	13383 (29014)
	CAT	950	2.29 (3.00)	12790 (28600)		CAT	950F	2.50 (3.25)	15660 (34530)
	CLARK	75B	2.29 (3.00)	13310 (29340)		JOHN DEERE	624E	2.60 (3.38)	14060 (31000)
	JCB	423	2.29 (3.00)	14240 (31400)		JOHN DEERE	624G	2.60 (3.38)	12745 (28103)
	VME VOLVO	BM L90B	2.47 (3.25)	12800 (28200)					
<b>MACHINE SIZE RANGE, SAE RATED BUCKET M3(Yd3)</b>	<b>MAKE</b>	<b>MODEL</b>	<b>SAE RATED BUCKET SIZE M3(Yd3)</b>	<b>OPERATING WEIGHT Kg (Lbs)</b>	<b>MACHINE SIZE RANGE, SAE RATED BUCKET M3(Yd3)</b>	<b>MAKE</b>	<b>MODEL</b>	<b>SAE RATED BUCKET SIZE M3(Yd3)</b>	<b>OPERATING WEIGHT Kg (Lbs)</b>
<b>2.68 - 3.05</b> (3.50 - 3.99)	VOLVO	BM L90C	2.68 (3.50)	14760 (32550)	<b>2.68 - 3.05</b> (3.50 - 3.99)	MICHIGAN	L120	2.68 (3.50)	15471 (34110)
	CAT	950E	2.68 (3.50)	15780 (34800)		CASE	821 B	2.68 (3.50)	16824 (37090)
	TEREX	72-51AA	2.68 (3.50)	15280 (33700)		DRESSER	530C	2.86 (3.75)	13484 (29728)
	IHC	H80B	2.68 (3.50)	15300 (33739)		CAT	950F - SERIES II	2.90(3.75)	16451(36274)
	IHC	H90C	2.68 (3.50)	15330 (33800)					
<b>3.06 - 3.43</b> (4.00 - 4.49)	VOLVO	4500	3.06 (4.00)	13990 (30843)	<b>3.06 - 3.43</b> (4.00 - 4.49)	F/A	756C	3.06 (4.00)	18300 (40360)
	CASE	W36	3.06 (4.00)	15030 (33150)		CLARKE	125B	3.06 (4.00)	18680 (41190)
	VOLVO	BM L120B	3.06 (4.00)	15700 (34700)		CAT	980	3.06 (4.00)	19950 (44000)
	ICH	540	3.06 (4.00)	16210 (35750)		KOMATSU	WA380-1	3.06 (4.00)	16200 (35710)
	F/A	745B	3.06 (4.00)	16290 (35910)		CASE	821	3.06 (4.00)	16420 (36210)
	DRESSER	538	3.06 (4.00)	16730 (36885)		CAT	966C	3.06 (4.00)	16730 (36890)
	CAT	960F	3.06(4.00)	17545 (38687)		JOHN DEERE	644E	3.20 (4.25)	17230 (38000)
	IHC	H90E	3.06 (4.00)	18258 (40260)		JOHN DEERE	644G	3.20 (4.25)	16035 (35357)
<b>3.44 - 3.81</b> (4.50 - 4.99)	TEREX	72-51B	3.44 (4.50)	17770 (39177)	<b>3.44 - 3.81</b> (4.50 - 4.99)	CAT	966F	3.60 (4.75)	20490 (45160)
	IHC	H100B	3.44 (4.50)	18800 (41500)		JCB	428	3.60 (4.75)	15260 (33650)
	F/A	FR20	3.44 (4.50)	19270 (42500)		KOMATSU	WA420-1	3.60 (4.75)	18165 (40050)
	IHC	H100C	3.44 (4.50)	21540 (47508)		VOLVO	BM L120C	3.60 (4.75)	18530 (40850)
	MICHIGAN	L160	3.44 (4.50)	22260 (49080)		DRESSER	542	3.60 (4.75)	18930 (41733)
	CAT	966F - SERIES II	3.60(4.75)	20725(45699)					

# FORM 1000

3.82 - 4.19 (5.00 - 5.49)	CAT	970F	3.82(5.00)	22682(50014)
	CASE	921	3.82 (5.00)	22725 (50100)
	CASE	921 B	3.82 (5.00)	22928 (50547)
	IHC	H120B	3.82 (5.00)	23130 (51000)
	CLARK	175B	3.82 (5.00)	23450 (51710)

3.82 - 4.19 (5.00 - 5.49)	CAT	980B	3.82 (5.00)	24220 (53400)
	IHC	H120C	3.82 (5.00)	25030 (55200)
	MICHIGAN	L150	3.90 (5.10)	20588 (45400)
	VOLVO	BM L150C	4.00 (5.20)	22210 (48960)
	CAT	980C	4.01 (5.25)	26910 (59335)

4.20 - 4.58 (5.50 - 5.99)	DRESSER	545	4.20 (5.50)	22025 (48555)
	JOHN DEERE	744	4.20 (5.50)	22680 (50000)
	KOMATSU	WA470-1	4.20 (5.50)	21245 (46840)
	KOMATSU	WA450-2	4.20 (5.50)	21700 (47840)
	TEREX	80C	4.20 (5.50)	26843 (59190)

4.20 - 4.58 (5.50 - 5.99)	TEREX	72-61	4.20 (5.50)	25810 (56908)
	CAT	980F	4.20 (5.50)	27314(60217)
	CAT	980F - SERIES II	4.20 (5.50)	27314(60217)
	MICHIGAN	L190B	4.40 (5.80)	27561 (60770)
	KOMATSU	WA500-1	4.40 (5.80)	27285 (60150)

4.59 - 4.96 (6.00 - 6.49)	CAT	988	4.59 (6.00)	32070 (70720)
	CLARK	275B	4.59 (6.00)	35910 (79180)

4.59 - 4.96 (6.00 - 6.49)	DRESSER	555	4.60 (6.00)	28708 (63290)
	CAT	980F	4.70 (6.00)	27390 (60380)

4.97 - 5.34 (6.50 - 6.99)	F/A	945B	4.97 (6.50)	29610 (65300)
	IHC	560	4.97 (6.50)	36590 (80690)


5.35 - 7.0	TEREX	72-71	5.35 (7.00)	31750 (70002)
	KOMATSU	WA600-1	5.70 (7.50)	40770 (89880)
	TEREX	90C	5.70 (7.50)	44407 (97920)
	CAT	988B	6.00 (7.80)	42640 (94000)
	MICHIGAN	L270B	6.00 (7.80)	41208 (90860)
	CAT	988F	6.00(7.80)	44328(97727)
	MICHIGAN	L320	6.90 (9.00)	44805 (98800)

5.35 - 7.0	CAT	992	7.60 (10.00)	47620 (105000)
	CAT	990	8.40 (11.00)	73480(161994 )
	MICHIGAN	L480	9.60 (12.50)	80480 (177460)
	CAT	994	10.00 (13.00)	170740 (376400)
	CAT	992C	10.40 (13.50)	87450 (192780)
	CAT	992D	10.70 (14.00)	87590 (193110)
	CAT	994	14.00 (18.00)	175500(387000)

### OFF HIGHWAY TRUCKS

MAKE	MODEL	NET POWER		EMPTY WEIGHT		MAX PAYLOAD	
		kW	HP	kg	LB	tonne	Ton
KOMATSU	HD025-3	221	296	39180	86392	20.0	22.0
TEREX	3305B	242	324	22660	49965	31.0	34.2
CATERPILLAR	769B	309	414	28000	61740	32.0	35.3
KOMATSU	HD325-5	346	463	59255	130657	32.0	35.3
DRESSER	140M	336	450	31411	69261	36.2	39.9
CATERPILLAR	769C	336	450	31178	68747	36.3	40.0

MAKE	MODEL	NET POWER		EMPTY WEIGHT		MAX PAYLOAD	
		kW	HP	kg	LB	tonne	Ton
KOMATSU	HD325-6	364	488	60755	133965	36.5	40.2
EUCLID	R35	321	430	28440	62710	37.6	41.4
CATERPILLAR	771C	336	450	31178	78750	40.0	44.0
TEREX	3307	380	509	33710	74331	45.0	49.6
CATERPILLAR	773B	485	650	39396	86869	52.6	58.0

# FORM 1000

## ARTICULATED ROCK TRUCKS

MAKE	MODEL	NET POWER		EMPTY WEIGHT		MAX PAYLOAD	
		kW	HP	kg	LB	tonne	Ton
CATERPILLAR	D20D	134	479	15000	33075	18.0	19.8
VOLVO	A20	137	183	15720	34663	18.5	20.4
CATERPILLAR	D22	175	234	17700	39029	20.0	22.0
MOXY	5222B	161	216	16800	37044	22.0	24.2
VOLVO	A25B	177	237	15515	34211	22.5	24.8
CATERPILLAR	D250B	163	218	17963	39608	22.7	25.0
CATERPILLAR	D25	175	234	17300	38147	22.7	25.0
CATERPILLAR	D25B	190	254	17900	39470	22.7	25.0
CATERPILLAR	D25D	194	260	19700	43439	22.7	25.0
CATERPILLAR	D25C	194	260	19233	42409	22.7	25.0
CATERPILLAR	D250D	160	214	17300	38147	22.8	25.0
CATERPILLAR	D250E	194	260	21000	46300	22.7	25.0
TEREX	2566	167	224	16800	37044	23.0	25.3
CATERPILLAR	D275	175	234	18700	41234	25.0	27.6
CATERPILLAR	D250	175	234	18500	40793	25.0	27.6
TEREX	2766	177	237	17200	37926	25.0	27.6
MOXY	6225B	187	250	16275	35886	25.0	27.6
CATERPILLAR	D275B	190	254	19200	42336	25.0	27.6
MOXY	6227B	187	250	17619	38850	27.0	29.8
TEREX	3066	192	257	19220	42380	27.0	29.8
CATERPILLAR	D30C	194	260	21320	47011	27.2	30.0
CATERPILLAR	D300B	194	260	19800	43659	27.2	30.0

MAKE	MODEL	NET POWER		EMPTY WEIGHT		MAX PAYLOAD	
		kW	HP	kg	LB	tonne	Ton
CATERPILLAR	D300D	213	285	20680	45599	27.2	30.0
CATERPILLAR	D300E	213	285	21180	46695	27.2	30.0
CATERPILLAR	D30D	213	285	21900	48290	27.2	30.0
CATERPILLAR	D300	190	254	19500	42998	30.0	33.1
CATERPILLAR	D330B	190	254	20200	44541	30.0	33.1
CATERPILLAR	D330	190	254	20000	44100	30.0	33.1
CATERPILLAR	D350	190	254	21000	46305	31.8	35.0
CATERPILLAR	D35	190	254	20000	44100	31.8	35.0
CATERPILLAR	D350B	190	254	21400	47187	31.8	35.0
CATERPILLAR	D35C	194	260	23860	52611	31.8	35.0
CATERPILLAR	D350C	194	260	23315	51410	31.8	35.0
CATERPILLAR	D350D	213	285	24595	54232	31.8	35.0
CATERPILLAR	D35HP	287	384	24950	55015	31.8	35.0
VOLVO	A35	240	321	24400	53802	32.0	35.3
MOXY	7235B	307	411	25720	55720	35.0	38.6
CATERPILLAR	D40D	287	384	28027	61800	36.3	40.0
CATERPILLAR	D400	287	384	25765	56812	36.3	40.0
CATERPILLAR	D400D	287	384	28027	61800	36.3	40.0
CATERPILLAR	D400E	287	384	29263	64512	36.3	40.0
TEREX	4066	278	372	25500	56228	36.5	40.2
CATERPILLAR	D44	336	450	28000	61740	40.0	44.1
CATERPILLAR	D44B	343	459	32296	71213	40.0	44.1

## MOTOR GRADER - ARTICULATED FRAME

MINIMUM OPERATING WEIGHT	MINIMUM NET FLYWHEEL POWER	MAKE	MODEL	NET FLYWHEEL ENGINE POWER kW (Hp)	OPERATING WEIGHT KG (LB)
9,072 (20,000)	60 (80)	KOMATSU	GD313A-1	63 (85)	7,390 (16,290)
		KOMATSU	GD461A-1	84 (113)	9,050 (19,950)
		JOHN DEERE	570B	67 (90)	9,545 (21,000)
		JOHN DEERE	570A	67 (90)	9,545 (21,000)
		KOMATSU	GD523A-1	101 (135)	10,800 (23,810)
		KOMATSU	GD521A-1	101 (135)	10,800 (23,810)
		KOMATSU	GD511A-1	101 (135)	10,800 (23,810)
		KOMATSU	GD611A-1	116 (155)	12,500 (27,558)

MINIMUM OPERATING WEIGHT	MINIMUM NET FLYWHEEL POWER	MAKE	MODEL	NET FLYWHEEL ENGINE POWER kW (Hp)	OPERATING WEIGHT KG (LB)
9,072 (20,000)	60 (80)	CATERPILLAR	120H NA	93 (125)	12,519 (27,600)
		GALION	830	107 (144)	12,600 (27,800)
		GALION	830 B	107 (144)	12,600 (27,800)
		KOMATSU	GD525A-1	101 (135)	12,620 (27,830)
		GALION	830 AWD	107 (144)	12,600 (27,800)
		GALION	830BAWD	107 (144)	12,600 (27,800)
		CATERPILLAR	120G	93 (125)	12,863 (28,359)

**FORM 1000**

12,701 (28,000)	100 (135)	CHAMPION	710A	101 (135)	12,701 (28,000)
		KOMATSU	GD621A-I	116 (155)	12,701 (28,000)
		KOMATSU	GD623A-I	116 (155)	12,701 (28,000)
		JOHN DEERE	670A	101 (135)	12,805 (28,230)
		JOHN DEERE	670B	101 (135)	12,805 (28,230)
		CATERPILLAR	135 H NA	101 (135)	12,950 (28,550)
		KOMATSU	GD661A-I	134 (180)	13,300 (29,320)
		CHAMPION	710A S III	101 (135)	13,318 (29,360)
		CATERPILLAR	12 G	101 (135)	13,325 (29,375)
		CATERPILLAR	140H	138 (185)	13,581 (29,941)
		GALION	850	124 (166)	13,682 (30,100)
		GALION	850 B	124 (166)	13,682 (30,100)
		GALION	850 VHP	124 (166)	13,682 (30,100)
		GALION	850B VHP	124 (166)	13,682 (30,100)

<b>MINIMUM OPERATING WEIGHT</b>	<b>MINIMUM NET FLYWHEEL POWER</b>	<b>MAKE</b>	<b>MODEL</b>	<b>NET FLYWHEEL ENGINE POWER kW (Hp)</b>	<b>OPERATING WEIGHT KG (LB)</b>
---------------------------------	-----------------------------------	-------------	--------------	--	---------------------------------

14,515 (32,000)	112 (150)	GALION	870 AWD	152 (204)	14,534 (32,400)
		GALION	870 B	152 (204)	14,534 (32,400)
		DRESSER	870	160 (215)	14,607 (32,400)
		CHAMPION	720A S IV	114 (153)	14,620 (32,230)
		CHAMPION	720 A VHP	114 (153)	14,642 (32,280)
		CHAMPION	726A S IV	114 (153)	14,642 (32,280)
		JOHN DEERE	772B	116 (155)	14,717 (32,450)
		CATERPILLAR	140H VHP	112 (150)	14,724 (32,460)
		CATERPILLAR	143H VHP	112 (150)	14,724 (32,460)
		CHAMPION	730A	139 (187)	14,724 (32,460)
		CATERPILLAR	140 H NA	112 (150)	14,724 (32,460)
		JOHN DEERE	772 BH	116 (155)	14,739 (32,500)

12,701 (28,000)	100 (135)	KOMATSU	GD625A-1	116 (155)	13,700 (30,210)
		JOHN DEERE	672 B	101 (135)	13,710 (30,230)
		CATERPILLAR	130G	101 (135)	13,736 (30,220)
		CHAMPION	720A	114 (153)	13,817 (30,460)
		CHAMPION	716A S III	101 (135)	14,003 (30,871)
		CHAMPION	710A S IV	101 (135)	14,084 (31,050)
		CATERPILLAR	140G VHP	112 (150)	14,106 (31,100)
		JOHN DEERE	770B	116 (155)	14,175 (31,250)
		JOHN DEERE	770A	116 (155)	14,175 (31,250)
		JOHN DEERE	770 B H	116 (155)	14,195 (31,300)
		CATERPILLAR	12 H NA	104 (140)	14,247 (31,410)
		CHAMPION	716A S IV	101 (135)	14,270 (31,460)
		CHAMPION	720A	114 (153)	14,474 (31,910)
		CHAMPION	720AVHP	116 (155)	14,479 (31,920)

<b>MINIMUM OPERATING WEIGHT</b>	<b>MINIMUM NET FLYWHEEL POWER</b>	<b>MAKE</b>	<b>MODEL</b>	<b>NET FLYWHEEL ENGINE POWER kW (Hp)</b>	<b>OPERATING WEIGHT KG (LB)</b>
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14,515 (32,000)	112 (150)	CHAMPION	736A S IV	139 (187)	15,341 (33,820)
		CHAMPION	740A	157 (210)	15,565 (34,315)
		CATERPILLAR	160 H NA	134 (180)	15,586 (34,360)
		CATERPILLAR	160 H VHP	134 (180)	15,586 (34,360)
		CATERPILLAR	140GAW D	134 (180)	15,787 (34,732)
		CHAMPION	736A S III	139 (187)	16,026 (35,331)
		CATERPILLAR	163 H NA	134 (180)	16,538 (36,460)
		CATERPILLAR	163 H VHP	134 (180)	16,538 (36,460)
		CHAMPION	750A	150 (200)	16,919 (37,300)
		KOMATSU	GD705A-4	149 (200)	17,620 (38,580)
		CHAMPION	780A	150 (200)	18,416 (40,600)
		KOMATSU	GD725A-1	149 (200)	18,500 (40,790)

## FORM 1000

		CATERPILLAR	143 H NA	112 (150)	14,774 (32,570)
		CHAMPION SIII	726A VHP	116 (155)	15,205 (33,521)
		CHAMPION	730A SIII	139 (187)	15,341 (33,820)
		CHAMPION	730A SIV	139 (187)	15,341 (33,820)

		CATERPILLAR	14G	149 (200)	20,534 (45,175)
		KOMATSU	GD825A-1	209 (280)	25,750 (56,770)
		CATERPILLAR	140G	112 (150)	15,627 (34,380)
		CATERPILLAR	16G	205 (275)	27,323 (60,110)

### Rubber Tired Backhoe / Loader Combinations

POWER RANGE		MAKE	MODEL	NET FLYWHEEL ENGINE POWER	
KILOW ATTS	HORSE POWER			KILOW ATTS	HORSE POWER
49 - 63	66 - 85	JCB	214	57	
		JOHN DEERE	310E	53	71
		CASE	580L	54	73
		FORD-NEW HOLLAND	555E	56	75
		FORD-NEW HOLLAND	NH75	56	75
		CAT	416C	56	75
		CAT	428C	56	75
		CAT	426C	60	80
		JOHN DEERE	310SE	60	80

POWER RANGE		MAKE	MODEL	NET FLYWHEEL ENGINE POWER		
KILOW ATTS	HORSE POWER			KILOW ATTS	HORSE POWER	
49 - 63	66 - 85	JOHN DEERE	315SE	60	80	
		CASE	580L TURBO	60	80	
		JCB	215	63	85	
		CAT	436C	63	85	
		CAT	438C	63	85	
		FORD-NEW HOLLAND	575E	63	85	
		FORD-NEW HOLLAND	NH85	63	85	
		FORD-NEW HOLLAND	655E	63	85	

64 - 82	86 - 110	JOHN DEERE	410E	67	90
		CASE	580 SUPER L	67	90
		JCB	1600B	67	90
		JCB	214-4WD	69	92
		JCB	215S	69	92
		JCB	217	69	92
		JCB	217S	69	92

64 - 82	86 - 110	FORD-NEW HOLLAND	675E	70	95
		FORD-NEW HOLLAND	NH95	70	95
		CASE	590 SUPER L	74	99
		JCB	214S	75	101
		CAT	446B	76	102
		FORD-NEW HOLLAND	LB115	79	106

83 - 112	111 - 150	JOHN DEERE	710D	86	115
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### PAVEMENT PROFILERS / COLD PLANERS

CUT WIDTH		MAKE	MODEL
CM	INCHES		
LESS THAN 30	LESS THAN 12	CAT	PR75
30 - 46	12 - 18	CAT INGERSOLL RAND	PR105 MW175
76	30	INGERSOLL RAND	MW250C
137	54	CAT	PR225
168	66	CAT GALION/DRESSER	PR275 SP600

# FORM 1000

## Mini Excavators

MAKE	MODEL	OPERATING WEIGHT ( kgs)
CATERPILLAR	301.5	1673
	301.6	1770
	301.8	1800
	302.5	2734
	303.5	3550
	304.5	4595
JOHN DEERE	17ZTS	1730
	27ZTS	2885
	35ZTS	3530
	50ZTS	4792

MAKE	MODEL	OPERATING WEIGHT ( kgs)
KUBOTA	K008	866
	KX41	1685
	KX61	2685
	KX91	3250
	KX121	3885
	KX161	5530

# FORM 1100



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

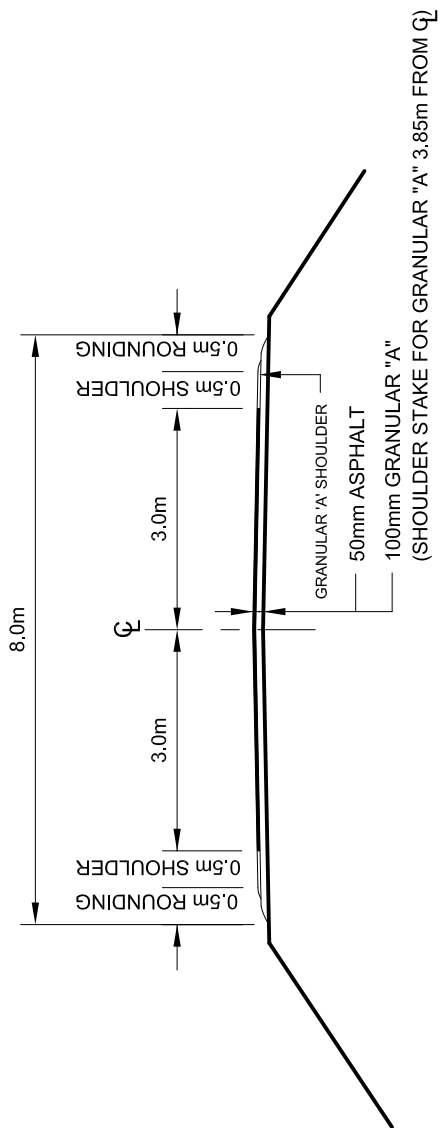
## DIVISION 11

### STANDARD ROAD CROSS-SECTIONS

#### INDEX

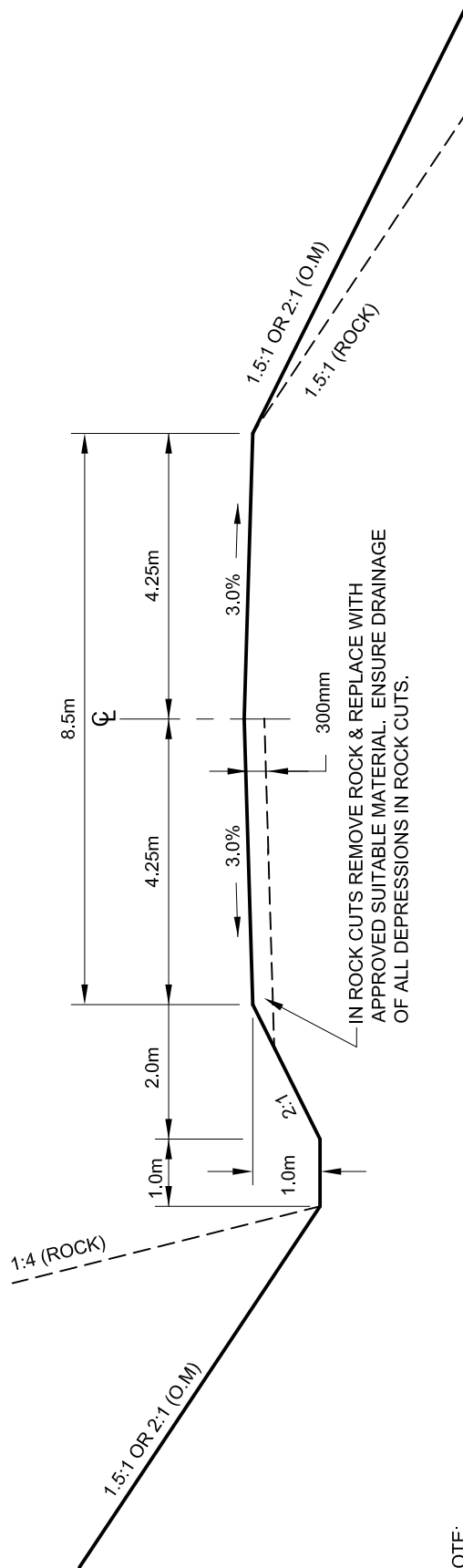
Section		Number of Pages
1100	Index	1
1110	RLU 60	1
1111	RLU 60 Modified	1
1115	RLU 70	1
1116	RLU 70 Modified	1
1120	RLU 80	1
1121	RLU 80 Modified	1
1122	RCU 80	1
1125	RAU 90	1
1127	RAU 100	1
1130	RAD 90	1
1134	RAD 100	1
1140	Interchange Ramp	1
1141	Interchange Ramp (Former Standard)	1
1150	Other Material Back Slope Treatment with Benching	1
1154	Gabion Protection of Slopes	1
1155	Rockcut with No Benching	1
1156	Rock Back Slope Treatment with Benching	1
1160	Underpass Clearance for RAD 100	1
1170	Minor Intersection	1
1171	Entrance to Commercial Development	1
1175	Private Entrance in Cut	1
1176	Private Entrance in Fill	1

**RLU 60**



STANDARD WIDTH OF R.O.W. 20.0m  
 STANDARD WIDTH OF CUTTING 20.0m  
 STANDARD WIDTH OF GRUBBING 15.0m

**TYPICAL CROSS SECTION FOR RLU 60 FINAL CONSTRUCTION**



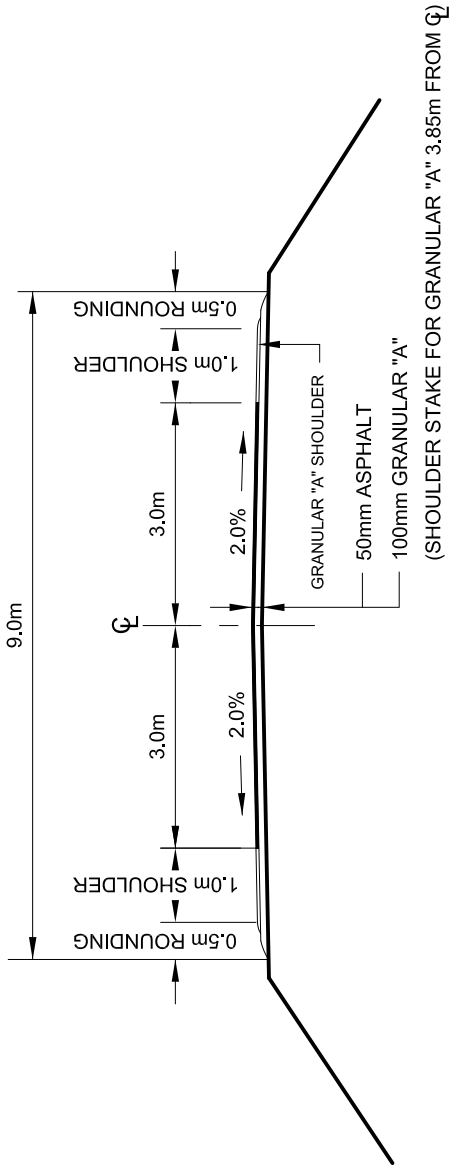
NOTE:  
 SHOULDER STAKE 3.75m FOR SHOULDERING MACHINE TO ACHIEVE REQUIRED ROUNDING.

IF SCARIFYING IS REQUIRED WIDTH OF SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS 300mm ON BOTH SIDES.

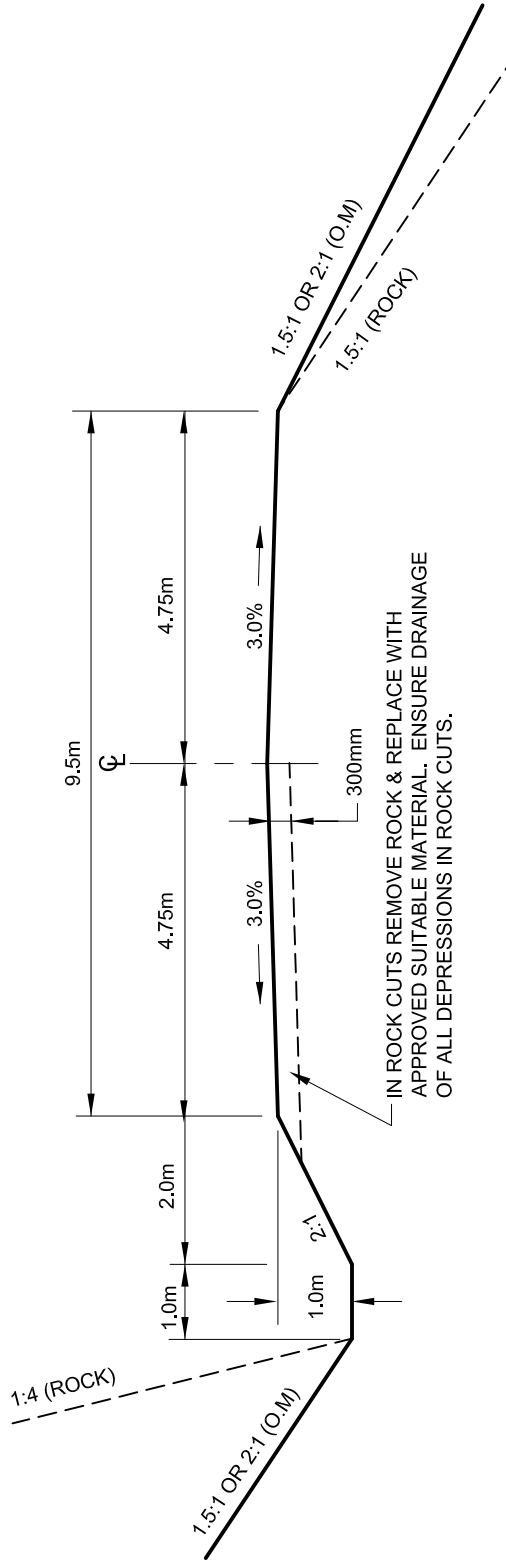
**TYPICAL CROSS SECTION FOR RLU 60 SUB-GRADE CONSTRUCTION**



**RLU 60 (MODIFIED)**



**TYPICAL CROSS SECTION FOR RLU 60 FINAL CONSTRUCTION**



**TYPICAL CROSS SECTION FOR RLU 60 SUB-GRADE CONSTRUCTION**

NOTE:  
 SHOULDER STAKE 4.25m FOR SHOULDERING MACHINE TO ACHIEVE REQUIRED ROUNDING.

IF SCARIFYING IS REQUIRED WIDTH OF SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS 300mm ON BOTH SIDES.



TRANSPORTATION AND WORKS  
 HIGHWAY DESIGN DIVISION

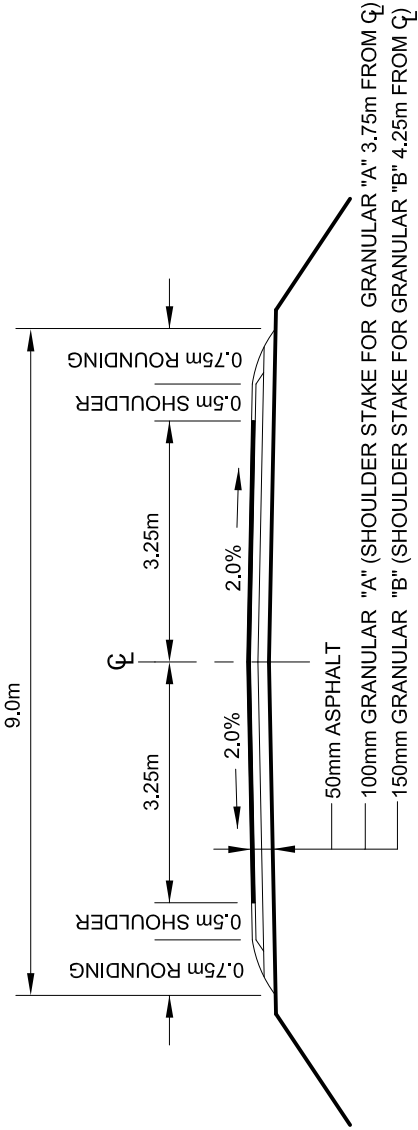
**TYPICAL CROSS SECTION (MODIFIED) RLU 60**

DRAWN BY: BMF

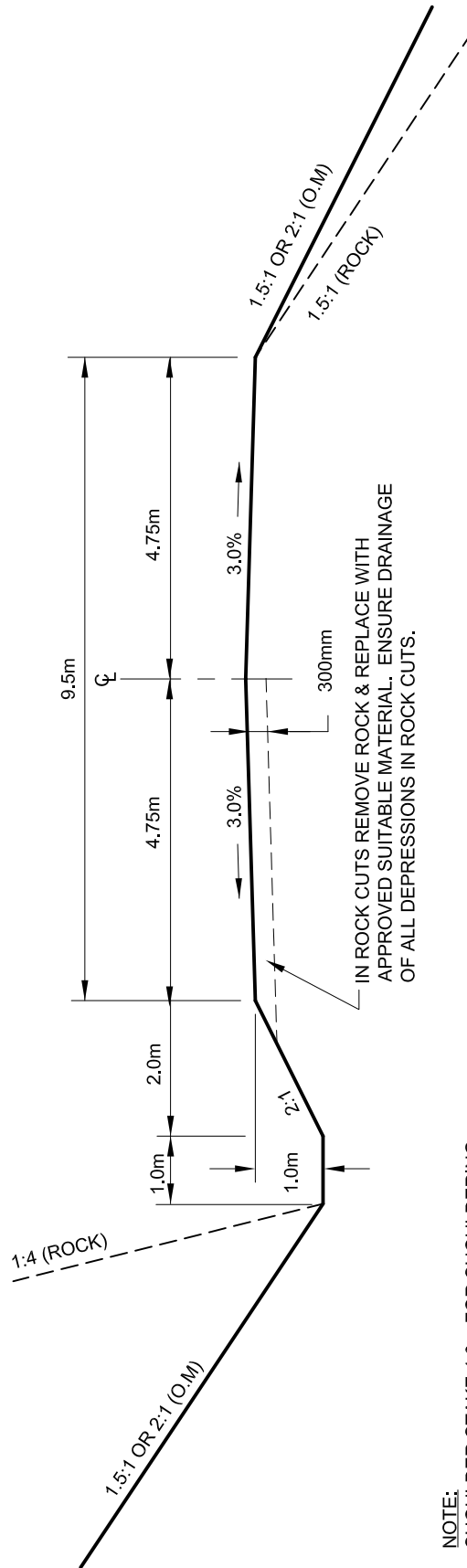
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SCALE 1:100

RLU 70



TYPICAL CROSS SECTION FOR  
RLU 70 FINAL CONSTRUCTION

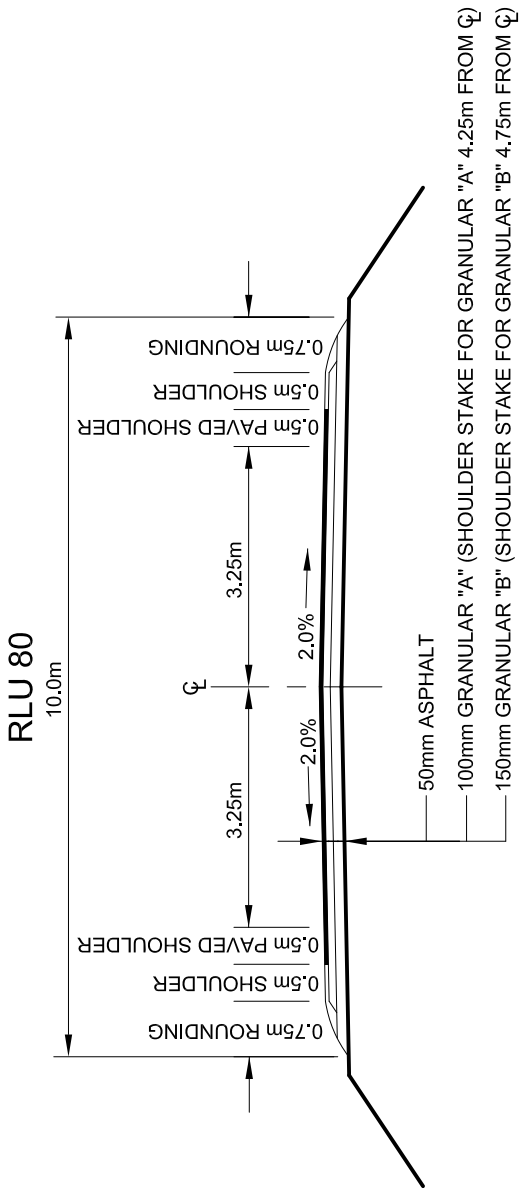


TYPICAL CROSS SECTION FOR  
RLU 70 SUB-GRADE CONSTRUCTION

NOTE:  
SHOULDER STAKE 4.0m FOR SHOULDERING MACHINE TO ACHIEVE REQUIRED ROUNDING.

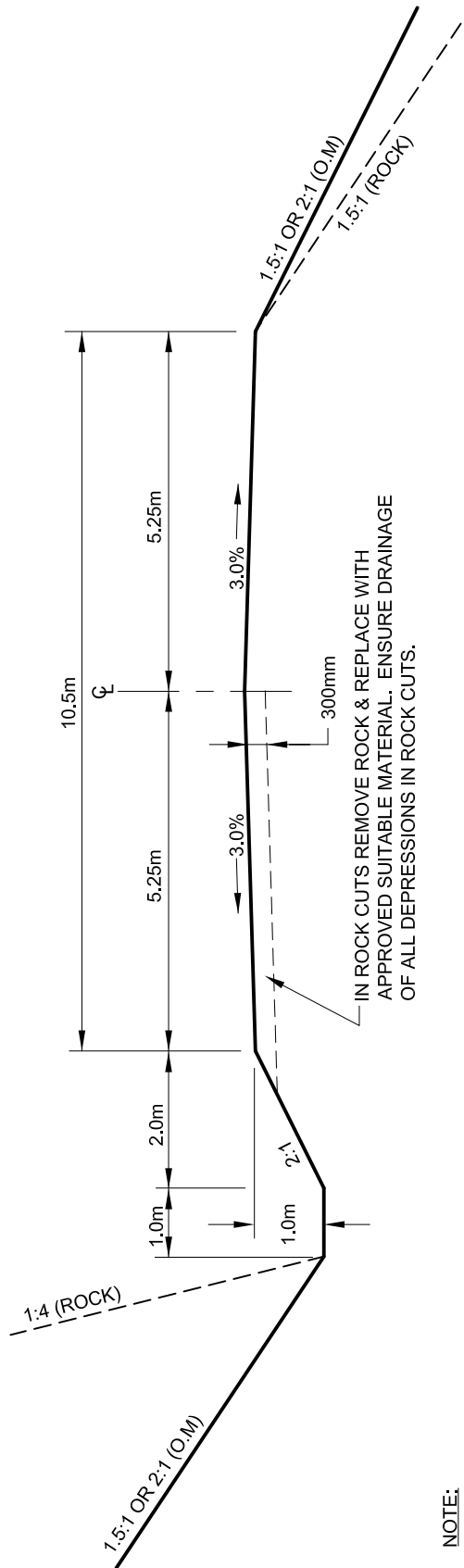
IF SCARIFYING IS REQUIRED WIDTH OF SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS 300mm ON BOTH SIDES.





TYPICAL CROSS SECTION FOR  
RLU 80 FINAL CONSTRUCTION

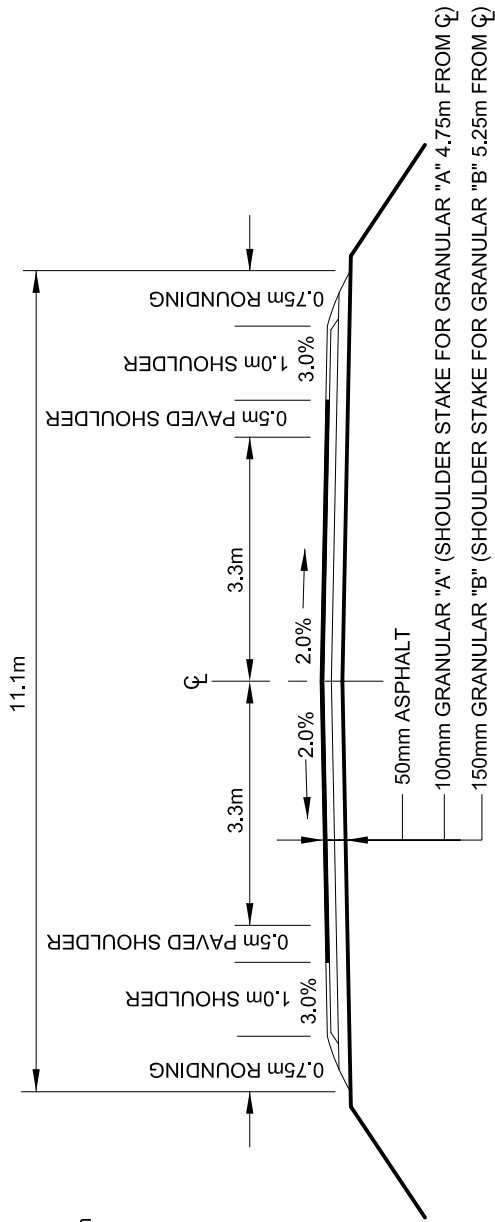
STANDARD WIDTH OF R.O.W. 30.0m  
STANDARD WIDTH OF CUTTING 30.0m  
STANDARD WIDTH OF GRUBBING 20.0m



TYPICAL CROSS SECTION FOR  
RLU 80 SUB-GRADE CONSTRUCTION

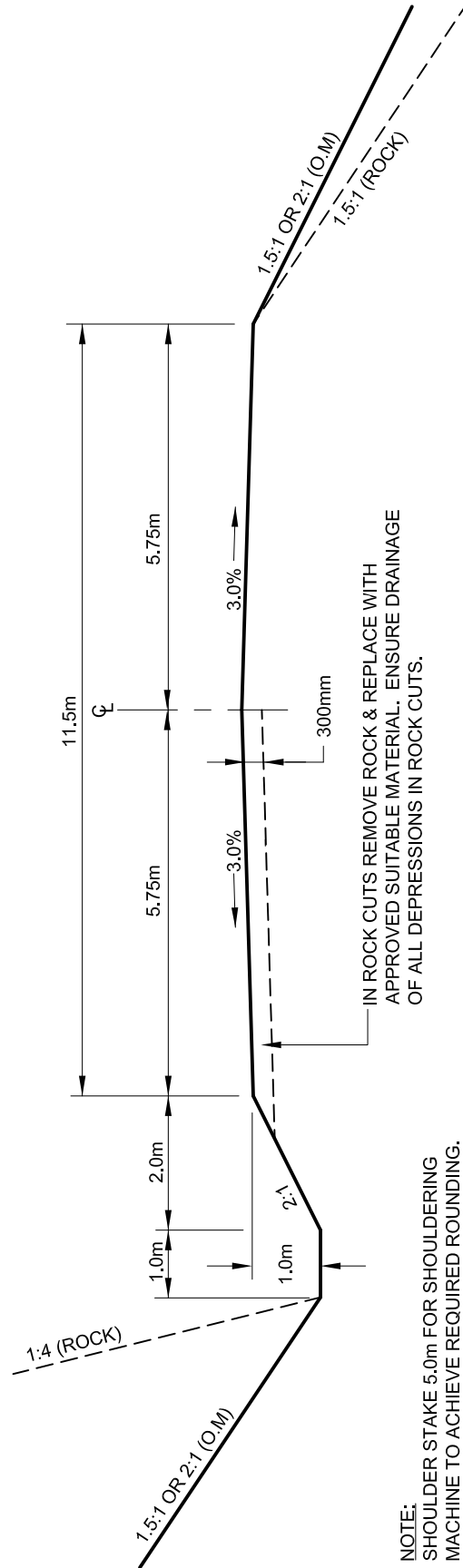
NOTE:  
SHOULDER STAKE 4.5m FOR SHOULDERING MACHINE TO ACHIEVE REQUIRED ROUNDING.  
IF SCARIFYING IS REQUIRED WIDTH OF SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS 300mm ON BOTH SIDES.

**RLU 80 (MODIFIED)**



STANDARD WIDTH OF R.O.W. 30.0m  
 STANDARD WIDTH OF CUTTING 30.0m  
 STANDARD WIDTH OF GRUBBING 20.0m

**TYPICAL CROSS SECTION FOR  
 RLU 80 FINAL CONSTRUCTION**



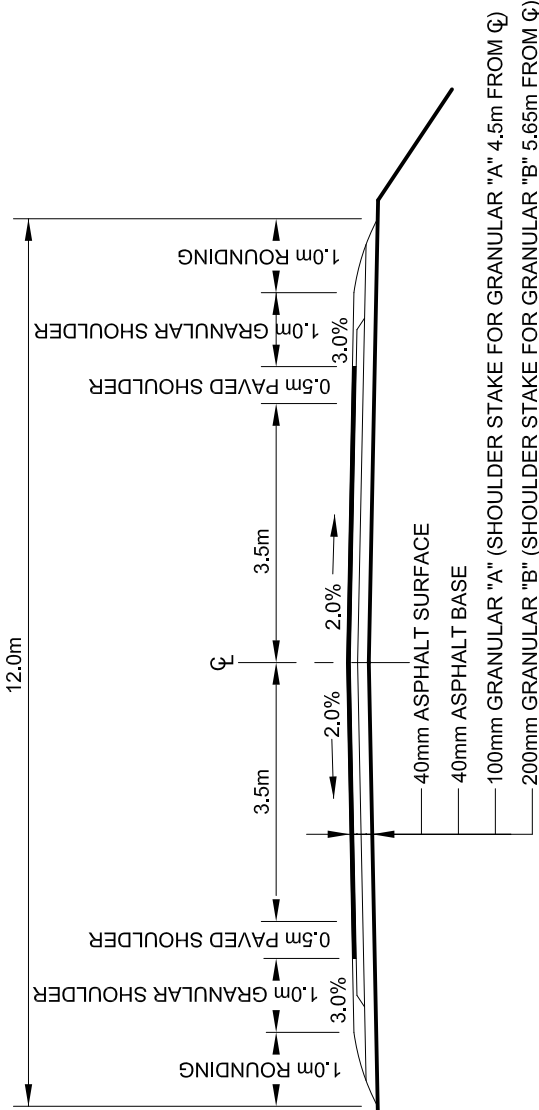
NOTE:  
 SHOULDER STAKE 5.0m FOR SHOULDERING  
 MACHINE TO ACHIEVE REQUIRED ROUNDING.

IF SCARIFYING IS REQUIRED WIDTH OF  
 SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS  
 300mm ON BOTH SIDES.

IN ROCK CUTS REMOVE ROCK & REPLACE WITH  
 APPROVED SUITABLE MATERIAL. ENSURE DRAINAGE  
 OF ALL DEPRESSIONS IN ROCK CUTS.

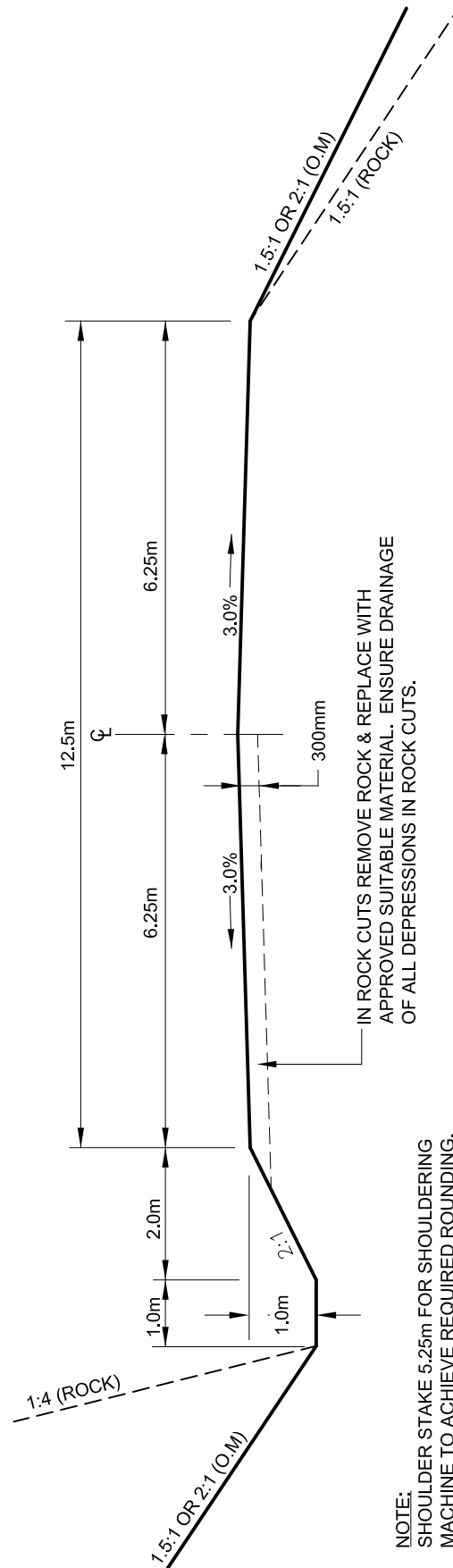
**TYPICAL CROSS SECTION FOR  
 RLU 80 SUB-GRADE CONSTRUCTION**

RCU 80



STANDARD WIDTH OF R.O.W. 40.0m  
 STANDARD WIDTH OF CUTTING 40.0m  
 STANDARD WIDTH OF GRUBBING 30.0m

TYPICAL CROSS SECTION FOR  
 RCU 80 FINAL CONSTRUCTION



NOTE:  
 SHOULDER STAKE 5.25m FOR SHOULDERING  
 MACHINE TO ACHIEVE REQUIRED ROUNDING.

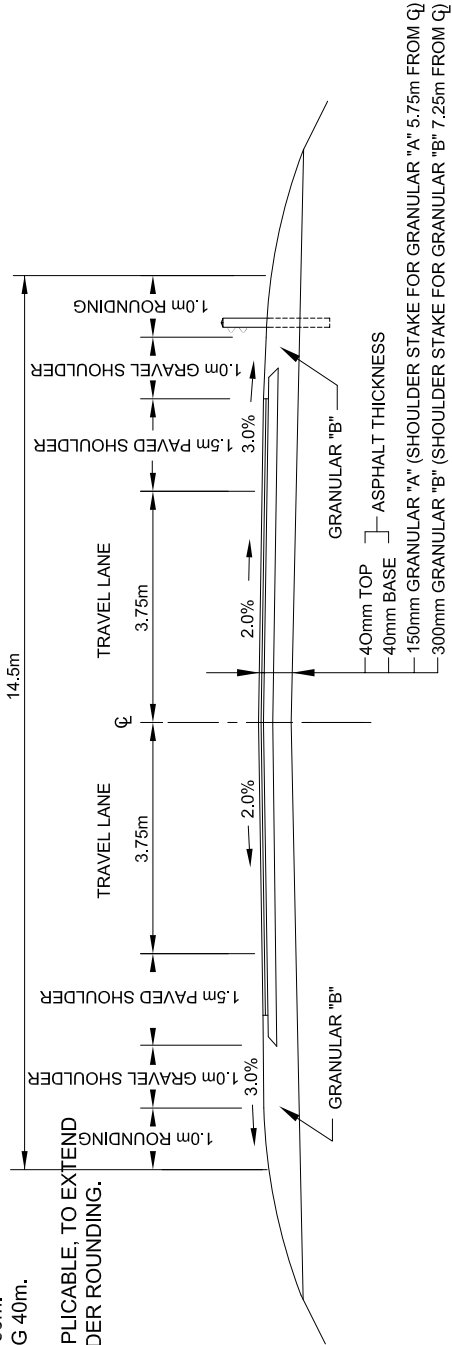
IF SCARIFYING IS REQUIRED WIDTH OF  
 SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS  
 300mm ON BOTH SIDES.

TYPICAL CROSS SECTION FOR  
 RCU 80 SUB-GRADE CONSTRUCTION

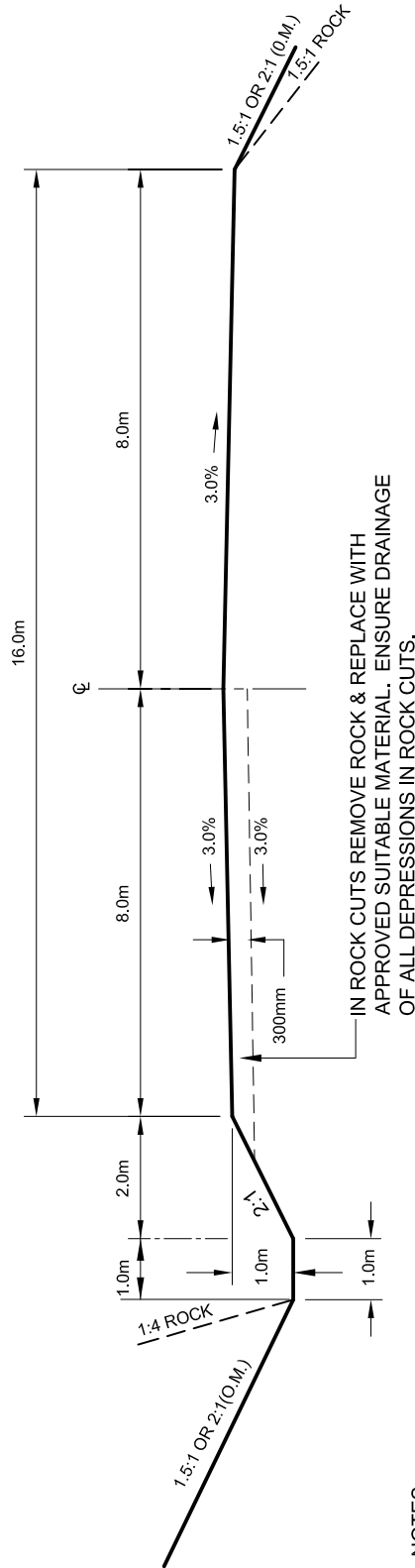
**RAU 90**

STANDARD WIDTH R.O.W., 60m (2 LANES).  
 STANDARD WIDTH CUTTING 60m.  
 STANDARD WIDTH GRUBBING 40m.

HYDROSEEDING, WHERE APPLICABLE, TO EXTEND FROM MID-POINT OF SHOULDER ROUNDING.



**TYPICAL CROSS SECTION FOR RAU 90 FINAL CONSTRUCTION**



NOTES:  
 SHOULDER STAKE 6.75m FOR SHOULDERING MACHINE TO ACHIEVE REQUIRED ROUNDING.

IF SCARIFYING IS REQUIRED WIDTH OF SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS 300mm ON BOTH SIDES.

IF CLIMBING LANE IS REQUIRED ADD 3.75m TO BOTH CROSS SECTIONS.

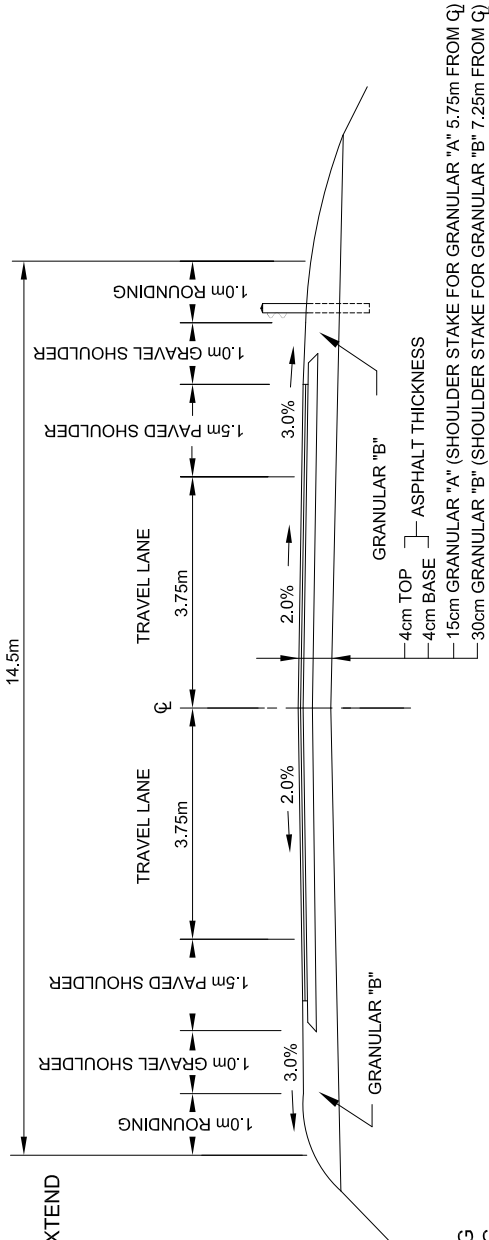
IN ROCK CUTS REMOVE ROCK & REPLACE WITH APPROVED SUITABLE MATERIAL. ENSURE DRAINAGE OF ALL DEPRESSIONS IN ROCK CUTS.

**TYPICAL CROSS SECTION FOR RAU 90 SUB-GRADE CONSTRUCTION**

**RAU 100**

STANDARD WIDTH R.O.W. 60m (2 LANES).  
STANDARD WIDTH CUTTING 60m.  
STANDARD WIDTH GRUBBING 40m.

HYDROSEEDING, WHERE APPLICABLE, TO EXTEND FROM MID-POINT OF SHOULDER ROUNDING.

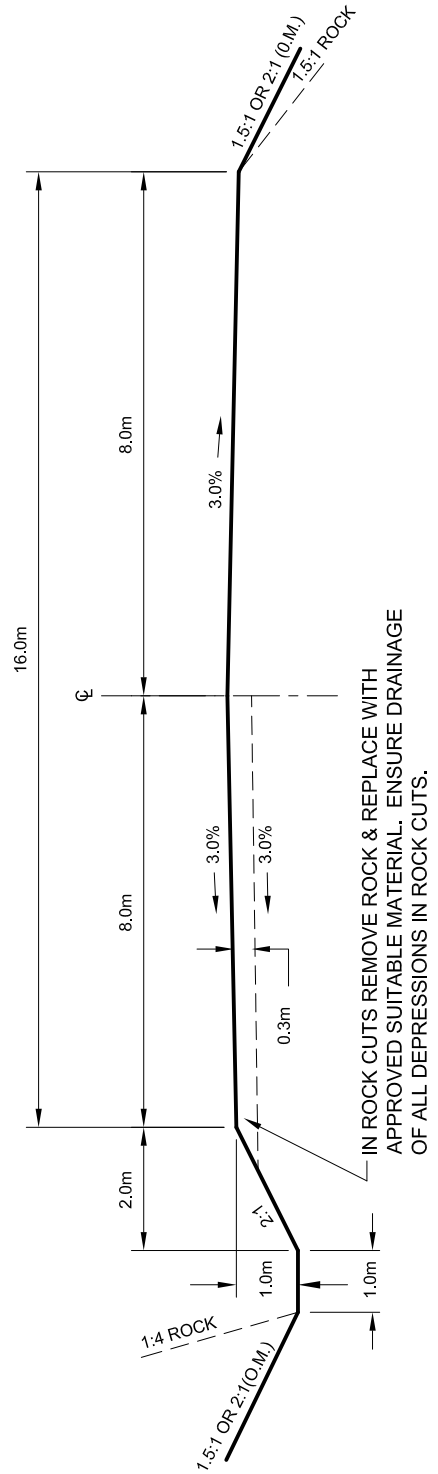


NOTES:  
SHOULDER STAKE 6.75m FOR SHOULDERING MACHINE TO ACHIEVE REQUIRED ROUNDING.

IF SCARIFYING IS REQUIRED WIDTH OF SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS 300mm ON BOTH SIDES.

IF CLIMBING LANE IS REQUIRED ADD 3.75m TO BOTH CROSS SECTIONS.

**TYPICAL CROSS SECTION FOR RAU 100 FINAL CONSTRUCTION**



IN ROCK CUTS REMOVE ROCK & REPLACE WITH APPROVED SUITABLE MATERIAL. ENSURE DRAINAGE OF ALL DEPRESSIONS IN ROCK CUTS.

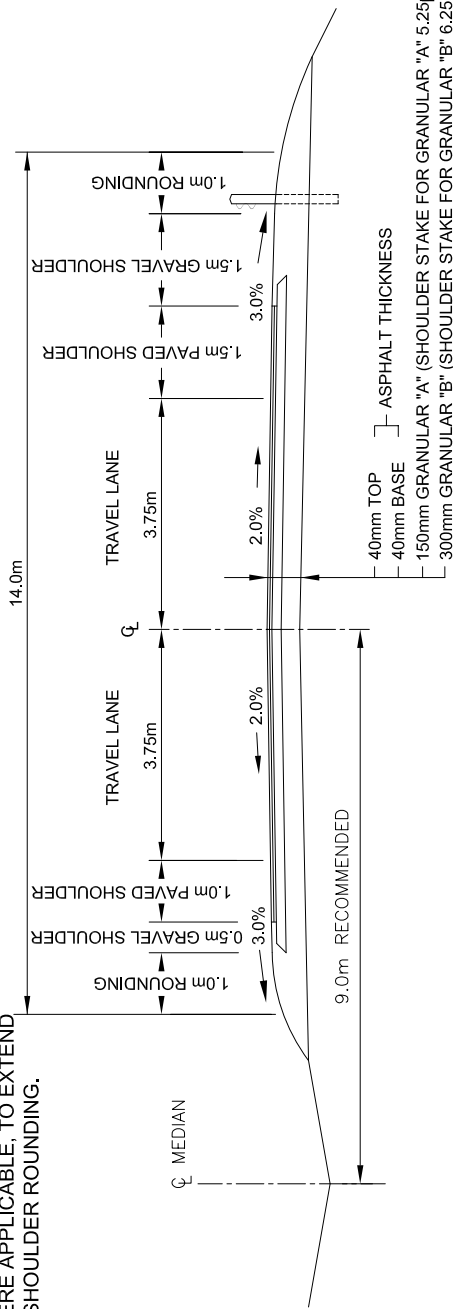
**TYPICAL CROSS SECTION FOR RAU 100 SUB-GRADE CONSTRUCTION**



STANDARD WIDTH R.O.W. 60m (2 LANES).  
 STANDARD WIDTH CUTTING 60m.  
 STANDARD WIDTH GRUBBING 40m.

**RAD 90**

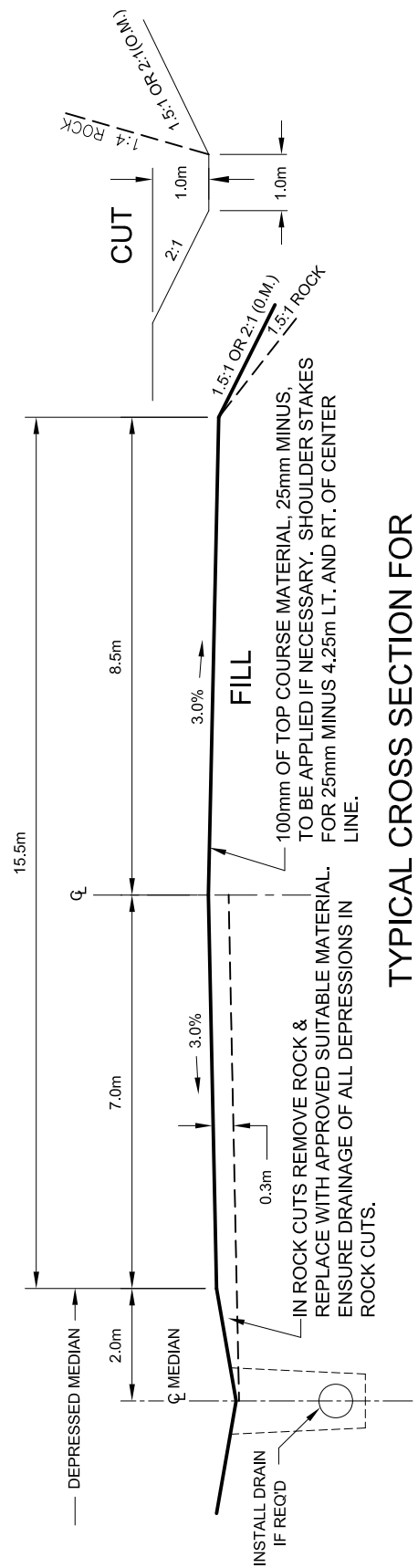
HYDROSEEDING, WHERE APPLICABLE, TO EXTEND FROM MID-POINT OF SHOULDER ROUNDING.



**NOTES:**  
 SHOULDER STAKE 5.75m LT. 7.25m RT. FOR SHOULDERING MACHINE TO ACHIEVE REQUIRED ROUNDING.

IF SCARIFYING IS REQUIRED WIDTH OF SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS 300mm ON BOTH SIDES.

**TYPICAL CROSS SECTION FOR  
 RAD 90 FINAL CONSTRUCTION (HALF SECTION)**

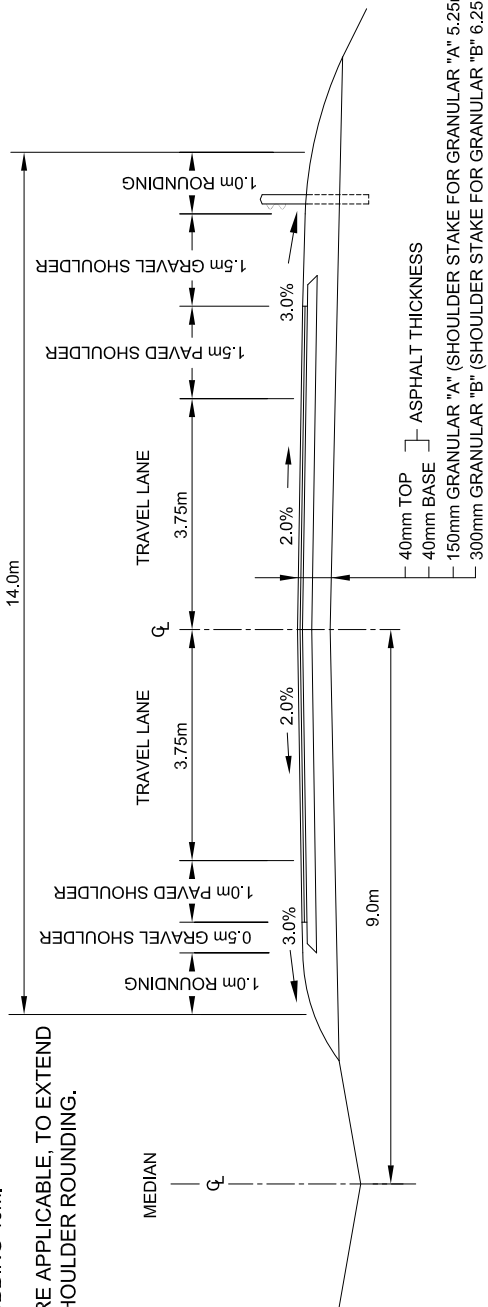


**TYPICAL CROSS SECTION FOR  
 RAD 90 SUB-GRADE CONSTRUCTION**

# RAD 100

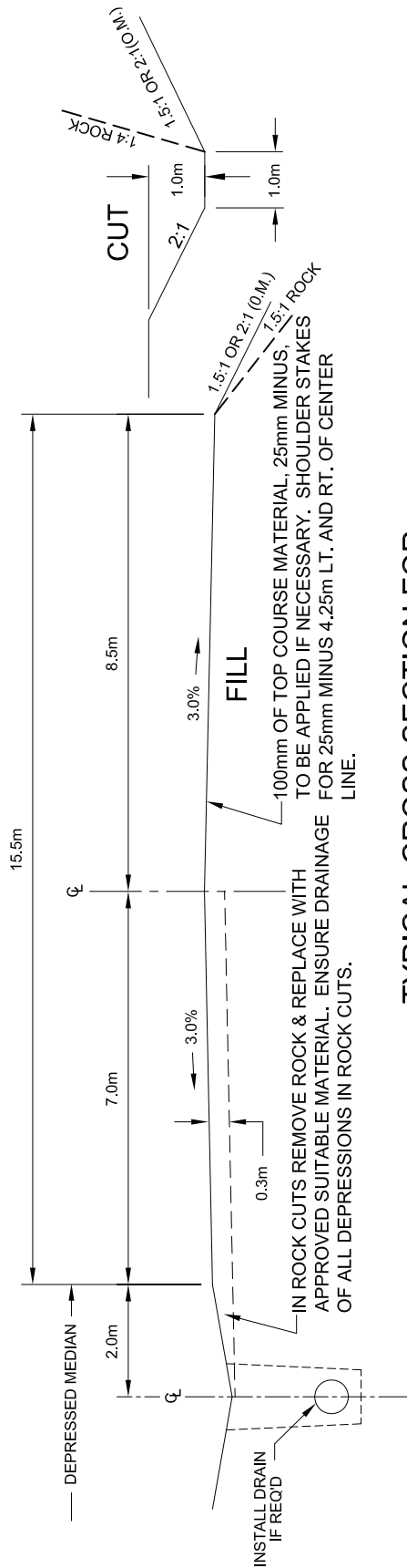
STANDARD WIDTH R.O.W. 60m (2 LANES).  
STANDARD WIDTH CUTTING 60m.  
STANDARD WIDTH GRUBBING 40m.

HYDROSEEDING, WHERE APPLICABLE, TO EXTEND FROM MID-POINT OF SHOULDER ROUNDING.

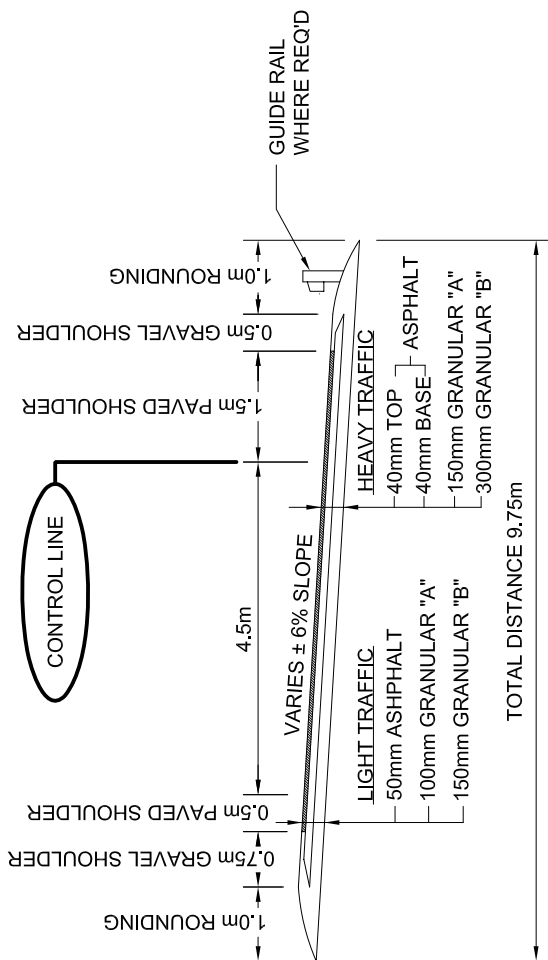


NOTES:  
SHOULDER STAKE 5.75m LT. 7.25m RT. FOR SHOULDERING MACHINE TO ACHIEVE REQUIRED ROUNDING.  
IF SCARIFYING IS REQUIRED WIDTH OF SCARIFYING SHALL BE WIDTH OF PAVEMENT PLUS 300mm ON BOTH SIDES.

## TYPICAL CROSS SECTION FOR RAD 100 FINAL CONSTRUCTION (HALF SECTION)

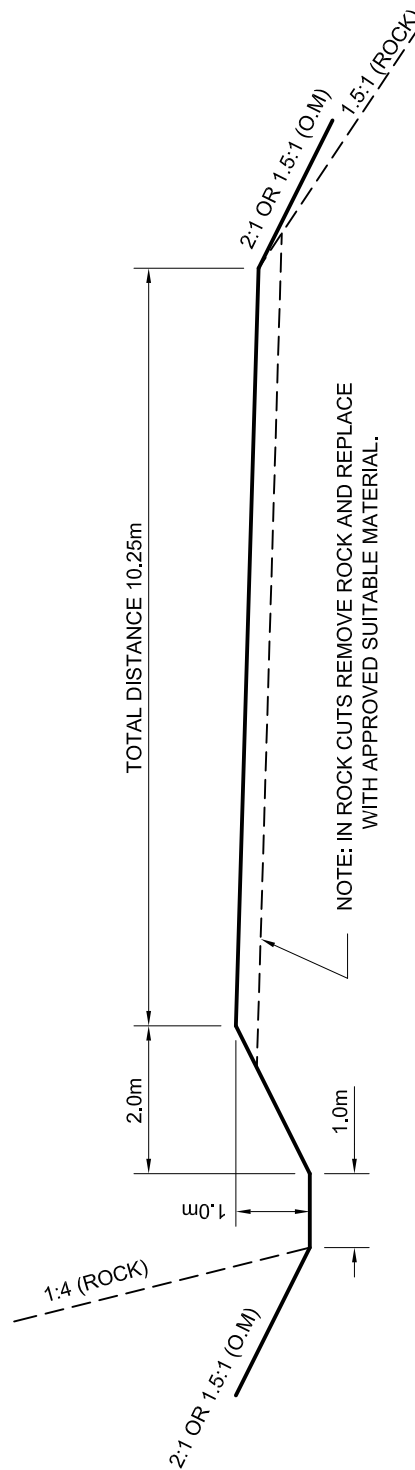


## TYPICAL CROSS SECTION FOR RAD 100 SUB-GRADE CONSTRUCTION



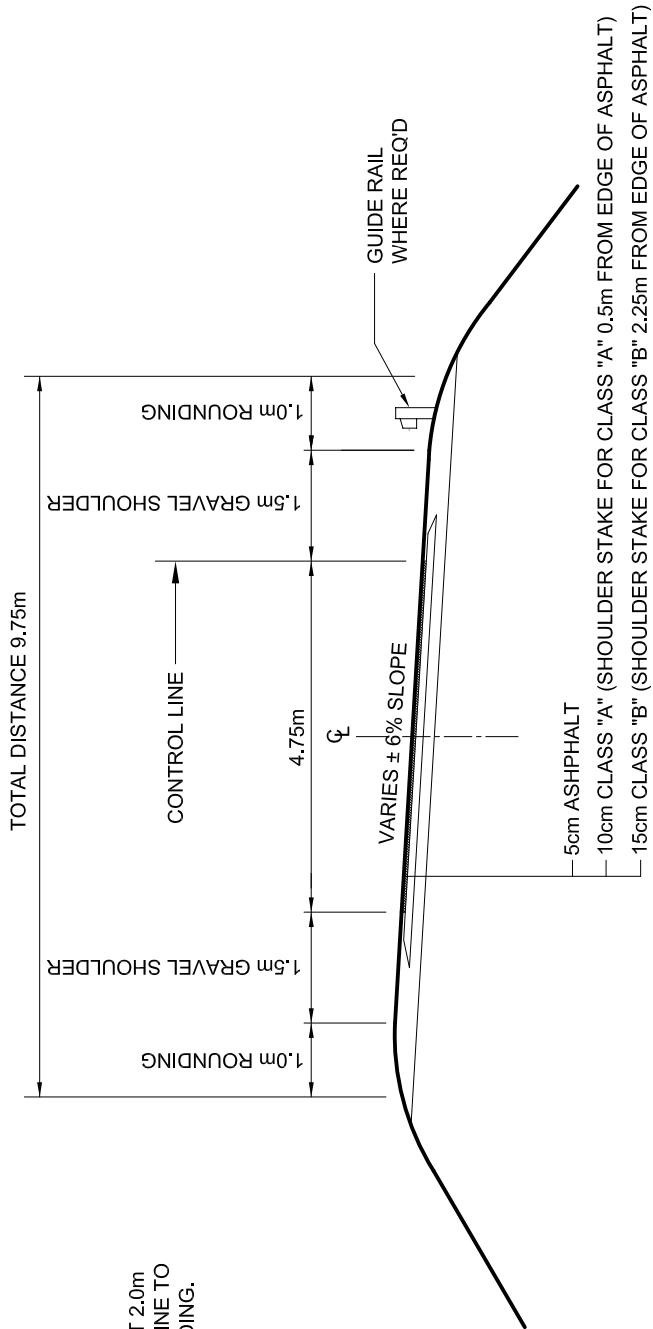
STAKE DISTANCES (METERS FROM CONTROL LINE)	LIGHT TRAFFIC		HEAVY TRAFFIC	
	LT	RT	LT	RT
GRANULAR "B"	6.50	2.75	6.25	2.50
GRANULAR "A"	5.50	2.00	5.50	2.00
SHOULDER	5.75	2.00	5.75	2.00

TYPICAL CROSS SECTION FOR RAMP FINAL CONSTRUCTION



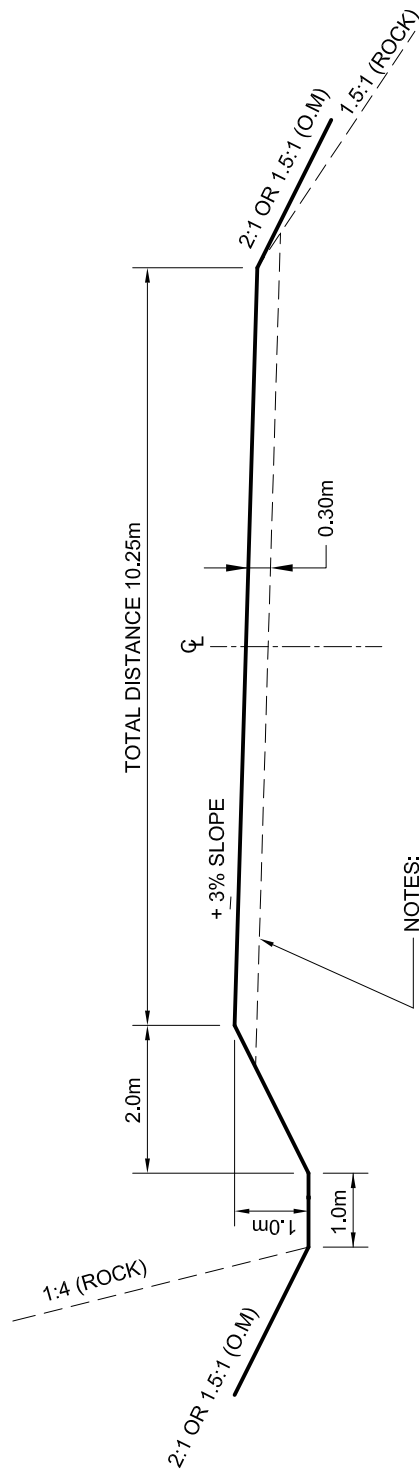
NOTE: IN ROCK CUTS REMOVE ROCK AND REPLACE WITH APPROVED SUITABLE MATERIAL.

TYPICAL CROSS SECTION FOR RAMP SUB-GRADE CONSTRUCTION

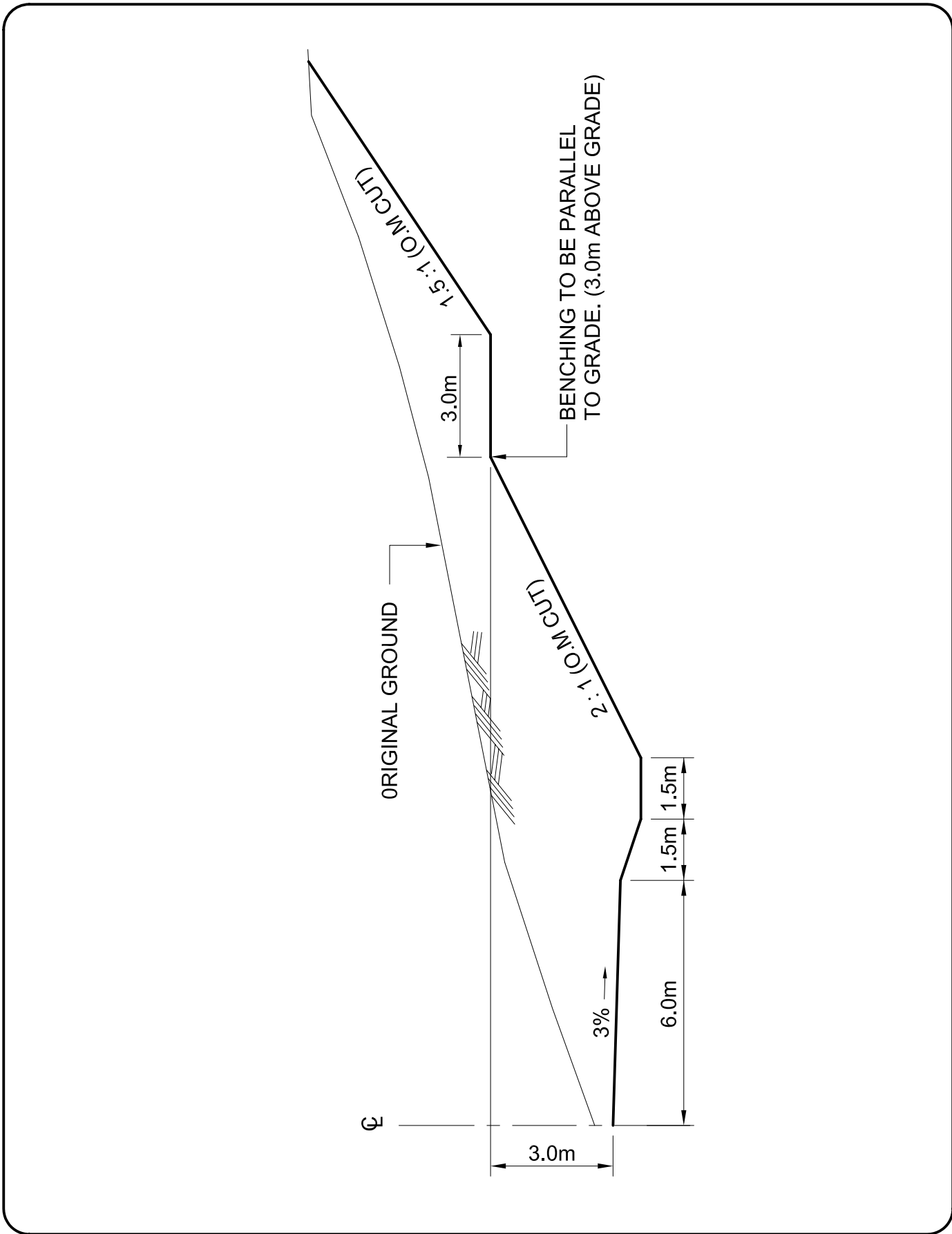


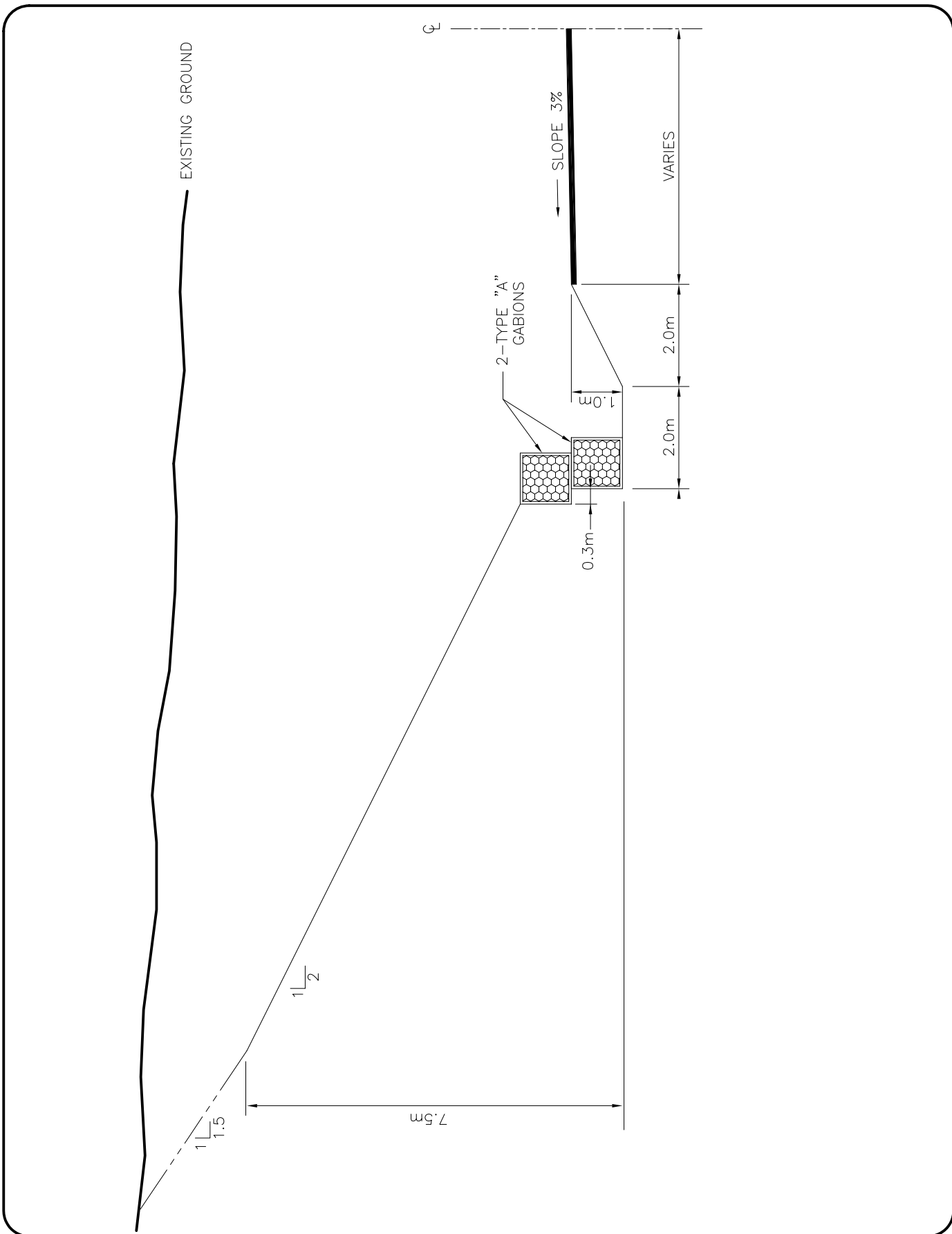
NOTES:  
SHOULDER STAKE OFFSET 2.0m  
FOR SHOULDERING MACHINE TO  
ACHIEVE REQUIRED ROUNDING.

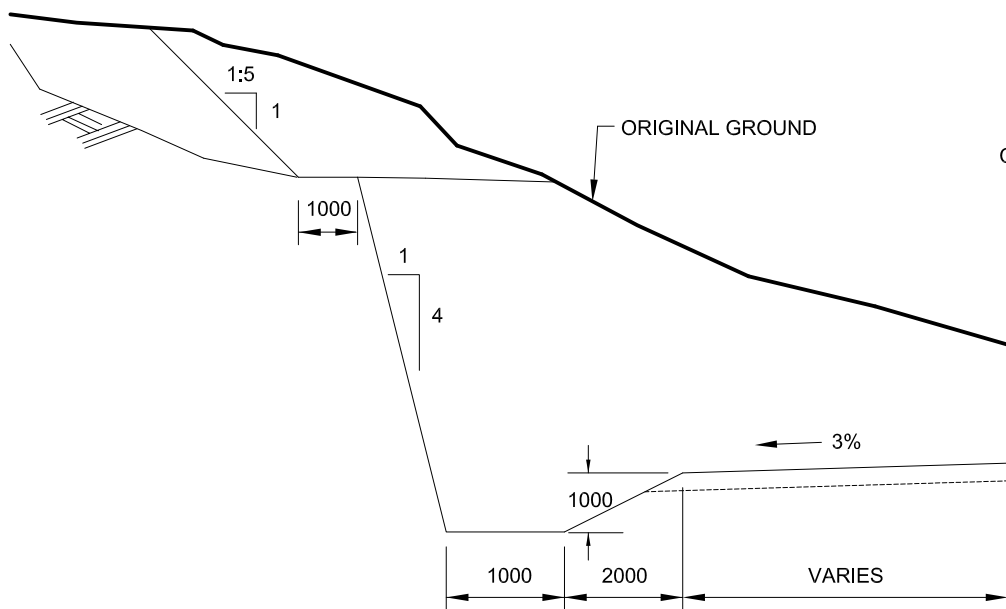
TYPICAL CROSS SECTION FOR RAMP, FINAL CONSTRUCTION



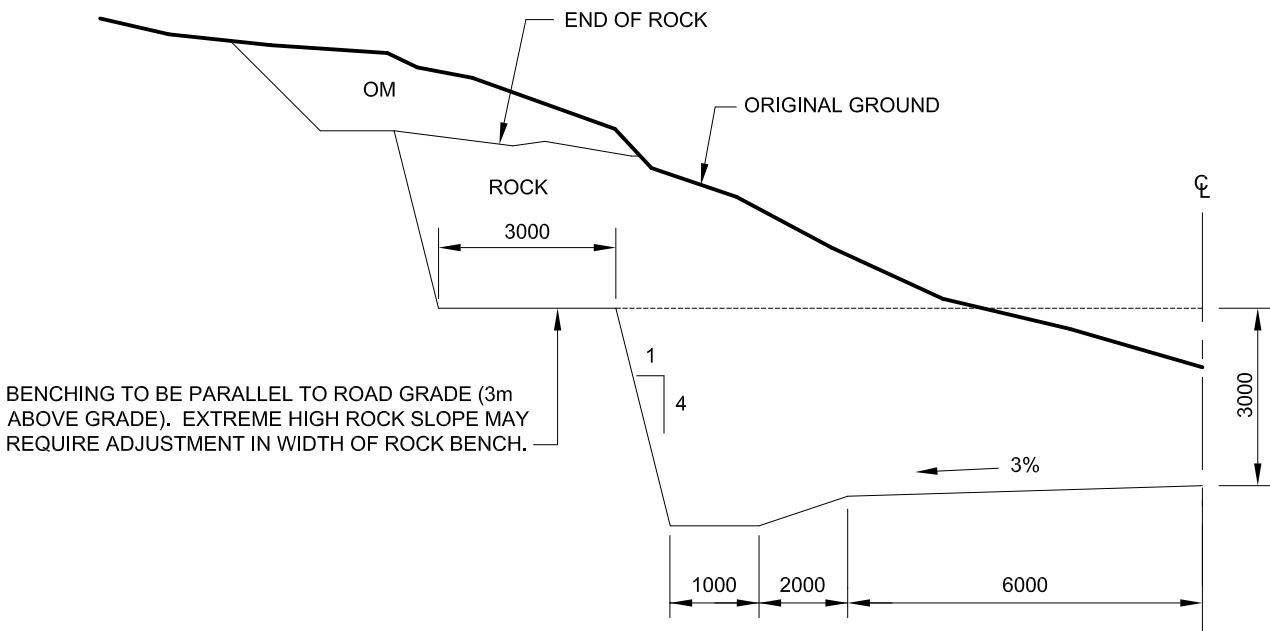
TYPICAL CROSS SECTION FOR RAMP SUB-GRADE CONSTRUCTION



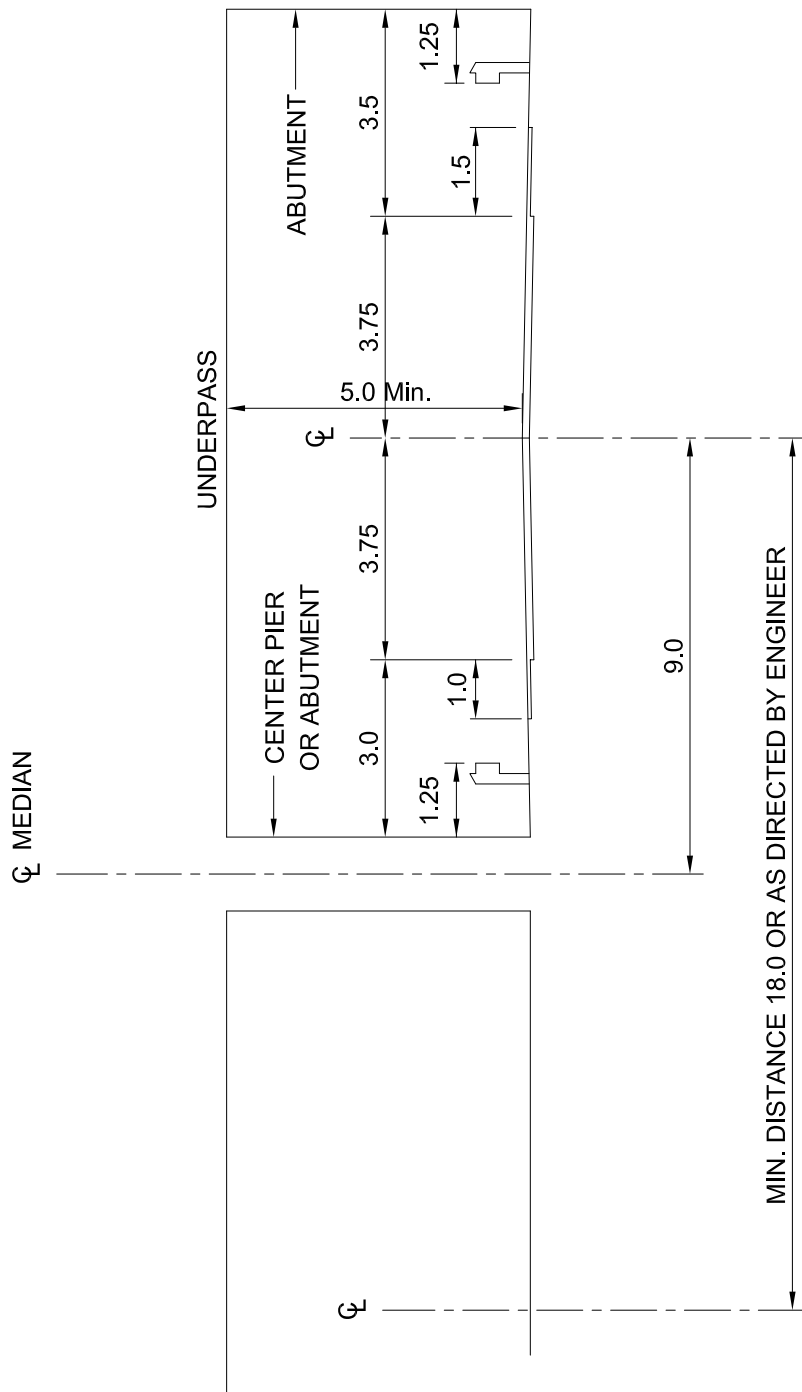




### TYPICAL SECTION - ROCK CUT WITH NO BENCHING

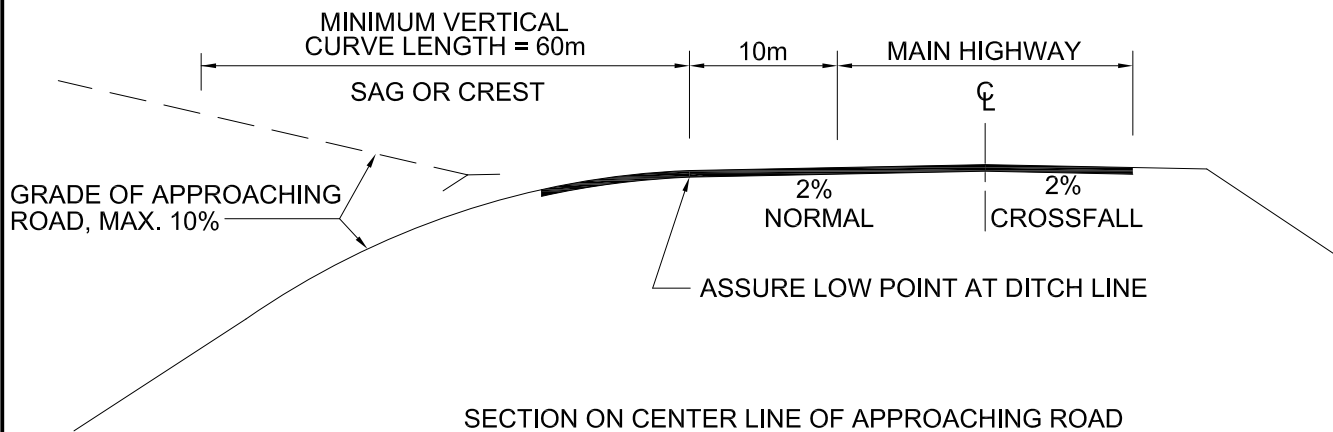
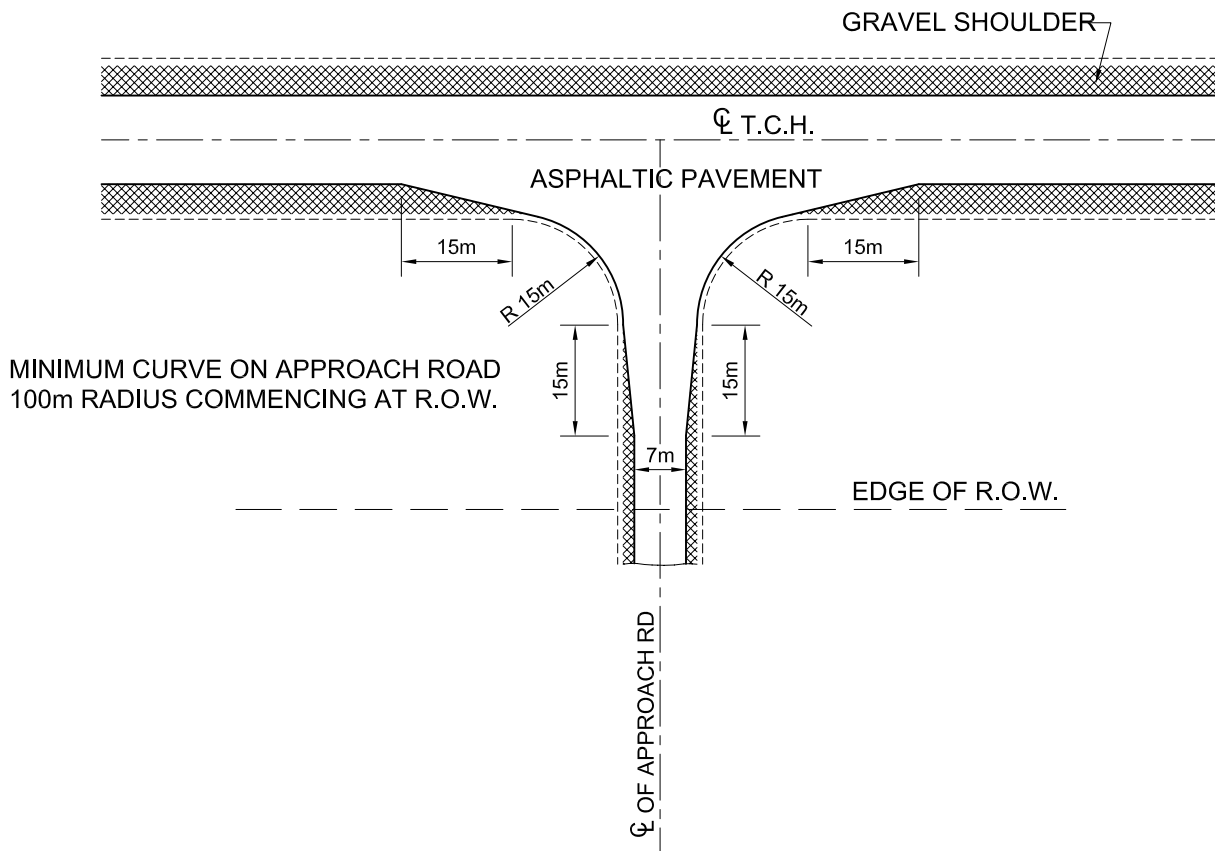


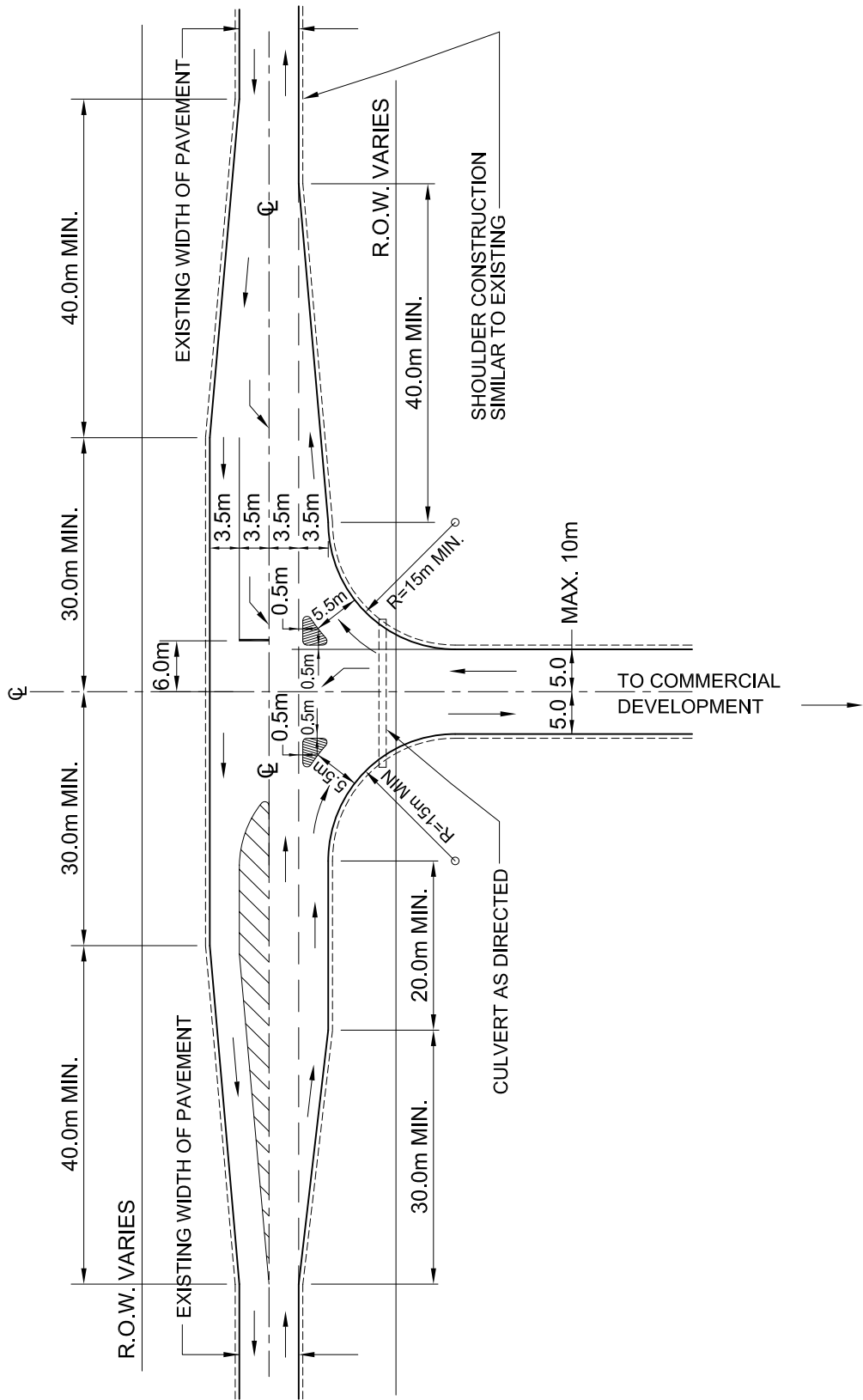


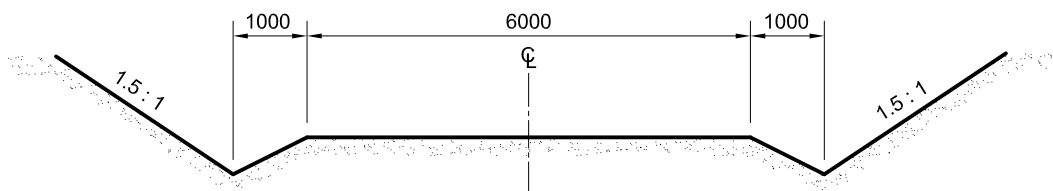


NOTES:  
DIMENSIONS BASED ON GEOMETRIC DESIGN STANDARDS.

MINIMUM SIGHT DISTANCE 300m  
 HEIGHT OF EYE = 1.0m HEIGHT OF OBJECT = 0.0m

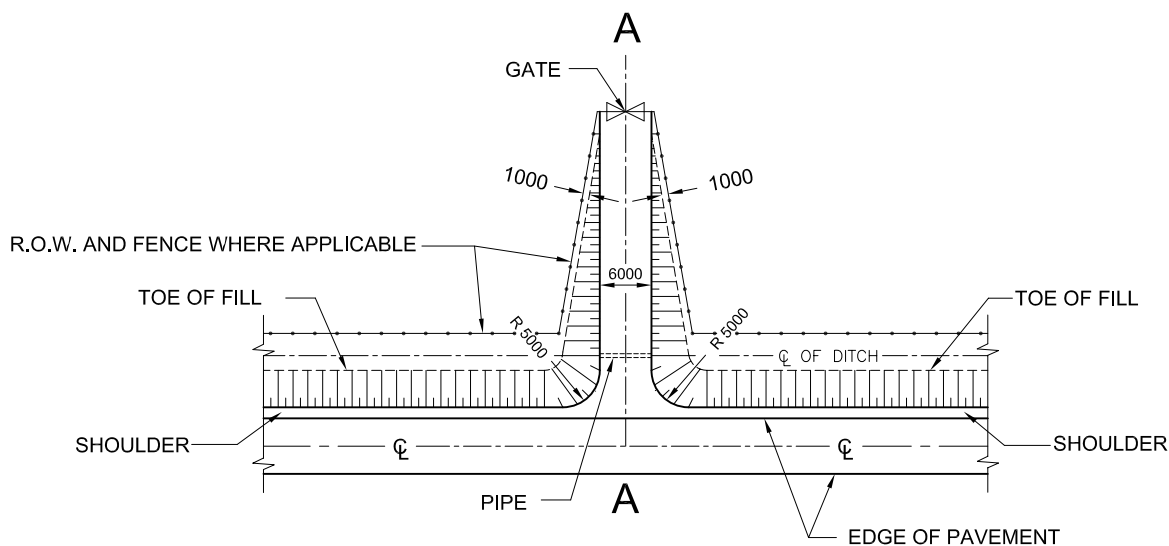






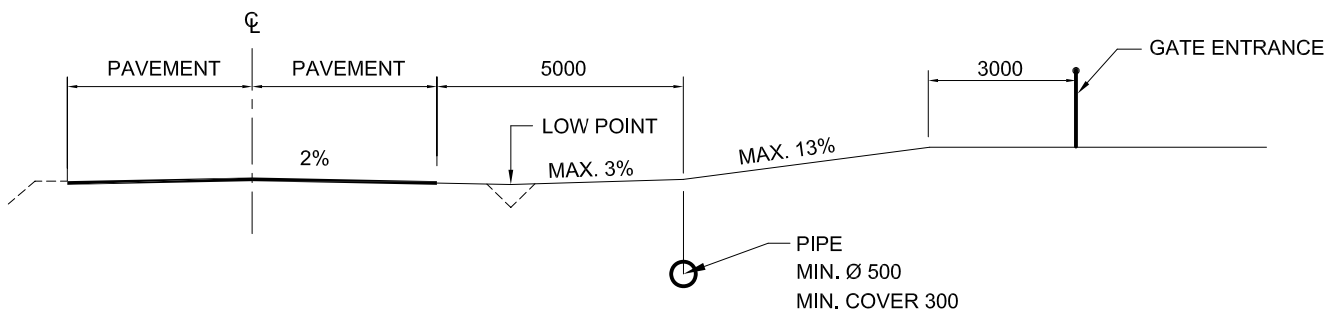
**CROSS SECTION OF PRIVATE ENTRANCE**

N.T.S.



**PLAN**

N.T.S.



**SECTION A-A**

SCALE 1 : 150



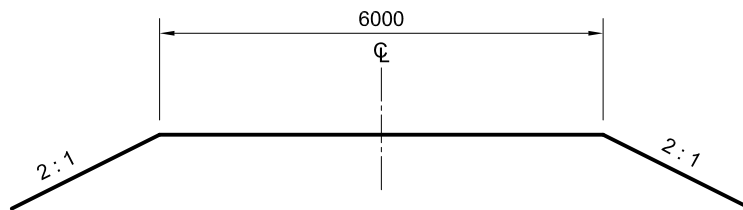
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

**PRIVATE ENTRANCE IN CUT**

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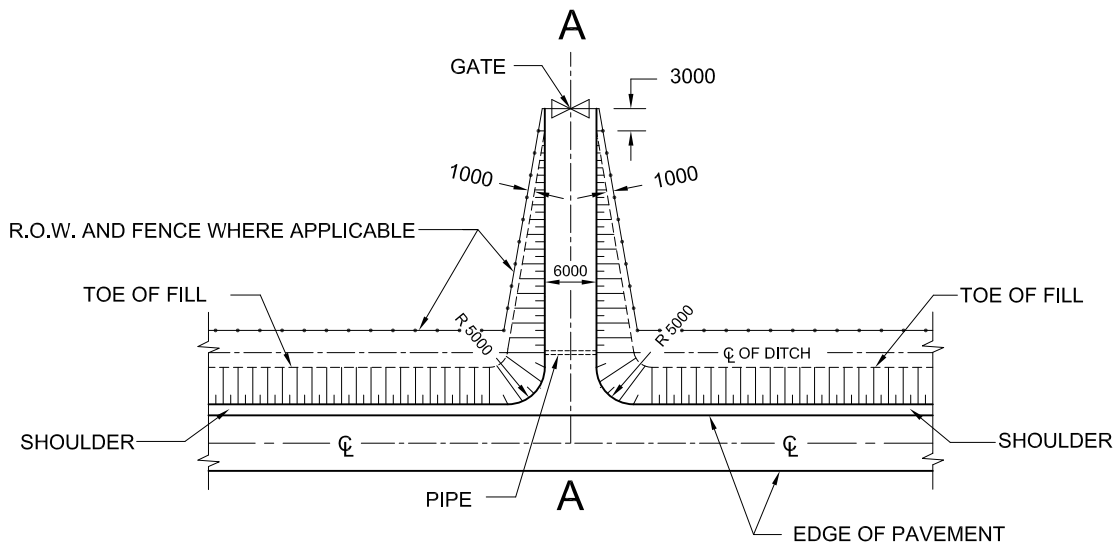
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SCALE N.T.S.



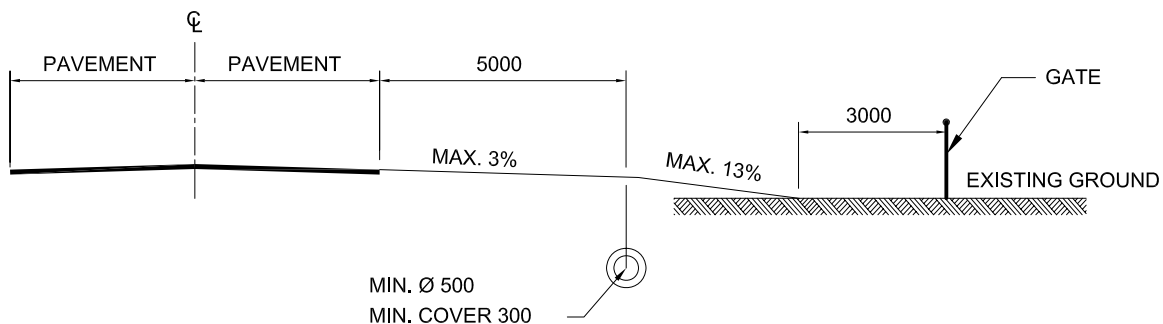
**CROSS SECTION OF PRIVATE ENTRANCE**

N.T.S.



**PLAN**

N.T.S.



**SECTION A-A**

N.T.S.

# FORM 1200



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Department of Transportation and Works  
Highway Design Division

## DIVISION 12 STANDARD DRAWINGS INDEX

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1202	Portable Scale House For Beam Type Scales	1
1203	Field Laboratory	1
1204	Portable Scale House for Electronic Type Scales	1
1205	Guidelines for Ditching	1
1206	Guidelines for Benching of Earth Slopes	1
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1240	Catch Basin Pup	1
1241	Shallow Sump Non-inspection Catch Basin with Frame and Grate	1
1242	Deep Sump Non-Inspection Catch Basin with Frame and Grate	1

MARCH 2011

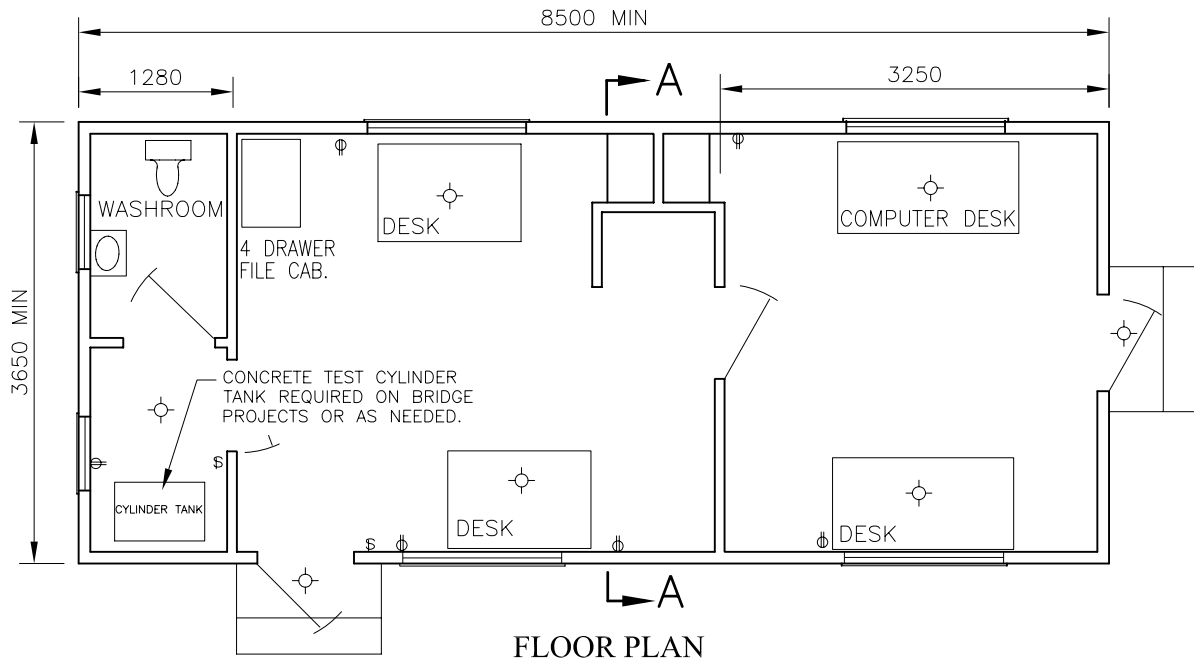
<b>Section</b>	<b>Number of Pages</b>	
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1288c	Type 1 Installation of Preformed Inductive Loop Placement in New Road	1
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1290	Sign Post Installation Details Type "A"	1
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1294a	Sign Post Installation Details Type "H"	1
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**MARCH 2011**

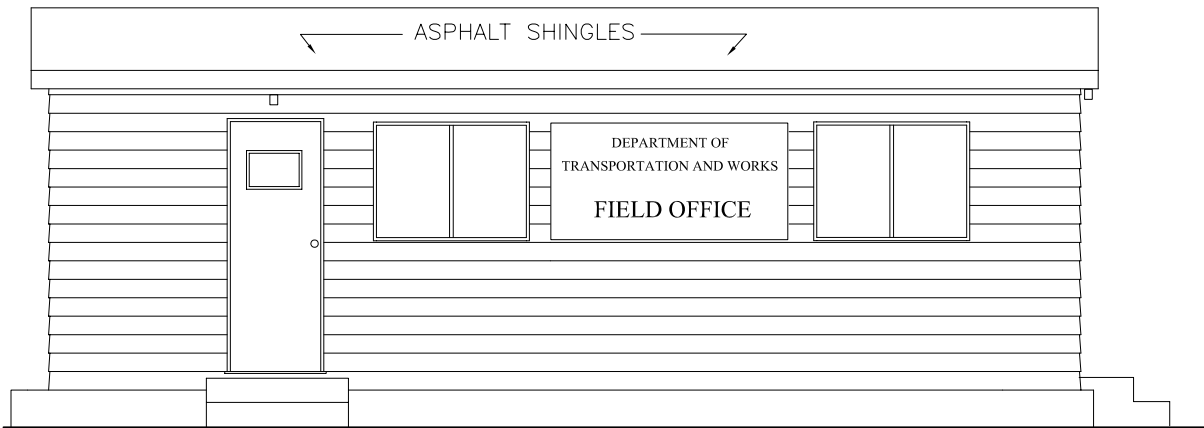
**FORM 1200**

1296a	Sign Post Installation Details Type "I"	1
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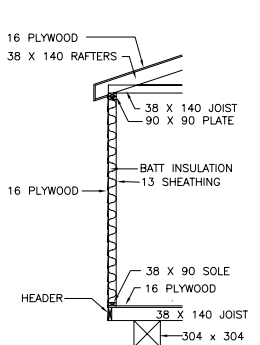




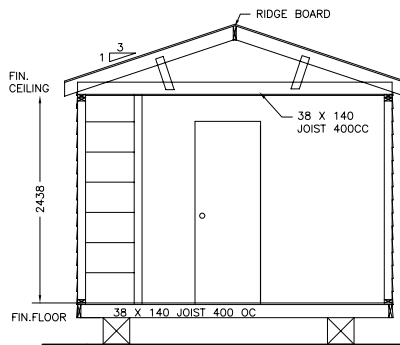
FLOOR PLAN



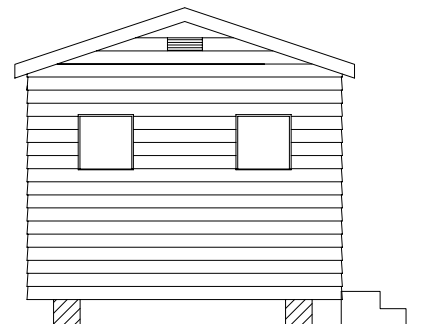
FRONT ELEVATION



TYPICAL WALL SECTION



SECTION A-A



LEFT ELEVATION

ALL ELEMENTS OF THIS STRUCTURE MUST ADHERE TO THE NATIONAL BUILDING CODE OF CANADA.



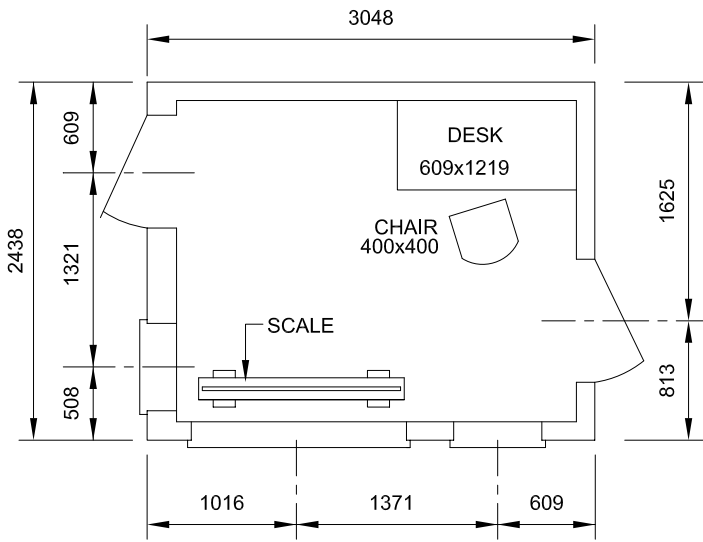
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

FIELD OFFICE

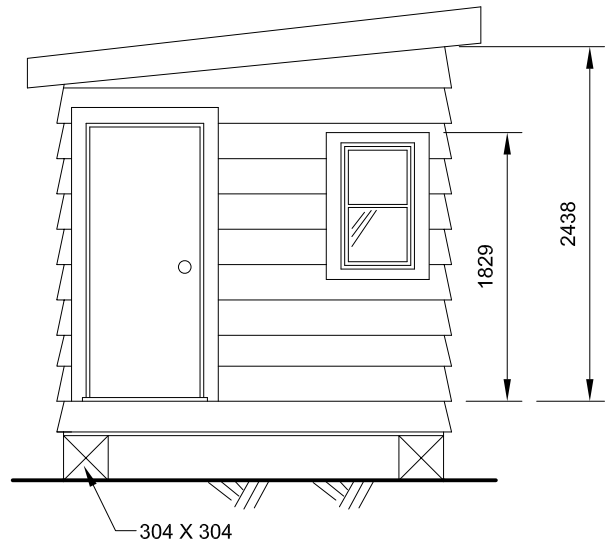
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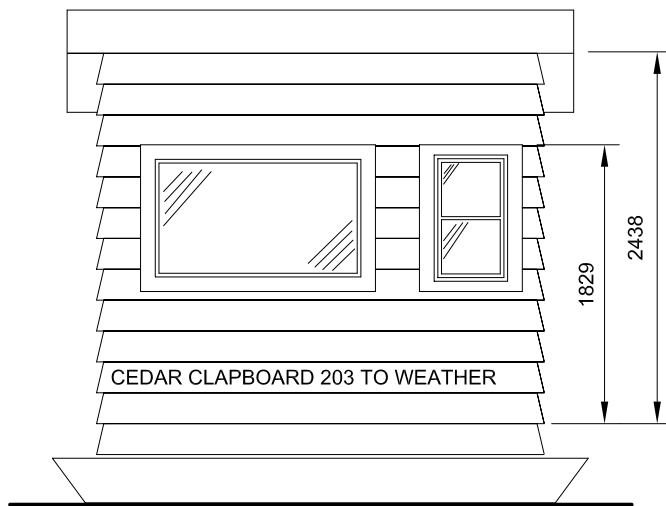
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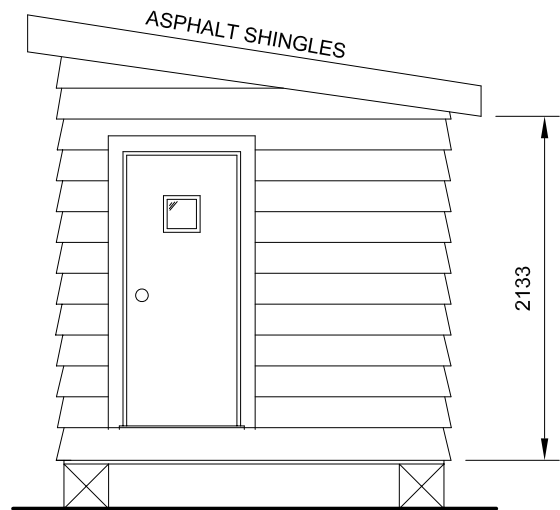
FLOOR PLAN



LEFT SIDE ELEVATION



FRONT ELEVATION



RIGHT SIDE ELEVATION

NOTES:  
PROVISION FOR HEATING & LIGHTING SHALL BE MADE BY CONTRACTOR.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

PORTABLE SCALE HOUSE  
FOR BEAM TYPE SCALES

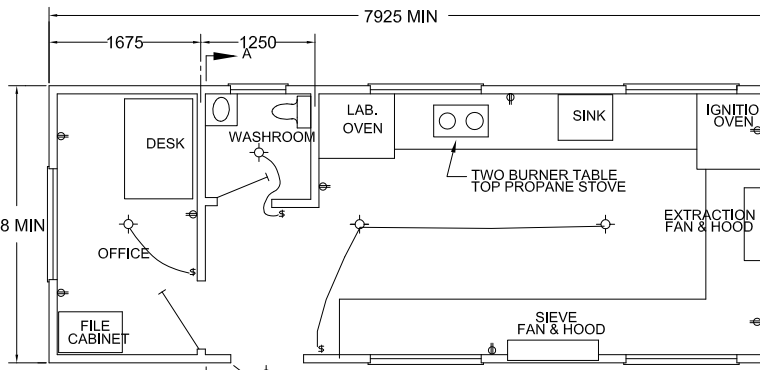
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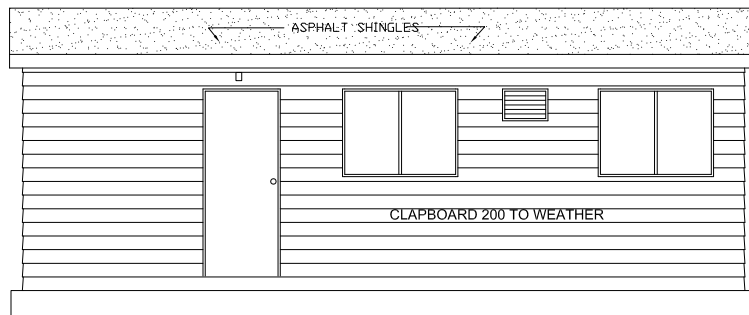
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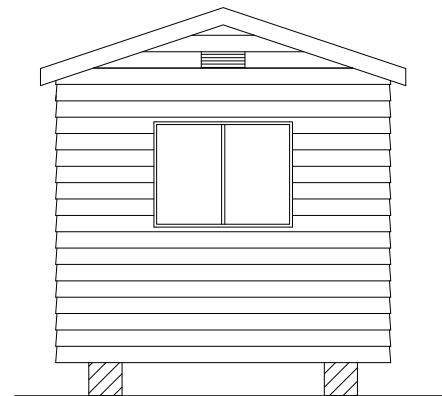
1. WORK BENCHES AROUND THREE WALLS 610mm WIDE 1066mm HIGH. THE TOTAL FRONT PERIMETER BENCH LENGTH TO BE A MINIMUM OF 9700mm. FREE BENCH SPACE SHALL BE A MINIMUM OF 6000mm IN FRONT PERIMETER LENGTH. APPROX. 50% OF BENCH TOP AREA TO BE STAINLESS STEEL AND REMAINDER EPOXY RESIN BLACK.
2. SHELVES REQUIRED UNDER ALL BENCHES 460mm OFF THE FLOOR.
3. WATER TAP TO BE AT LEAST 460mm ABOVE BOTTOM OF SINK. SINK TO BE MINIMUM OF 410mm x 450mm AND STAINLESS STEEL.
4. INCANDESCENT LIGHTING.
5. ELECTRIC OUTLETS SEPARATE LINES.
6. ELECTRIC LABORATORY OVEN M&L 30145 OR EQUIVALENT VENTED OUTSIDE AND CAPABLE OF HEATING TO AMBIENT TEMPERATURE 177°C WITH FORCED AIR CIRCULATION AND ADJUSTABLE SHELVING.
7. TWO BURNER PROPANE TABLE TOP STOVE PROPANE BOTTLE INSTALLED AND STORED OUTSIDE LAB.
8. FIRE EXTINGUISHERS - TWO 4.5kg CARBON DIOXIDE TYPE INSTALLED AS PER REGULATION.
9. ELECTRIC HEAT - 100w FOR LAB, 500w FOR OFFICE, 500w FOR WASHROOM.
10. EXTRACTION FAN - DUNDAS (OR EQUIVALENT) 1/4 hp 1725 RPM FOUNDRY MODEL E-10 INCH. TO MEET AT LEAST 3000 CFM.
11. SIEVE FAN DUNDAS FOUNDRY MODEL E-12 (OR EQUIVALENT) 1/4 hp 1725 RPM TO MEET AT LEAST 1700 CFM.
12. FAN HOODS - EACH FAN EQUIPPED WITH HOOD 700mm ABOVE COUNTERTOP, VENTED OUTSIDE WITH SHIELD TO PREVENT AIR REVERSAL.
13. ALL FURNITURE SHOWN TO BE SUPPLIED BY CONTRACTOR.
14. ASPHALT IGNITION OVEN - TROXLER NTO 4730 OR EQUIVALENT TO BE APPROVED BY THE MATERIALS ENGINEERING DIVISION.
15. SITE SELECTION AND INSTALLATION OF THE ASPHALT IGNITION OVEN AND EXHAUST SYSTEM WILL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. THE OVEN MUST BE SITUATED SO AS TO PERMIT ACCESS TO THE PLENUM BOX FOR CLEANING. DO NOT LOCATE EXHAUST POINT NEAR AIR INTAKES OR DOORWAYS.
16. CARBON MONOXIDE DETECTOR/ALARM MEETING THE REQUIREMENTS OF UL STANDARD 2034 TO BE INSTALLED.
17. FIELD LABORATORIES MUST BE BLOCKED AND PROPERLY SUPPORTED.



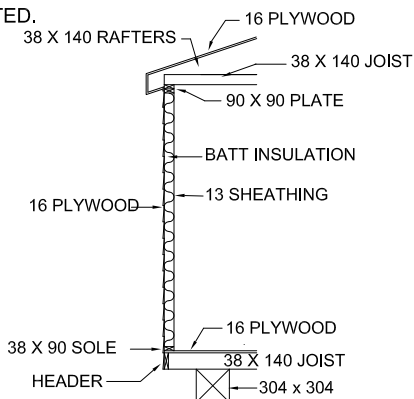
FLOOR PLAN



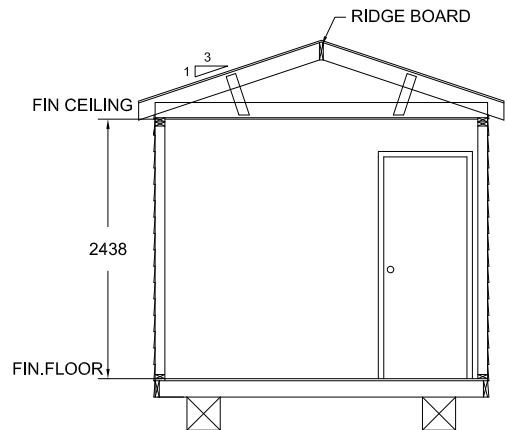
FRONT ELEVATION



LEFT ELEVATION



TYPICAL WALL SECTION



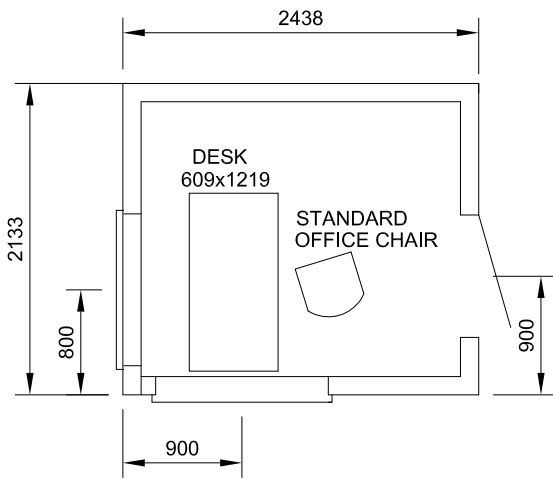
SECTION A-A



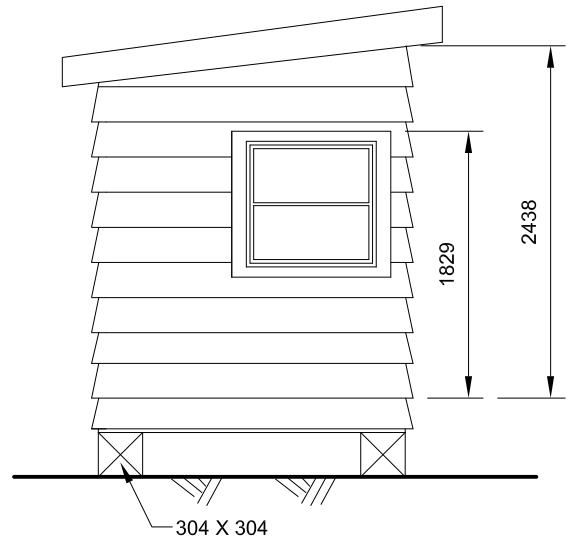
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

FIELD LABORATORY

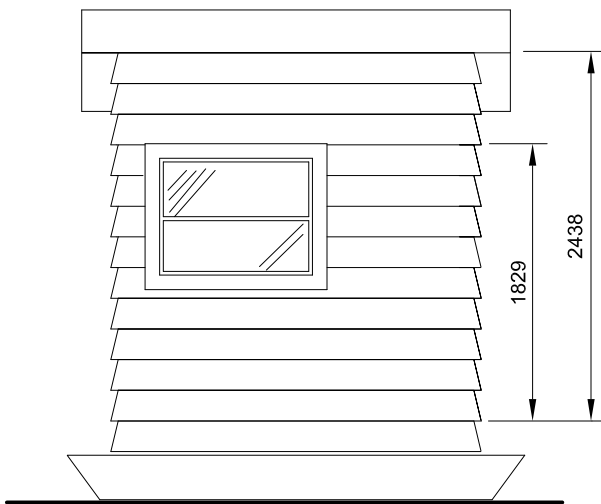
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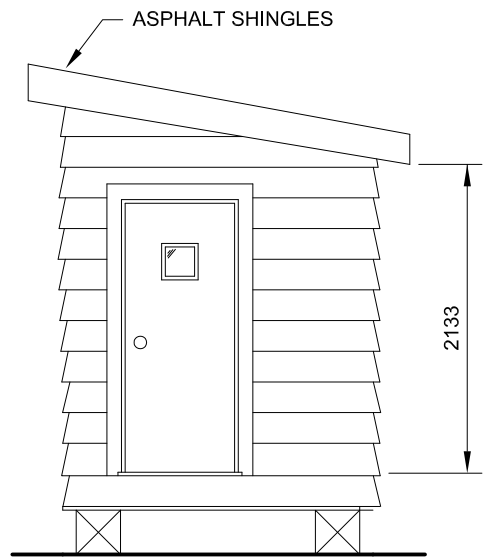
FLOOR PLAN



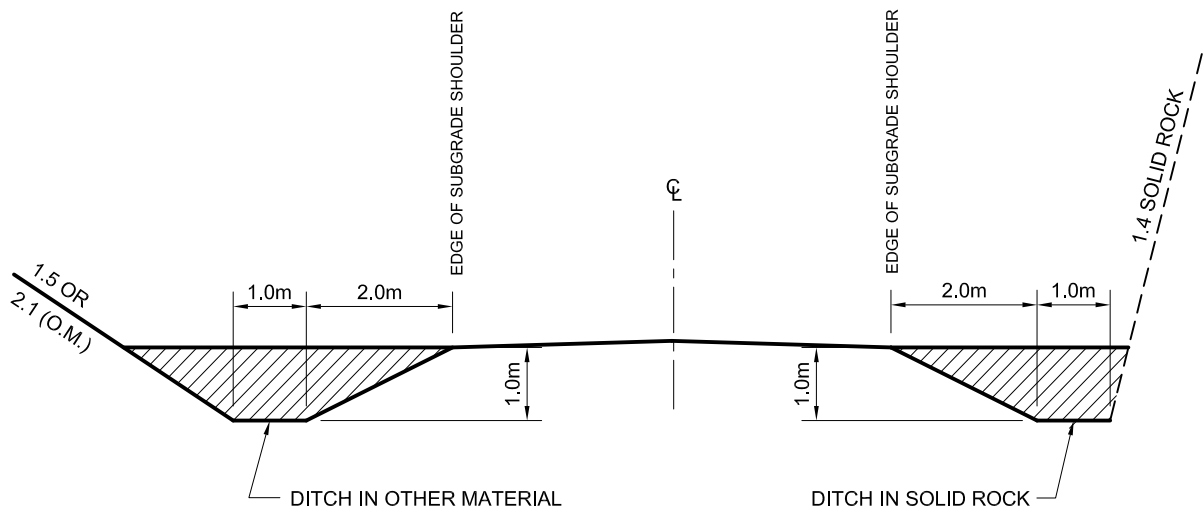
LEFT SIDE ELEVATION



FRONT ELEVATION



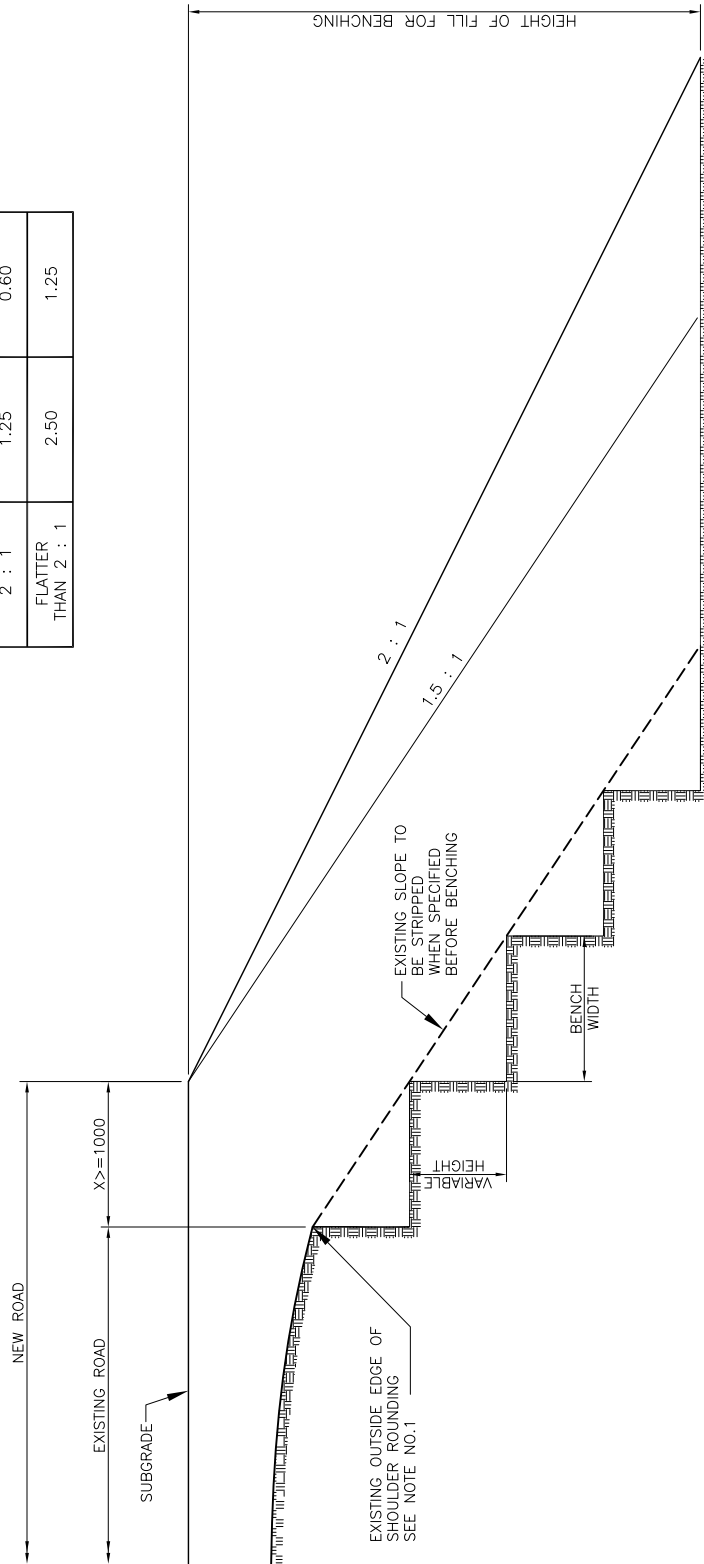
RIGHT SIDE ELEVATION



 PAY LIMITS FOR DITCHING

## GUIDE LINES FOR DITCHING

WIDTH OF BENCHES (m)		
EXISTING SLOPES	FILLS OF 3.5m OR GREATER	FILLS LESS THAN 3.5m
1.5 : 1	1.00	0.50
2 : 1	1.25	0.60
FLATTER THAN 2 : 1	2.50	1.25



- NOTES:
1. WHEN THE SUBGRADE IS BELOW THE EXISTING OUTSIDE EDGE OF SHOULDER ROUNDING, BENCHING SHALL BE CARRIED OUT BELOW THE POINT WHERE THE SUBGRADE INTERSECTS THE EXISTING SLOPE.
  2. THIS STANDARD APPLIES TO WIDENING OF FILLS WHERE THE DISTANCE "X" IS 1.0M OR MORE AT NEW TOP OF SUBGRADE LEVEL.
  3. BENCHING IS NOT REQUIRED ON EXISTING SLOPES FLATTER THAN 3:1 OR WHERE SPECIFIED.
  4. BENCHES ARE TO BE EXCAVATED ONE LEVEL AT A TIME AND THE COMPACTED FILL BROUGHT UP BEFORE THE NEXT BENCHING LEVEL IS EXCAVATED.
  5. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES UNLESS OTHERWISE SHOWN.



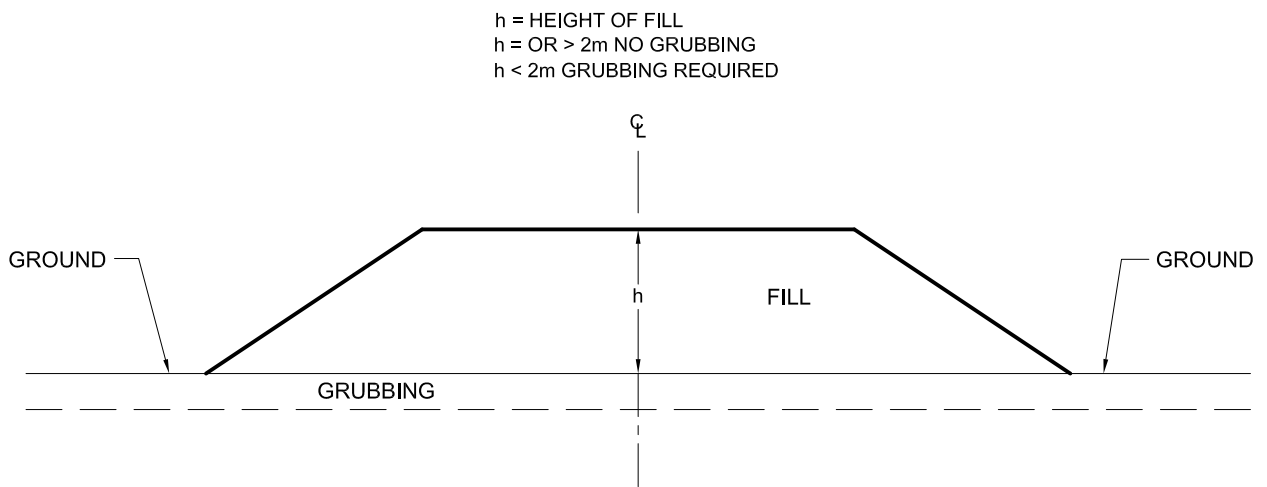
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

GUIDE LINES FOR  
BENCHING OF EARTH SLOPES

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DATE: 2007-12-12

NOT TO SCALE



**NOTES:**

- 1.) IF FILL IS HIGHER THAN, OR EQUAL TO 2m, THEN DO NOT GRUB.
- 2.) IF FILL IS LOWER THAN 2m, THEN GRUB.



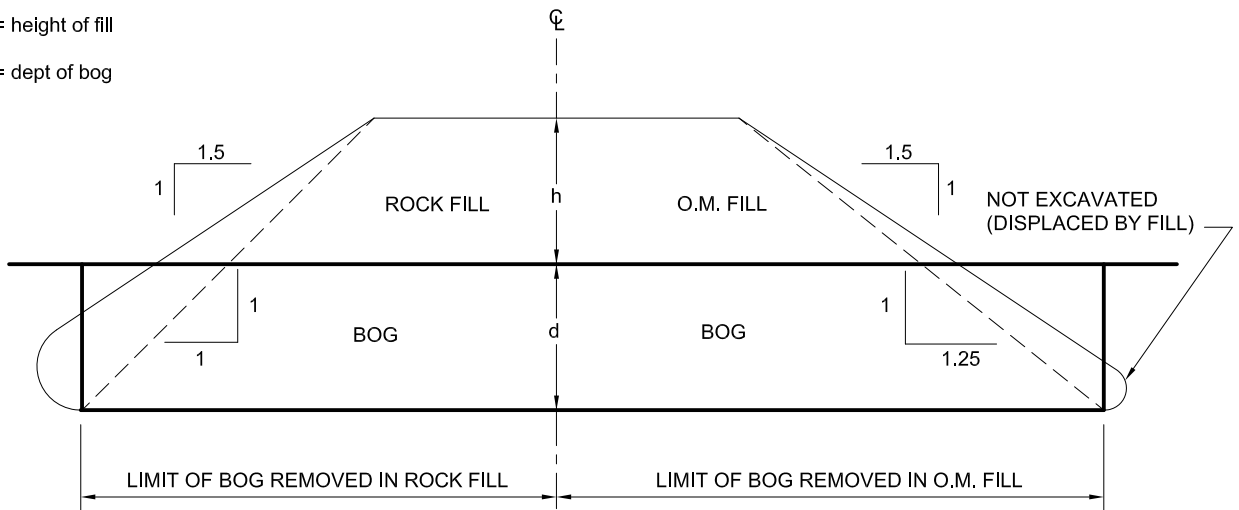
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## GUIDE LINES FOR GRUBBING

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h = height of fill

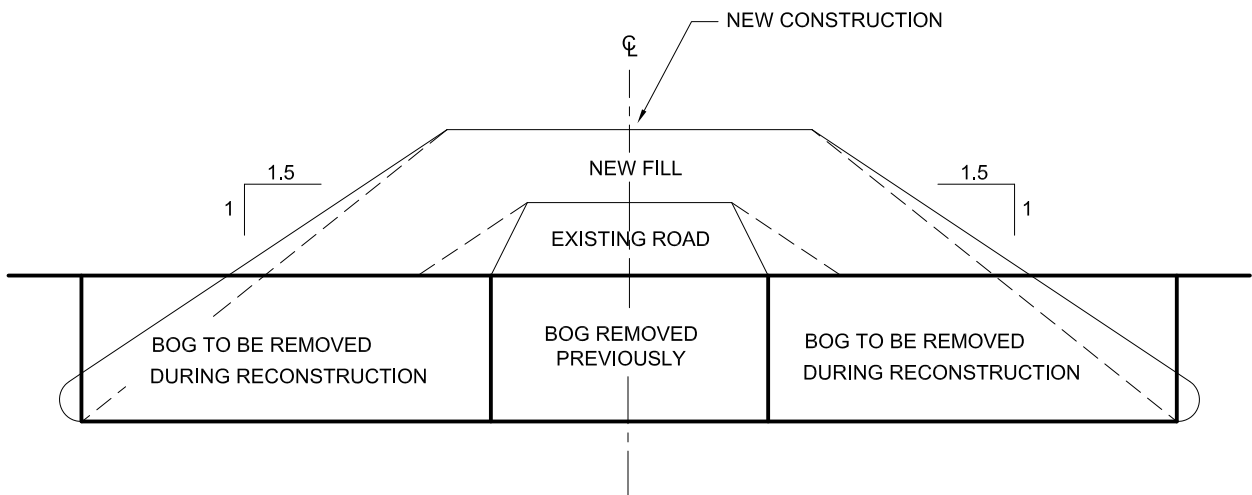
d = dept of bog



### NEW CONSTRUCTION

#### NOTES FOR BOG REMOVAL

1. IF FILL IS LOWER THAN 2m, THEN REMOVE BOG.
2. IF FILL IS HIGHER THAN OR EQUAL TO 2m, AND IF FILL IS LOWER THAN OR EQUAL TO TWICE THE DEPTH OF BOG, THEN REMOVE BOG.
3. IF FILL IS HIGHER THAN OR EQUAL TO 6m, DO NOT REMOVE BOG.



### RECONSTRUCTION



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

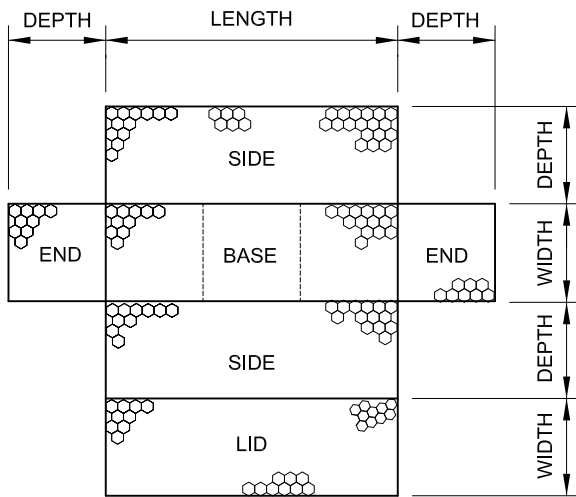
## GUIDE LINES FOR BOG REMOVAL

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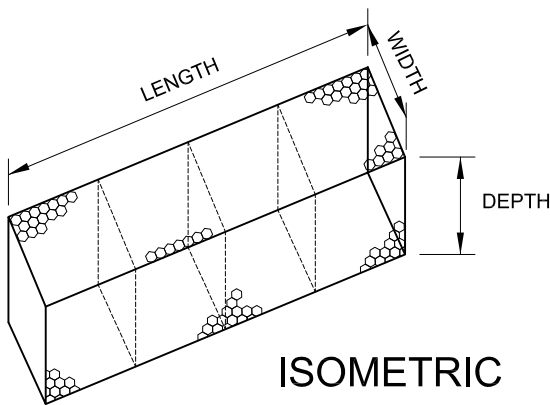
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**GABION PLAN**

1. GABIONS SHALL BE MADE OF ZINC COATED STEEL WIRE, TRIPLE TWISTED, FORMING A UNIFORM HEXOGONAL MESH PATTERN OF 80 x 100 OPENING.
2. GALVANIZED WIRE SHALL BE 2.9Ø FOR GALVANIZED GABIONS AND 2.7Ø P.V.C. COATED GABIONS.
3. GABIONS SHALL BE SUPPLIED FOLDED FLAT TO FACILITATE HANDLING & TRANSPORTATION. THEY SHALL FORM RECTANGULAR BASKETS OF SPECIFIED SIZE WHEN CONSTRUCTED.
4. GABIONS SHALL BE SUPPLIED WITH SECURELY TIED DIAPHRAGMS CONNECTED TO THE BASE WITH MATERIAL OF THE SAME COMPOSITION AS THE GABION, TO FORM INDIVIDUAL CELLS OF 1.0 IN WIDTH.
5. THE EDGES OF THE GABION WITH SECURELY TIED DIAPHRAGM BE MANUFACTURED INTO SECURELY CONNECTED SELVAGES TO PREVENT RAVELING.
6. THE SALVAGE OR PERIMETER WIRE SHALL BE MADE OF 3.8Ø GALVANIZED WIRE FOR GALVANIZED GABIONS & 3.4Ø P.V.C. COATED FOR P.V.C. COATED GABIONS.
7. P.V.C. COATED & GALVANIZED TYING AND CONNECTING SHALL BE SUPPLIED IN THE AMOUNT WIRE 2.2Ø OF NOT LESS THAN 8% OF THE WEIGHT OF THE BASKET.
8. ZINC COATING 0.26 kg/m<sup>2</sup>.
9. P.V.C. COATING FOR P.V.C. COATED GABIONS SHALL BE 0.4 THICK.



**ISOMETRIC**

GABION TYPE	LENGTH m	WIDTH m	DEPTH m	NO. OF DIAPHS.	CAPACITY m <sup>3</sup>
A	2	1	1	1	2
B	3	1	1	2	3
C	4	1	1	3	4
D	2	1	0.5	1	1
E	3	1	0.5	2	1.5
F	4	1	0.5	3	2
G	2	1	0.3	1	0.6
H	3	1	0.3	2	0.9
I	4	1	0.3	3	1.2



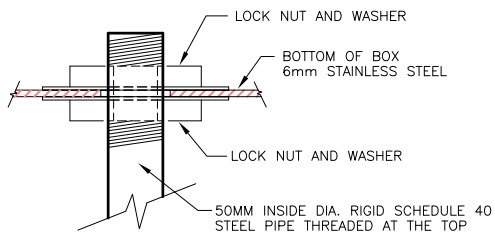
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**GABIONS**

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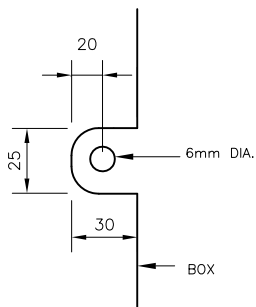
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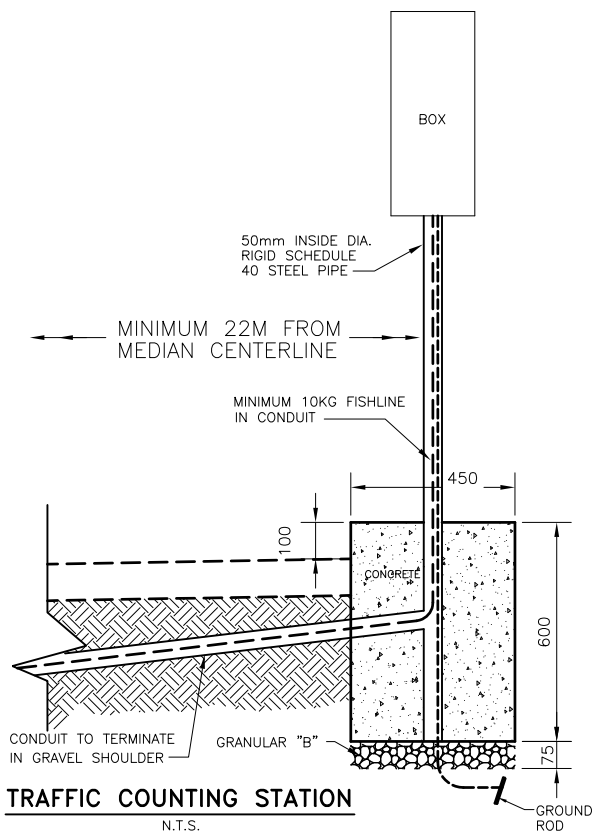
**BOLT DETAIL**

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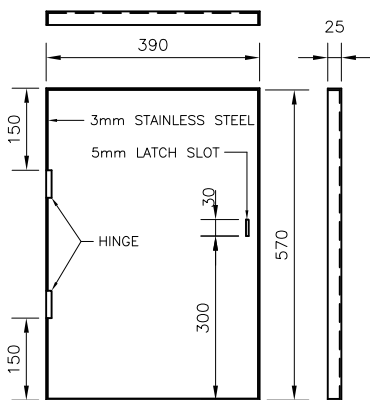
**LATCH DETAIL**

N.T.S.



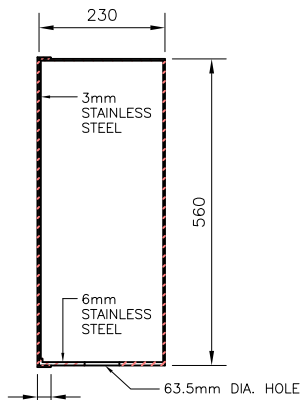
**TRAFFIC COUNTING STATION**

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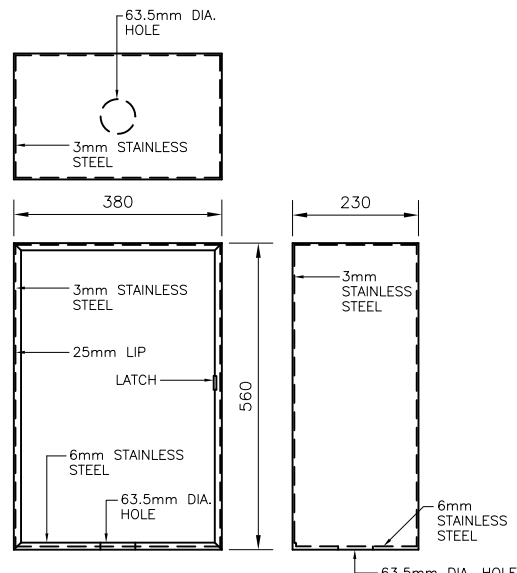
**BOX COVER**

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**SECTION OF BOX & COVER**

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**TRAFFIC COUNTER BOX**

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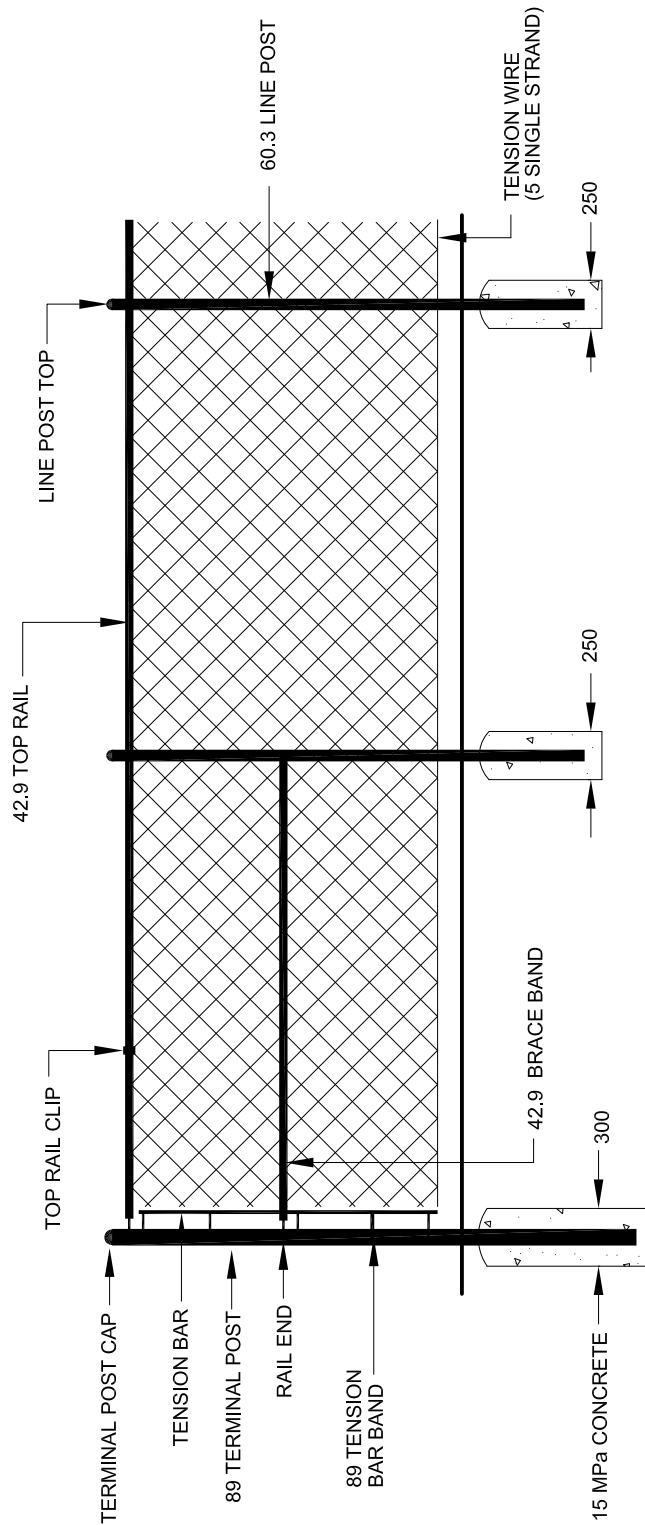
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

**TRAFFIC COUNTER BOX**

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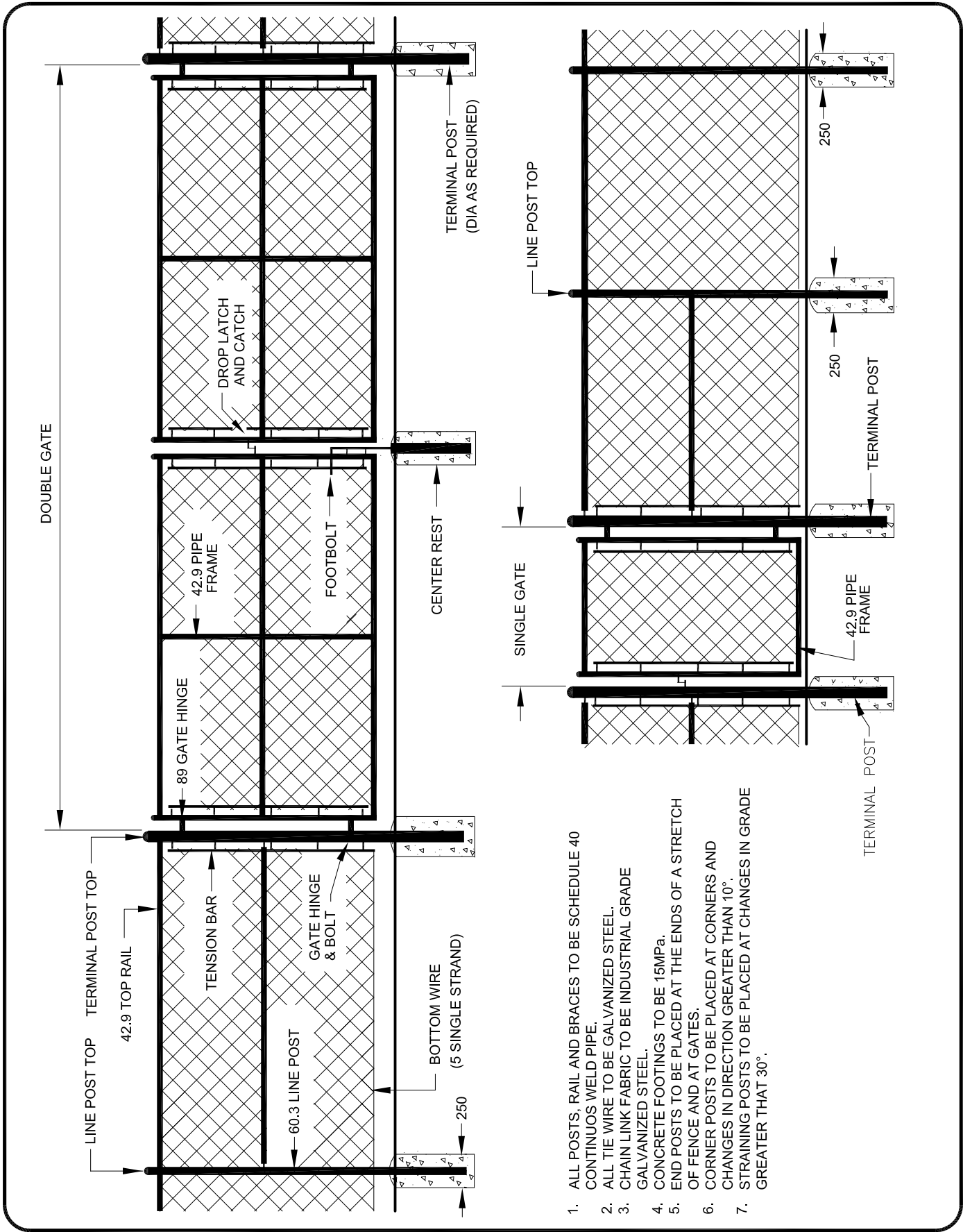
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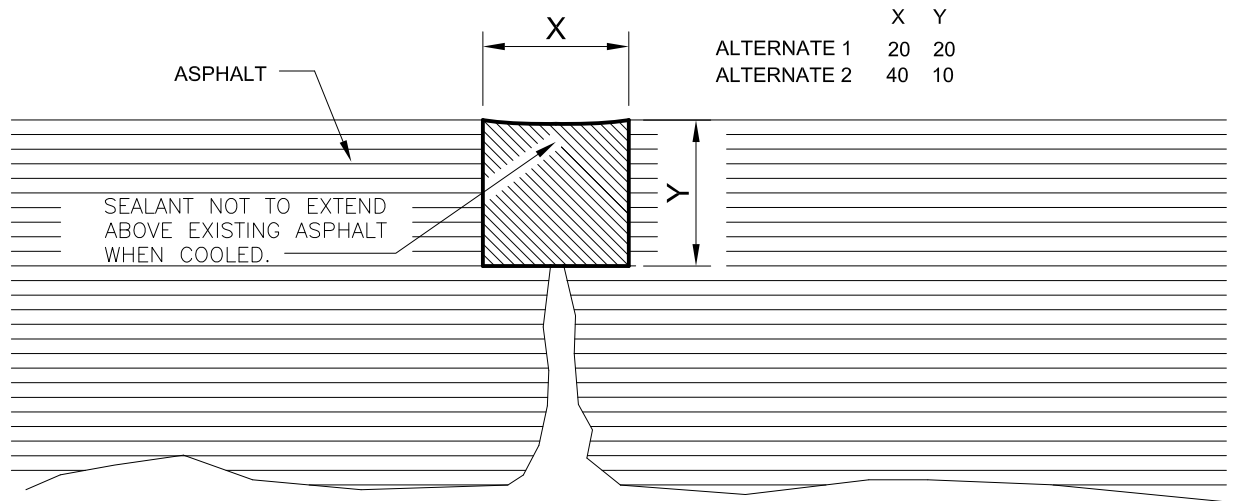


1. ALL POSTS, RAIL AND BRACES TO BE SCHEDULE 40 CONTINUOUS WELD PIPE.
2. ALL TIE WIRE TO BE GALVANIZED STEEL.
3. CHAIN LINK FABRIC TO BE INDUSTRIAL GRADE GALVANIZED STEEL.
4. CONCRETE FOOTINGS TO BE 15MPa.
5. END POSTS TO BE PLACED AT THE ENDS OF A STRETCH OF FENCE AND AT GATES.
6. CORNER POSTS TO BE PLACED AT CORNERS AND CHANGES IN DIRECTION GREATER THAN 10°.
7. STRAINING POSTS TO BE PLACED AT CHANGES IN GRADE GREATER THAN 30°.

## TYPICAL CHAIN LINK FENCE END FEATURES



1. ALL POSTS, RAIL AND BRACES TO BE SCHEDULE 40 CONTINUOUS WELD PIPE.
2. ALL TIE WIRE TO BE GALVANIZED STEEL.
3. CHAIN LINK FABRIC TO BE INDUSTRIAL GRADE GALVANIZED STEEL.
4. CONCRETE FOOTINGS TO BE 15MPa.
5. END POSTS TO BE PLACED AT THE ENDS OF A STRETCH OF FENCE AND AT GATES.
6. CORNER POSTS TO BE PLACED AT CORNERS AND CHANGES IN DIRECTION GREATER THAN 10°.
7. STRAINING POSTS TO BE PLACED AT CHANGES IN GRADE GREATER THAN 30°.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

## TYPICAL CRACK SEALING DETAIL

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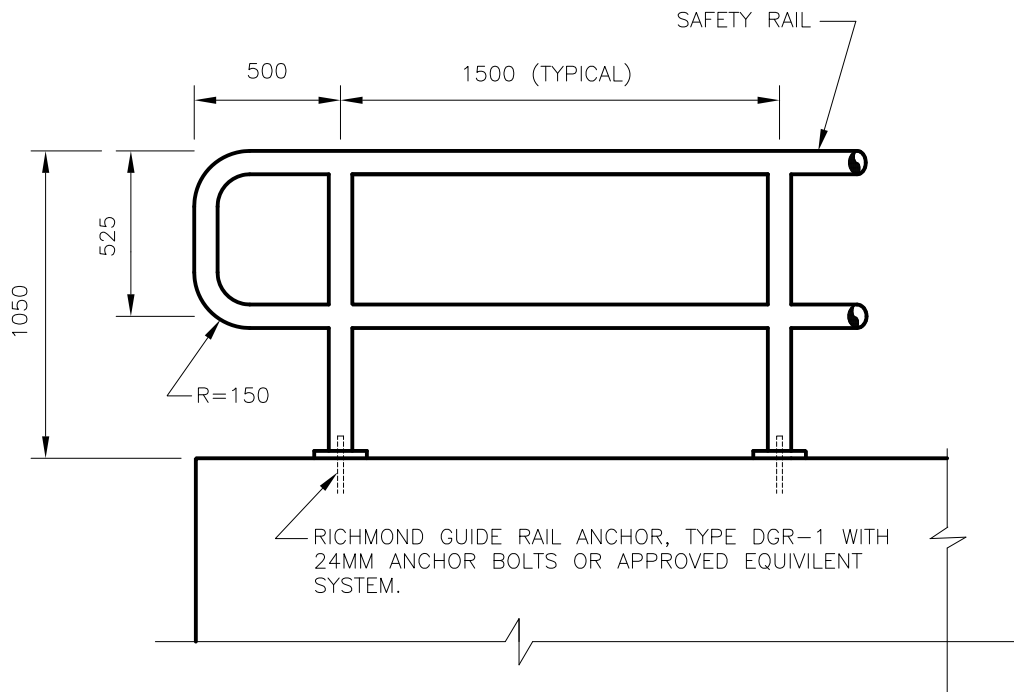
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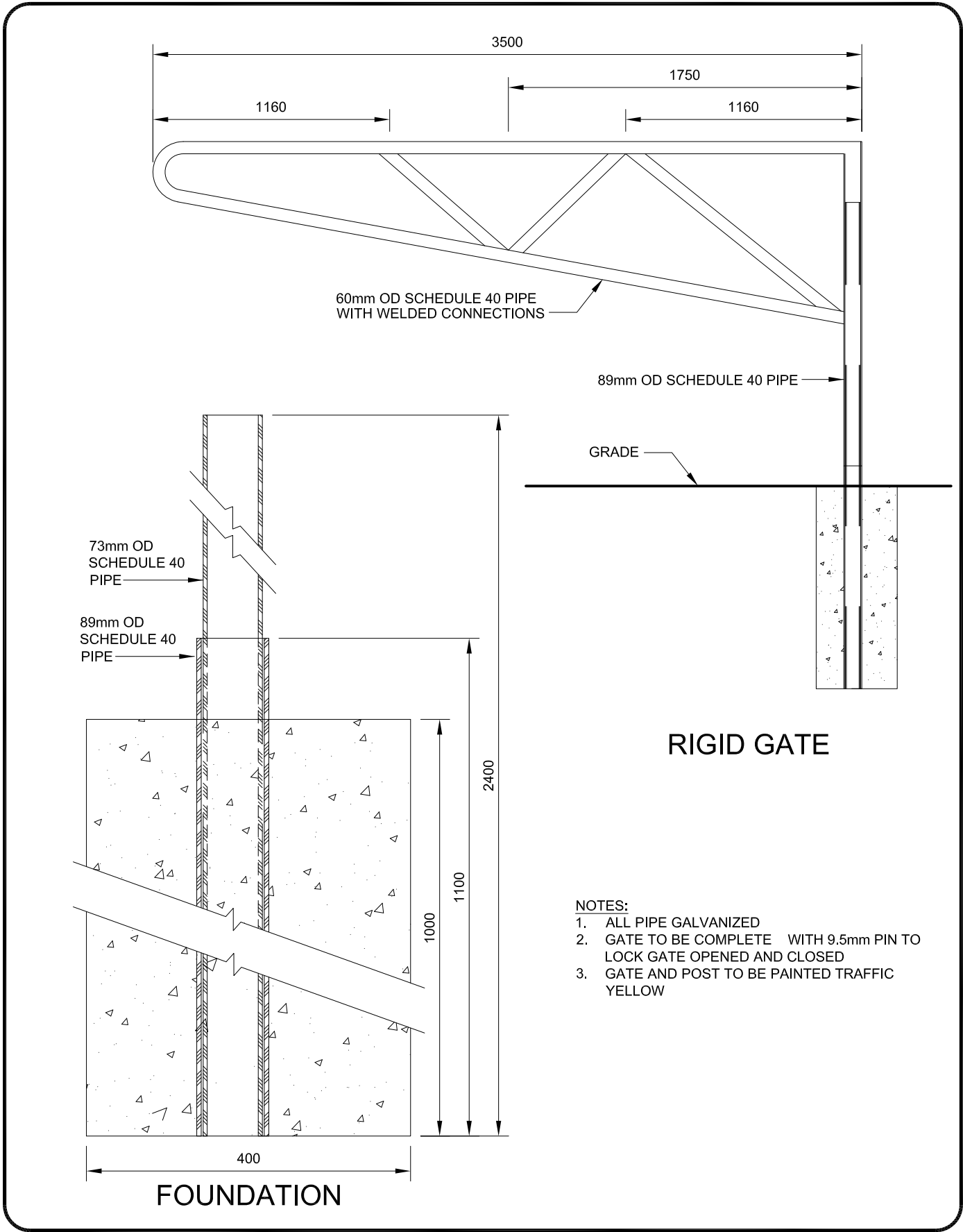
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NOT TO SCALE

**NOTES:**

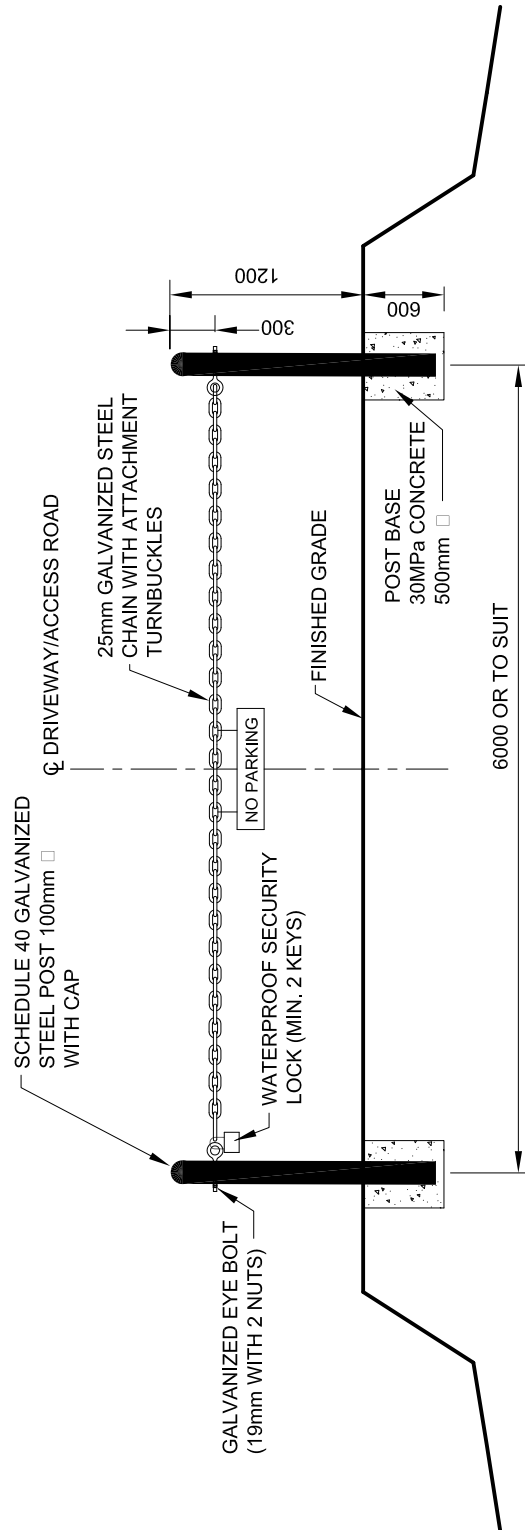
1. RAIL SHALL BE CONTINUOUS ALONG EACH RETAINING WALL AND SHALL TERMINATE AT THE ENDS OF THE WALL.
2. RAILS ON ADJACENT WALLS SHALL HAVE A GAP OF 75mm OR LESS.
3. RAIL SHALL BE 73mm Ø HOT DIP GALVANIZED STEEL PIPE WITH WALL THICKNESS 4.78mm.
4. POST SPACING SHALL BE AS DIRECTED BY THE ENGINEER TO PROVIDE A UNIFORM SYMMETRICAL APPEARANCE.
5. SHOP DRAWINGS ARE TO BE SUBMITTED FOR APPROVAL TWO WEEKS PRIOR TO FABRICATION OF RAIL.





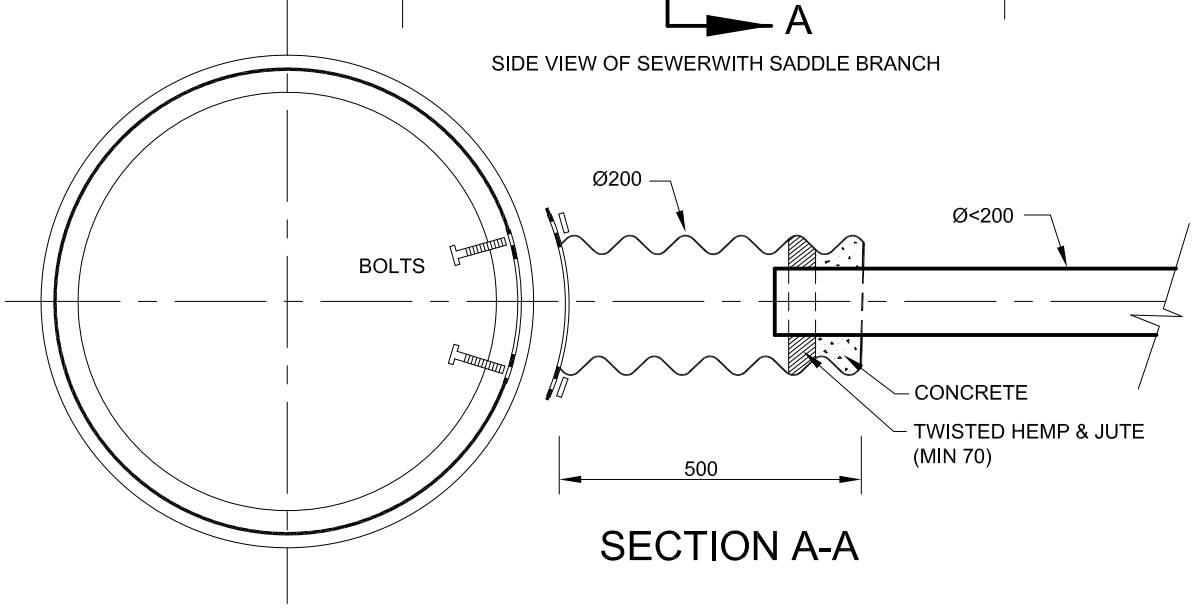
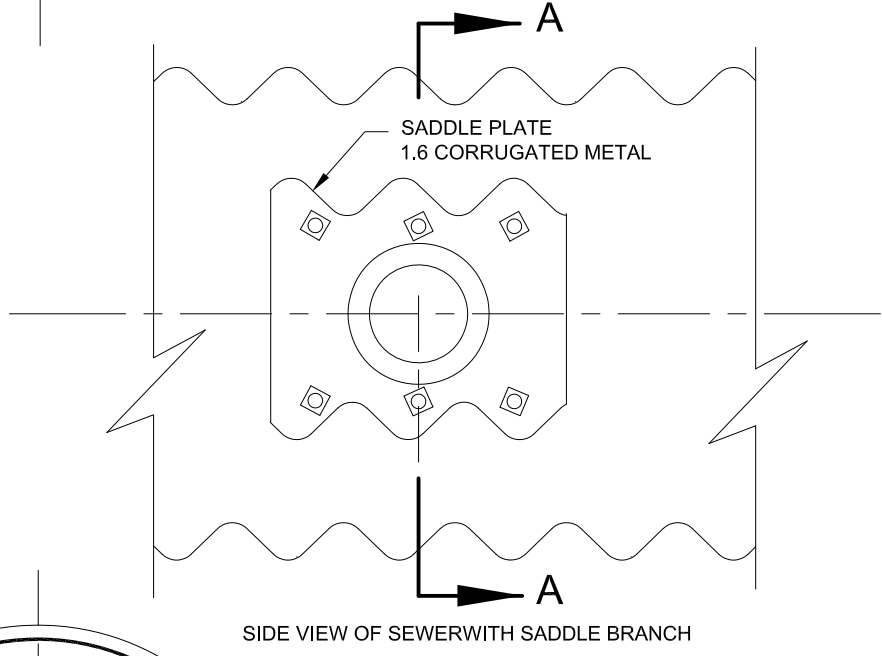
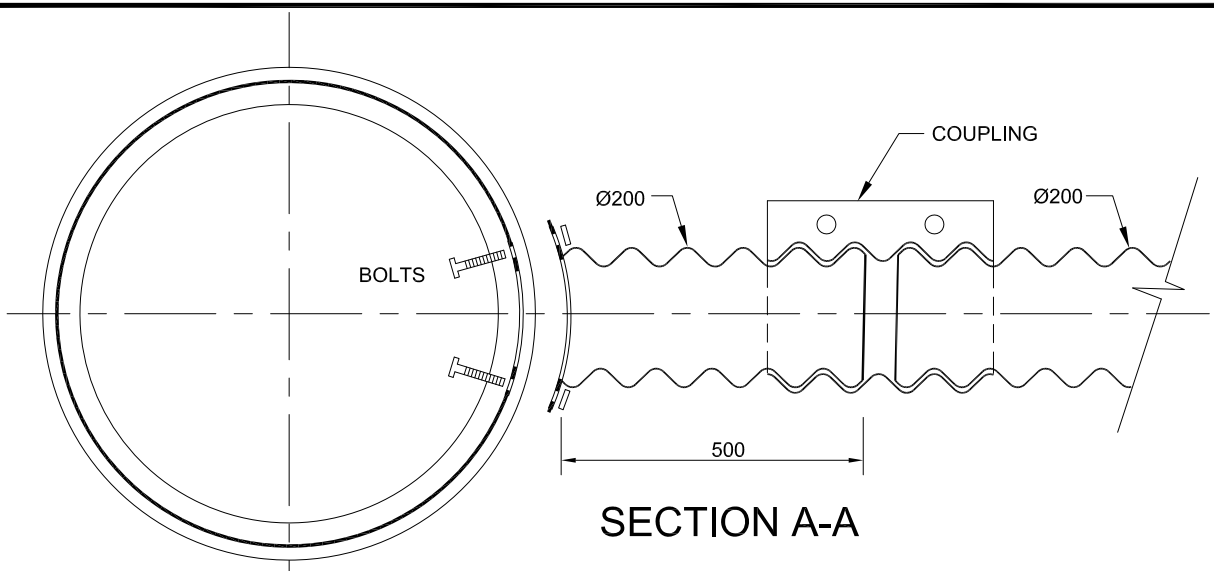
**NOTES:**

1. ALL PIPE GALVANIZED
2. GATE TO BE COMPLETE WITH 9.5mm PIN TO LOCK GATE OPENED AND CLOSED
3. GATE AND POST TO BE PAINTED TRAFFIC YELLOW



## TYPICAL POST AND CHAIN GATE DETAIL





TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

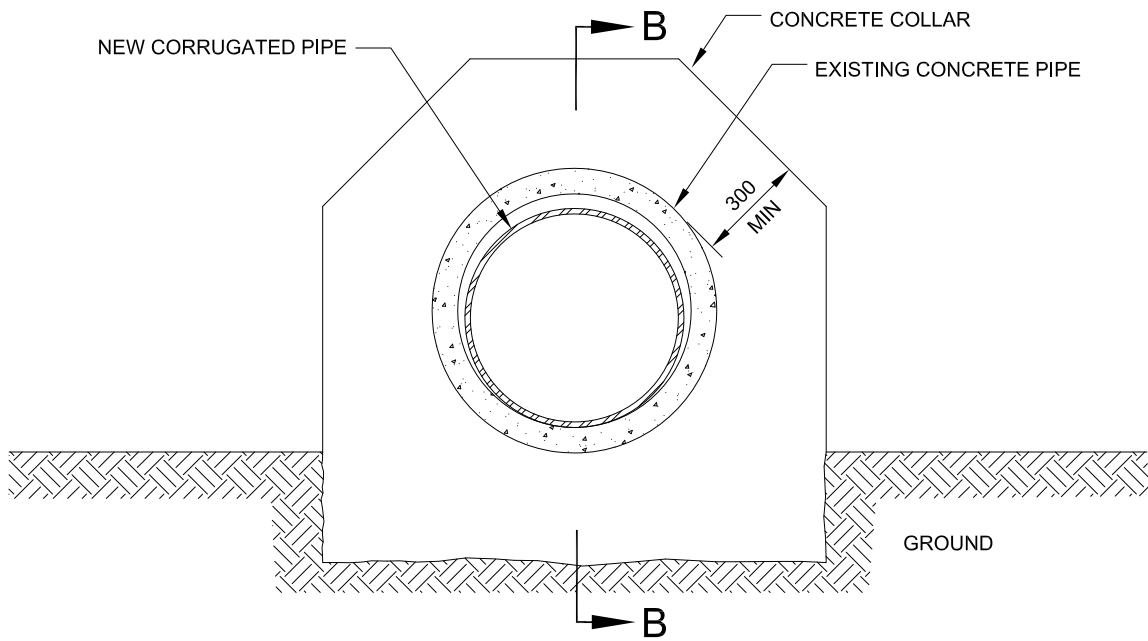
TYPICAL SADDLE BRANCH

DRAWN BY:

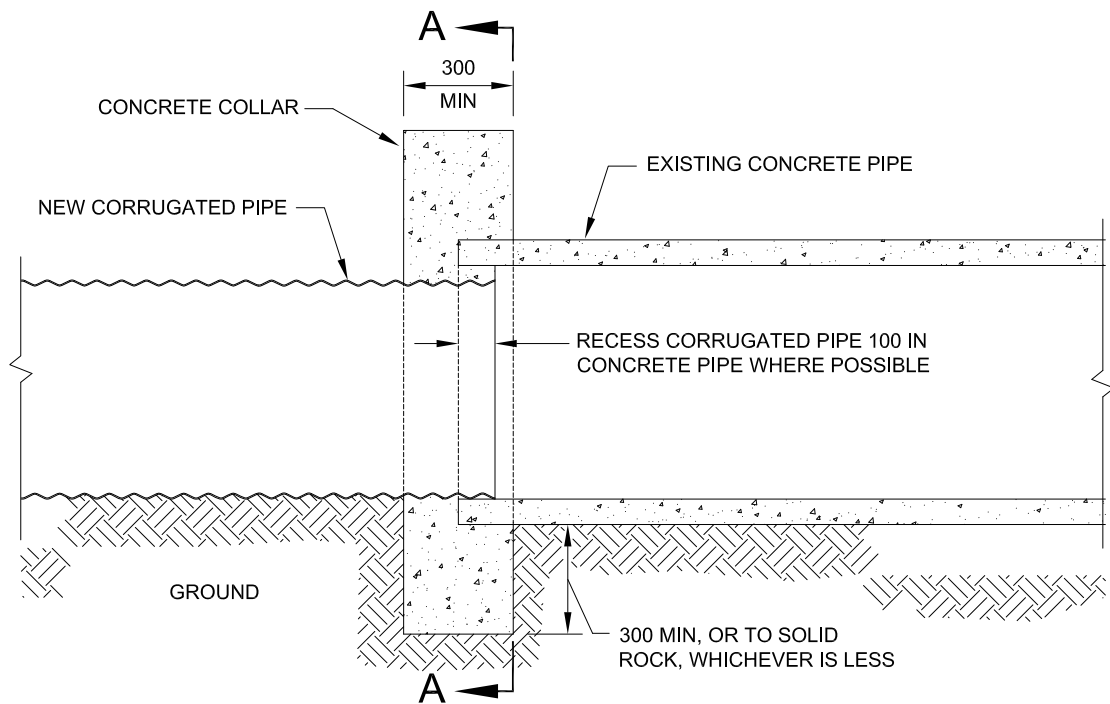
DATE:

REV 02-01-10

NOT TO SCALE



**SECTIONAL END ELEVATION ON A : A**



**SECTIONAL SIDE ELEVATION ALONG CENTER LINE VIEW ON B : B**

**NOTES:**

- ALL CONCRETE TO BE 25 MPa @ 28 DAYS, SLUMP 60, MAXIMUM PARTICLE SIZE 20.
- EXISTING CULVERT SIZES AND TYPES MAY VARY.
- ALL BACKFILLING AND BEDDING TO BE COMPACTED TO 95% PROCTOR DENSITY.



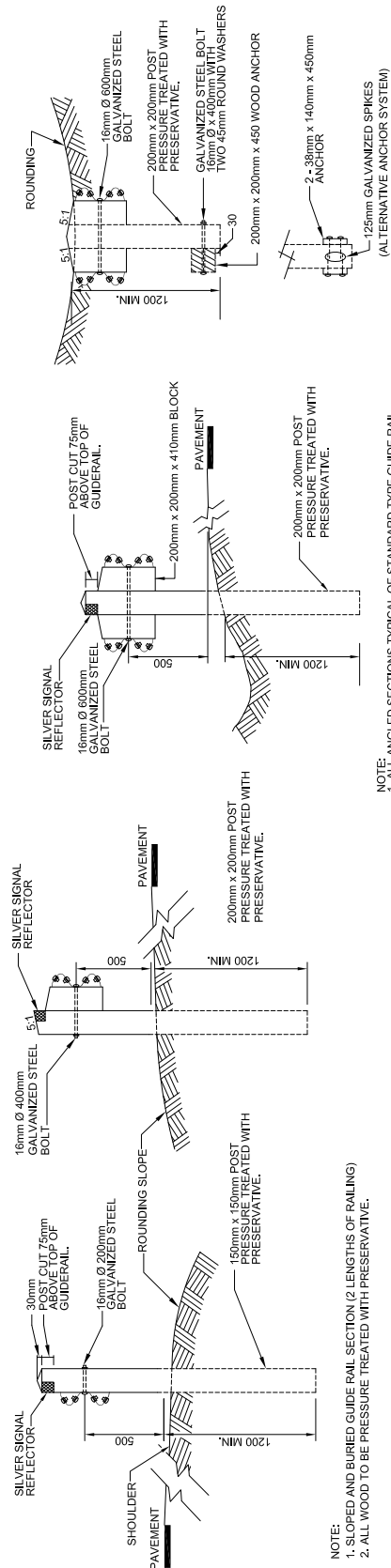
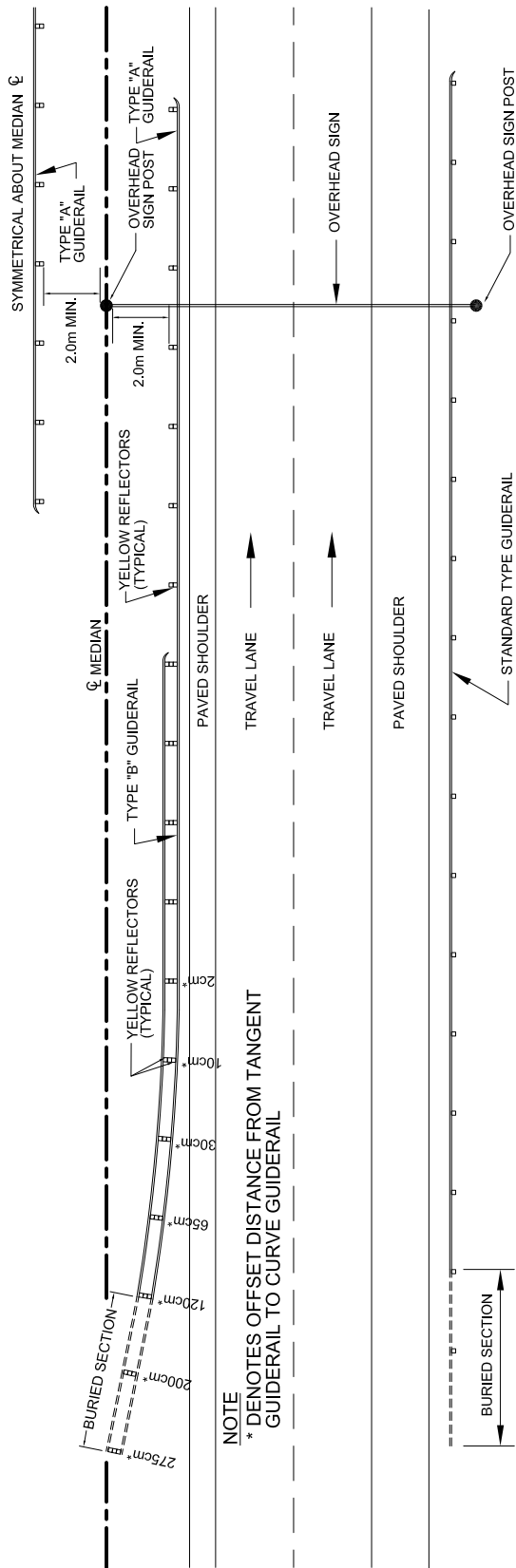
TRANSPORTATION AND WORKS  
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**TYPICAL CONCRETE COLLAR  
AT CONCRETE CULVERT CONNECTION**

DRAWN BY: J. ROBERTS

DATE: REV 02-01-10

NOT TO SCALE



NOTE:  
1. ANGLED SECTIONS TYPICAL OF STANDARD TYPE GUIDE RAIL  
2. ALL RAIL TERMINAL SECTIONS TYPICAL OF STANDARD GUIDE RAIL INSTALLATION.

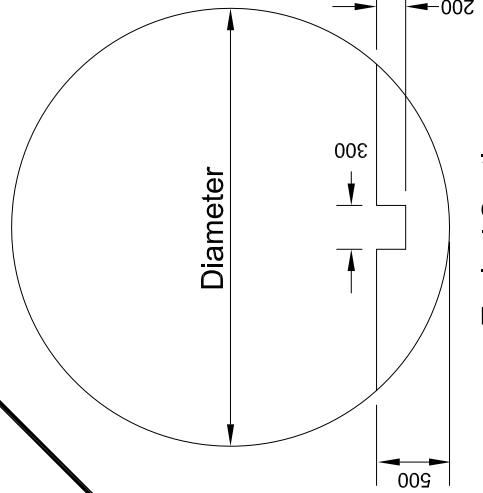
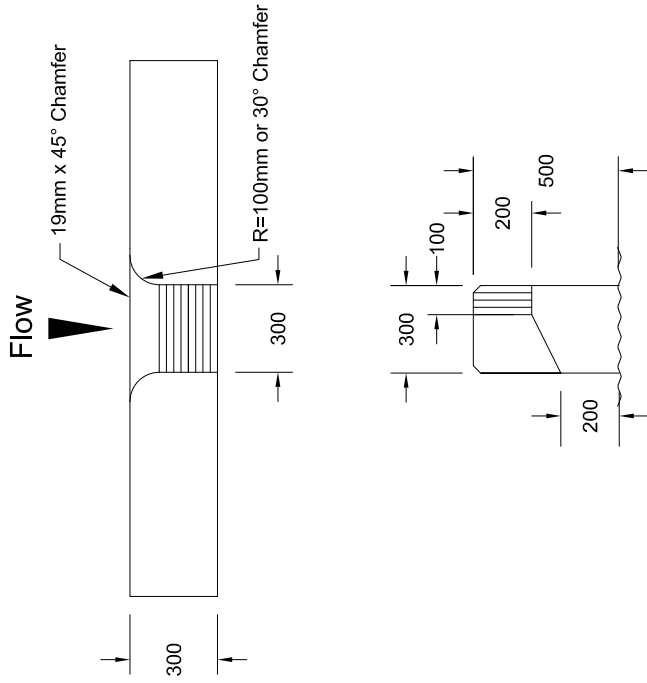
TYPE "B" - BURIED END

TYPE "B"

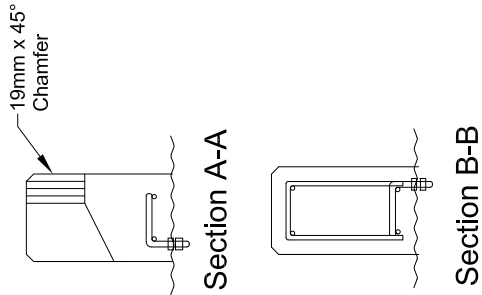
TYPE "A"

STANDARD TYPE

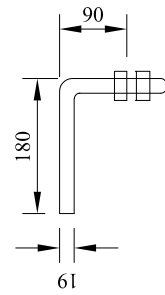
# GUIDERRAIL INSTALLATION DETAIL FOR PROTECTION OF MEDIAN STRUCTURES



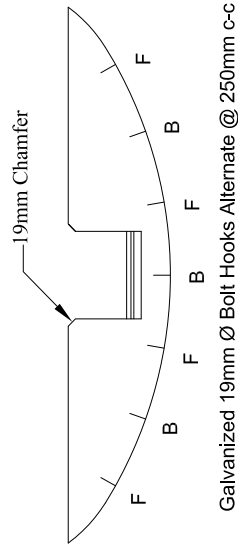
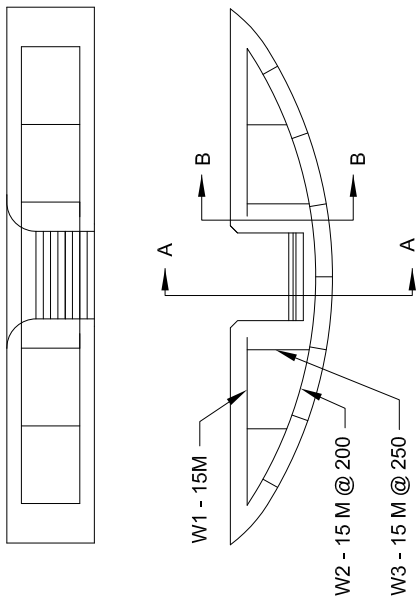
Typical Section  
Scale 1:50



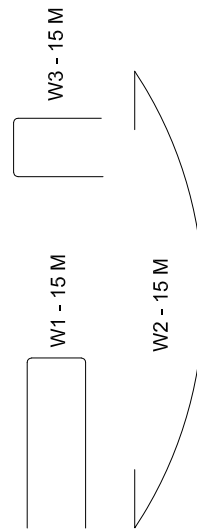
NOTES:  
CONCRETE QUALITY 30MPa @  
28 DAYS.  
AIR ENTRAINMENT 6 ± 1%



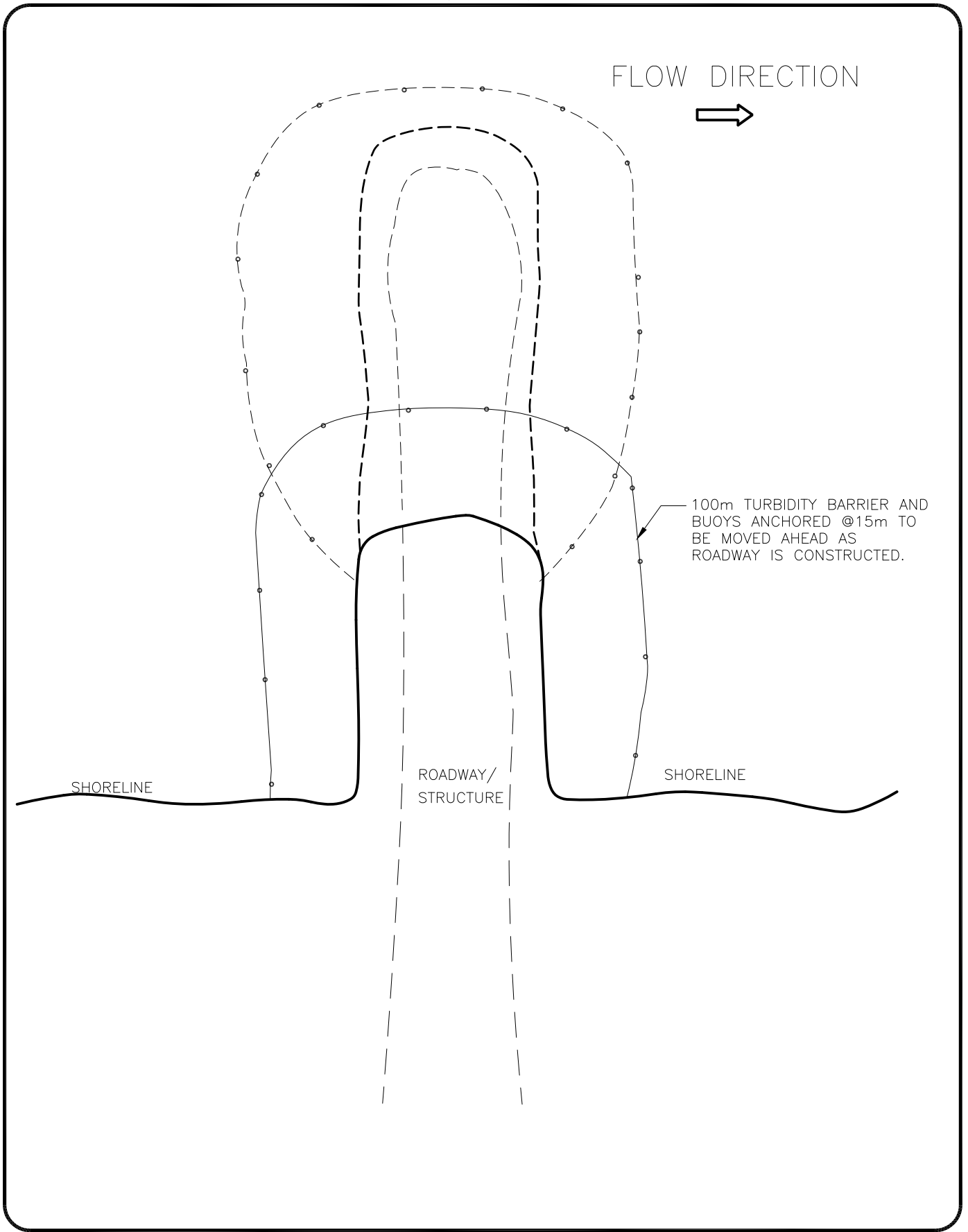
Bolt Hook Detail  
Scale 1:10

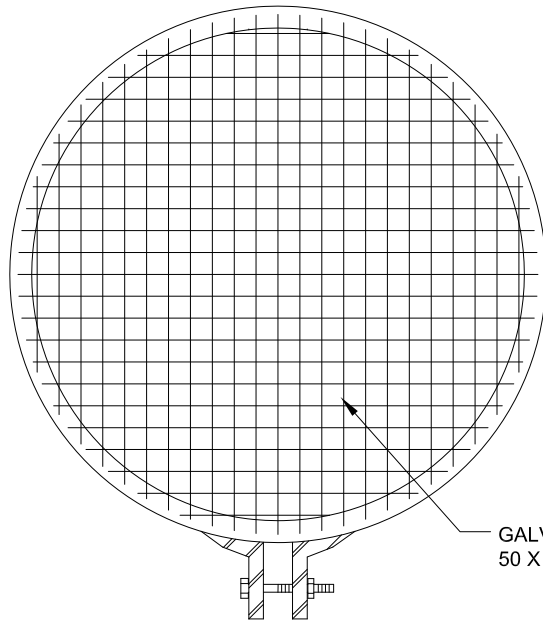


Galvanized 19mm Ø Bolt Hooks Alternate @ 250mm c-c



Slotted Weir Baffle Details  
Scale 1:25

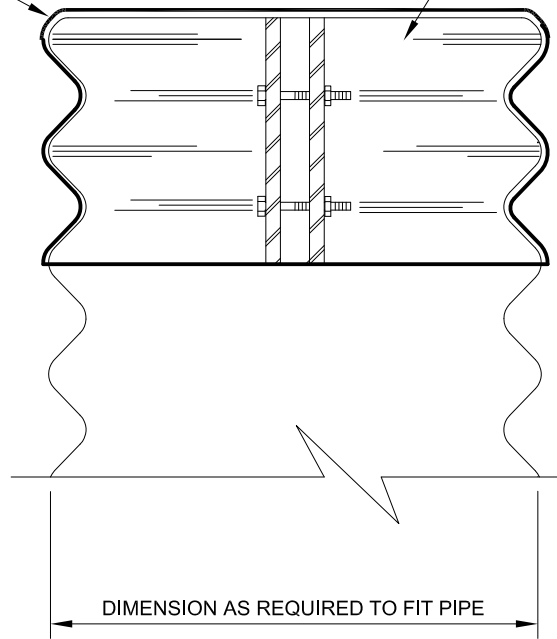




GALVANIZED STEEL MESH  
50 X 50 MAXIMUM

WIRE MESH TO BE BENT, WELDED TO THE  
COUPLING AT ALL PLACES AND RUST  
PROOFED WITH COLD GALVANIZED  
COMPOUND.

STANDARD COUPLING BAND



DIMENSION AS REQUIRED TO FIT PIPE



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HIGHWAY DESIGN DIVISION

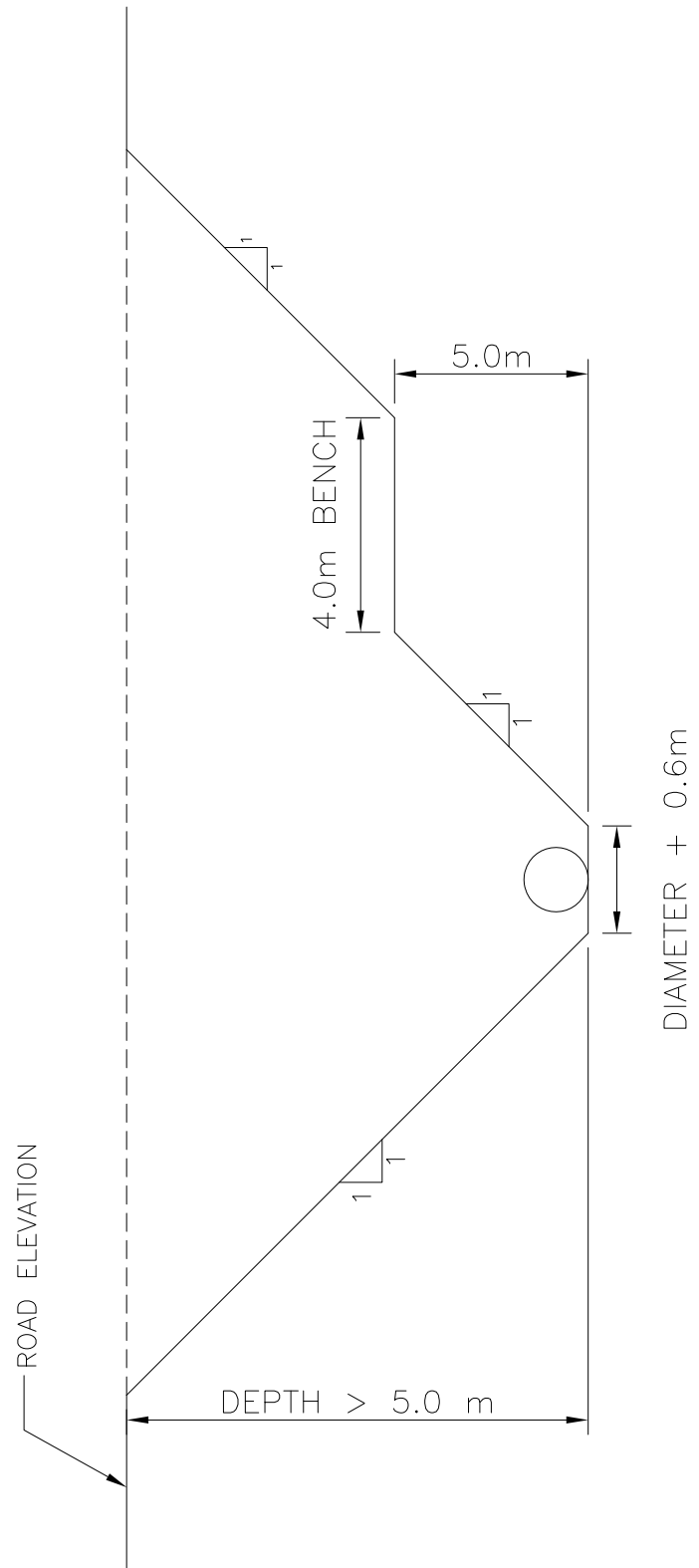
## END TREATMENT SCREEN FOR CORRUGATED STEEL PIPE

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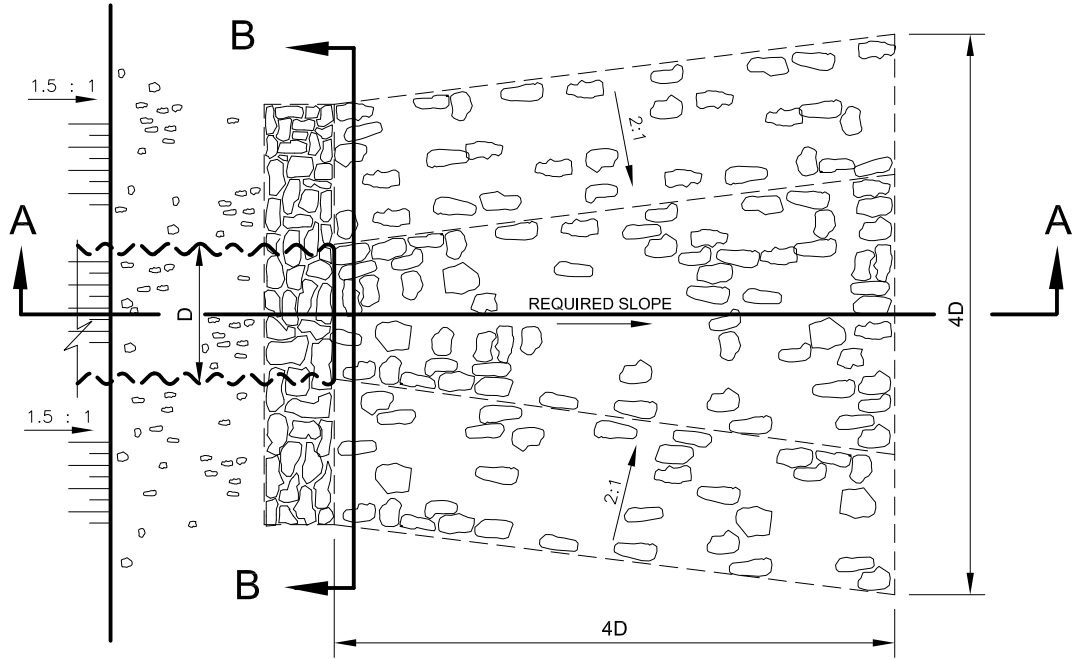
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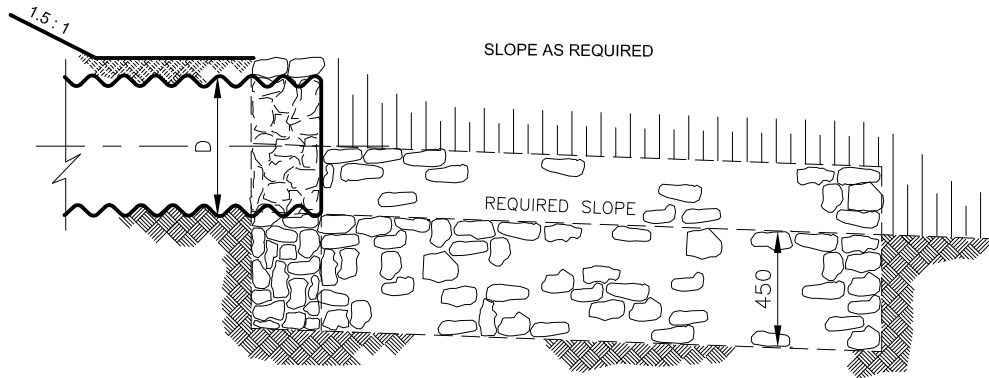
NOT TO SCALE



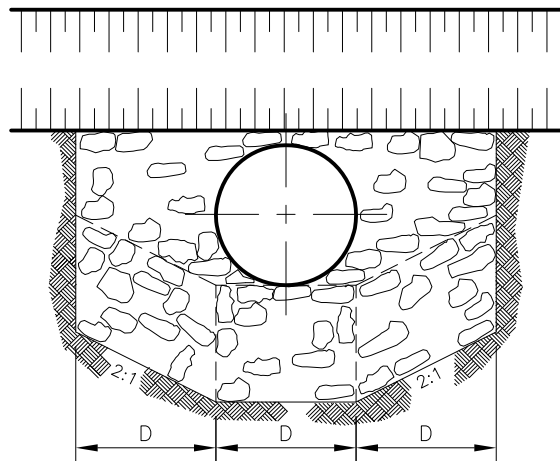
**TYPICAL CULVERT EXCAVATION PAY  
LIMIT FOR FILLS DEEPER THAN 5.0m**



PLAN

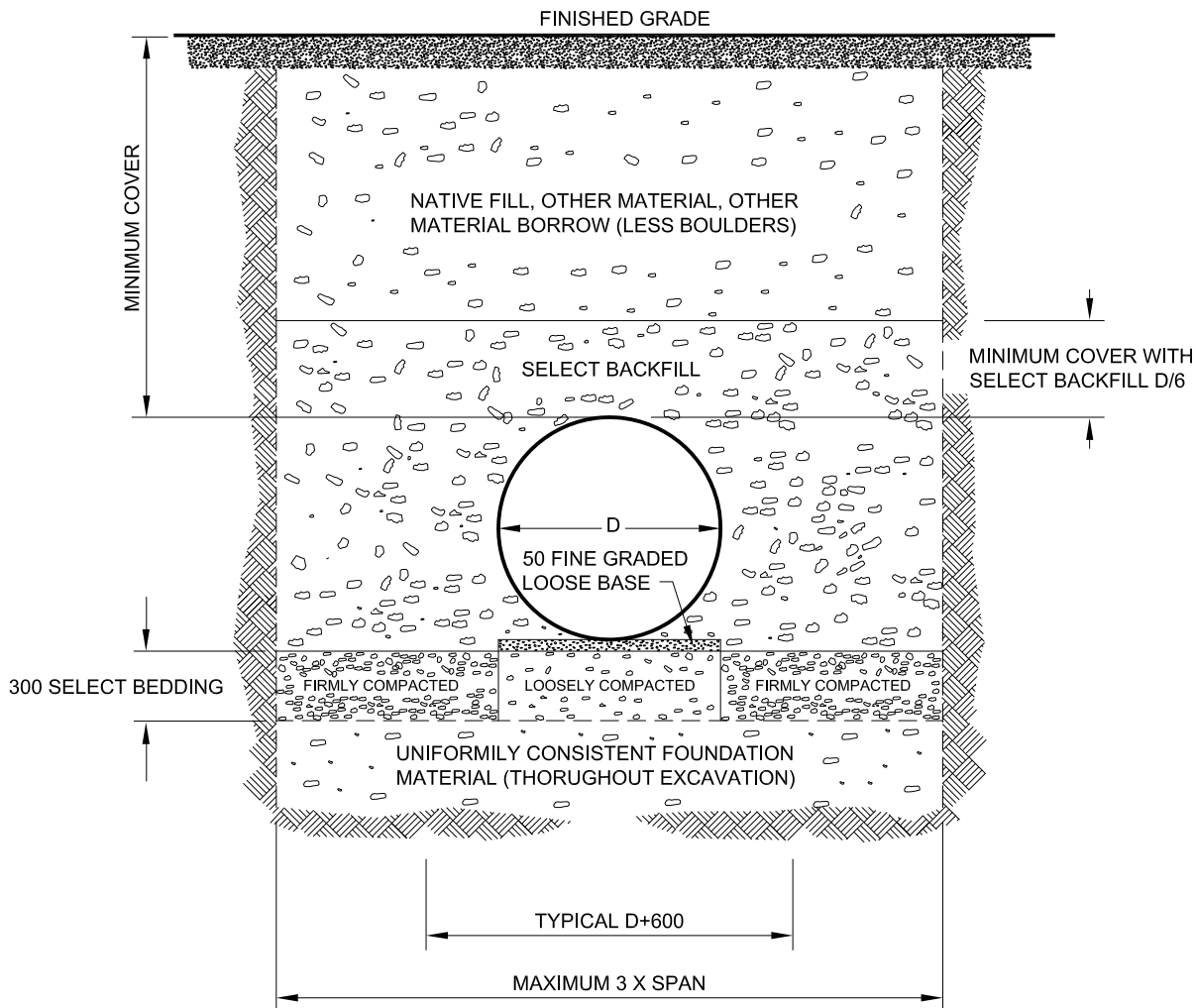


SECTION A-A



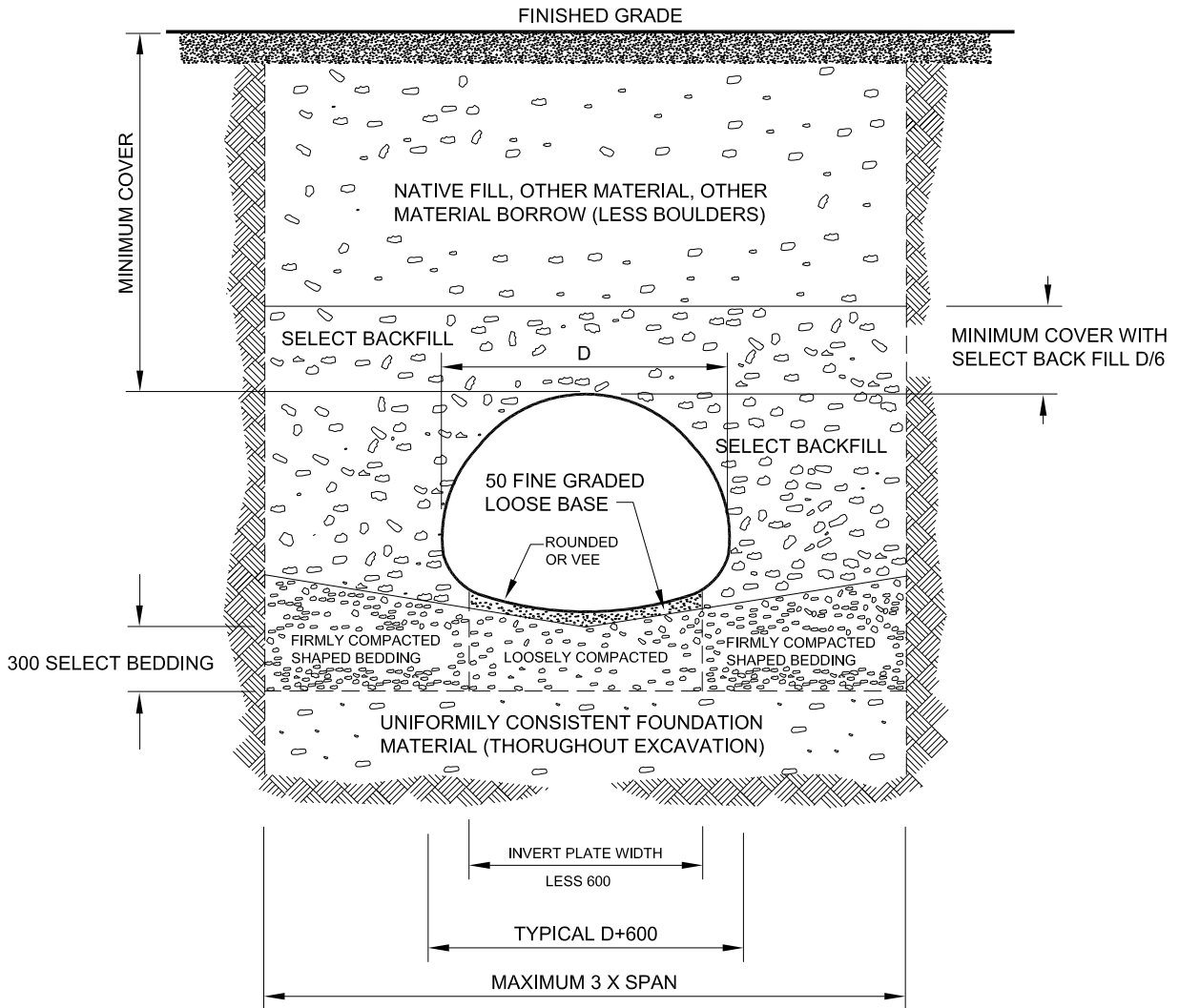
SECTION B-B





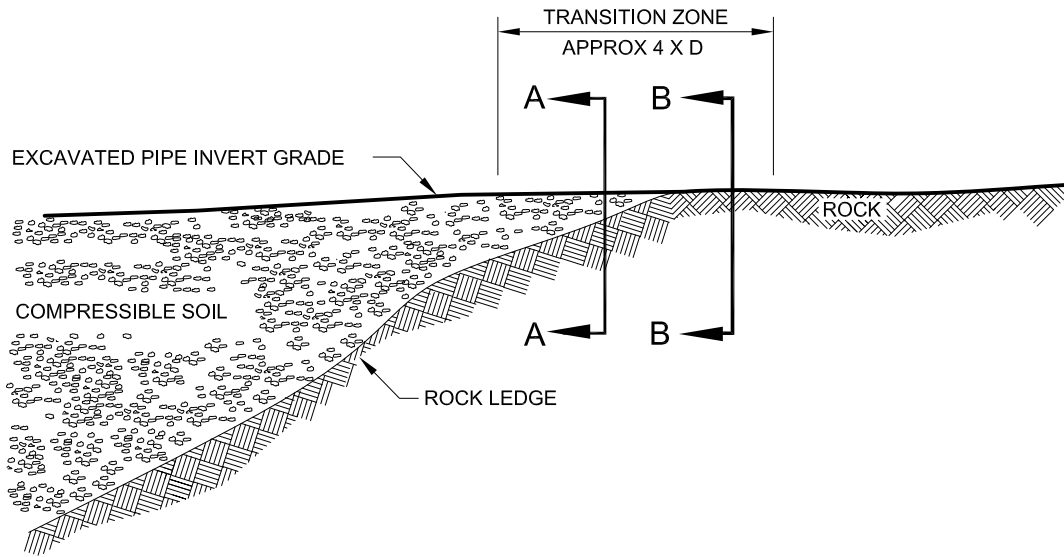
NOTES:

1. THE WIDTH OF THE EXCAVATION MAY BE REDUCED BY THE ENGINEER IN ACCORDANCE WITH SECTION 423.04 OF THE SPECIFICATIONS BOOK PROVIDED SURROUNDING SOIL IS COMPETENT ENOUGH TO SUPPORT DESIGN LOADS.
2. WIDTH FOR BEDDING AND BACKFILLING TO BE ADJUSTED IN ACCORDANCE WITH NOTE 1.
3. REFER TO SECTION 1233 FOR HARD FOUNDATION.

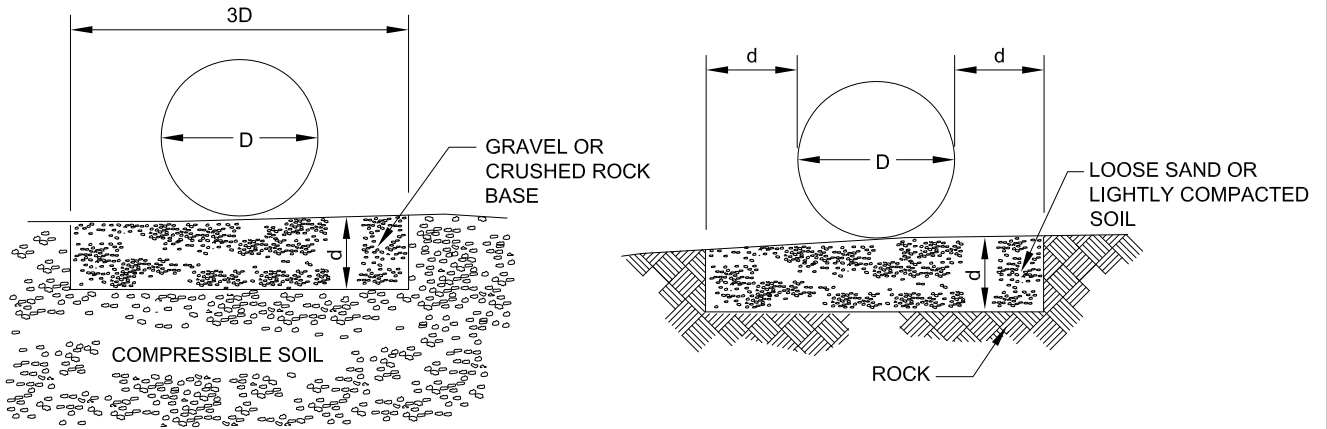


**NOTES:**

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2. WIDTH FOR BEDDING AND BACK FILLING TO BE ADJUSTED IN ACCORDANCE WITH NOTE 1.
3. REFER TO SECTION 1233 FOR HARD FOUNDATION.



TRANSITIONS OF PIPE FOUNDATIONS FROM COMPRESSIBLE SOILS TO ROCK.  
EXCAVATE ROCK AND COMPRESSIBLE SOIL IN TRANSITION SECTION TO PROVIDE REASONABLY  
UNIFORM LONGITUDINAL PIPE SUPPORT AND MINIMUM DIFFERENTIAL SETTLEMENT.



$d = 4\%$  OF FILL OVER PIPE WITH A 200 MINIMUM

SECTION A-A

SECTION B-B

SECTION B-B IS APPLICABLE TO ALL  
CONTINUOUS ROCK FOUNDATIONS.



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TYPICAL TREATMENT FOR ROCK,  
CULVERT, PIPE OR SEWER FOUNDATIONS

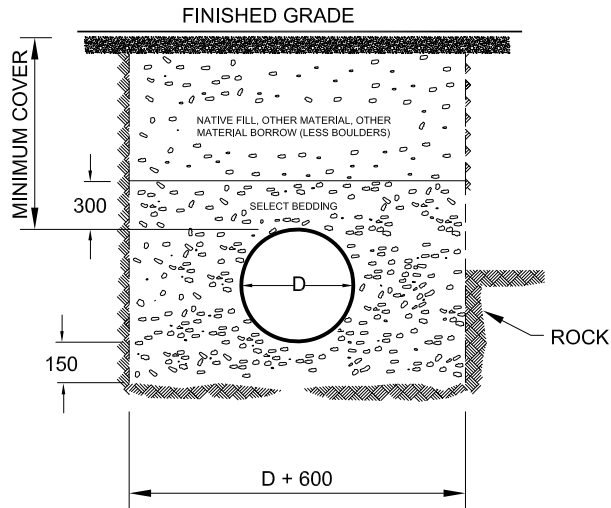
DRAWN BY:

DATE:

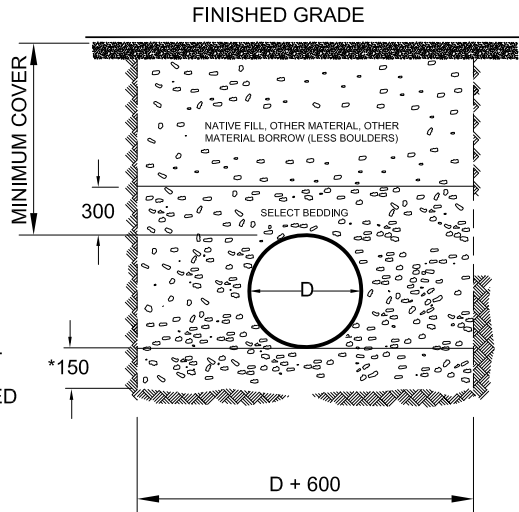
REV 02-01-10

NOT TO SCALE

## ROCK EXCAVATION

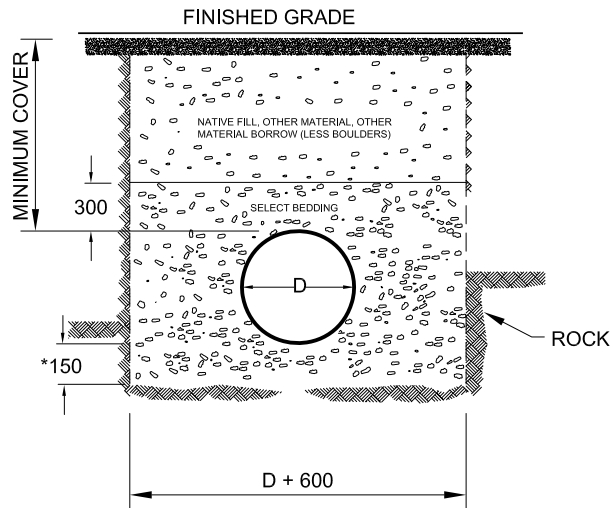


## OTHER MATERIAL EXCAVATION

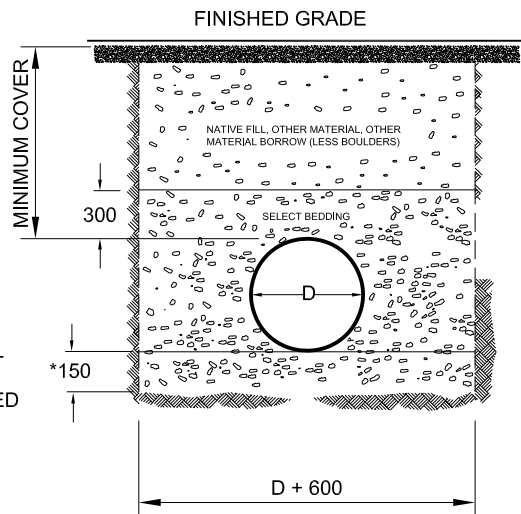


\* SELECT BEDDING IS ESSENTIAL UNDER PVC PIPE, BUT NOT REQUIRED UNDER CORRUGATED METAL PIPE.

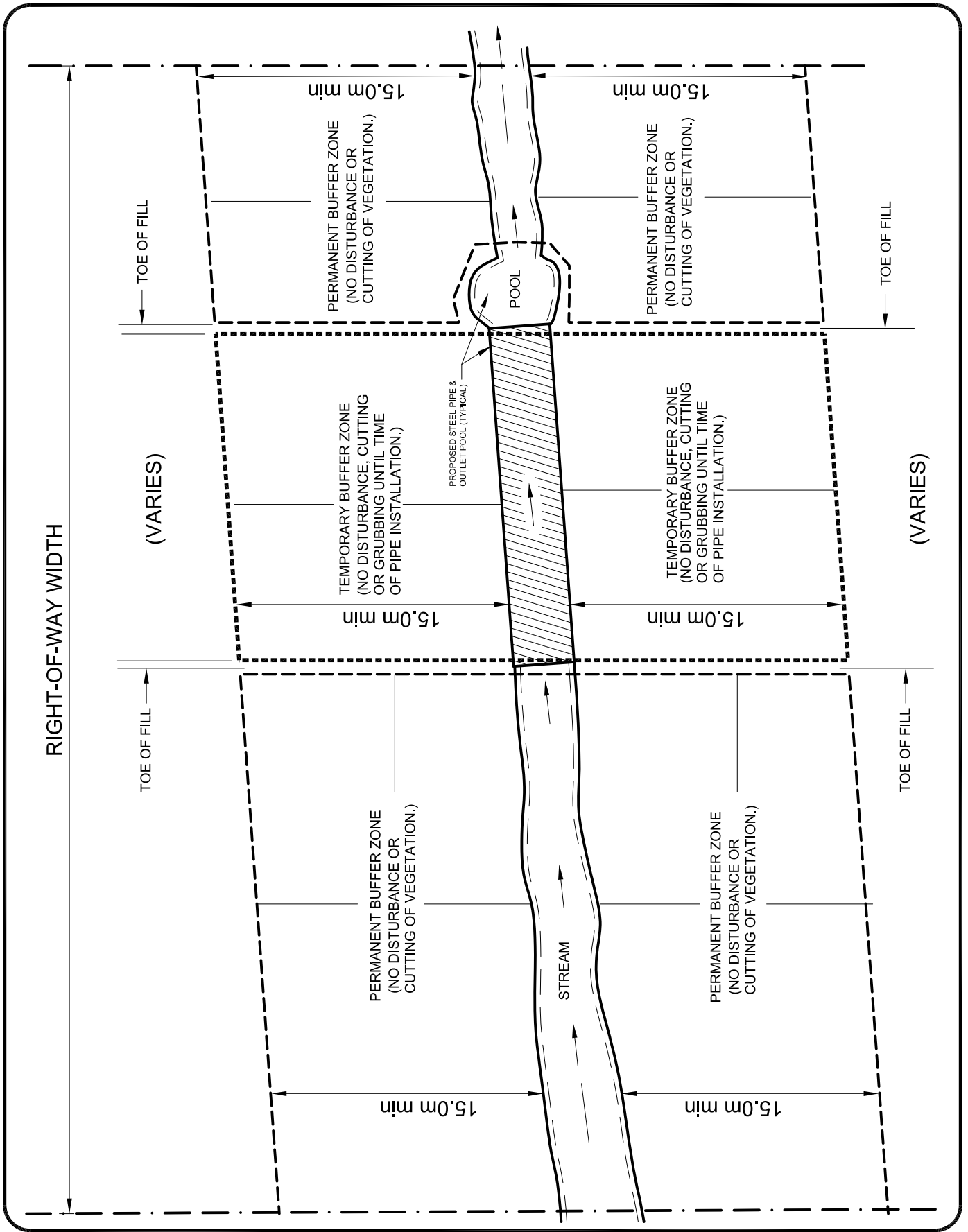
## ROCK EXCAVATION

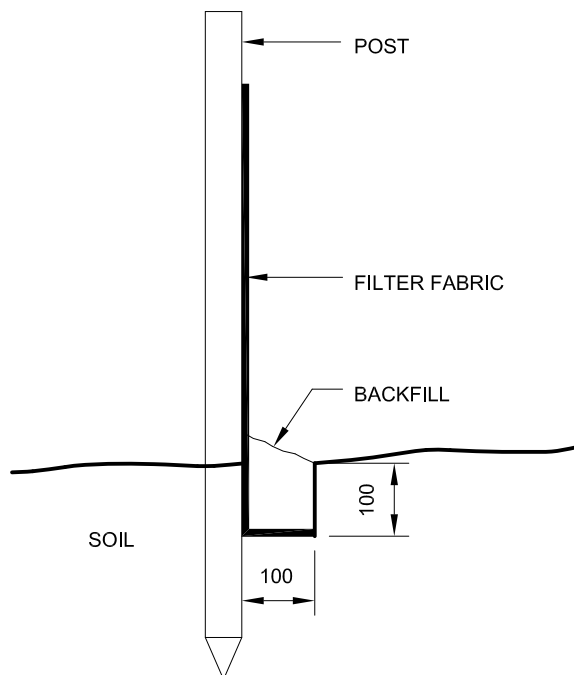


## OTHER MATERIAL EXCAVATION



\* SELECT BEDDING IS ESSENTIAL UNDER PVC PIPE, BUT NOT REQUIRED UNDER CORRUGATED METAL PIPE.





## INSTALLATION OF GEOTEXTILE SILT FENCE

1. EXCAVATE A 100 x 100 TRENCH IN A CRESENT SHAPE ACROSS THE FLOW PATH WITH ENDS POINTING UPSLOPE.
2. DRIVE STURDY STAKES, SPACED 3000 APART, INTO THE GROUND ALONG THE DOWNSLOPE SIDE OF THE TRENCH.
3. INSTALL THE FILTER FABRIC FROM A CONTINUOUS ROLL AND CUT TO REQUIRED LENGTH. THE FILTER FABRIC SHOULD BE STAPLED TO THE UPSTREAM SIDE OF THE STAKES, EXTENDING THE BOTTOM 200 INTO THE TRENCH.
4. BACKFILL AND COMPACT THE SOIL IN THE TRENCH OVER THE FILTER FABRIC.



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HIGHWAY DESIGN DIVISION

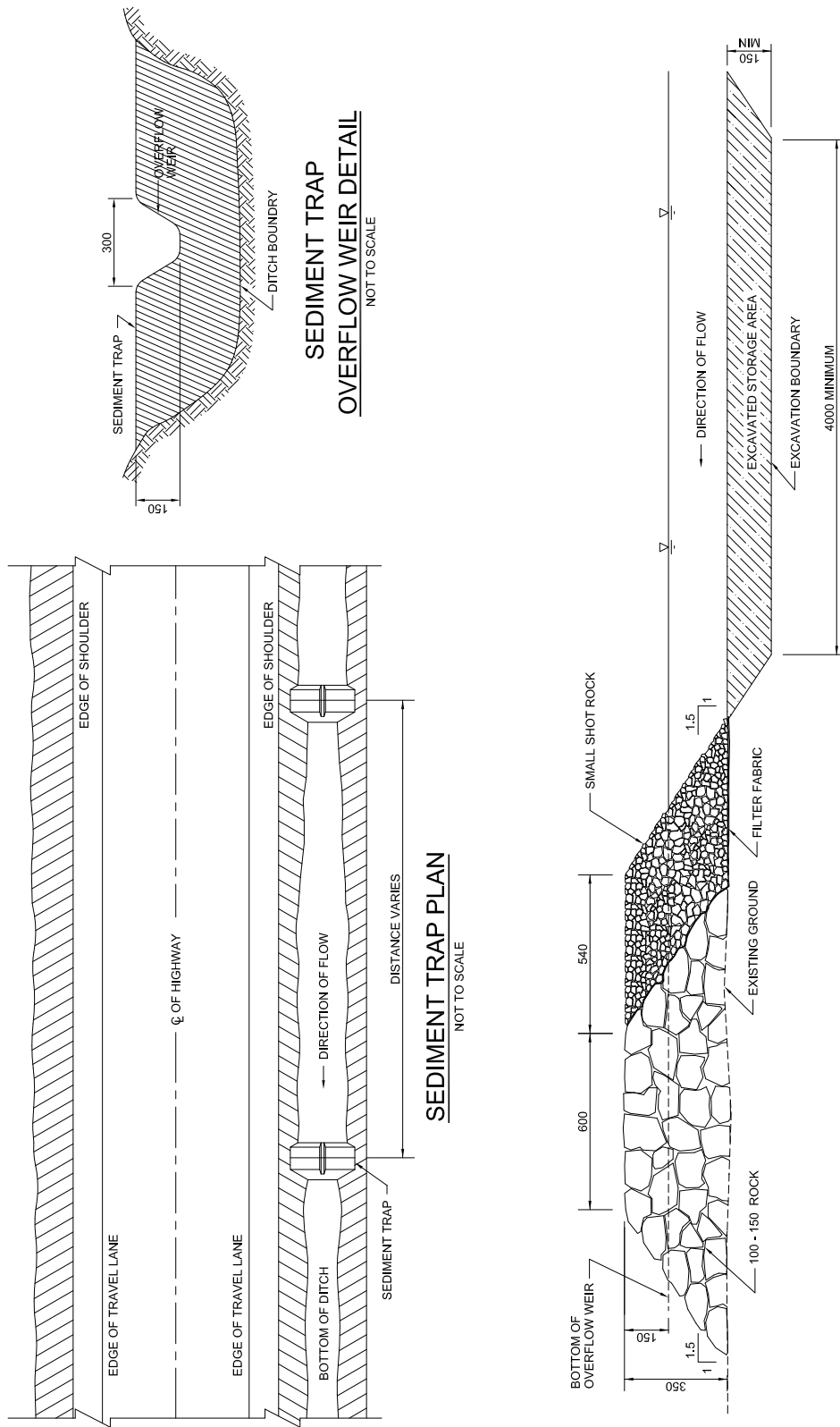
## TYPICAL SILT FENCE

DRAWN BY: J. ROBERTS

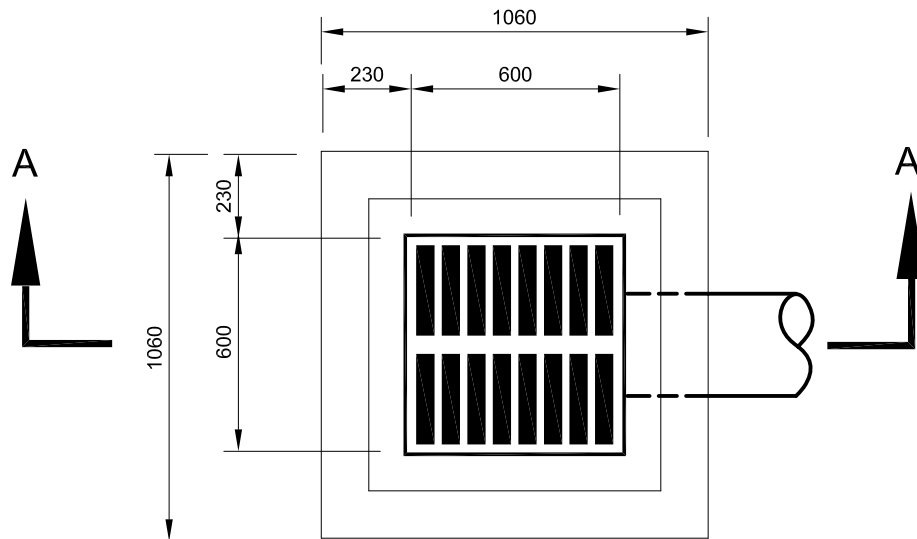
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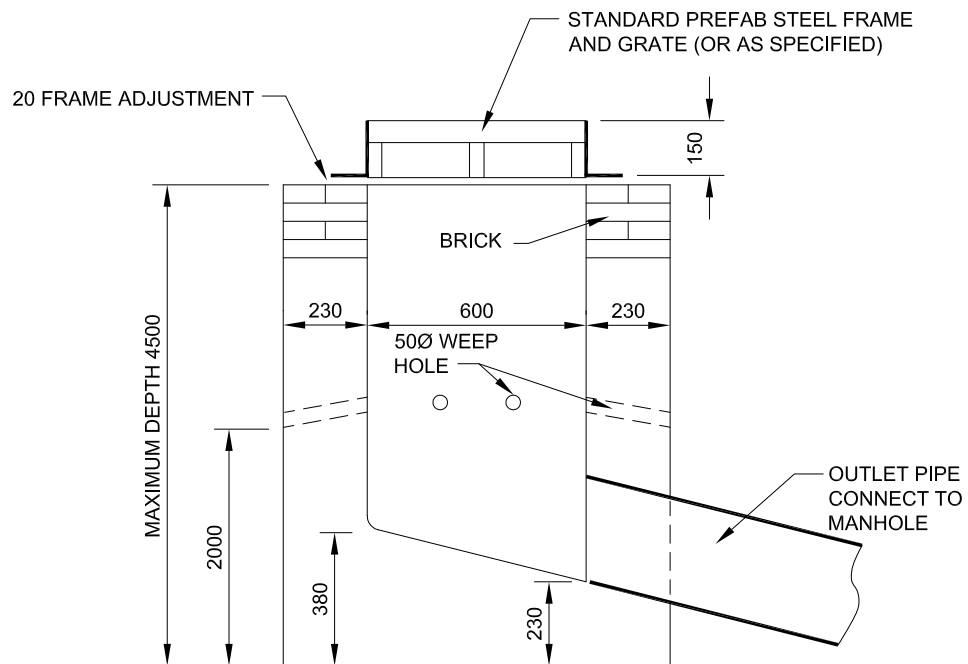
NOT TO SCALE







TOP VIEW



SECTION A-A

1. APPROVED SQUARE OR ROUND PRE-CAST UNITS MAY BE USED ON APPROVAL BY THE ENGINEER.
2. PORUS BACKFILL TO BE PLACED MINIMUM 300 ON ALL SIDES.
3. CONCRETE STRENGTH 25MPa AT 28 DAYS.
4. WEEP HOLES SHALL BE PLACED SO THAT THE BOTTOM OF THE WEEPER ON THE INSIDE AND THE TOP OF THE WEEPER ON THE OUTSIDE ARE LEVEL.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

CATCH BASIN PUP

DRAWN BY:

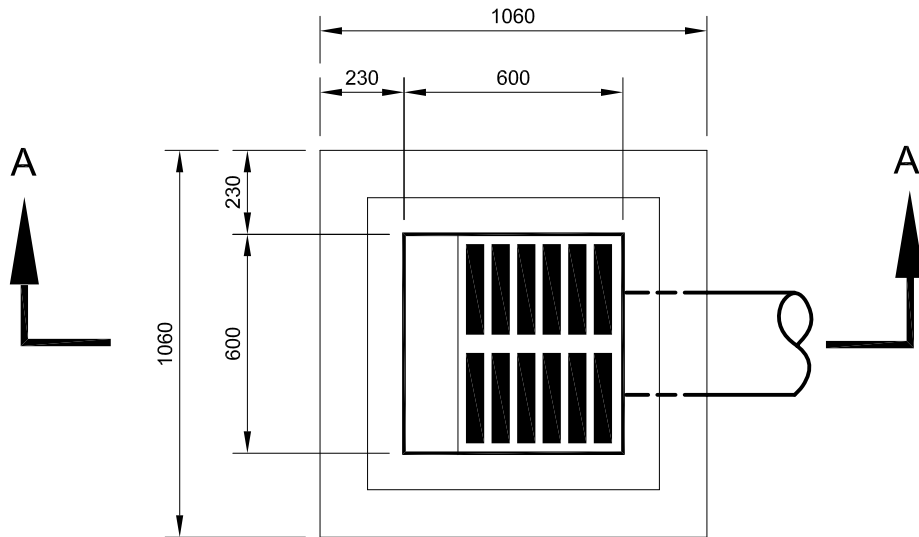
DATE:

REV 02-01-10

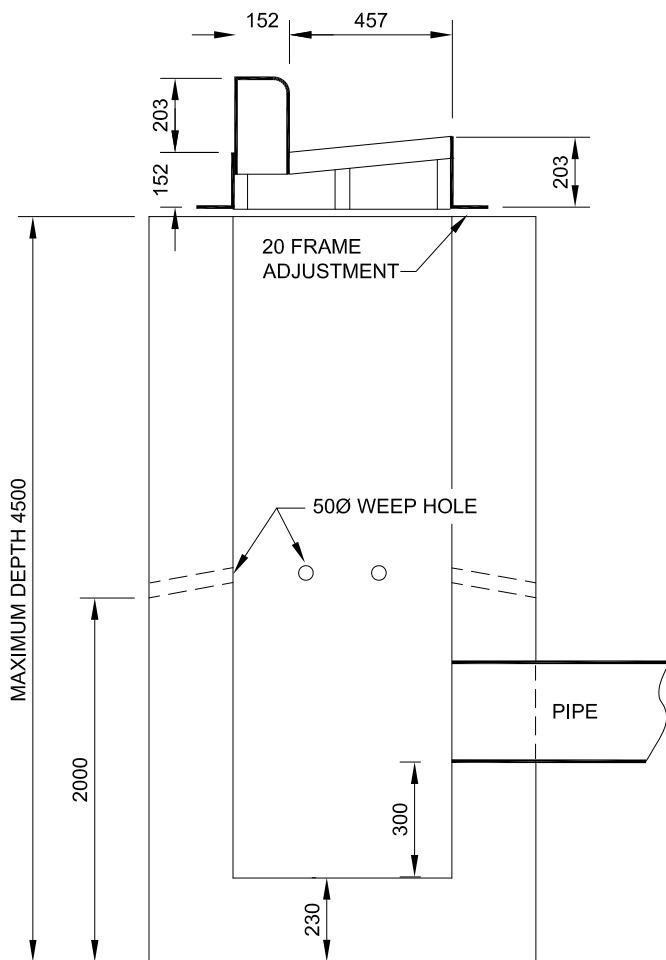
NOT TO SCALE

MARCH 2011

1240 -1

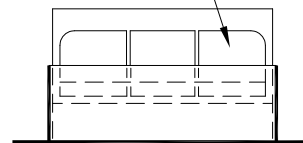


TOP VIEW

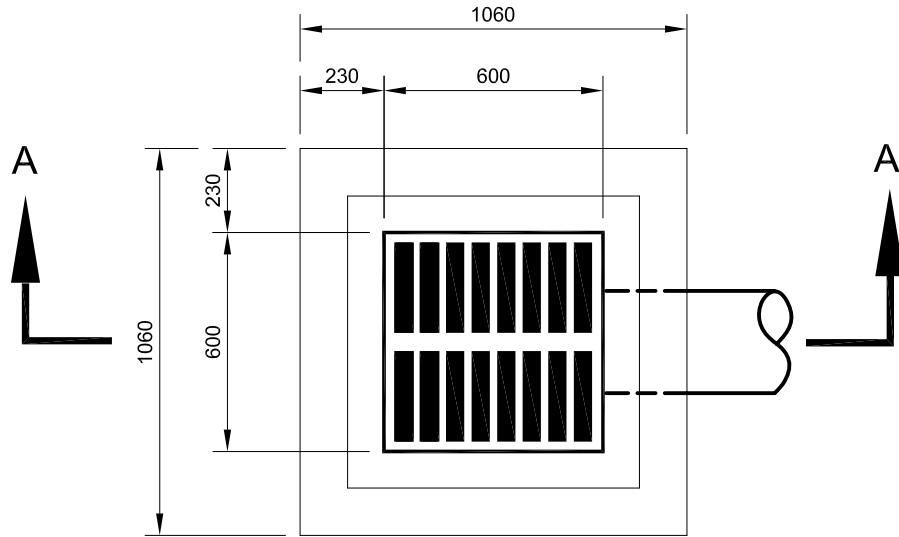


SECTION A-A

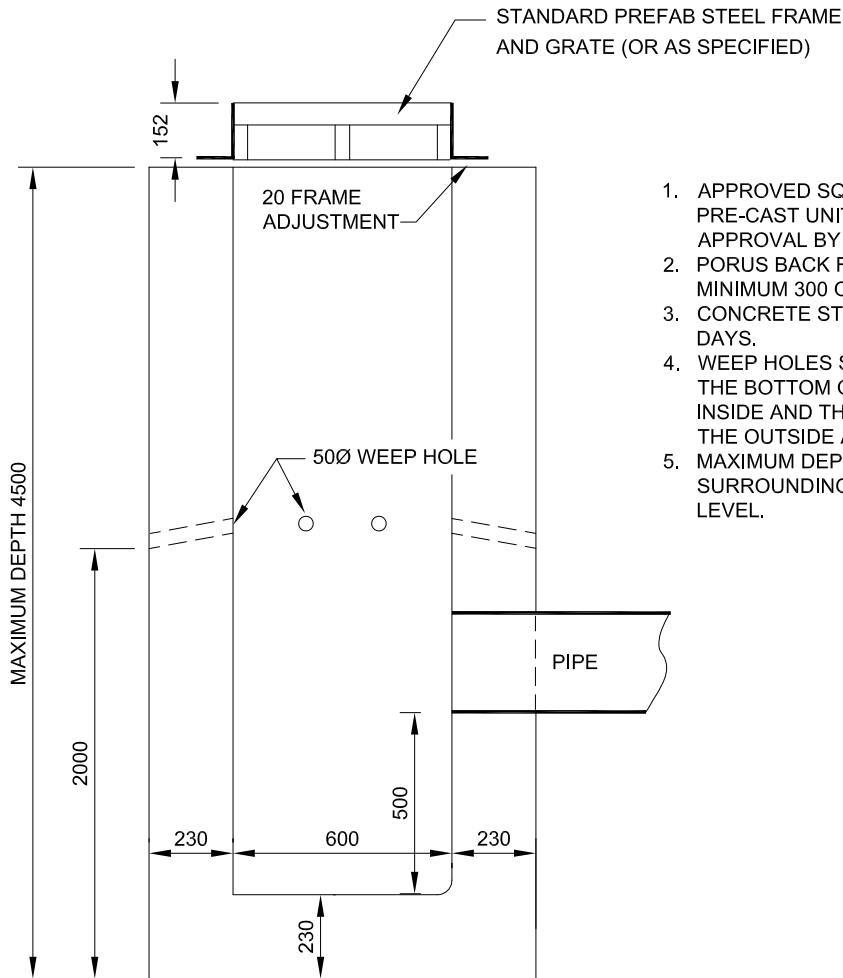
STANDARD PREFAB STEEL FRAME AND GRATE (OR AS SPECIFIED)



1. APPROVED SQUARE OR ROUND PRE-CAST UNITS MAY BE USED ON APPROVAL BY THE ENGINEER.
2. PORUS BACK FILL TO BE PLACED MINIMUM 300 ON ALL SIDES.
3. CONCRETE STRENGTH 25MPa AT 28 DAYS.
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5. MAXIMUM DEPTH TO BE REDUCED IF SURROUNDING TOPOGRAPHY IS NOT LEVEL.

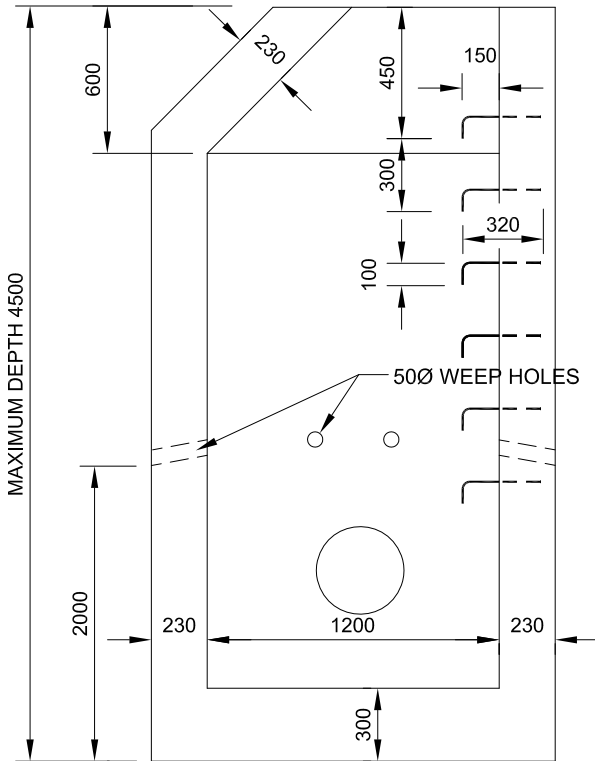
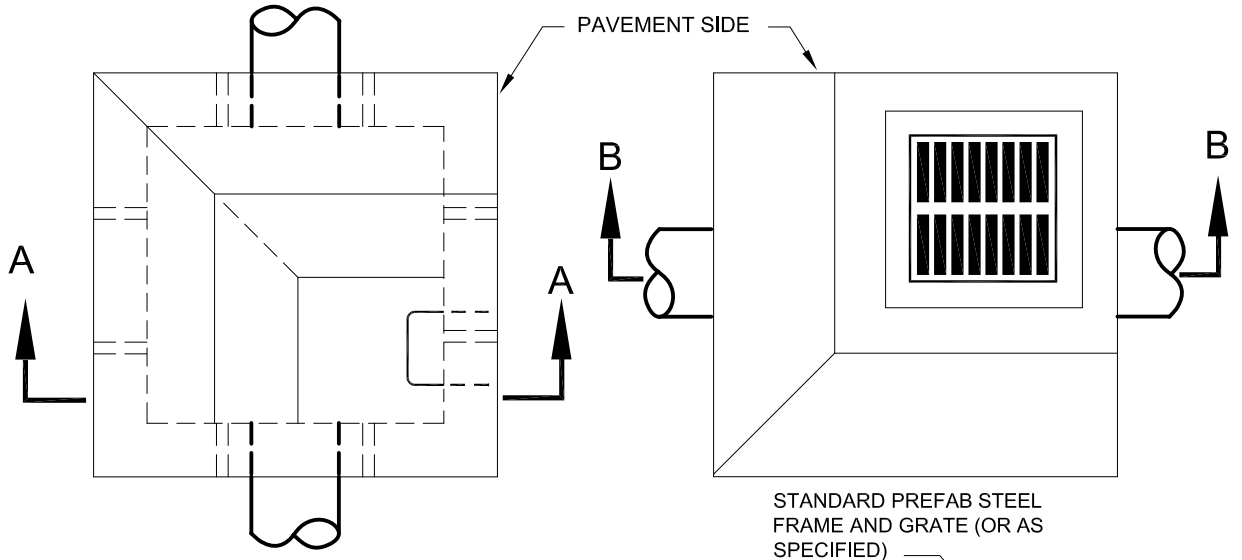


TOP VIEW

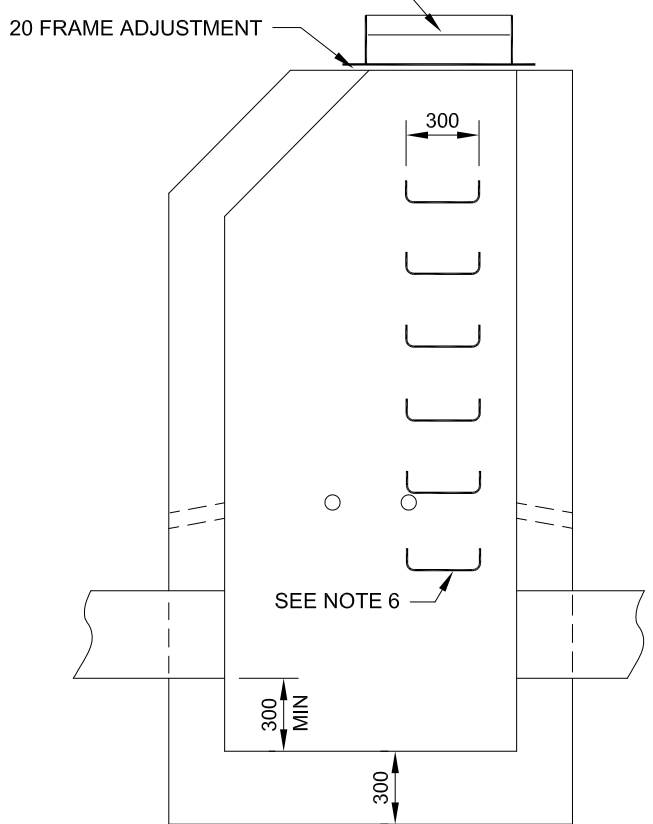


SECTION A-A

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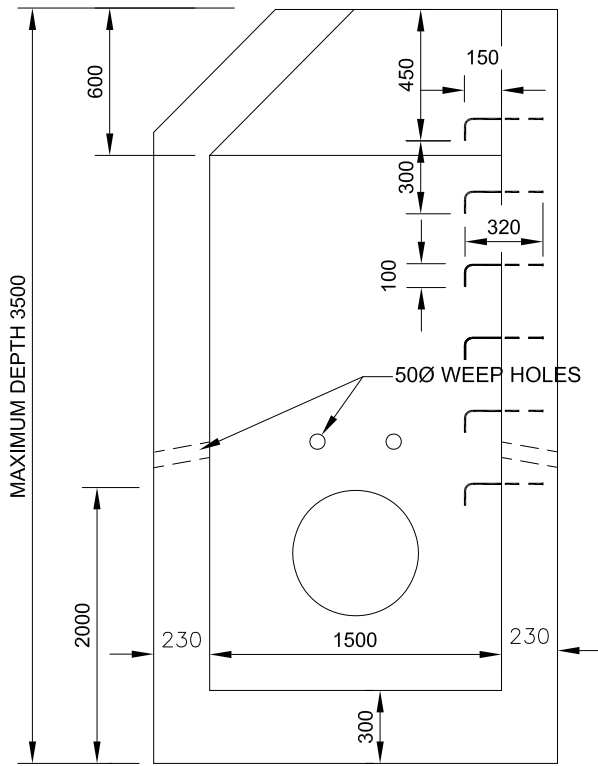
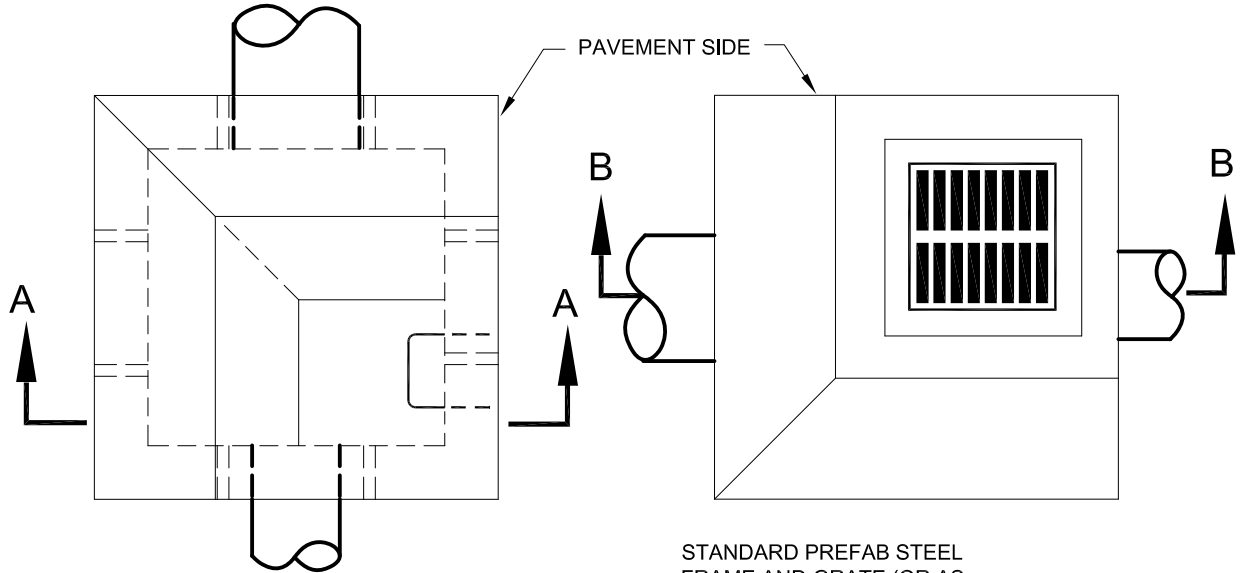


SECTION A-A

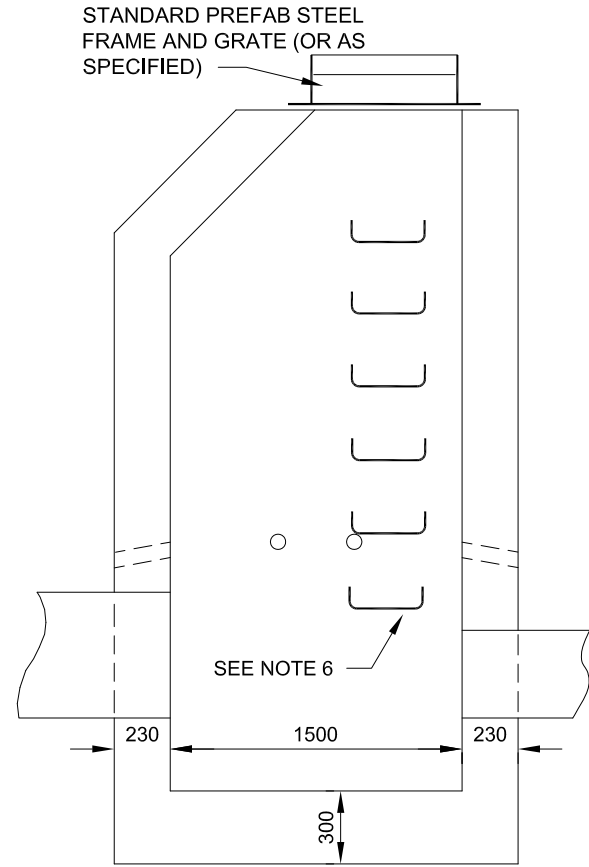


SECTION B-B

1. APPROVED SQUARE OR ROUND PRE-CAST UNITS MAY BE USED ON APPROVAL BY THE ENGINEER.
2. POROUS BACK FILL TO BE PLACED MINIMUM 300 ON ALL SIDES.
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4. WEEP HOLES SHALL BE PLACED SO THAT THE BOTTOM OF THE WEEPER ON THE INSIDE AND THE TOP OF THE WEEPER ON THE OUTSIDE ARE LEVEL.
5. MAXIMUM DEPTH TO BE REDUCED IF SURROUNDING TOPOGRAPHY IS NOT LEVEL.
6. LADDER RUNGS TO BE 20M HI-BOND BARS GALVANIZED OR EQUAL.



SECTION A-A



SECTION B-B

1. APPROVED SQUARE OR ROUND PRE-CAST UNITS MAY BE USED ON APPROVAL BY THE ENGINEER.
2. POROUS BACK FILL TO BE PLACED MINIMUM 300 ON ALL SIDES.
3. CONCRETE STRENGTH 25MPa AT 28 DAYS.
4. WEEPER HOLES SHALL BE PLACED SO THAT THE BOTTOM OF THE WEEPER ON THE INSIDE AND THE TOP OF THE WEEPER ON THE OUTSIDE ARE LEVEL.
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HIGHWAY DESIGN DIVISION

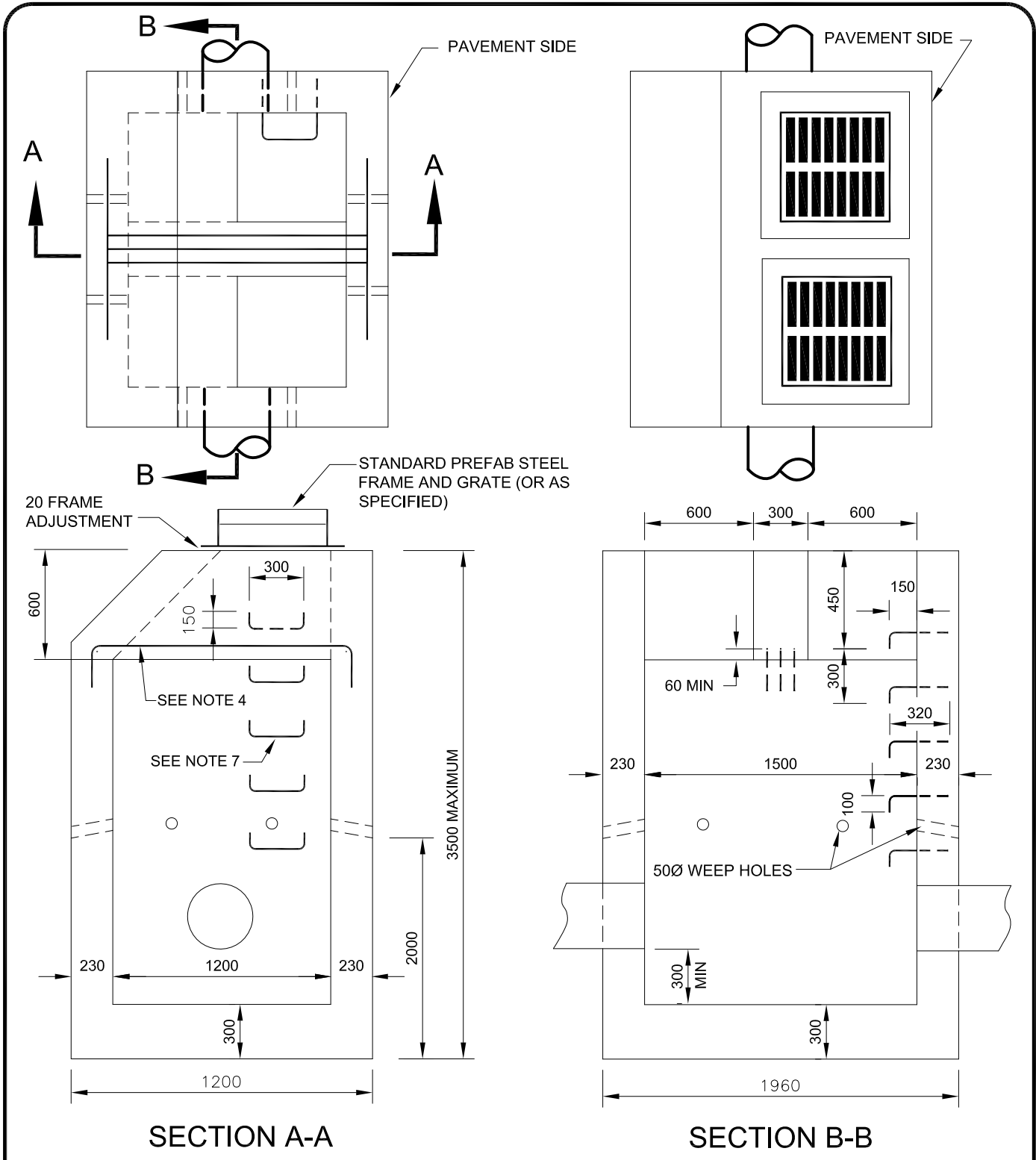
## SINGLE INLET LARGE INSPECTION CATCHBASIN

DRAWN BY:

DATE:

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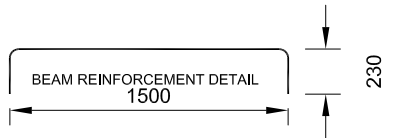
NOT TO SCALE

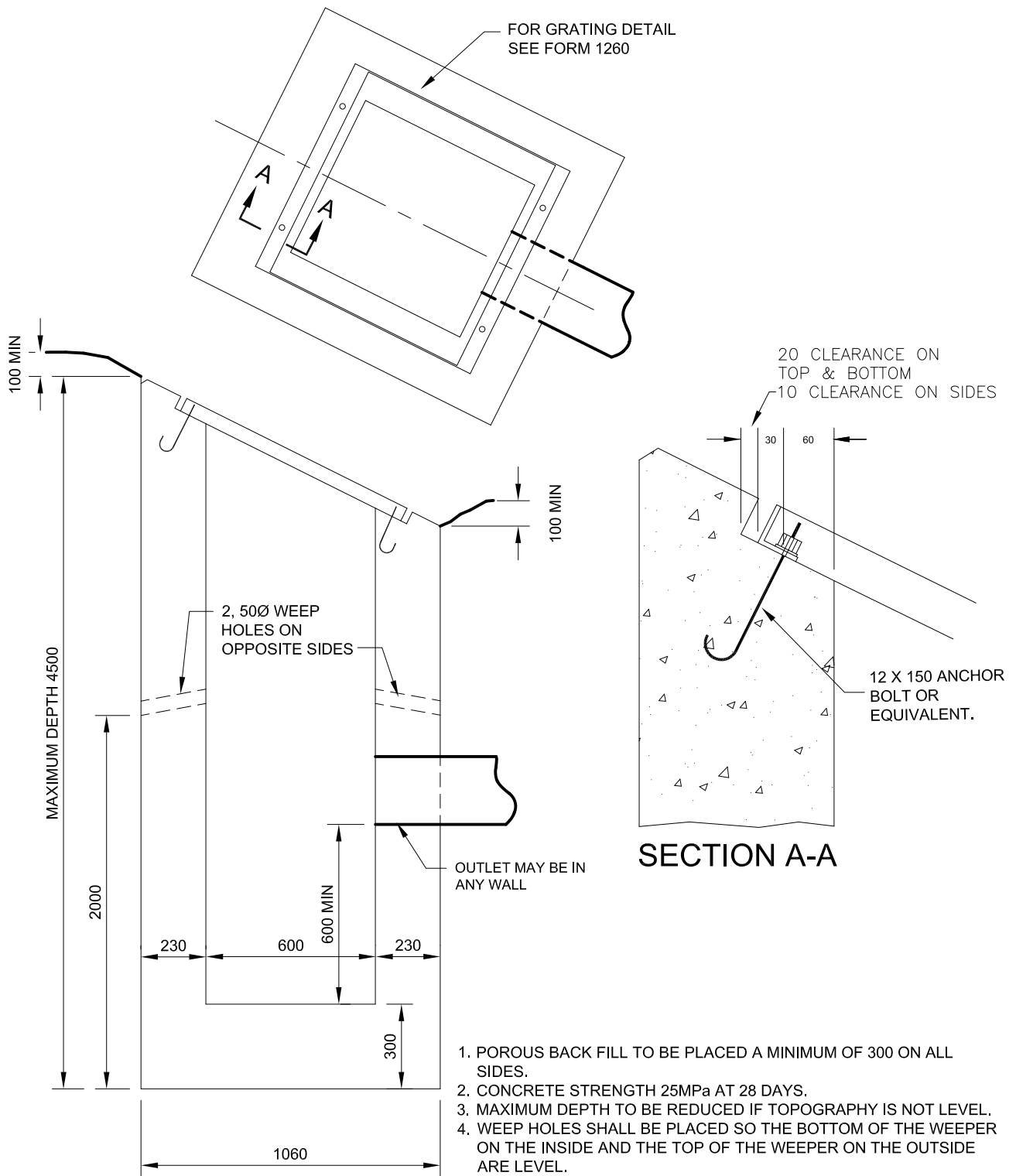


SECTION A-A

SECTION B-B

1. APPROVED SQUARE OR ROUND PRE-CAST UNITS MAY BE USED ON APPROVAL BY THE ENGINEER.
2. POROUS BACK FILL TO BE PLACED MINIMUM 300 ON ALL SIDES.
3. CONCRETE STRENGTH 25MPa AT 28 DAYS.
4. 3-15M HI-BOND BARS BENT AS PER DETAIL, TIES TO BE 15M HI-BOND BARS, 1000 LONG.
5. MAXIMUM DEPTH TO BE REDUCED IF TOPOGRAPHY IS NOT LEVEL.
6. WEEP HOLES SHALL BE PLACE SO THE BOTTOM OF THE WEEPER ON THE INSIDE AND THE TOP OF THE WEEPER ON THE OUTSIDE ARE LEVEL.
7. LADDER RUNGS TO BE 20M HI-BOND BARS, GALVANIZED OR EQUAL.





1. POROUS BACK FILL TO BE PLACED A MINIMUM OF 300 ON ALL SIDES.
2. CONCRETE STRENGTH 25MPa AT 28 DAYS.
3. MAXIMUM DEPTH TO BE REDUCED IF TOPOGRAPHY IS NOT LEVEL.
4. WEEP HOLES SHALL BE PLACED SO THE BOTTOM OF THE WEEPER ON THE INSIDE AND THE TOP OF THE WEEPER ON THE OUTSIDE ARE LEVEL.
5. WHERE INLET IS PLACED ACROSS DITCH AND IS ACCESSIBLE TO VEHICULAR TRAFFIC, GRATING IS TO BE 6:1 OR FLATTER.
6. APPROVED SQUARE OR ROUND PRE-CAST UNITS MAY BE USED ON APPROVAL OF THE ENGINEER.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

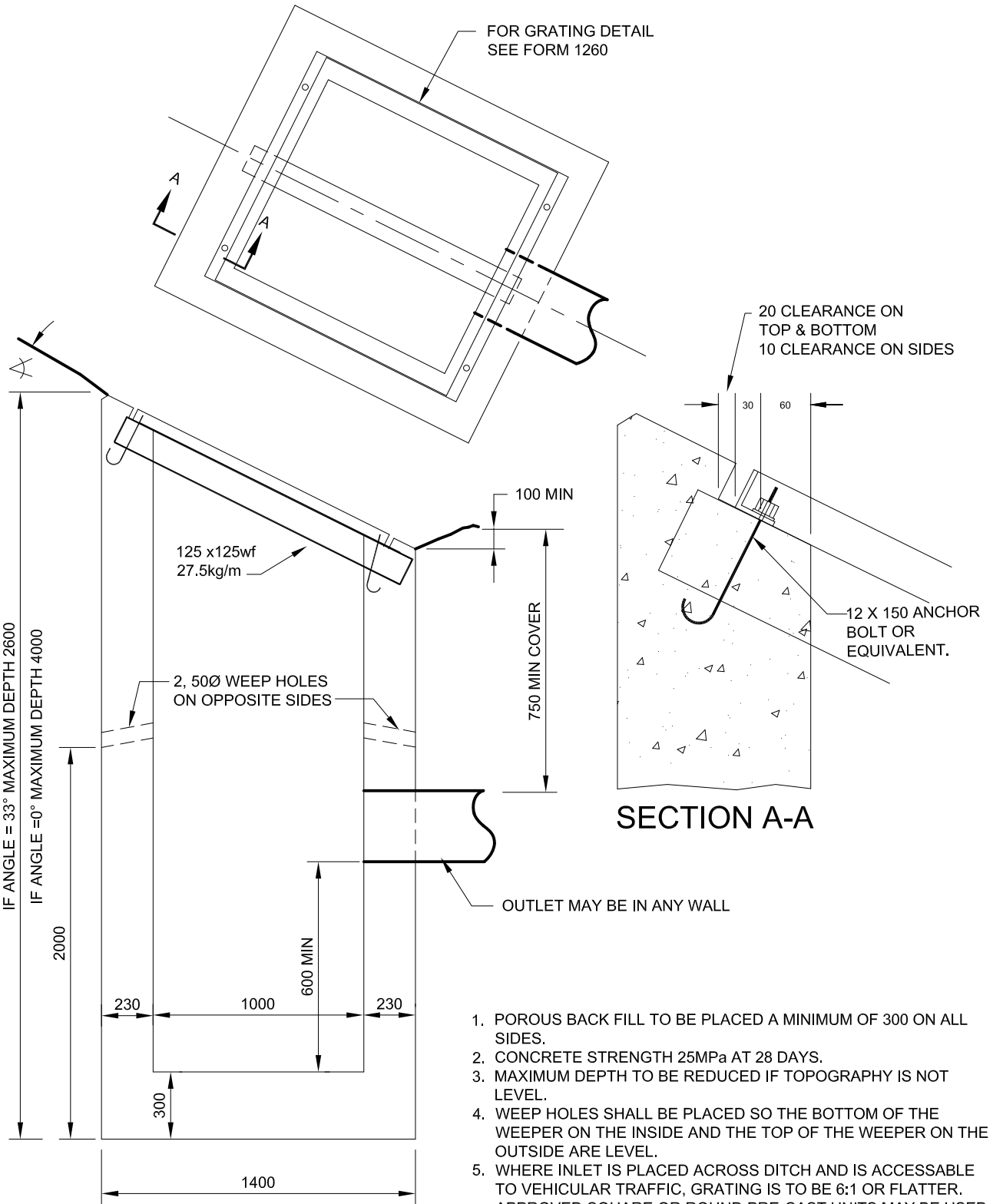
## 600 x 600 DITCH INLET CATCHBASIN

DRAWN BY:

DATE:

REV 02-01-10

NOT TO SCALE



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

## 1000 x 1000 DITCH INLET CATCHBASIN

DRAWN BY:

DATE:

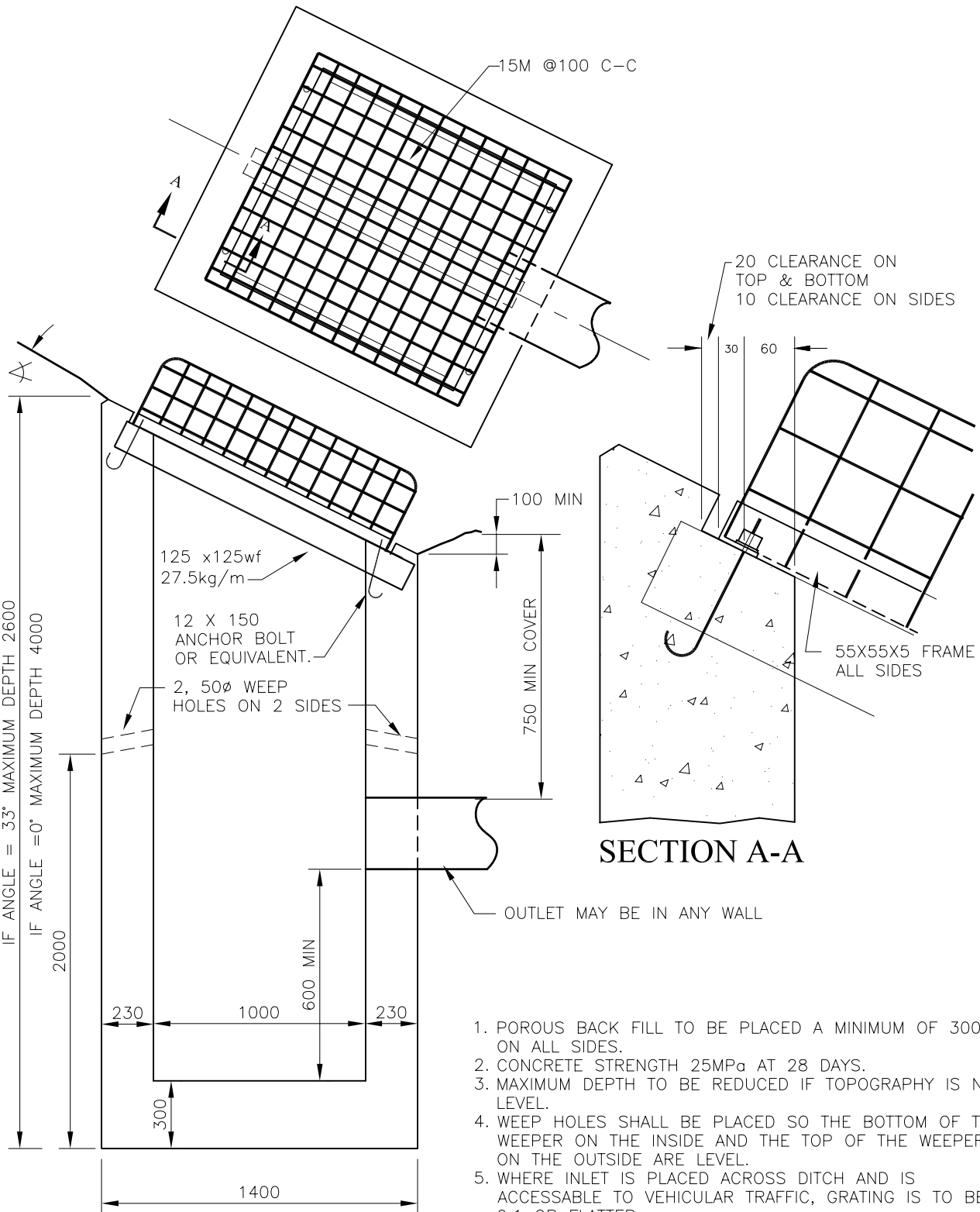
REV 02-01-10

NOT TO SCALE

MARCH 2011

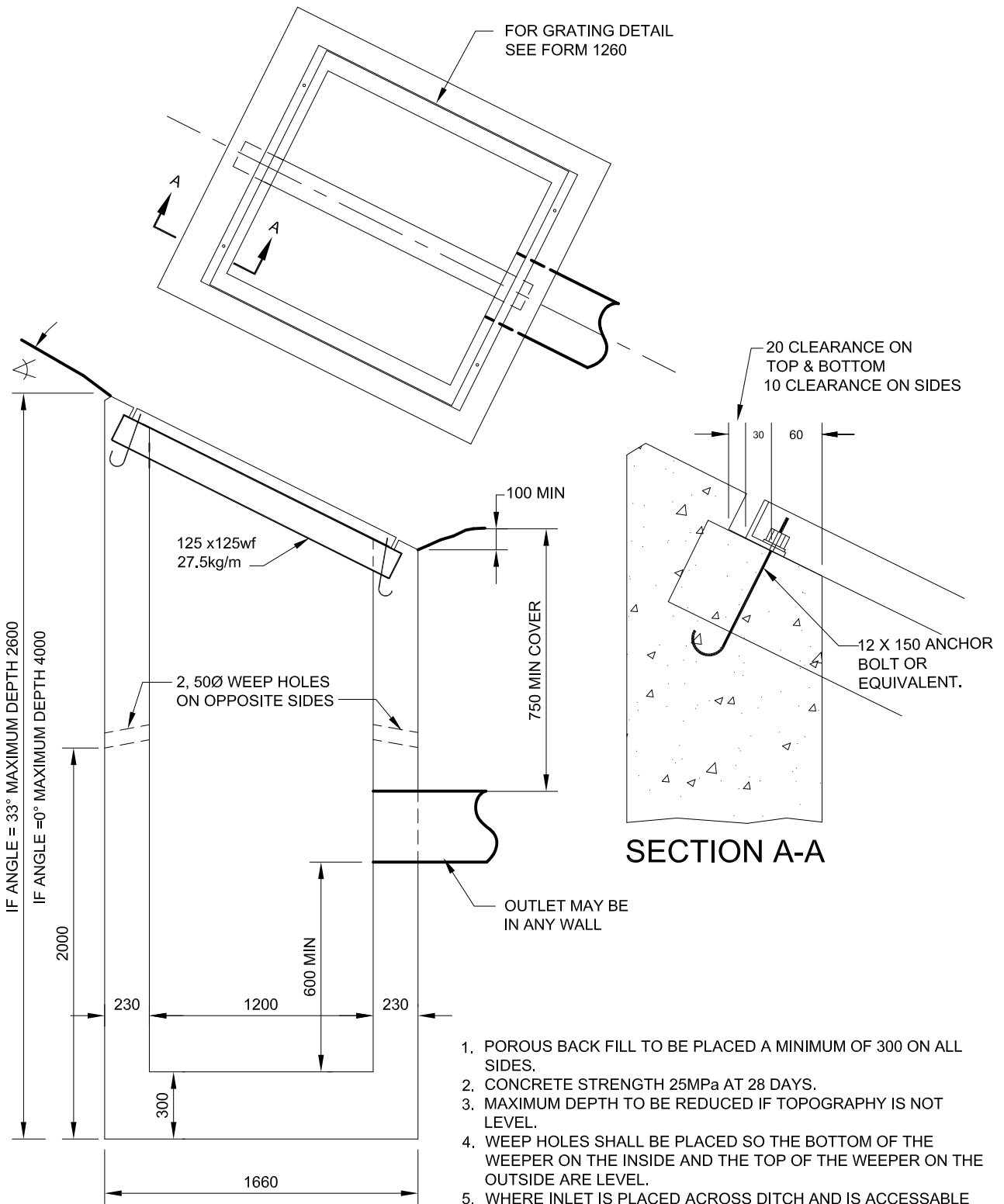
1256 -1



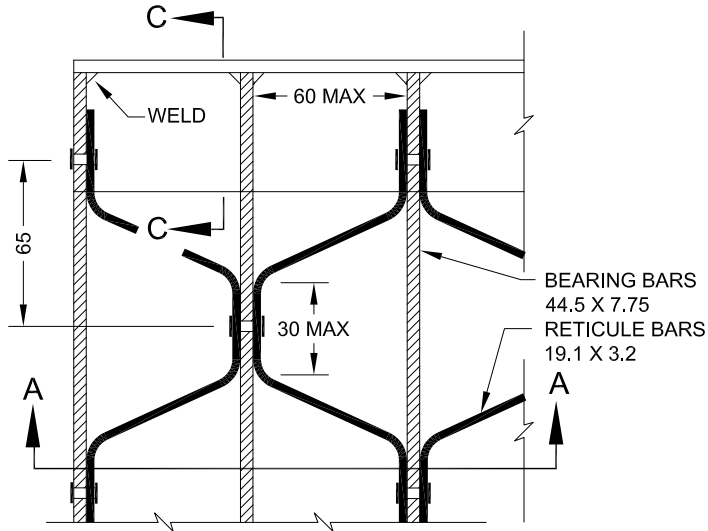


**SECTION A-A**

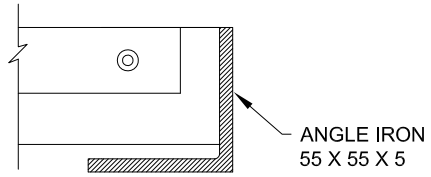
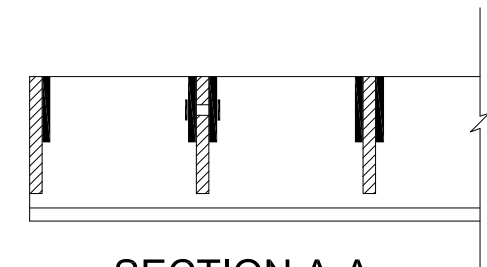
1. POROUS BACK FILL TO BE PLACED A MINIMUM OF 300 ON ALL SIDES.
2. CONCRETE STRENGTH 25MP<sub>a</sub> AT 28 DAYS.
3. MAXIMUM DEPTH TO BE REDUCED IF TOPOGRAPHY IS NOT LEVEL.
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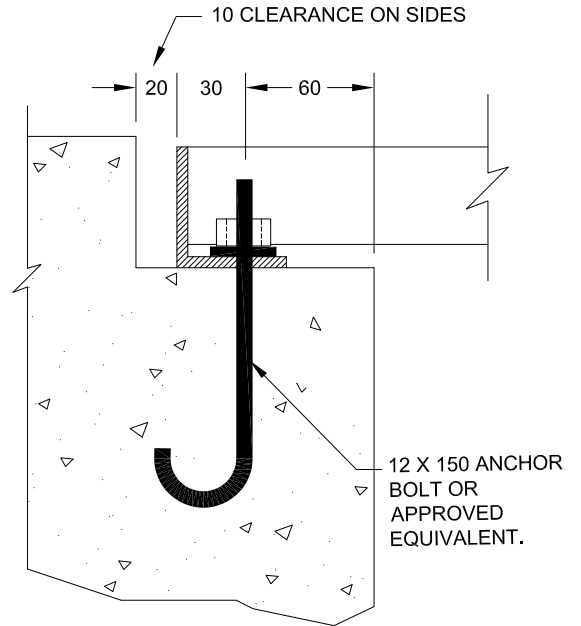
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3. MAXIMUM DEPTH TO BE REDUCED IF TOPOGRAPHY IS NOT LEVEL.
4. WEEP HOLES SHALL BE PLACED SO THE BOTTOM OF THE WEEPER ON THE INSIDE AND THE TOP OF THE WEEPER ON THE OUTSIDE ARE LEVEL.
5. WHERE INLET IS PLACED ACROSS DITCH AND IS ACCESSIBLE TO VEHICULAR TRAFFIC, GRATING IS TO BE 6:1 OR FLATTER.
6. APPROVED SQUARE OR ROUND PRE-CAST UNITS MAY BE USED ON APPROVAL OF THE ENGINEER.



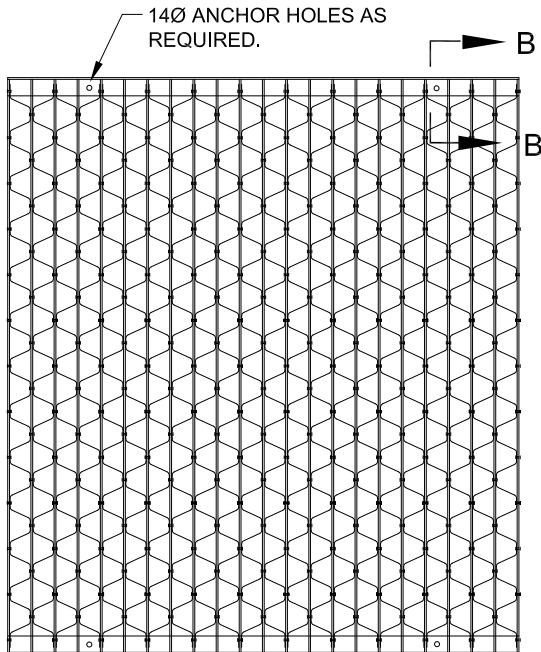
SECTION A-A



SECTION C-C



SECTION B-B



**MATERIALS**

BEARING BAR MINIMUM TENSILE STRENGTH SAE-1015  
 RETICULE BARS MINIMUM TENSILE STRENGTH SAE-1010  
 RIVETS FLAT HEAD.

**FINISH**

ALL SURFACES SHALL BE PAINTED WITH ONE SHOP COAT OF ASPHALT OR TAR BASE BLACK PAINT, HAVING A MINIMUM SOFTENING POINT OF 70°C

**WELDING**

END BEARING BARS TO BE WELDED TO ANGLE BAR ALONG BOTH LEGS WITH A 5MM FILE WELD. STANDARD METAL GRATING INSTITUTE MARKING RF-37-5.  
 RETICULE BARS MAY BE CRIMPED OR STRAIGHT, MAXIMUM LENGTH OF THE RETICULE BAR PARALLEL TO THE BEARING BAR IS 30 AT EACH RIVET.



TRANSPORTATION AND WORKS  
 HIGHWAY DESIGN DIVISION

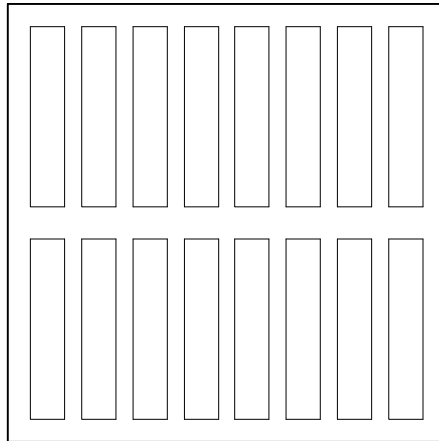
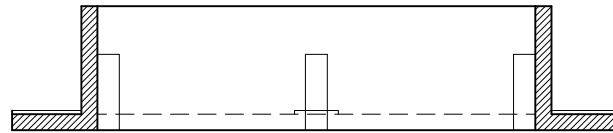
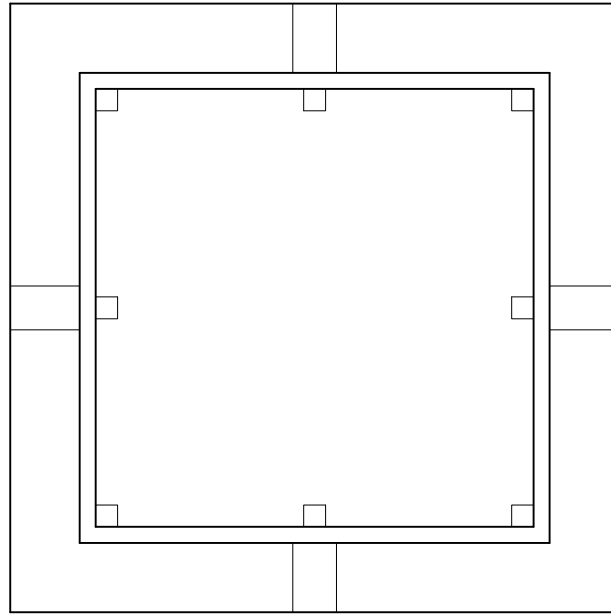
**TYPICAL DITCH INLET  
 GRATING DETAIL**

DRAWN BY:

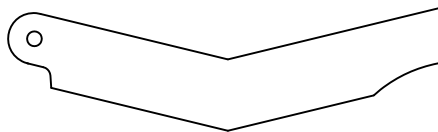
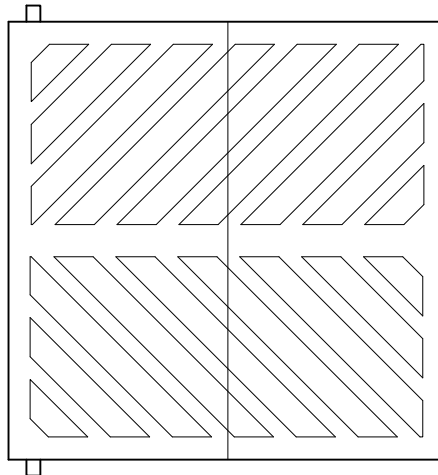
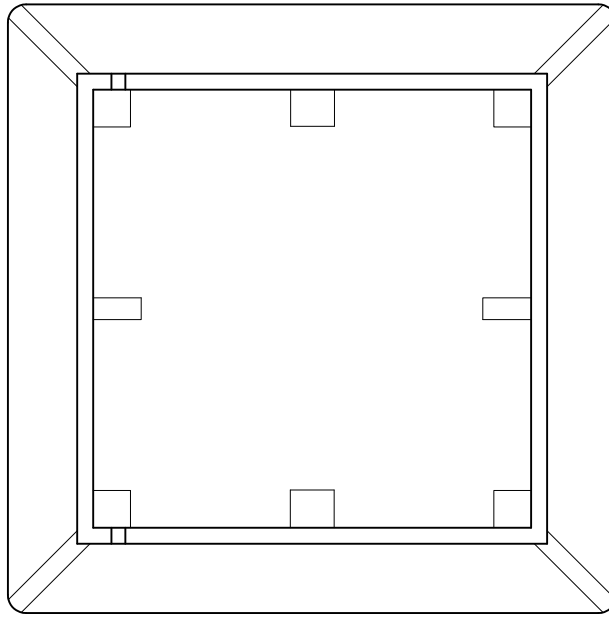
DATE:

REV 02-01-10

NOT TO SCALE



# STANDARD FRAME AND GRATE FOR CATCHBASIN



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

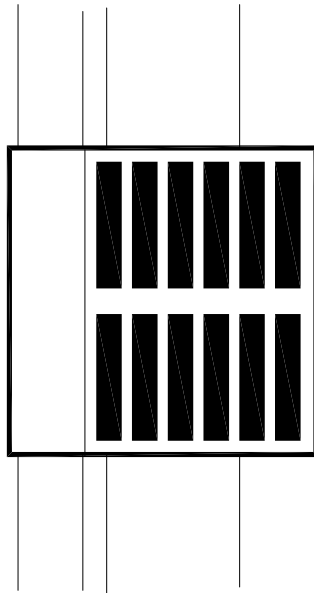
# STANDARD TYPE V FRAME AND GRATE FOR CATCHBASINS

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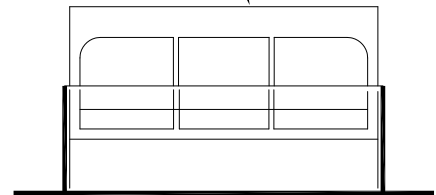
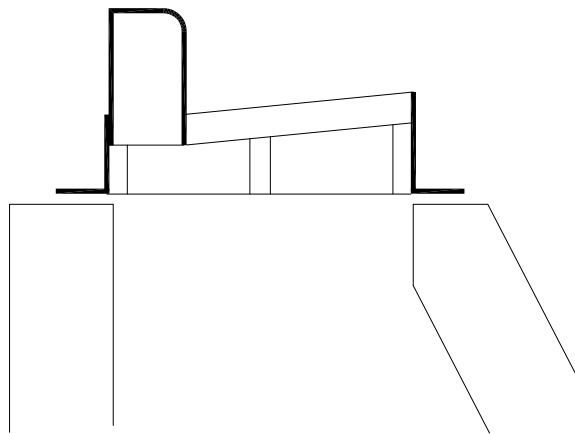
DATE:

REV 02-01-10

NOT TO SCALE



STANDARD PREFAB STEEL  
FRAME AND GRATE (OR AS  
SPECIFIED)



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

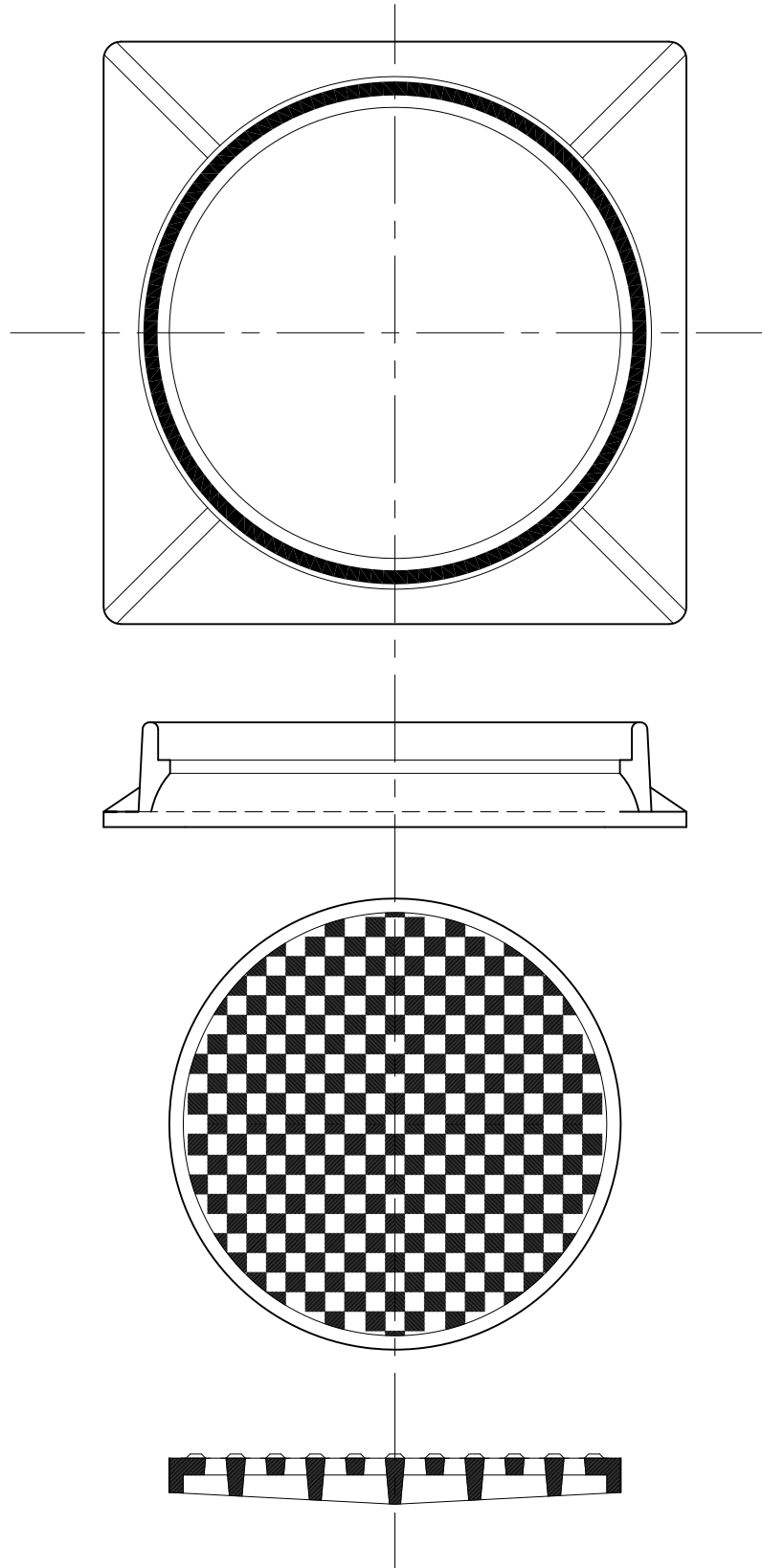
## STANDARD CURB AND GUTTER CASTING

DRAWN BY:

DATE:

REV 02-01-10

NOT TO SCALE



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

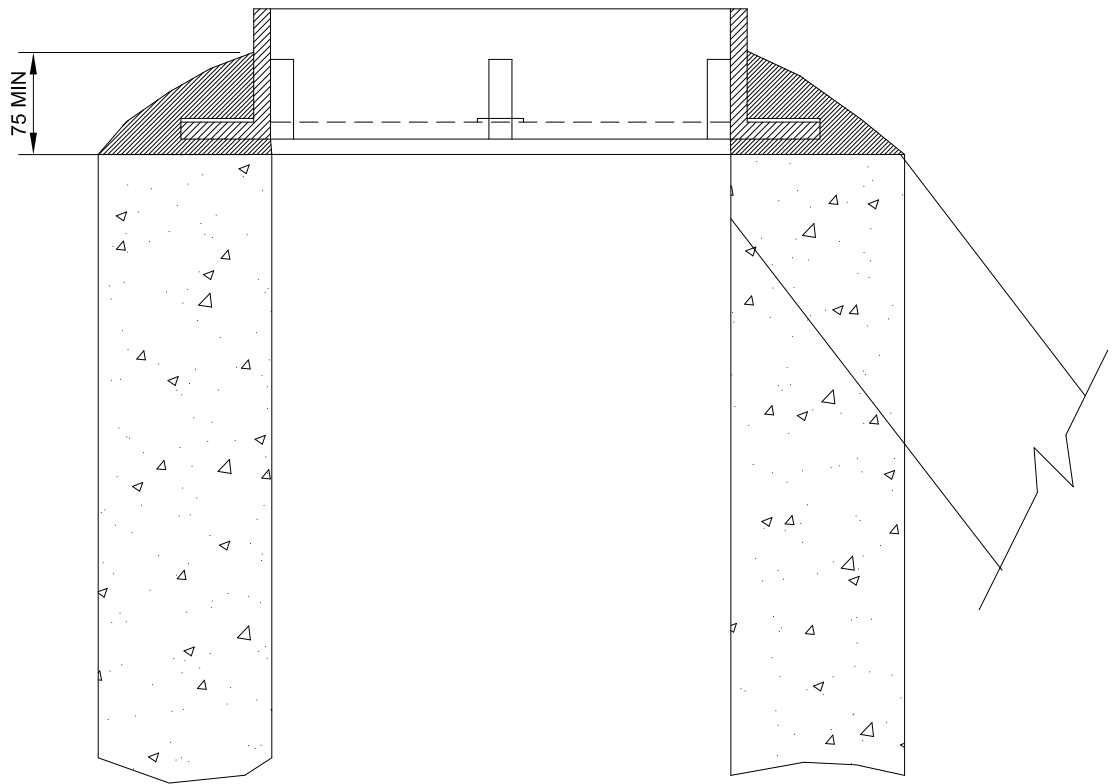
# STANDARD ROUND MANHOLE FRAME AND GRATE

DRAWN BY:

DATE:

REV 02-01-10

NOT TO SCALE



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

# STANDARD MANHOLE FRAME MORTAR DETAIL

DRAWN BY:

DATE:

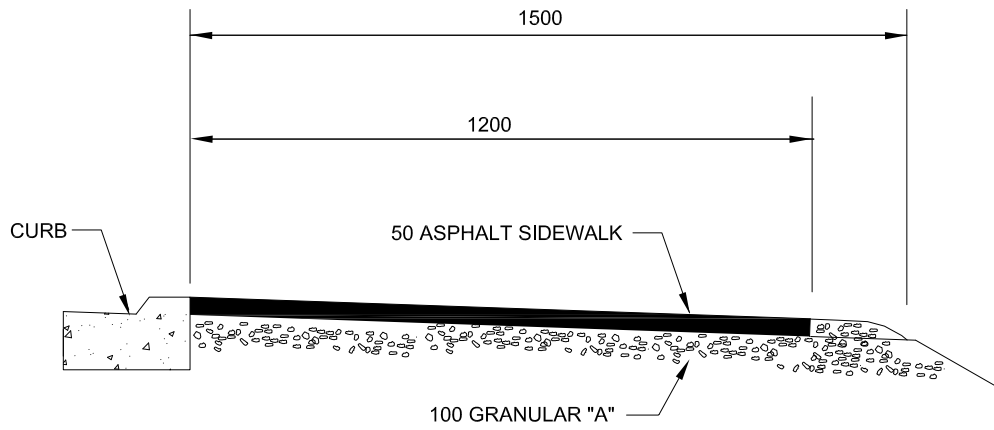
REV 02-01-10

NOT TO SCALE

MARCH 2011

1270 -1





TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

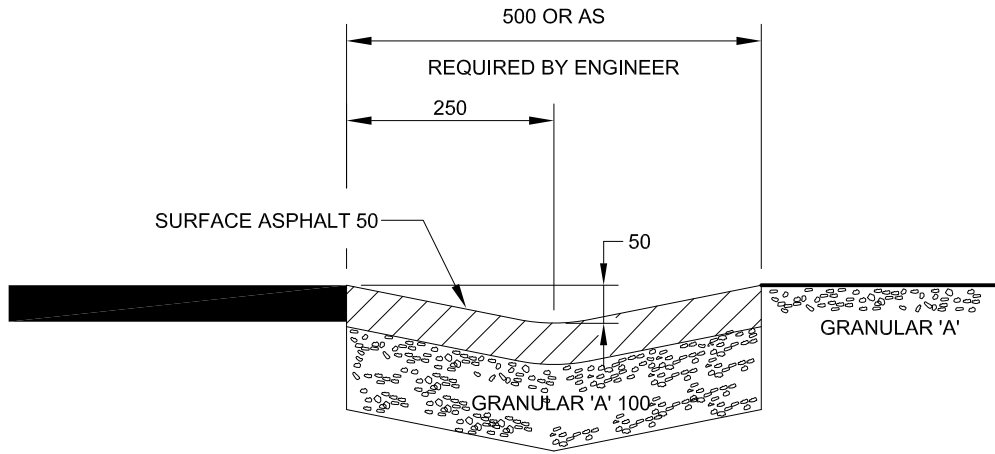
## ASPHALT SIDEWALK

DRAWN BY:

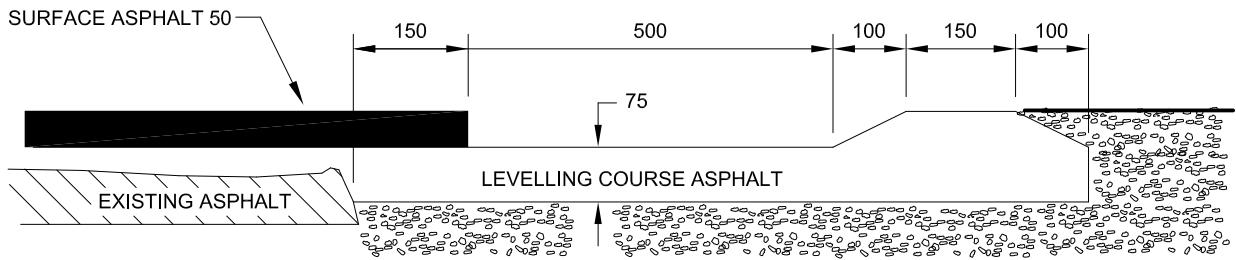
DATE:

REV 02-01-10

NOT TO SCALE



ASPHALT GUTTER WITH SURFACE COURSE ASPHALT



ASPHALT GUTTER WITH LEVELLING COURSE ASPHALT



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

ASPHALT GUTTER

DRAWN BY:

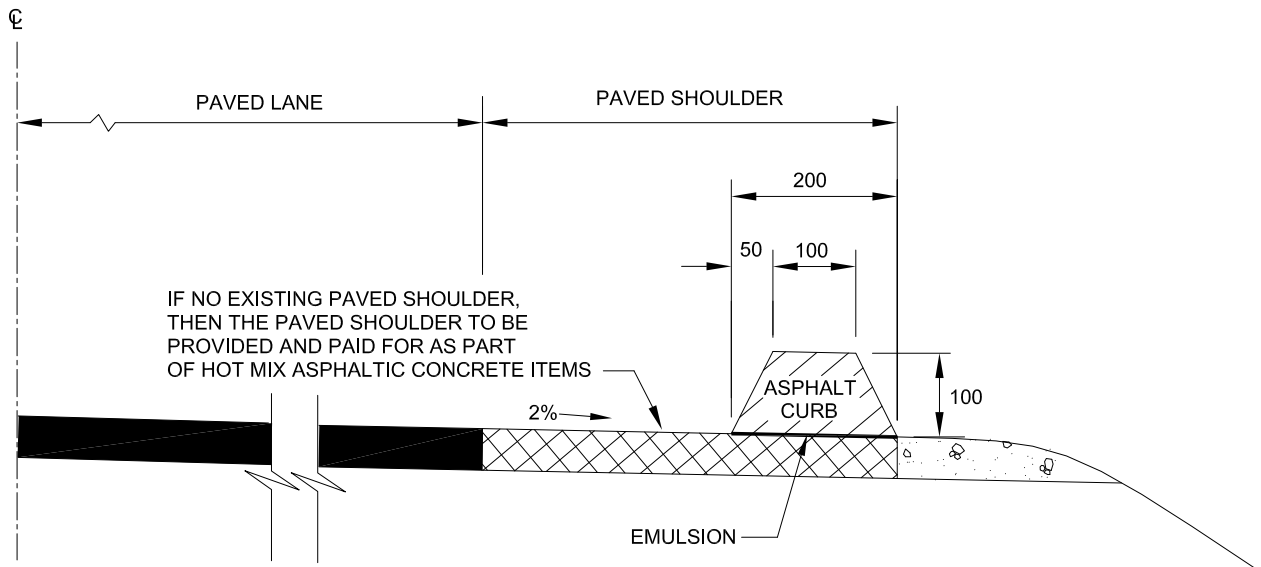
DATE:

REV 02-01-10

NOT TO SCALE

MARCH 2011

1273 -1



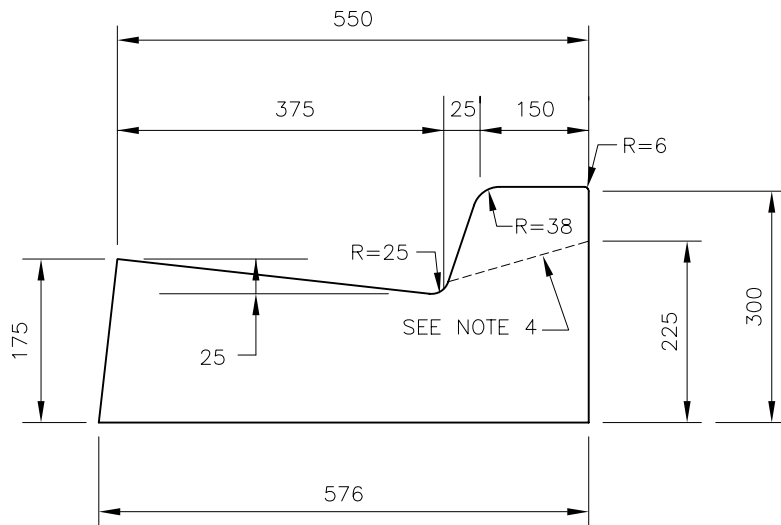
NOTES:  
 ASPHALT CURB SHALL COMPRISE MATERIAL CONFORMING TO THE REQUIREMENTS FOR ASPHALT SURFACE COURSE MATERIAL.



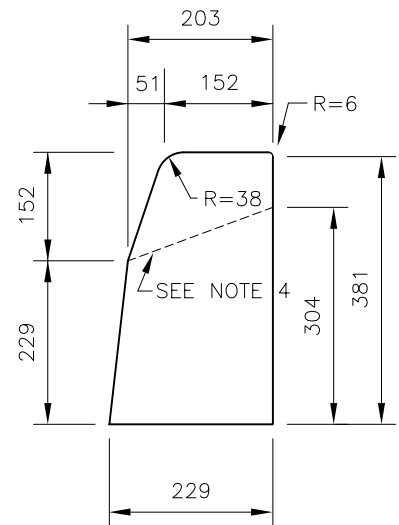
TRANSPORTATION AND WORKS  
 HIGHWAY DESIGN DIVISION

# ASPHALT CURB

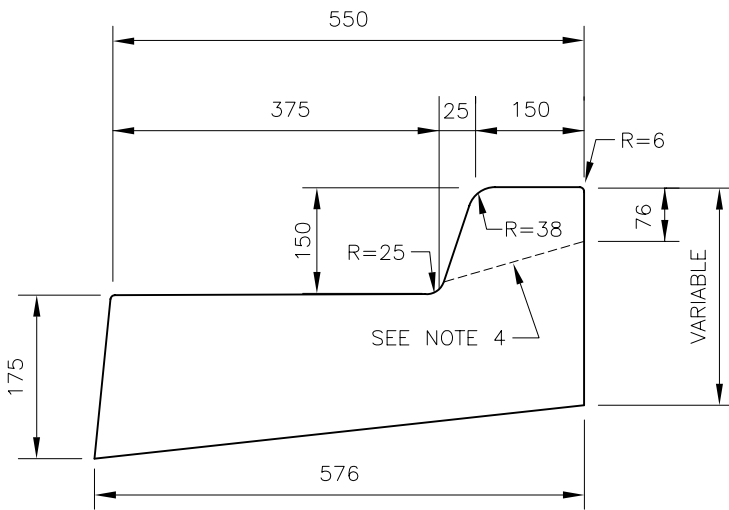
DRAWN BY: DEB KIRBY	DATE: REV 02-01-10	NOT TO SCALE
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TYPE 'C' CURB



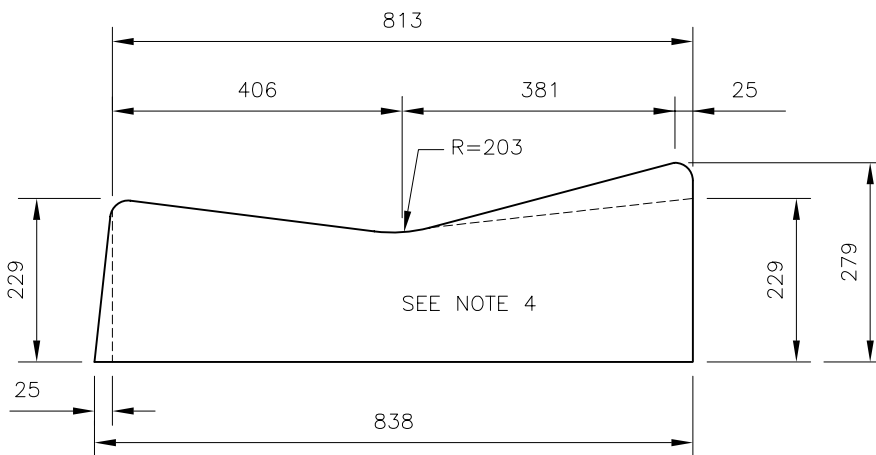
TYPE 'G' CURB



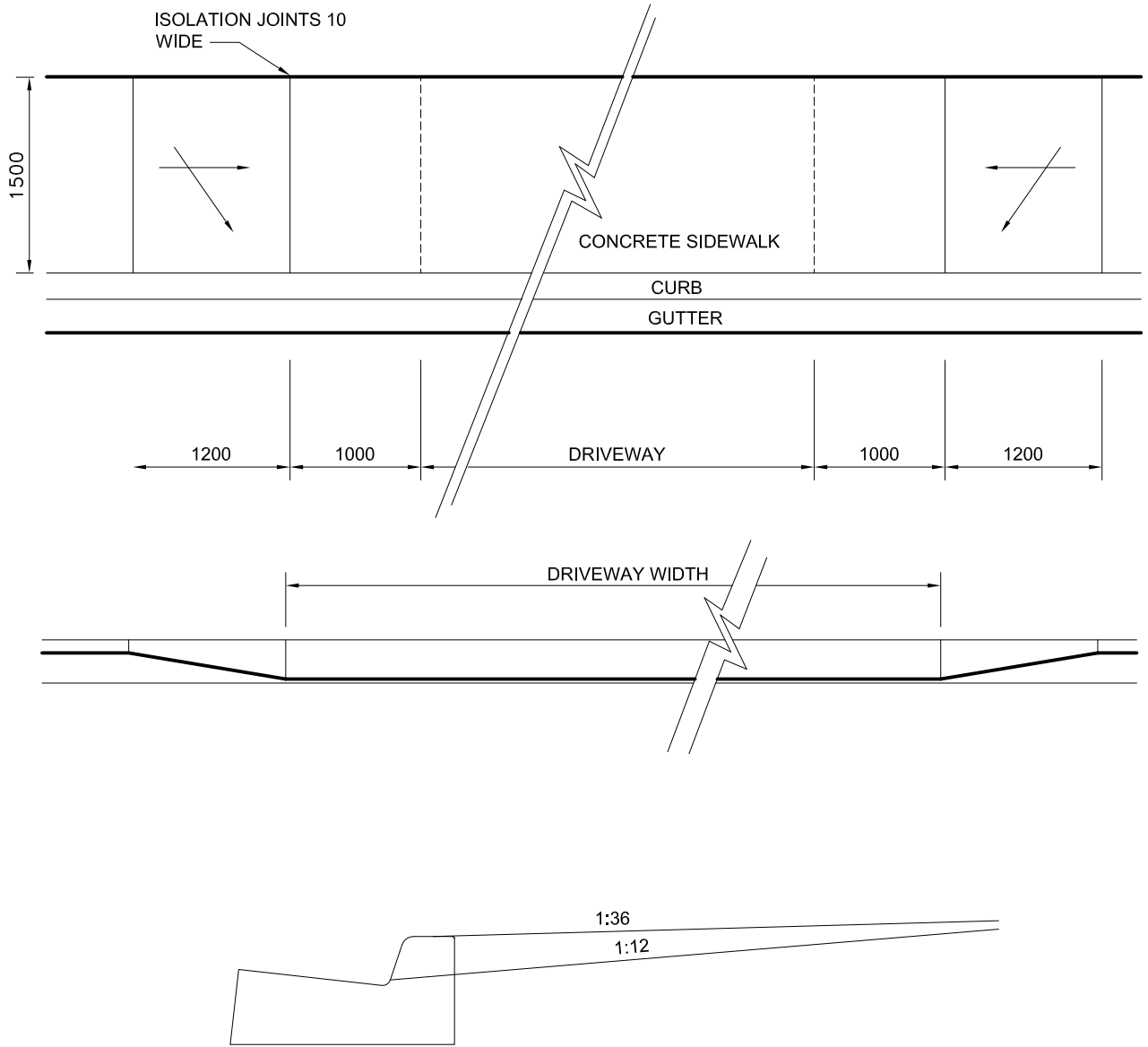
TYPE 'D' CURB

NOTES:

1. CONCRETE 35MP<sub>a</sub>
2. ISOLATION JOINTS @ 6.0m INTERVALS
3. ISOLATION JOINT MATERIAL TO BE ASPHALTIC, NON-PROTUDING MATERIAL.
4. DROP CURB AT ENTRANCES.
5. TAPERED END TREATMENT AT ENDS.



TYPE 'H' CURB



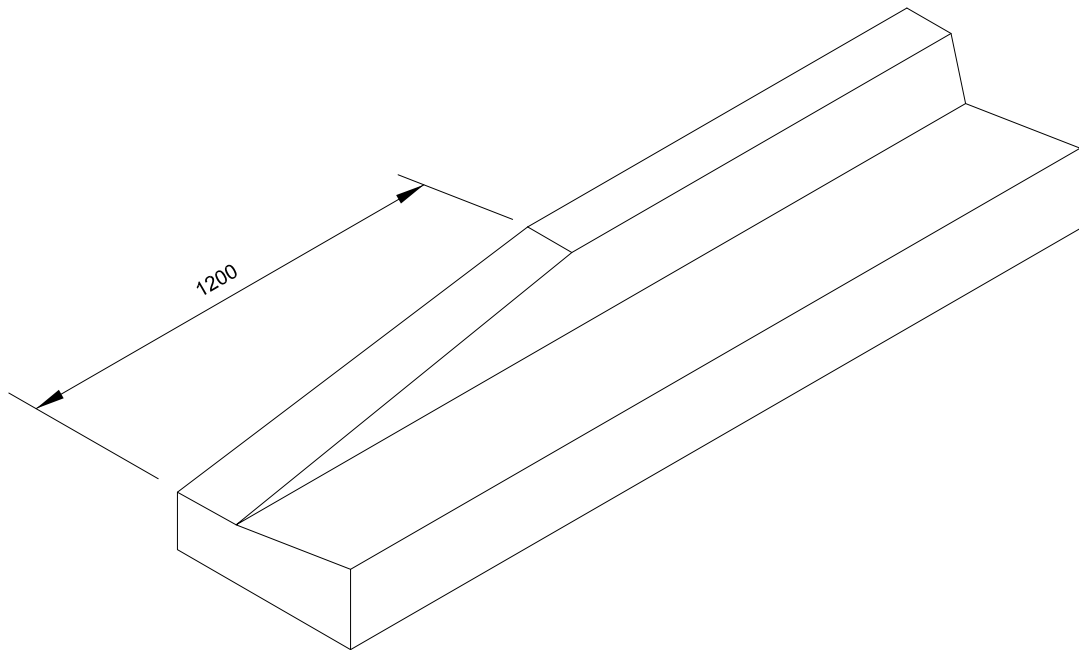
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

### TYPICAL DROP CURB WITH SIDEWALK

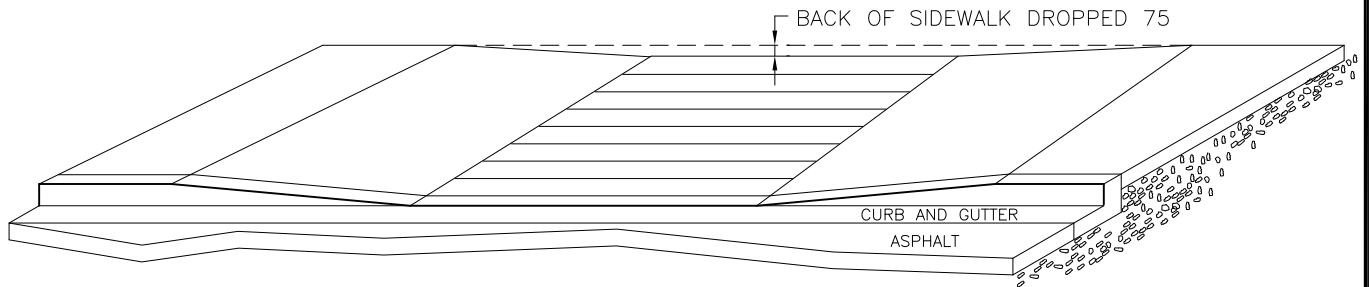
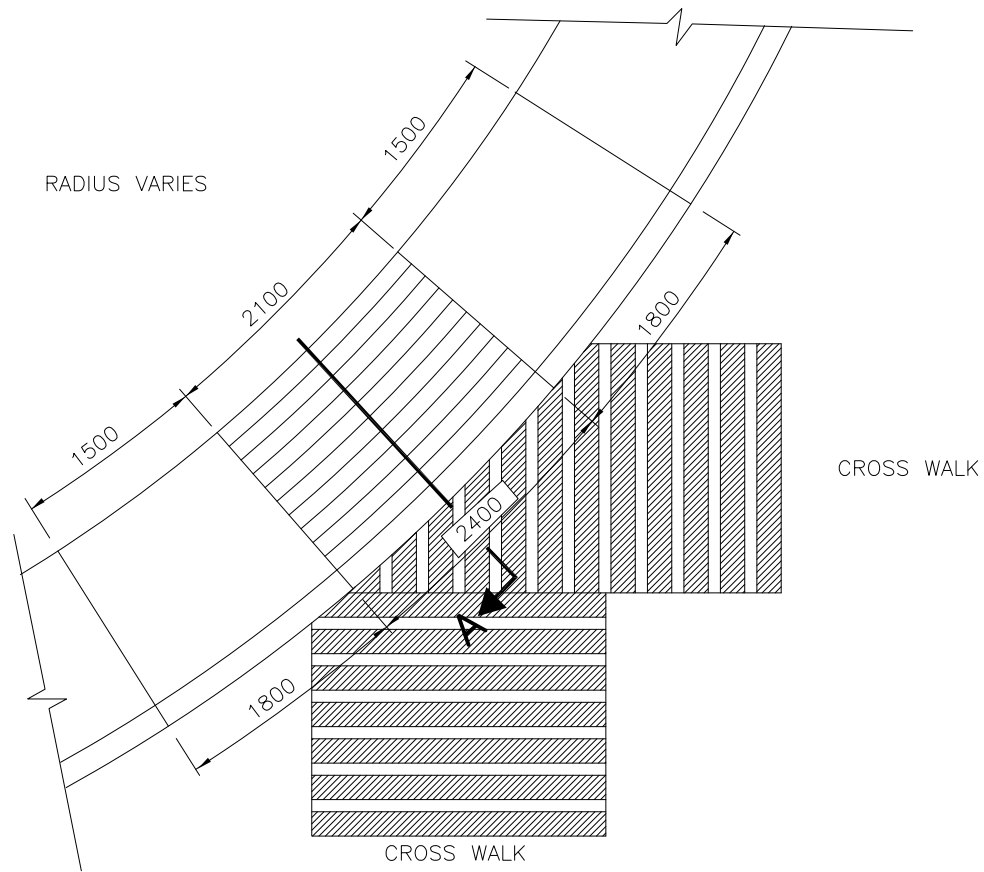
DRAWN BY: H. JONES

DATE: REV 02-01-10

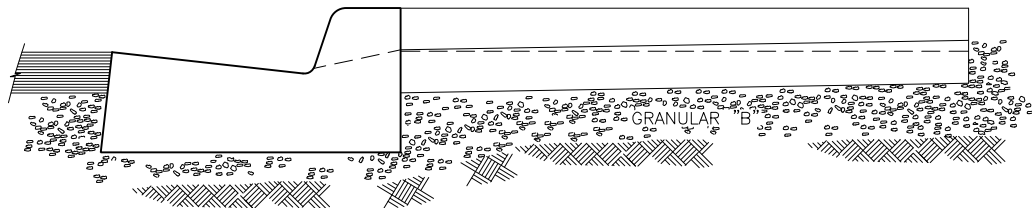
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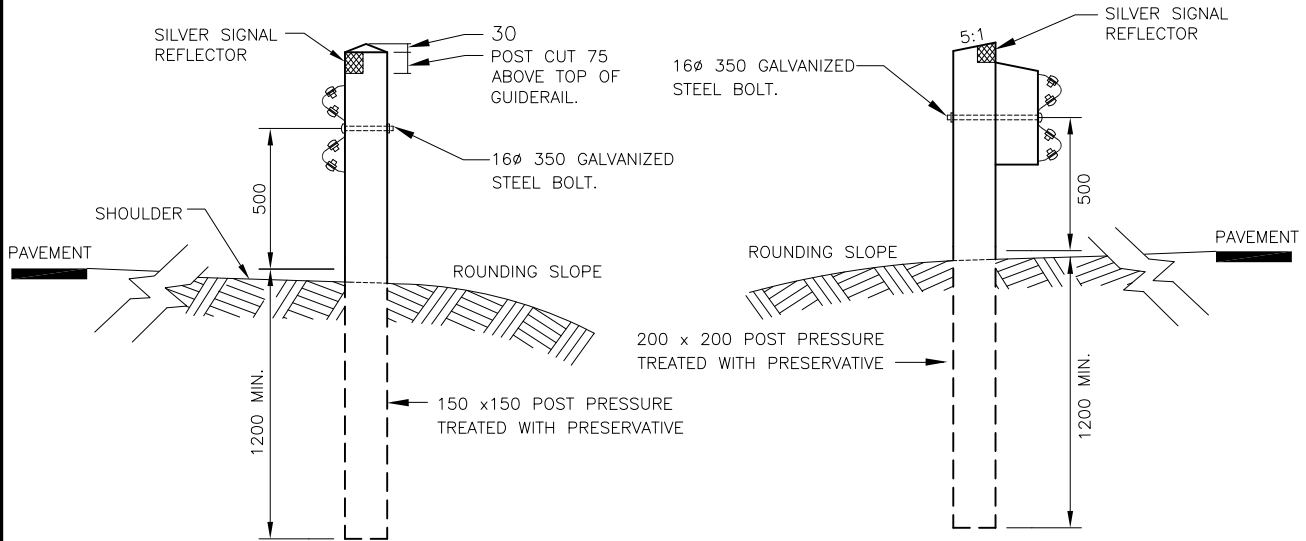


### TYPICAL CURB AND GUTTER TAPERED END TREATMENT



CONCRETE 35MPa.  
 150C-C NON SKID RIBBED SURFACE SHALL BE EDGED ON PARAPLEGIC RAMP.



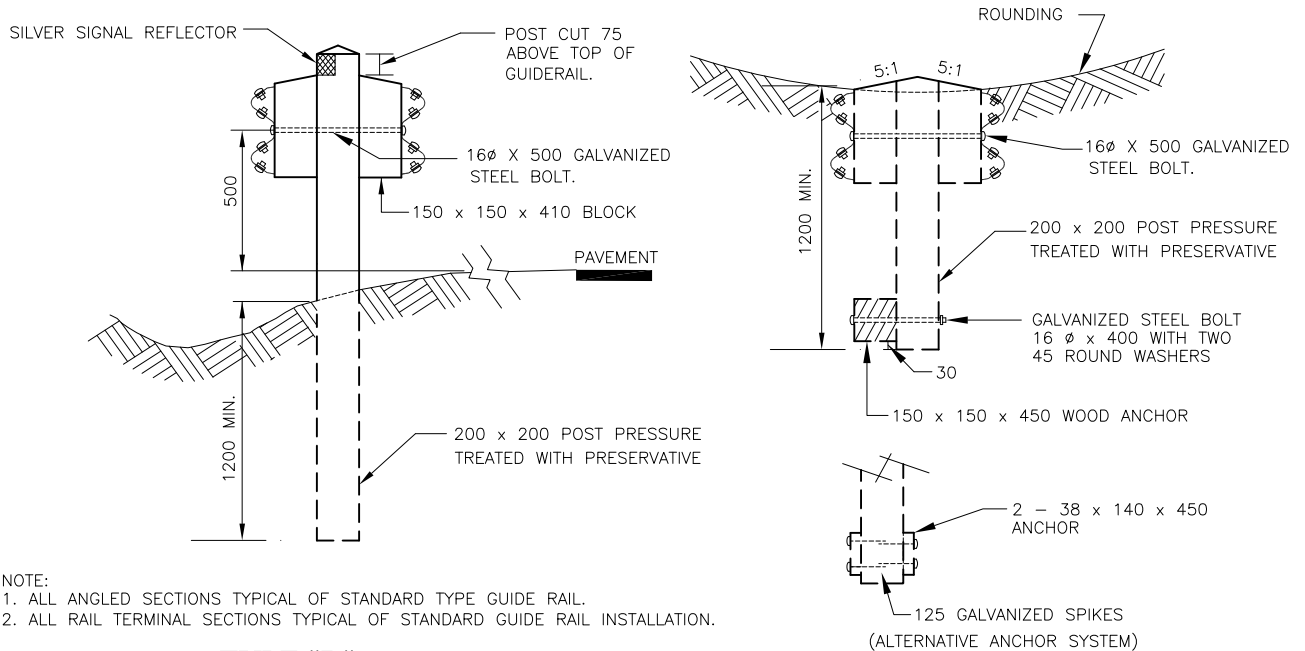


NOTE:

1. SLOPED AND BURIED GUIDE RAIL SECTION (2 LENGTHS OF RAILING)
2. ALL WOOD TO BE PRESSURE TREATED WITH PRESERVATIVE.

**STANDARD TYPE**

**TYPE "A"**



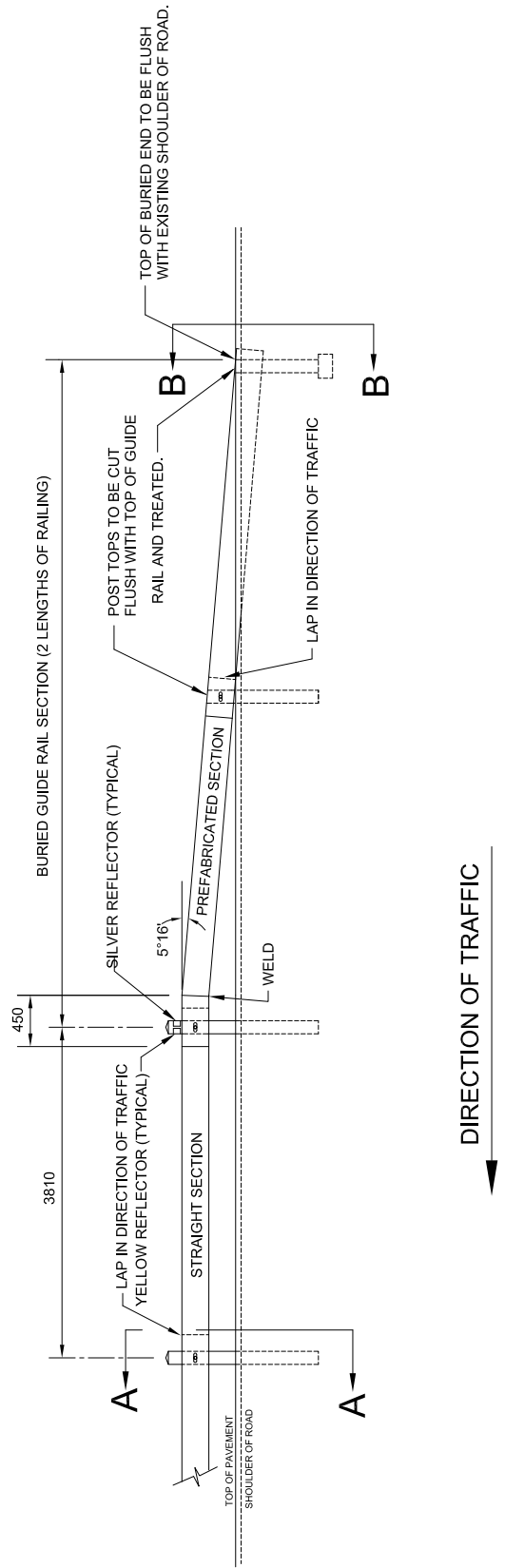
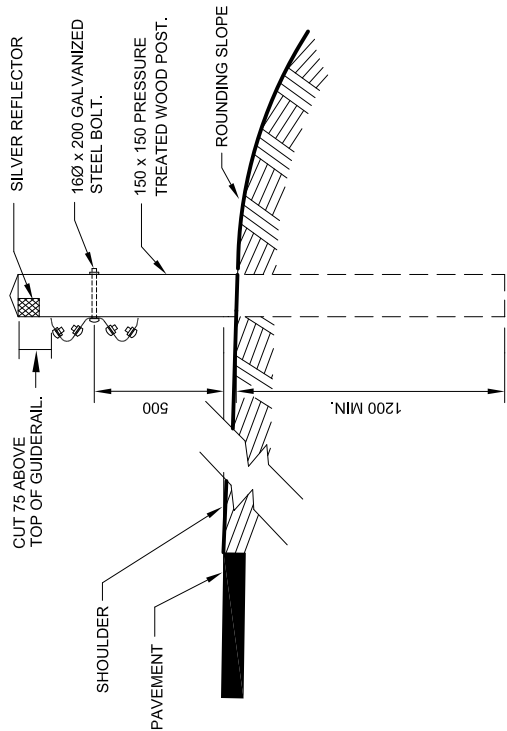
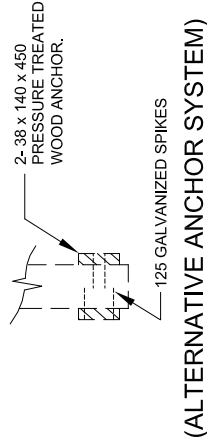
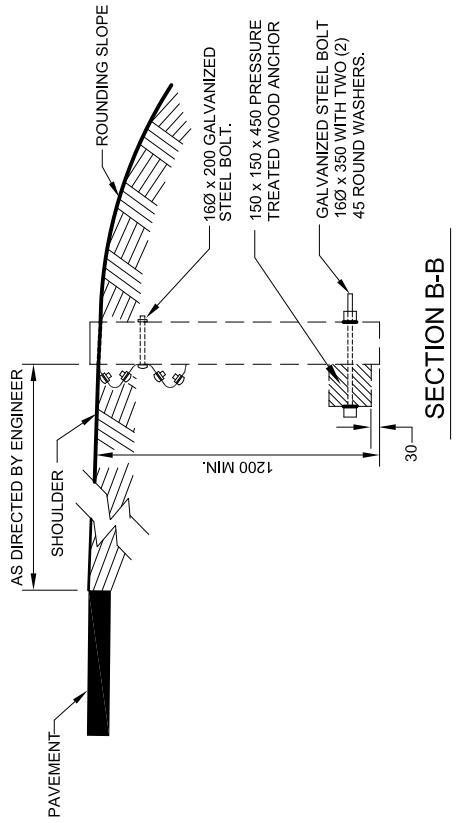
NOTE:

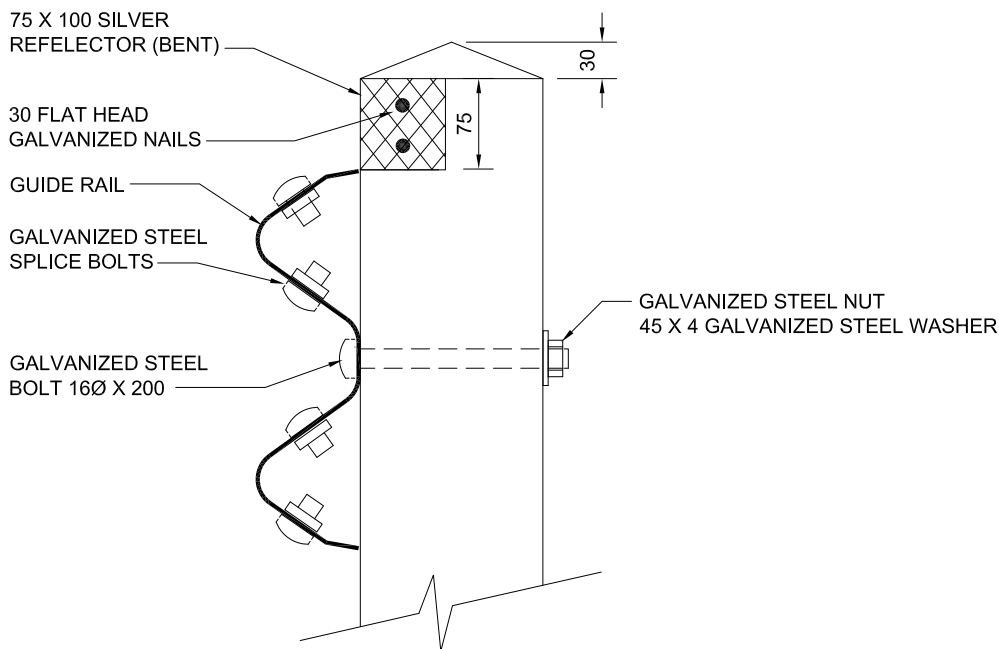
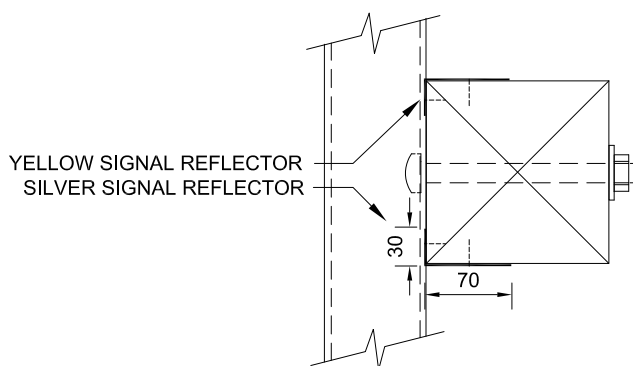
1. ALL ANGLED SECTIONS TYPICAL OF STANDARD TYPE GUIDE RAIL.
2. ALL RAIL TERMINAL SECTIONS TYPICAL OF STANDARD GUIDE RAIL INSTALLATION.

**TYPE "B"**

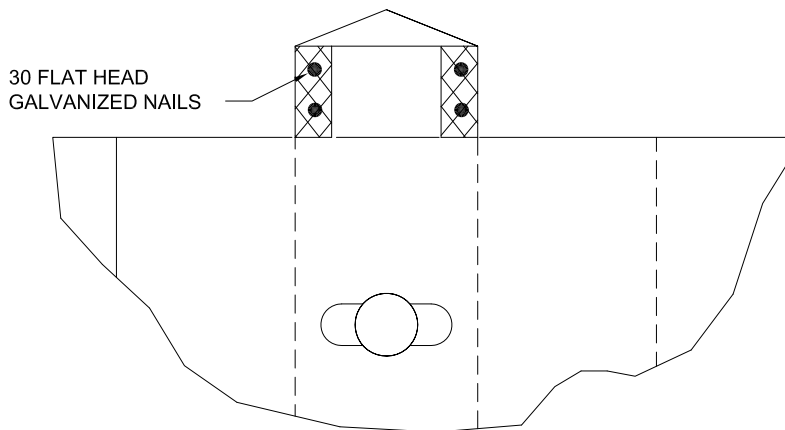
**TYPE "B" - BURIED END**

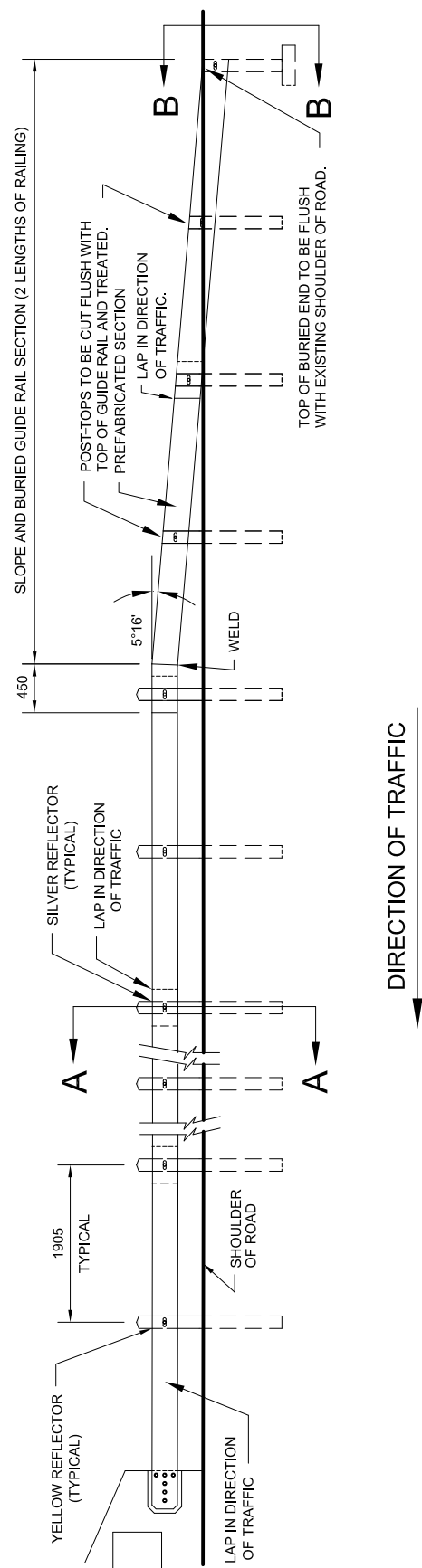
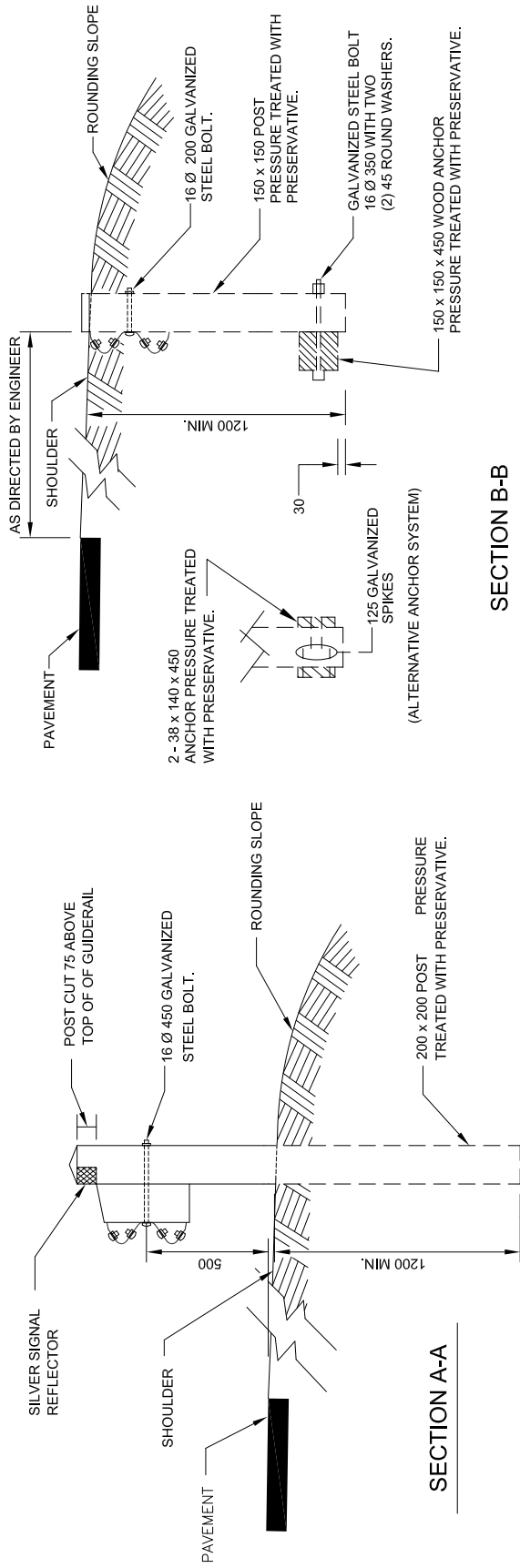






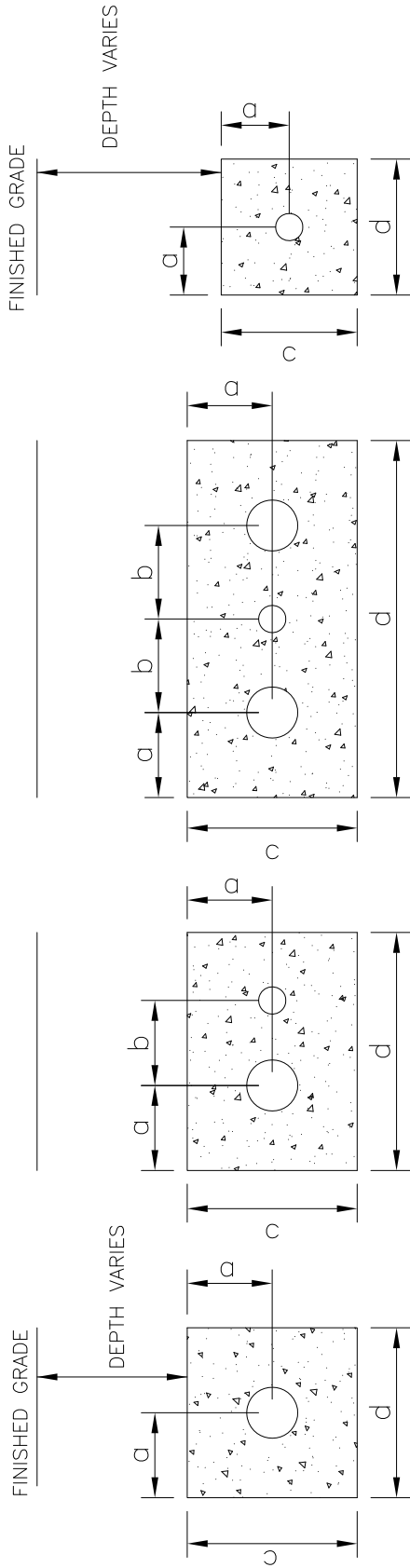
YELLOW SIGNAL REFLECTORS ARE OMITTED ON DIVIDED HIGHWAY.





**NOTES:**  
GUIDE RAIL WITH ADDITIONAL POSTS w/ OFFSET BLOCK TO BE PLACED UP TO A MINIMUM OF 7620 FROM EACH ENDBLOCK FOR ALL BRIDGES. UNLESS OTHERWISE SPECIFIED SLOPED AND BURIED GUIDED RAIL OR ADDITIONAL GUIDE RAIL SHALL BE AS PER STANDARD INSTALLATION. INTERMEDIATE POSTS TO BE INSTALLED AS INDICATED. SEE SPECIFICATIONS BOOK, SECTION 923, WHERE APPROPRIATE.

<p>TRANSPORTATION AND WORKS HIGHWAY DESIGN DIVISION</p>	<h2>GUIDE RAIL WITH ADDITIONAL POSTS</h2>		NOT TO SCALE
	DRAWN BY: DEB KIRBY	DATE: REV 02-01-10	



ONE DUCT BANK  
Type D

THREE DUCT BANK  
Type C

TWO DUCT BANK  
Type B

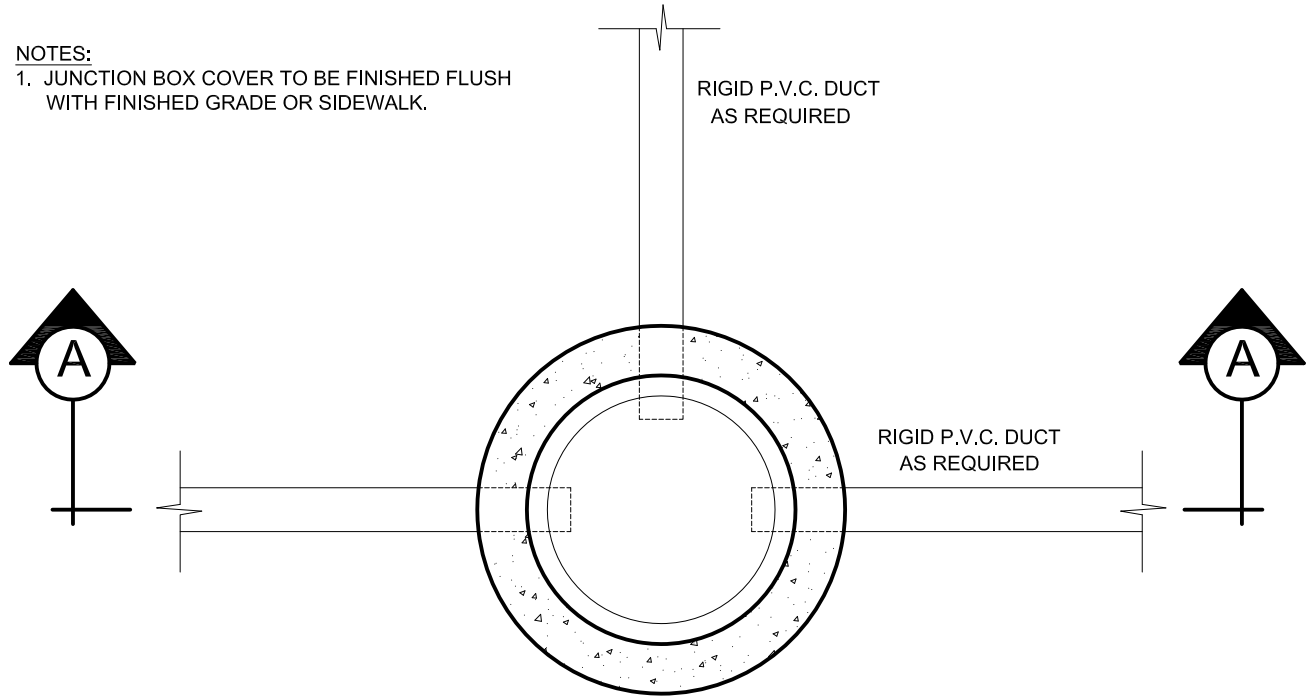
ONE DUCT BANK  
Type A

TYPE OF DUCT BANKS	TYPICAL DIMENSIONS FOR DUCT BANKS (mm)				NUMBER OF CONDUITS	
	a	b	c	d	40mm	75mm
A	125	—	250	250	—	1
B	125	125	250	350	1	1
C	125	137.5	250	525	1	2
D	100	—	200	200	1	—

1. ALL CONDUITS AND FITTINGS TO BE RIGID PVC.
2. THE TOP ELEVATION OF THE CONCRETE ENCASUREMENT SHALL BE A MINIMUM DEPTH OF 1000. IN ROCK THE TOP OF THE DUCT BANK MAY BE PLACED AT SUB GRADE OR AS OTHERWISE DIRECTED BY THE ENGINEER.
3. CONCRETE SHALL CONFORM TO THE DEPARTMENT OF WORKS, SERVICES AND TRANSPORTATION SPECIFICATION BOOK, DIVISION 904, "CONCRETE STRUCTURES" AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 30MPa.
4. THE USE OF TELEPHONE DUCT WILL NOT BE PERMITTED.

**NOTES:**

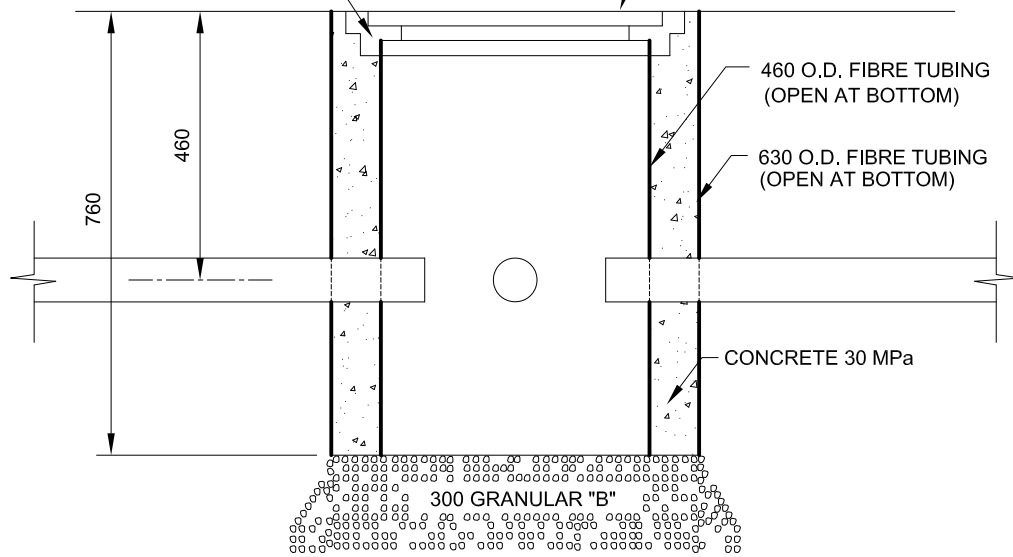
1. JUNCTION BOX COVER TO BE FINISHED FLUSH WITH FINISHED GRADE OR SIDEWALK.



CUT 3- 11 X 38 SLOTS IN FIBRE TUBE FOR VERTICAL FRAME ADJUSTMENT.  
 ANCHOR FRAME IN CONCRETE WITH 3- 10Ø X 38 LONG GALVANIZED BOLTS.  
 GROUND LUG FOR #6 AWG STRANDED COPPER WIRE TO BE ATTACHED TO ONE BOLT.

**PLAN**  
 SCALE N.T.S.

460 CAST IRON FRAME AND COVER ALMAT METAL LTD. CAT. No. DD-1428 OR EQUAL. COVER TO BE RETAINED BY A 13Ø STAINLESS STEEL CAP SCREW.



**SECTION A-A**  
 SCALE N.T.S.

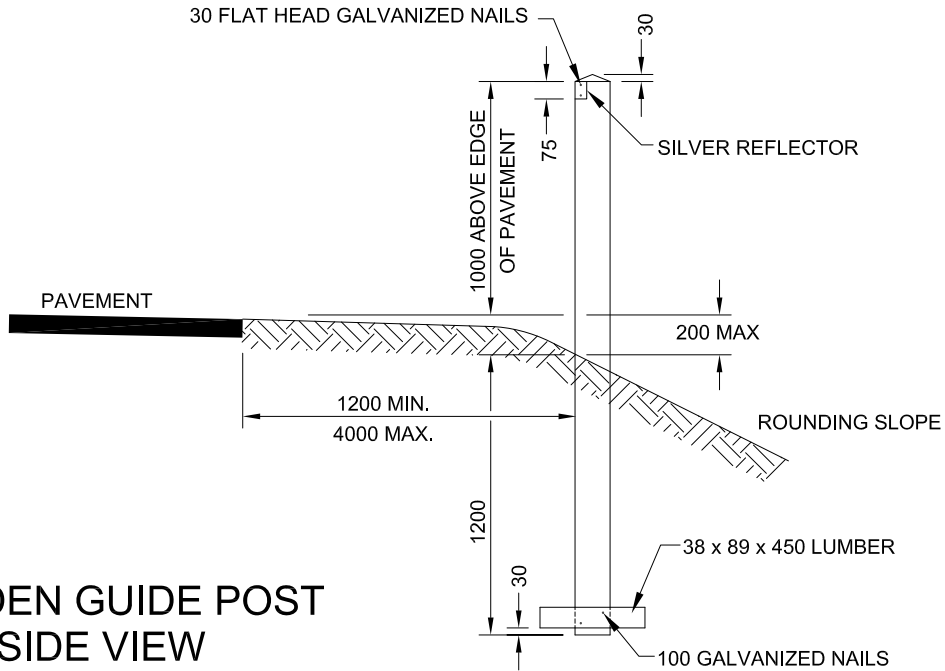


TRANSPORTATION AND WORKS  
 HIGHWAY DESIGN DIVISION

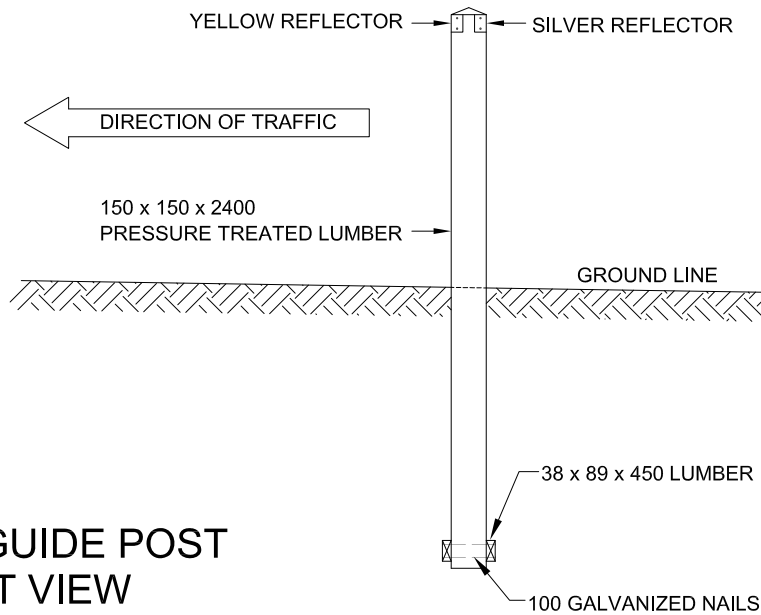
**ELECTRICAL JUNCTION BOX**

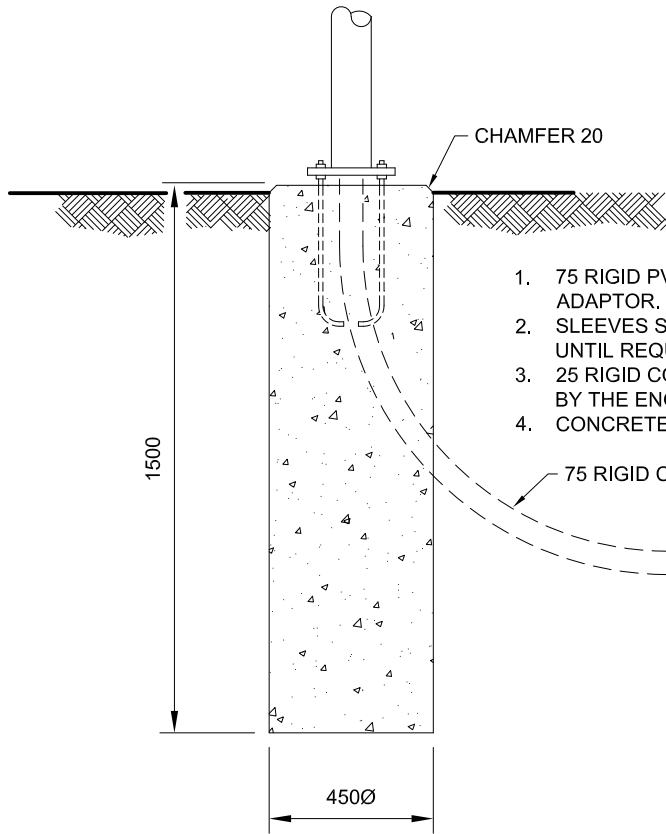
DRAWN BY: H. JONES      DATE: REV 02-01-10      NOT TO SCALE

WOODEN GUIDE POST  
SIDE VIEW



WOODEN GUIDE POST  
FRONT VIEW

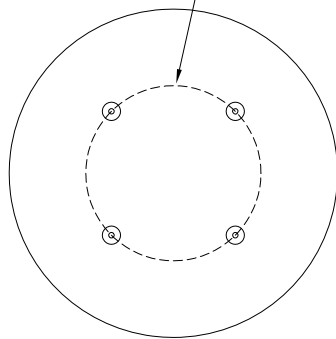




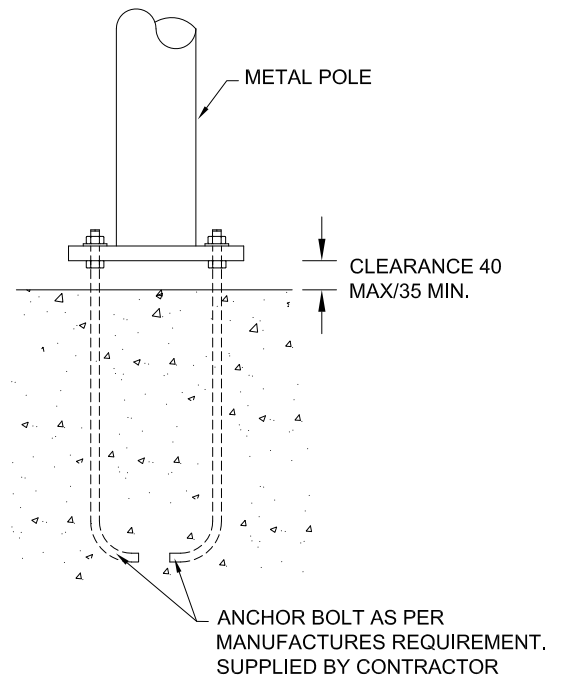
1. 75 RIGID PVC CONDUIT SHALL BE CONNECTED TO 75 DUCT WITH PVC ADAPTOR.
2. SLEEVES SHALL BE PLUGGED AT BOTH ENDS WITH PLASTIC PLUGS UNTIL REQUIRED FOR USE.
3. 25 RIGID CONDUIT IN POLE BASE AS PER DUCT PLAN OR AS DIRECTED BY THE ENGINEER.
4. CONCRETE SHALL BE 25MPa.

**ELEVATION**  
Scale NTS

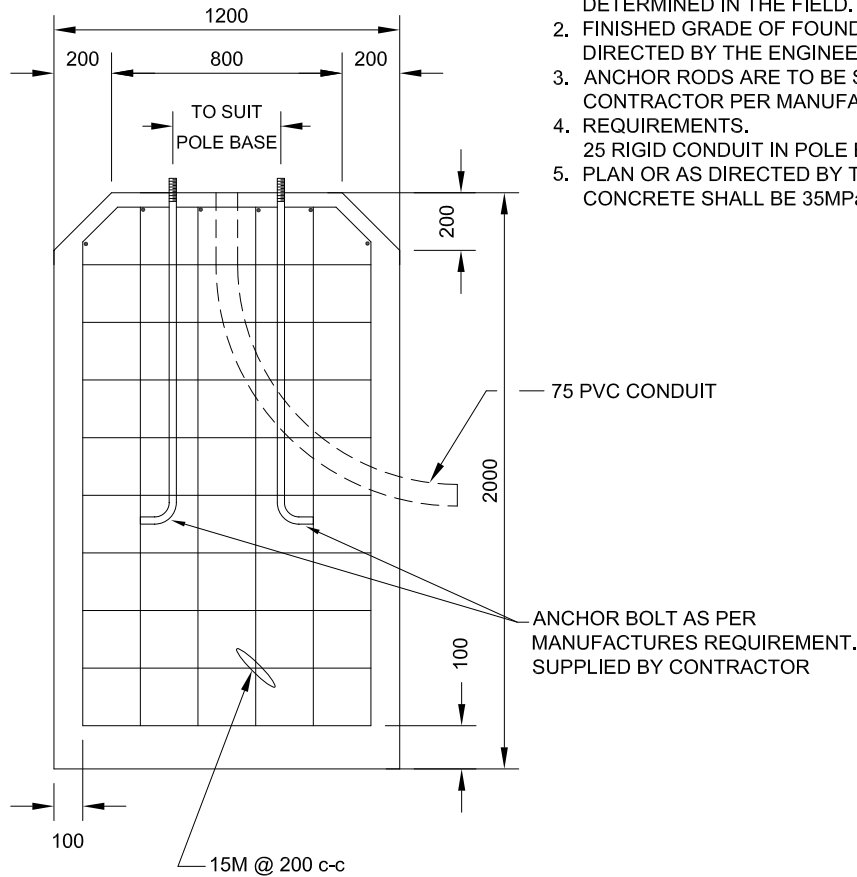
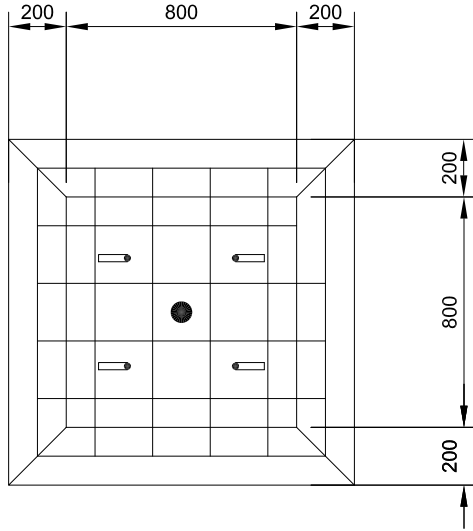
BOLT CIRCLE DIAMETER,  
MUST MATCH POLE BASE.



**ANCHOR BOLT TEMPLATE**  
Scale NTS

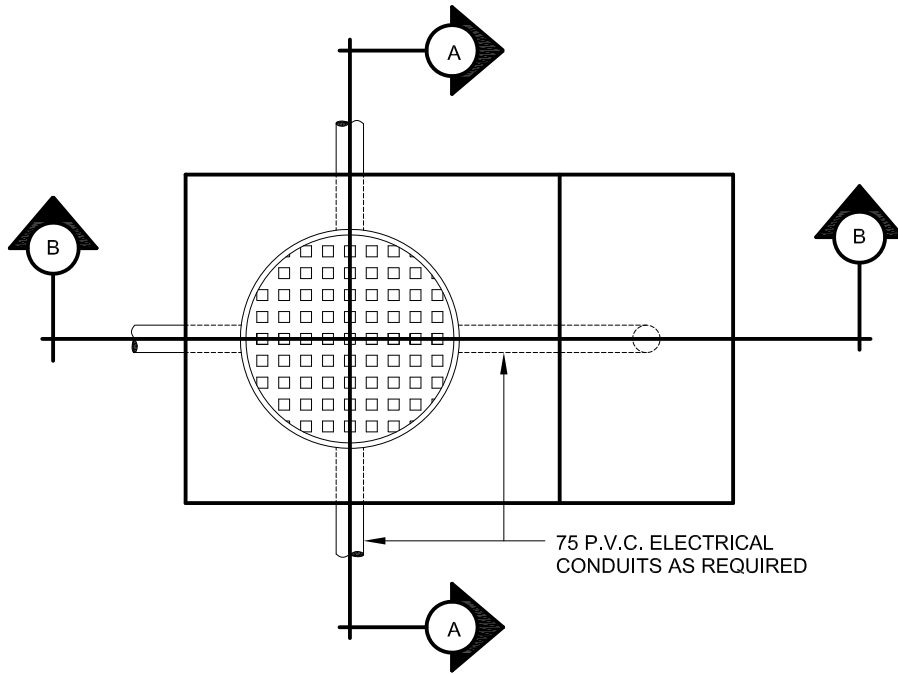


**FOUNDATION DETAIL**  
Scale NTS



1. NOT SHOWN IN DIAGRAM IS 50 RIGID CONDUIT IN POLE BASE WHICH IS CONNECTED TO 75 DUCT BY PVC ADAPTER, NUMBER AND LOCATION AS DETERMINED IN THE FIELD.
2. FINISHED GRADE OF FOUNDATION TOP AS DIRECTED BY THE ENGINEER.
3. ANCHOR RODS ARE TO BE SUPPLIED BY THE CONTRACTOR PER MANUFACTURERS REQUIREMENTS.
4. 25 RIGID CONDUIT IN POLE BASE AS PER DUCT PLAN OR AS DIRECTED BY THE ENGINEER.
5. CONCRETE SHALL BE 35MPa.

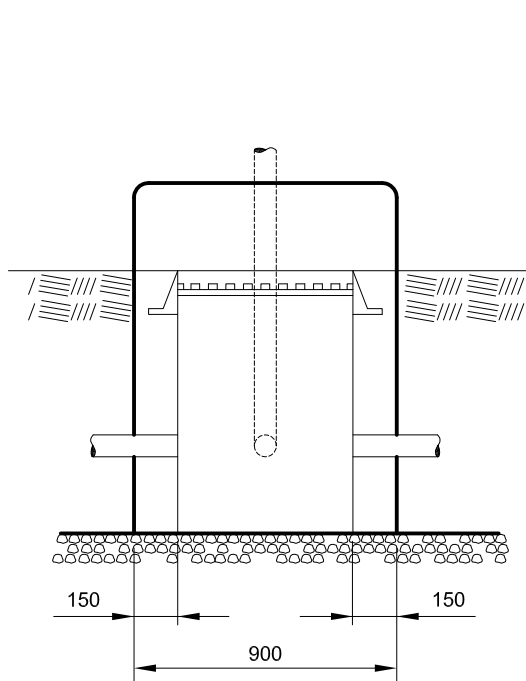




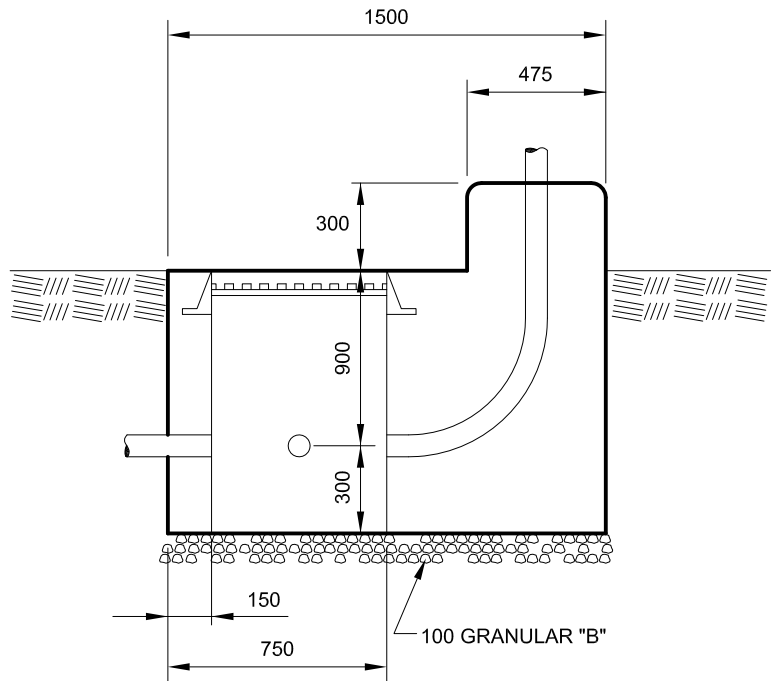
**PLAN VIEW**

**NOTES:**

1. CONCRETE 30 MPa
2. ALL EXPOSED EDGES TO BE CHAMFERED 25.



**SECTION A-A**



**SECTION B-B**



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

**FOUNDATION FOR  
TRAFFIC CONTROLLER**

DRAWN BY: H. JONES

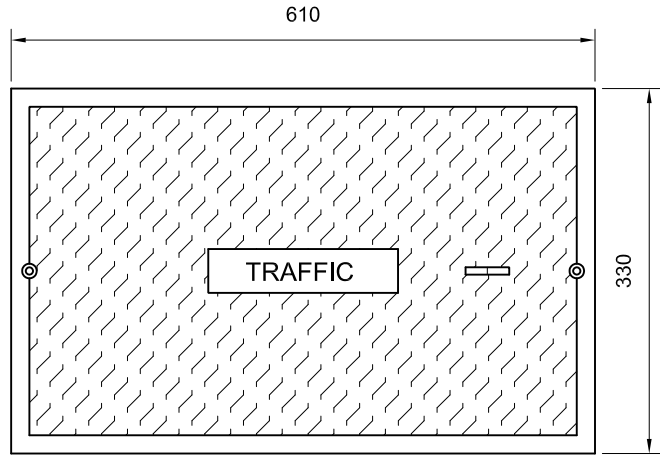
DATE: REV 02-01-10

NOT TO SCALE

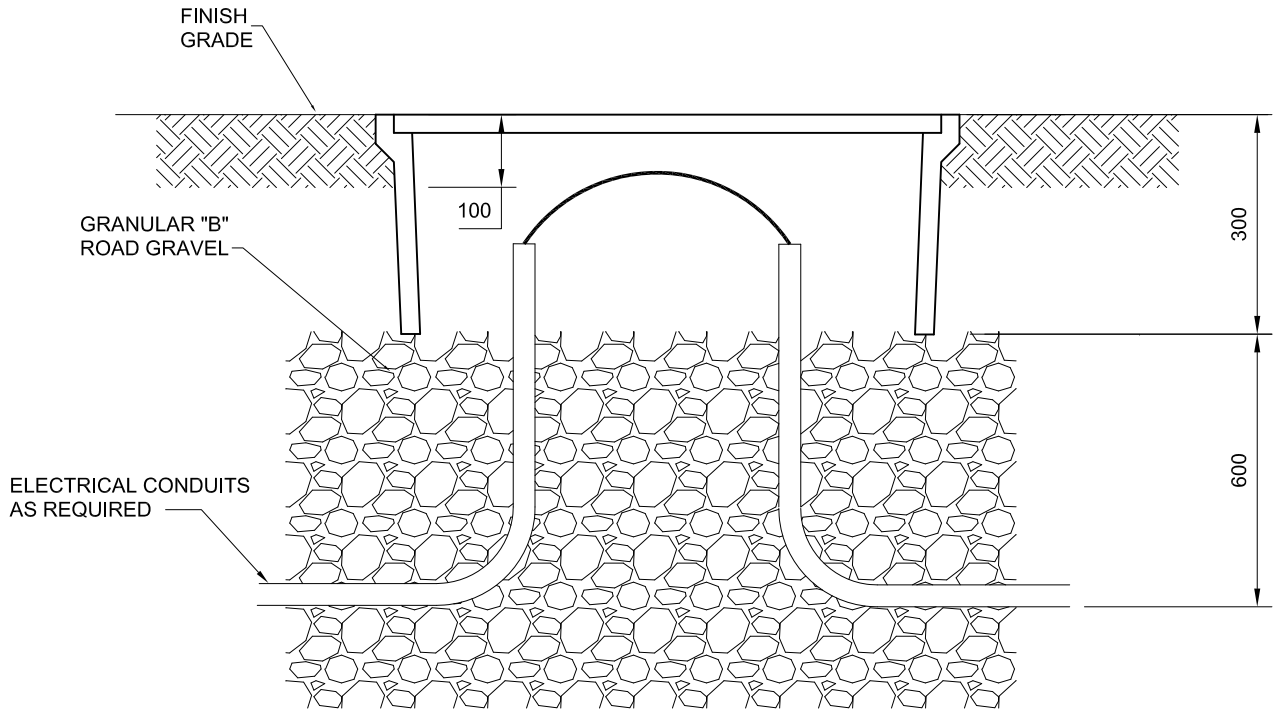
NOTES:

1. TOP OF BOX TO BE PLACED FLUSH WITH TOP OF SIDEWALK OR FINAL GRADE.
2. COVER TO HAVE TRAFFIC LOGO IMPRINTED ON TOP.
3. APPROVED MANUFACTURER  
QUAZITE COMPOSOLITE  
3621 INDUSTRIAL PARK DR.  
LENOIR CITY, TENNESSEE  
37771  
TEL. : 800/346-3062

COVER: PG1324HA00  
BOX: PG1324BA12



TOP VIEW



ELEVATION



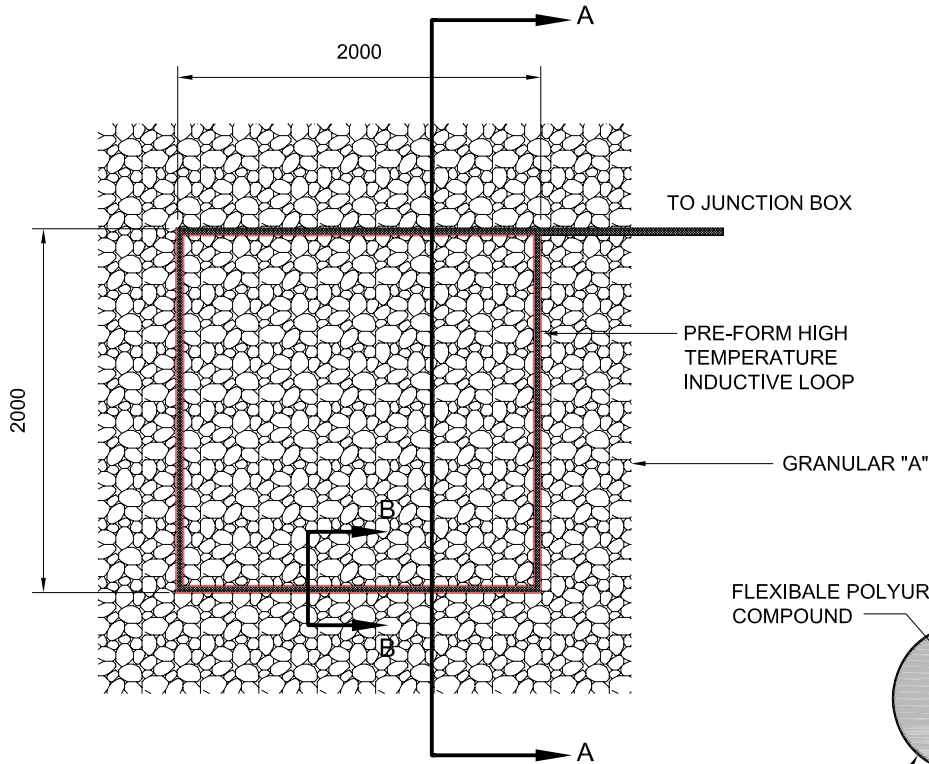
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

**TRAFFIC CONTROL PREFAB JUNCTION  
BOX QUAZITE COMPOSOLITE**

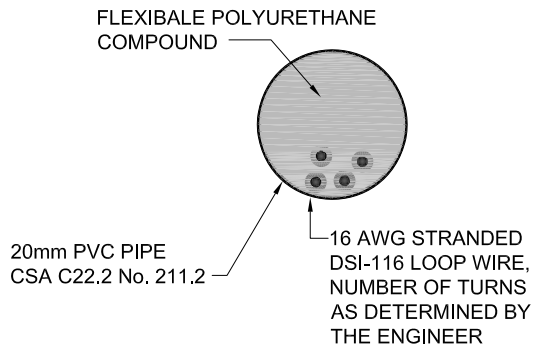
DRAWN BY:

DATE: February 16, 2010

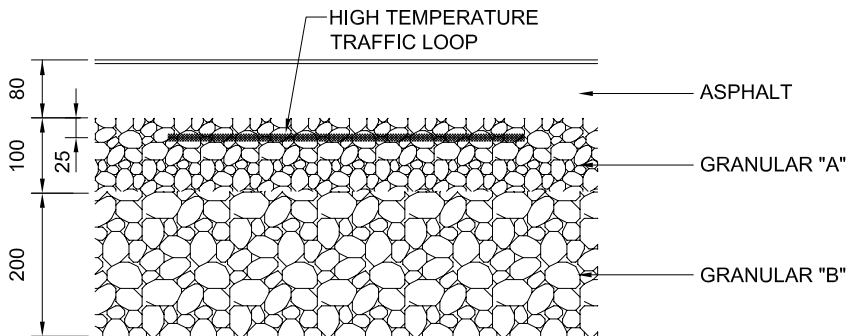
NOT TO SCALE



**PLAN VIEW**



**SECTION B-B**



**SECTION A-A**

**NOTE:**

1. WIRE PAIR FROM JUNCTION BOX TO LOOP TO BE TWISTED 17 TURNS/m.



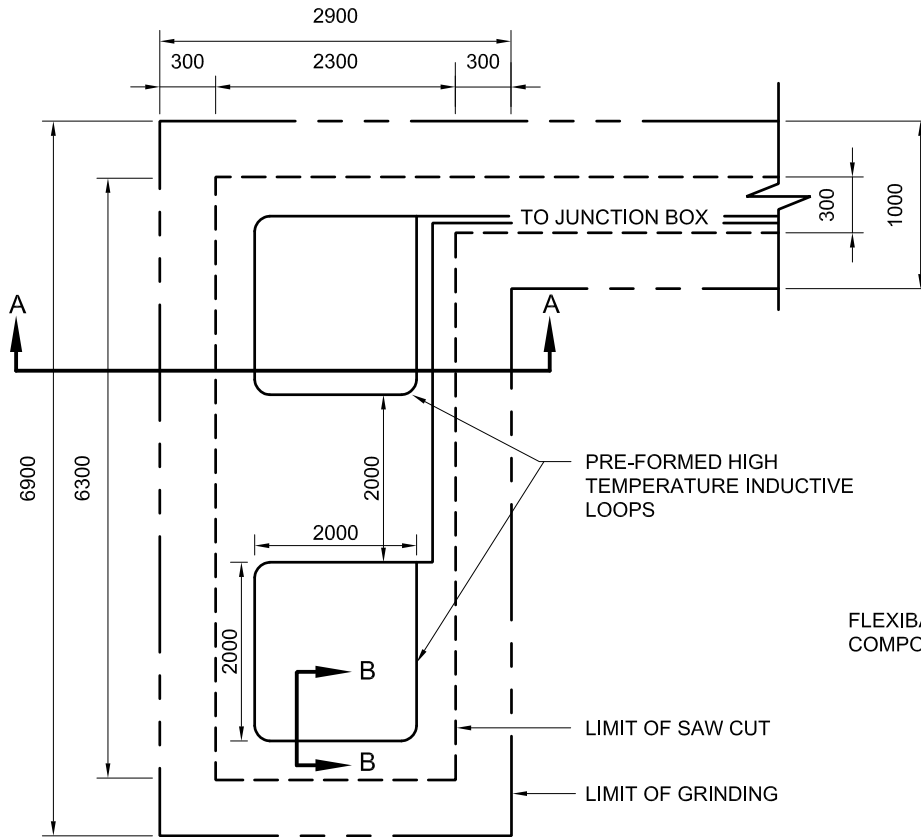
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

**TYPE 1 INSTALLATION OF PRE-FORMED  
INDUCTIVE LOOP PLACEMENT IN NEW ROAD**

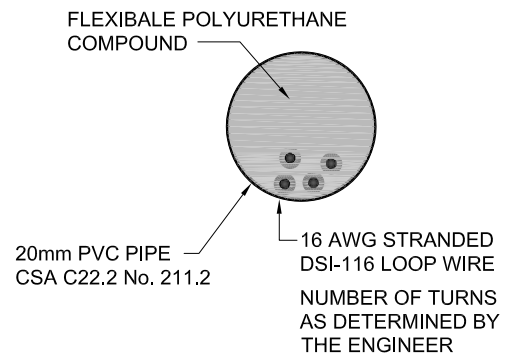
DRAWN BY:

DATE: February 16, 2010

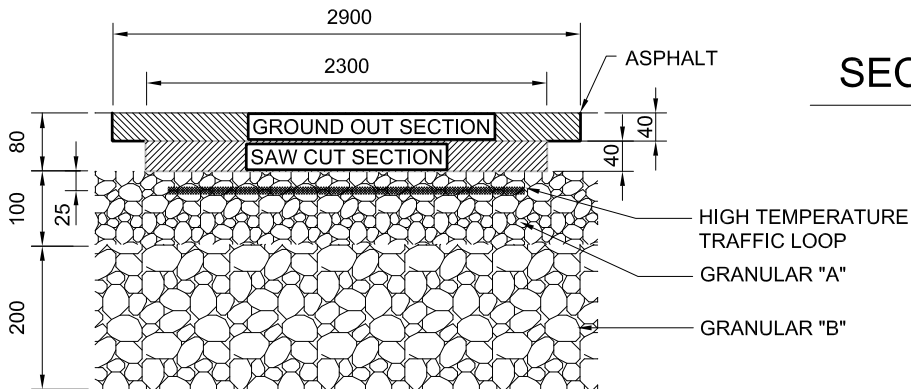
NOT TO SCALE



**PLAN VIEW**



**SECTION B-B**



**SECTION A-A**

**NOTE:**

1. WIRE PAIR FROM JUNCTION BOX TO LOOP TO BE TWISTED 17 TURNS/m.
2. TOP 40mm OF ASPHALT TO BE GROUND OUT AT A WIDTH OF 2900mm.
3. REMAINING 40mm OF ASPHALT TO BE SAW CUT OUT AT A WIDTH OF 2300mm.
3. ASPHALT SHALL BE REINSTATED AS PER SECTION 330 OF SPECIFICATIONS.



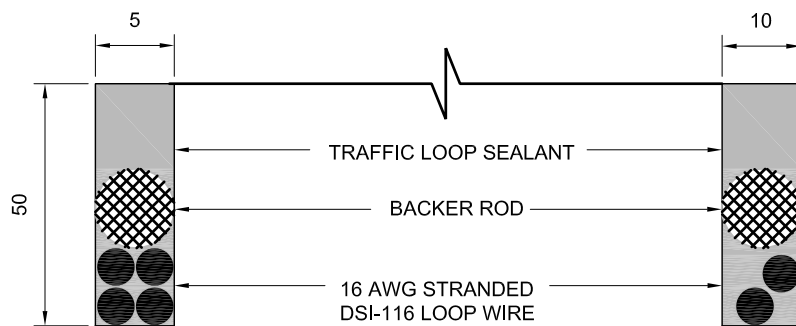
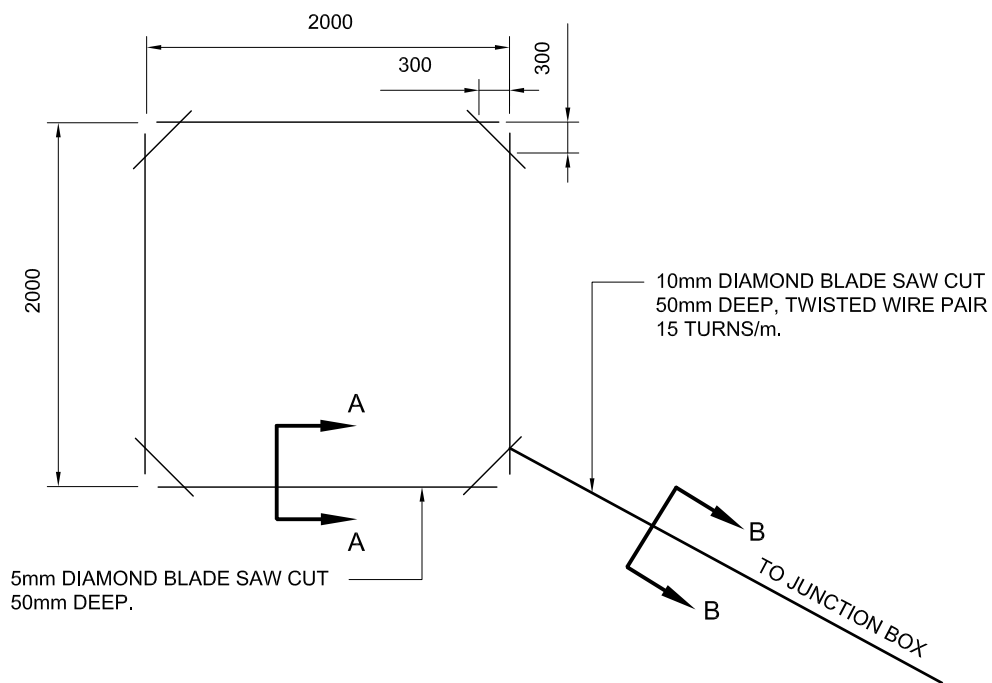
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

**TYPE 2 INSTALLATION OF PRE-FORMED  
INDUCTIVE LOOP PLACEMENT IN EXISTING ROAD**

DRAWN BY:

DATE: February 16, 2010

NOT TO SCALE



SECTION A-A

SECTION B-B

**NOTE:**

1. SEALANT TO SET AROUND & OVER ENTIRE WIRE AND BACKER ROD.
2. PLACE 100mm PIECES OF BACKER ROD INTERMITTENTLY TO KEEP WIRE IN PLACE WHILE POURING TRAFFIC LOOP SEALANT.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

ASPHALT CUT INDUCTIVE LOOP

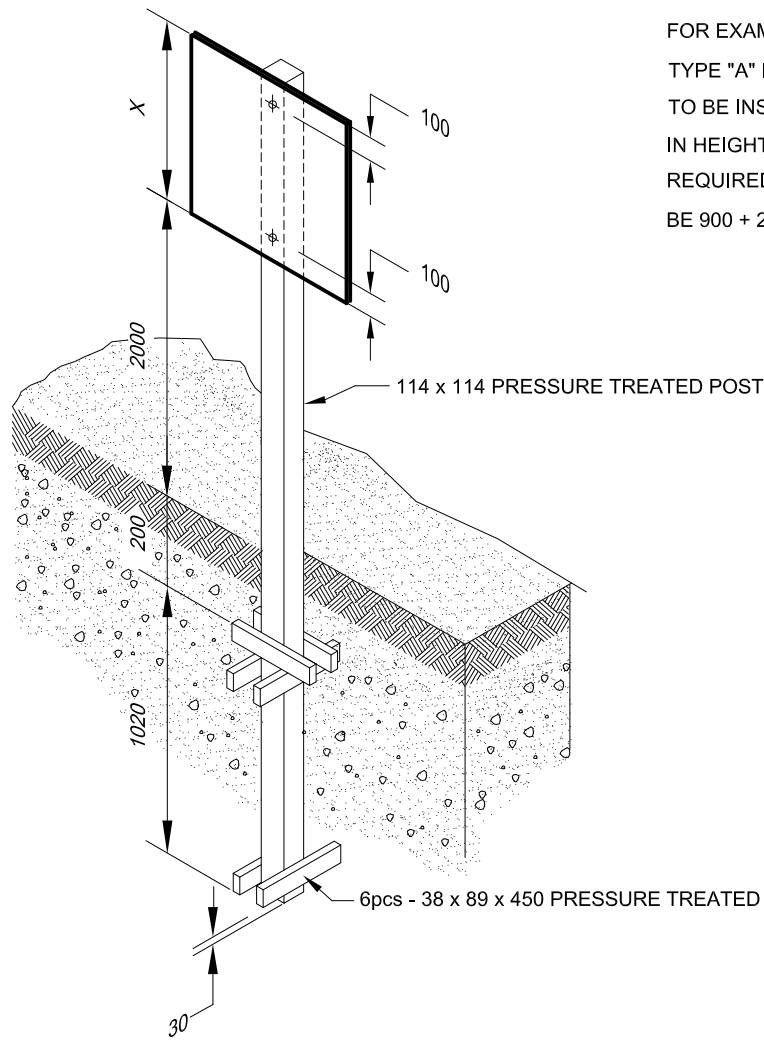
DRAWN BY:

DATE: February 16, 2010

NOT TO SCALE

TYPE "A" SIGNPOST INSTALLATIONS ARE DESIGNATED IN THE FORM:-TYPE A-X WHERE X IS THE HEIGHT IN MILLIMETRES, OF THE SIGN BOARD TO BE PLACED ON THE POST.

FOR EXAMPLE, TYPE "A" 900, MEANS A TYPE "A" INSTALLATION IN WHICH THE SIGN TO BE INSTALLED ON THE POST IS 900 IN HEIGHT. THE MINIMUM POST LENGTH REQUIRED FOR THIS SIGN WOULD THEN BE  $900 + 2000 + 1250$  OR 4150.



**NOTES:**

1. MAXIMUM SIGN AREA 1.1m<sup>2</sup>
2. CUSTOM SIGNS TO HAVE A MINIMUM OF TWO LAG BOLTS.
3. STANDARD SIGNS WILL BE PRE-DRILLED FOR LAG BOLTS.
4. TOP OF SIGN BOARD TO BE FLUSH WITH TOP OF POST.
5. LAG BOLTS 80 x 10 Ø GALVANIZED WITH GALVANIZED WASHER.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

## SIGN POST INSTALLATION DETAILS TYPE "A"

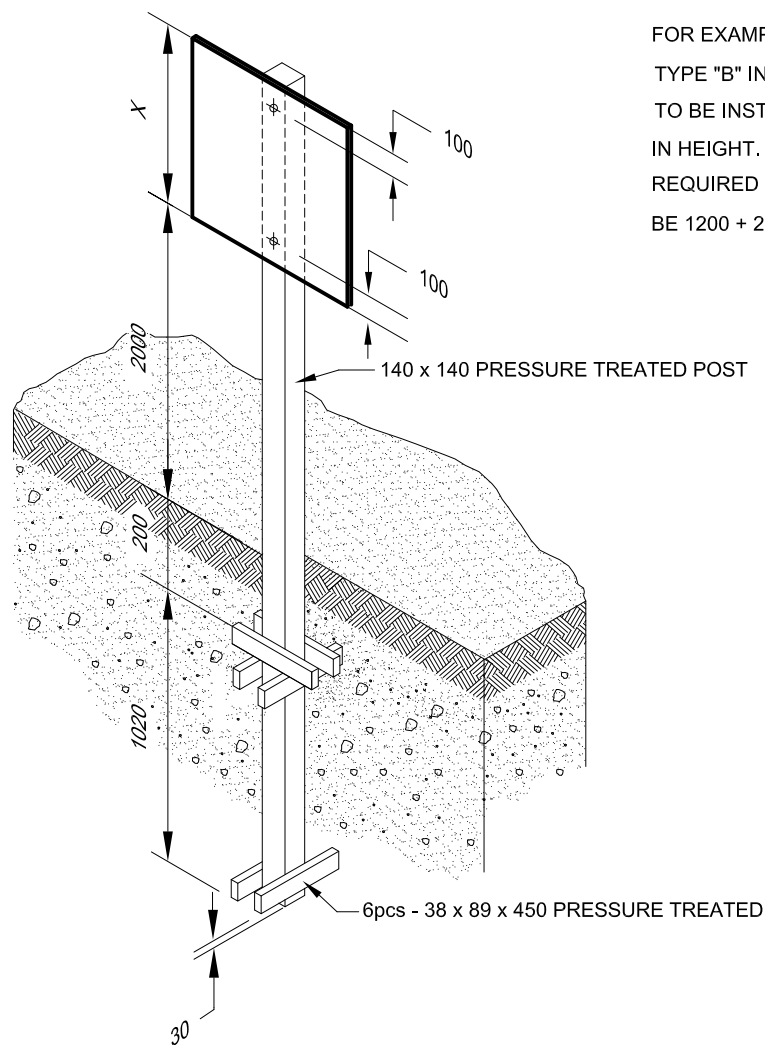
DRAWN BY: DEB KIRBY

DATE: REV 02-01-10

NOT TO SCALE

TYPE "B" SIGNPOST INSTALLATIONS ARE DESIGNATED IN THE FORM:-TYPE B-X WHERE X IS THE HEIGHT IN MILLIMETRES, OF THE SIGN BOARD TO BE PLACED ON THE POST.

FOR EXAMPLE, TYPE "B-1200, MEANS A TYPE "B" INSTALLATION IN WHICH THE SIGN TO BE INSTALLED ON THE POST IS 1200 IN HEIGHT. THE MINIMUM POST LENGTH REQUIRED FOR THIS SIGN WOULD THEN BE 1200 + 2000 + 1250 OR 4450.



**NOTES:**

1. MAXIMUM SIGN AREA > 1.1m<sup>2</sup>
2. CUSTOM SIGNS TO HAVE A MINIMUM OF TWO LAG BOLTS.
3. STANDARD SIGNS WILL BE PRE-DRILLED FOR LAG BOLTS.
4. TOP OF SIGN BOARD TO BE FLUSH WITH TOP OF POST.
5. LAG BOLTS 80 x 10 Ø GALVANIZED WITH GALVANIZED WASHER.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

## SIGN POST INSTALLATION DETAILS TYPE "B"

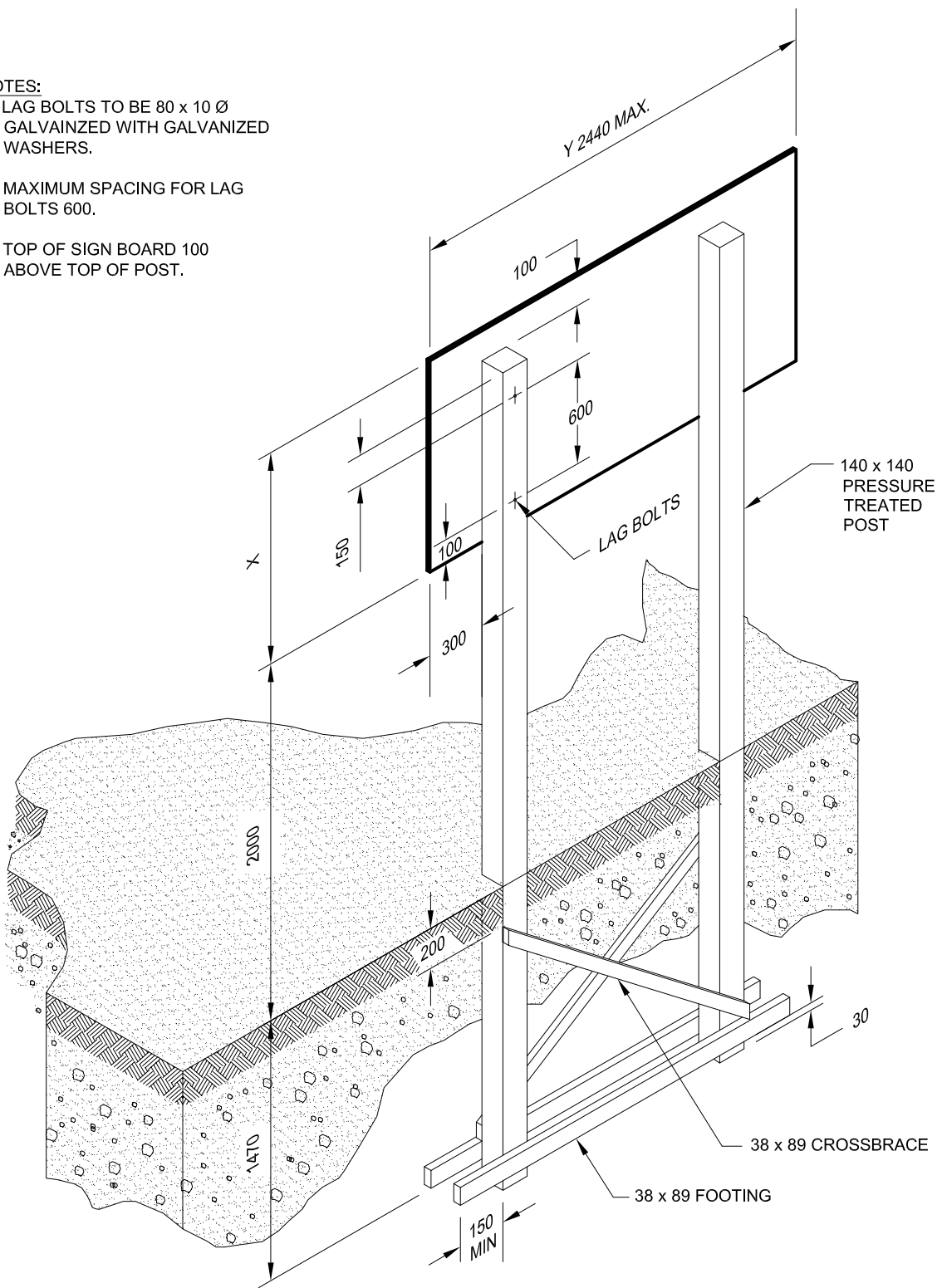
DRAWN BY: DEB KIRBY

DATE: REV 02-01-10

NOT TO SCALE

NOTES:

1. LAG BOLTS TO BE 80 x 10 Ø GALVANIZED WITH GALVANIZED WASHERS.
2. MAXIMUM SPACING FOR LAG BOLTS 600.
3. TOP OF SIGN BOARD 100 ABOVE TOP OF POST.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

## SIGN POST INSTALLATION DETAILS TYPE "C"

DRAWN BY:

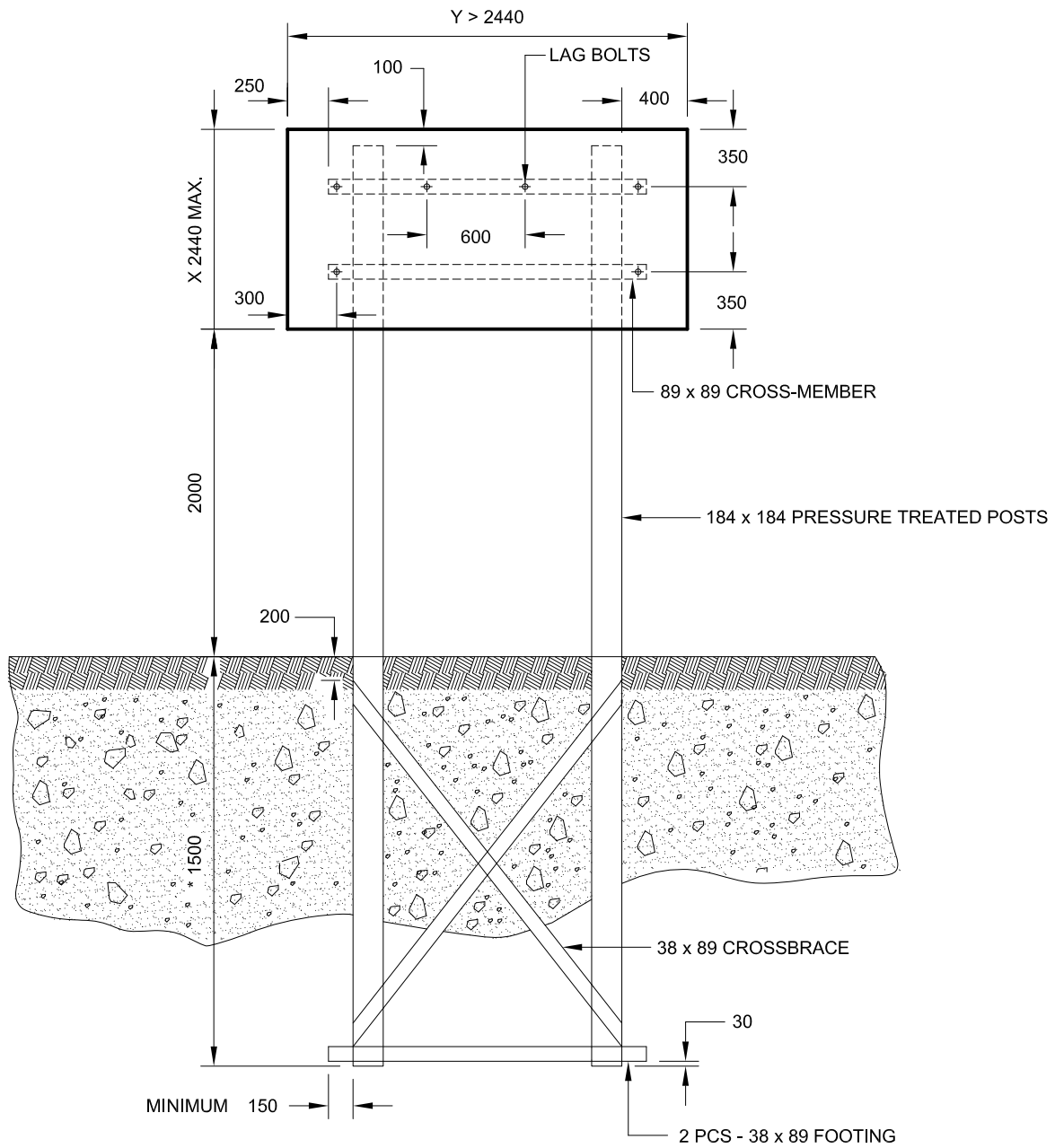
DEB KIRBY

DATE:

REV 02-01-10

NOT TO SCALE





**NOTES:**

1. TOP OF SIGN BOARD 100 ABOVE TOP OF POST.
2. LAG BOLTS TO BE 80 x 10Ø GALVANIZED WITH GALVANIZED WASHERS.
3. MAXIMUM SPACING FOR LAG BOLTS IS 600.
4. CROSS MEMBERS TO BE ATTACHED TO POSTS USING 300 x 20 GALVANIZED NUTS AND WASHERS.
5. ALL LUMBER TO BE PRESSURE TREATED.



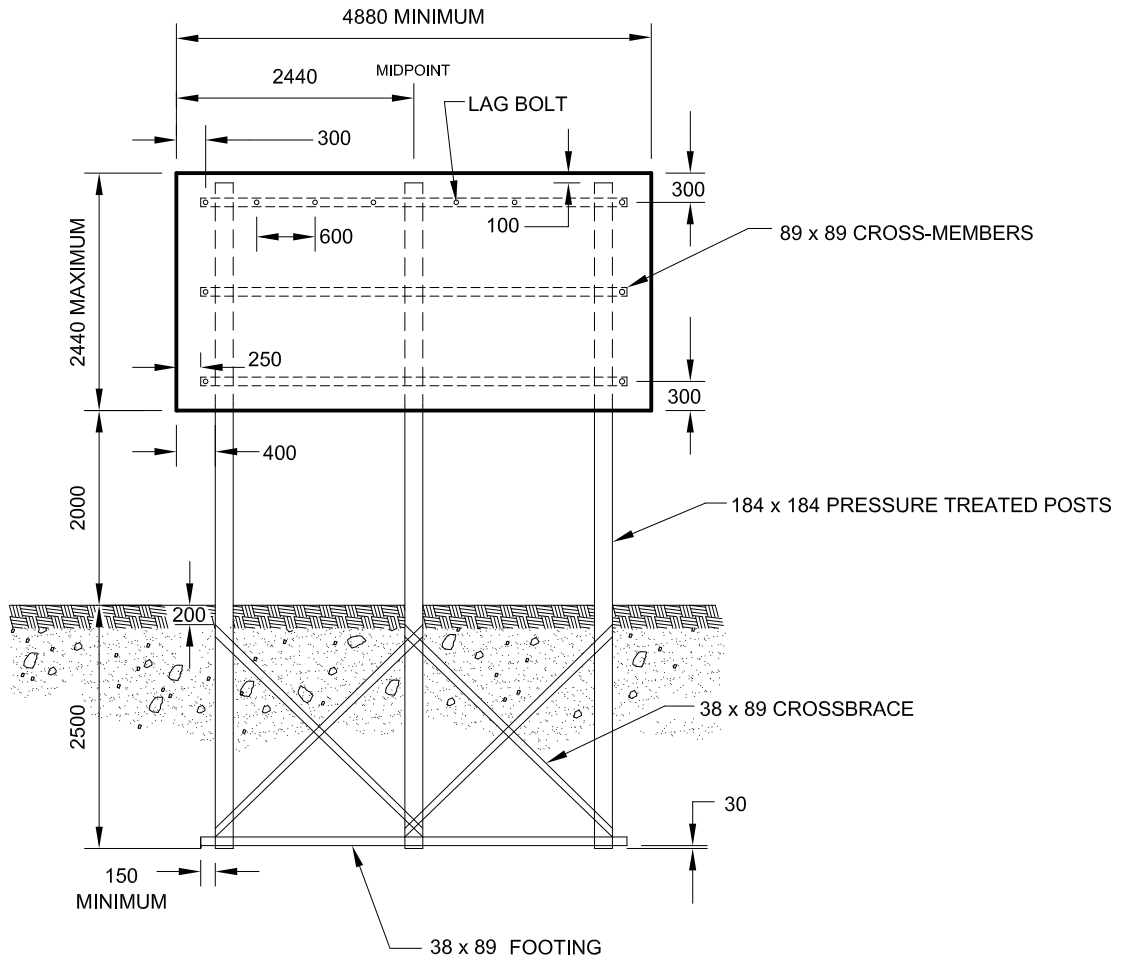
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

## SIGN POST INSTALLATION DETAILS TYPE "D"

DRAWN BY: DEB KIRBY	DATE: REV 02-01-10	NOT TO SCALE
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MARCH 2011

1293 -1



NOTES:

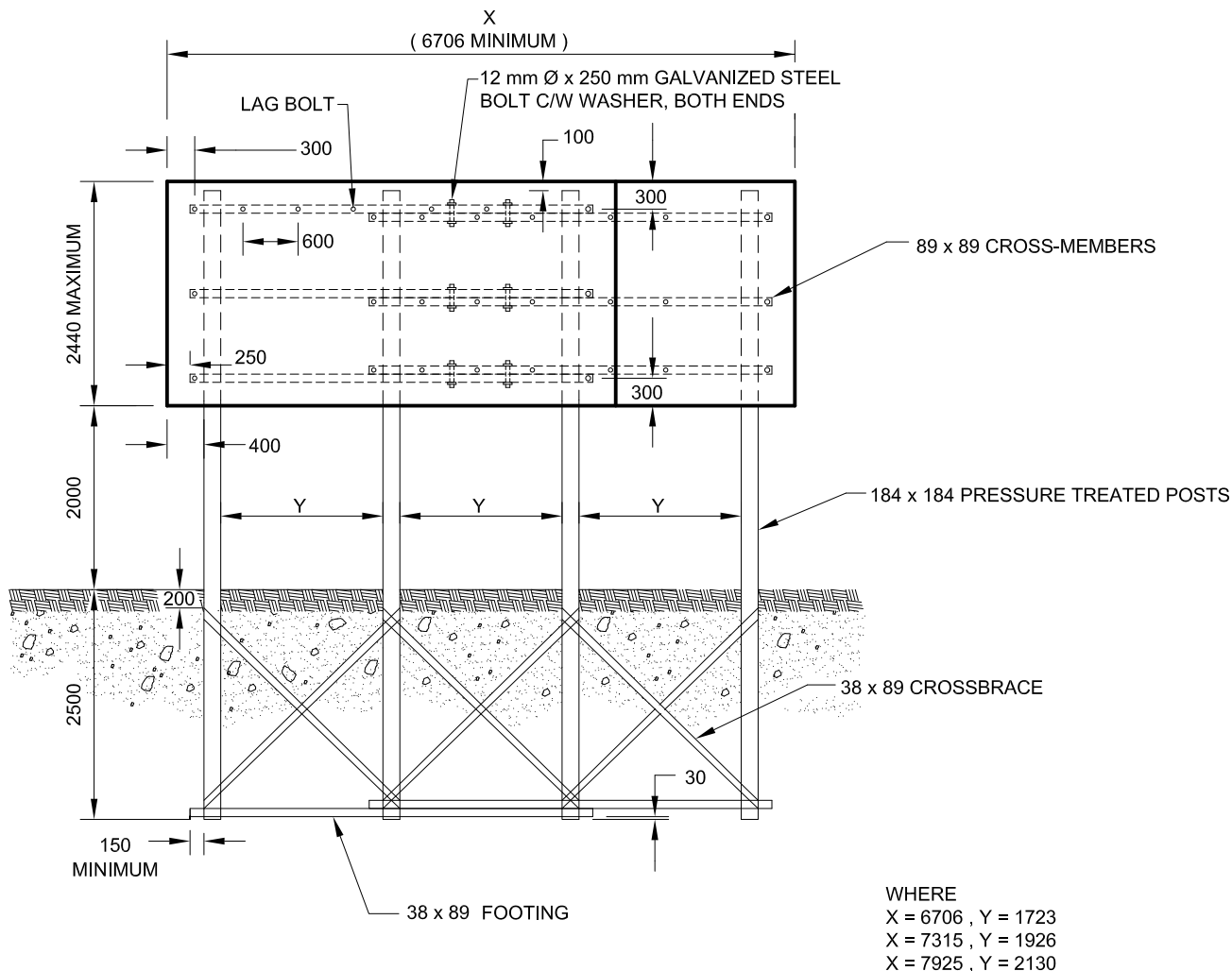
1. TOP OF SIGN BOARD 100 ABOVE TOP OF POST.
2. LAG BOLTS TO BE 80 x 10Ø GALVANIZED WITH GALVANIZED WASHERS.
3. MAXIMUM SPACING FOR LAG BOLTS IS 600.
4. CROSS MEMBERS TO BE ATTACHED TO POSTS USING 300 x 20Ø GALVANIZED BOLTS, WITH NUTS AND WASHERS.



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

SIGN POST INSTALLATION DETAILS  
TYPE "E"

DRAWN BY:	DEB KIRBY	DATE:	REV 02-01-10	NOT TO SCALE
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**NOTES**

1. TOP OF SIGN BOARD 100 ABOVE TOP OF POST.
2. LAG BOLTS TO BE 80 x 10Ø GALVANIZED WITH GALVANIZED WASHERS.
3. MAXIMUM SPACING FOR LAG BOLTS IS 600.
4. CROSS MEMBERS TO BE ATTACHED TO POSTS USING 300 x 20Ø GALVANIZED BOLTS, WITH NUTS AND WASHERS.
5. HORIZONTAL CROSS-MEMBERS TO SPAN 3 POSTS.



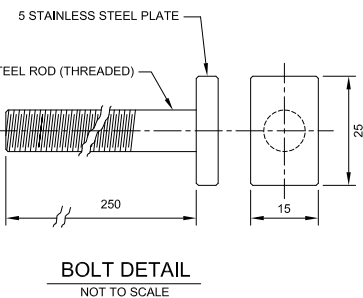
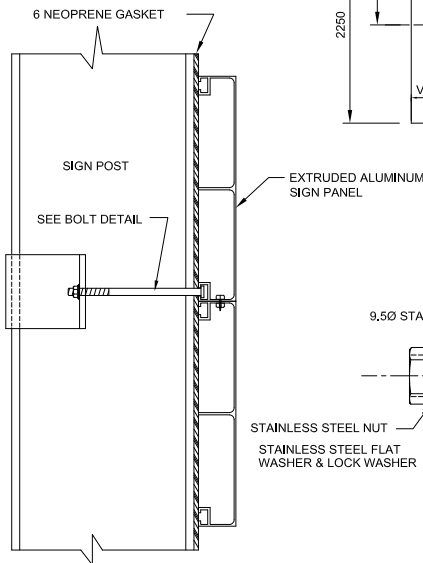
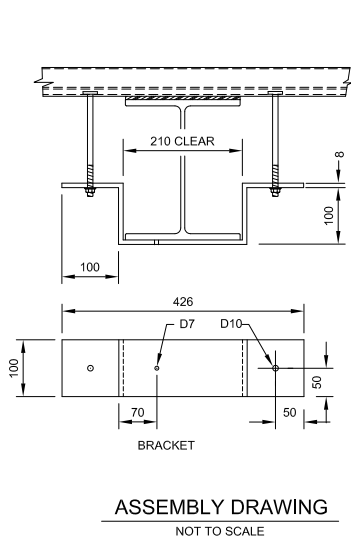
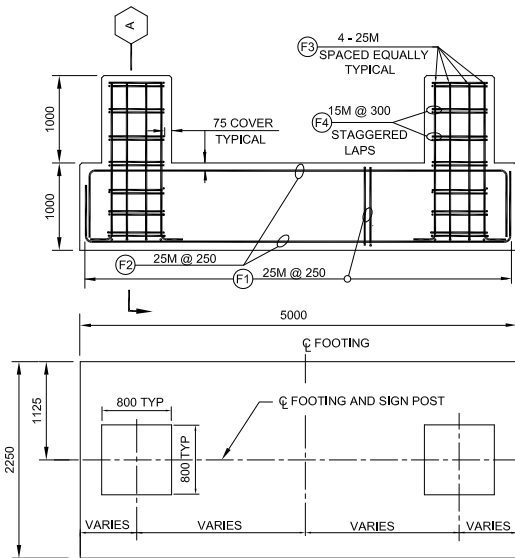
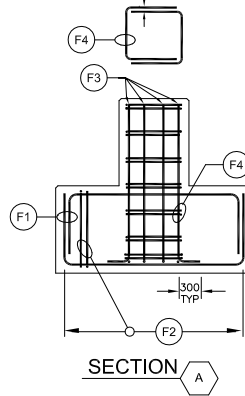
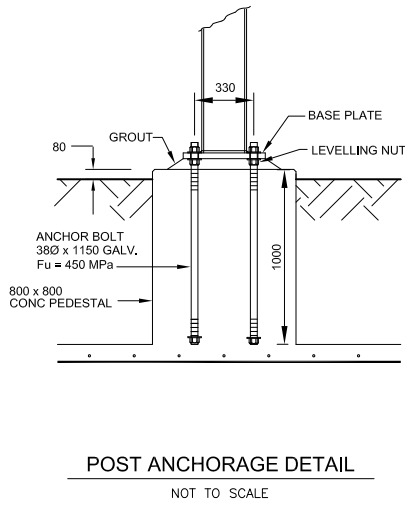
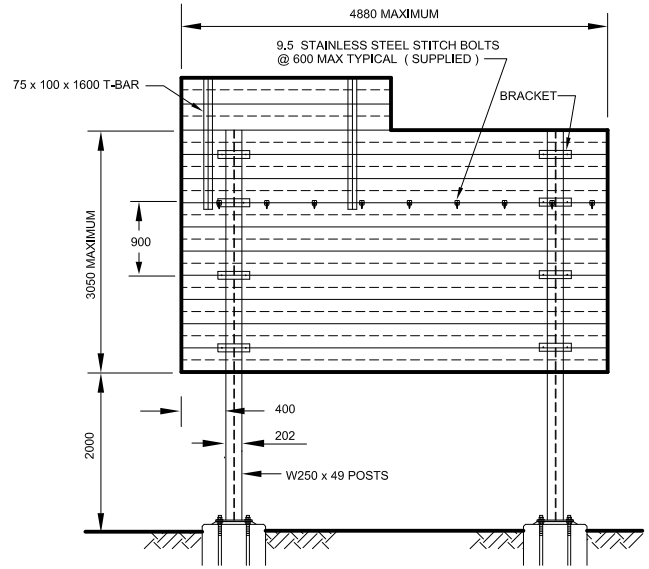
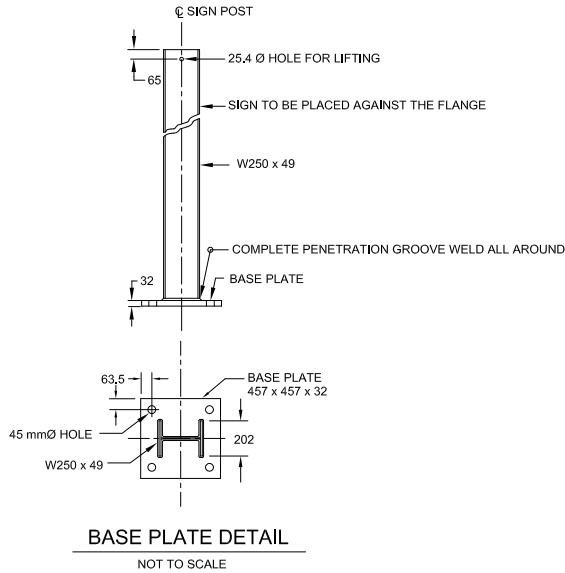
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

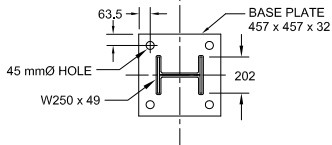
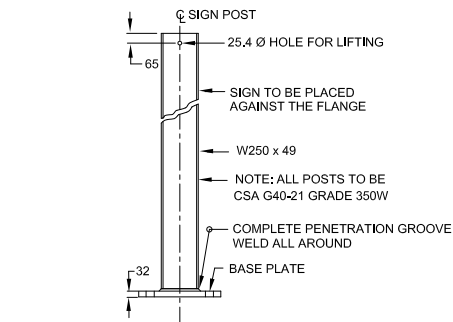
**SIGN POST INSTALLATION DETAILS  
TYPE "H"**

DRAWN BY:

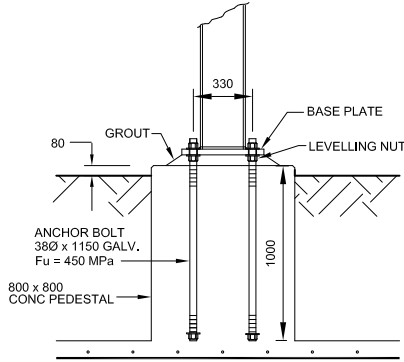
DATE:

NOT TO SCALE

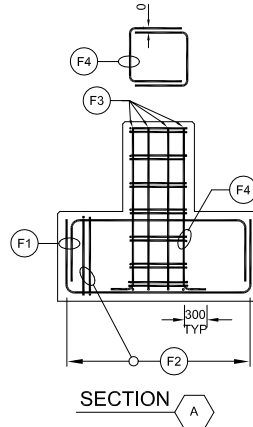




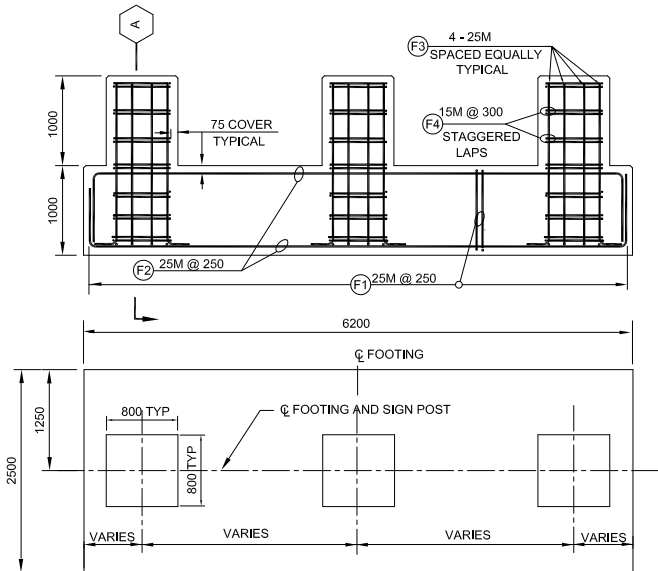
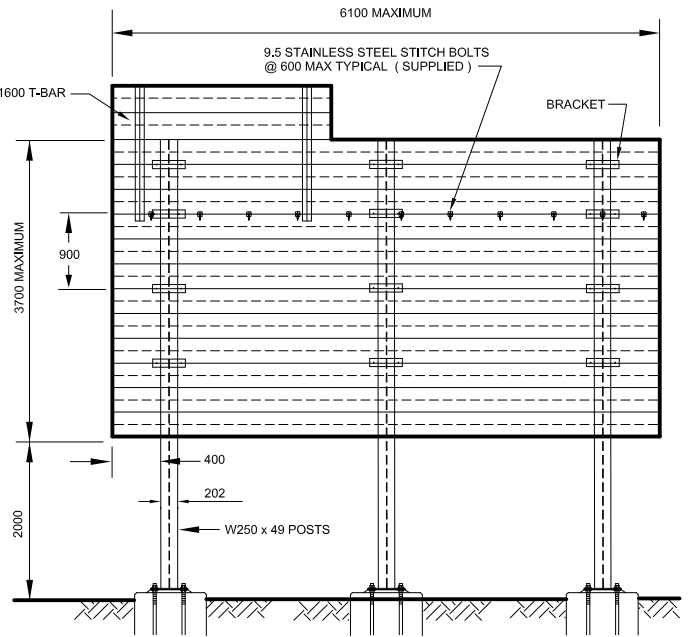
**BASE PLATE DETAIL**  
NOT TO SCALE



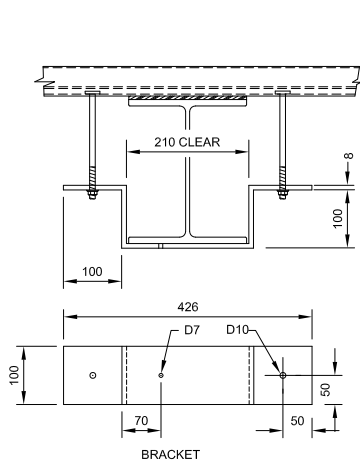
**POST ANCHORAGE DETAIL**  
NOT TO SCALE



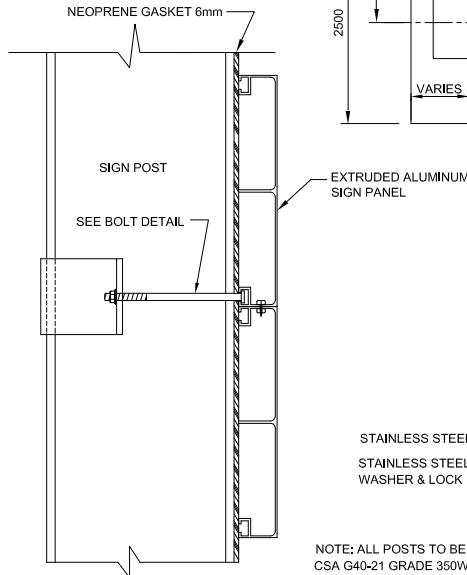
**SECTION A**



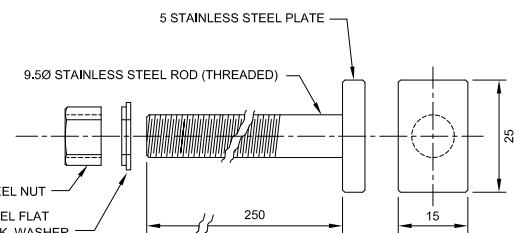
**FOUNDATION PLAN**  
NOT TO SCALE



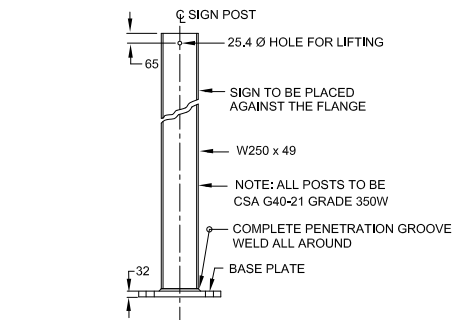
**ASSEMBLY DRAWING**  
NOT TO SCALE



NOTE: ALL POSTS TO BE  
CSA G40-21 GRADE 350W

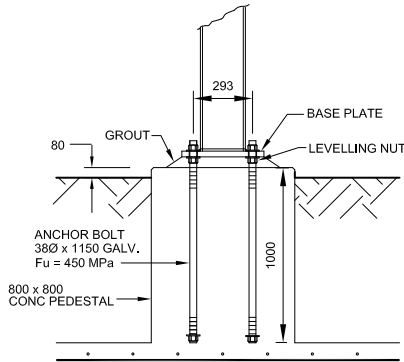
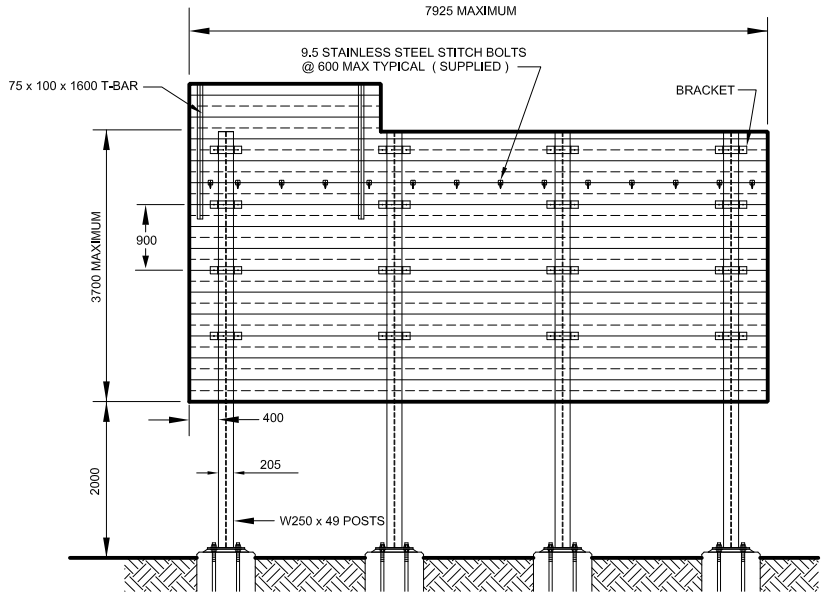
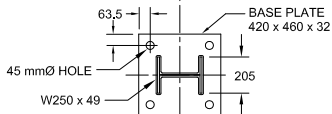


**BOLT DETAIL**  
NOT TO SCALE



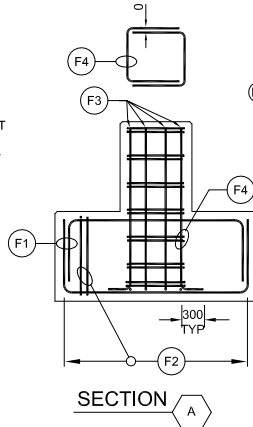
**BASE PLATE DETAIL**

NOT TO SCALE

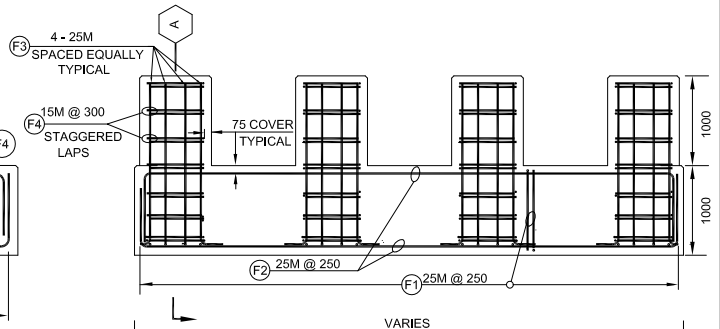


**POST ANCHORAGE DETAIL**

NOT TO SCALE

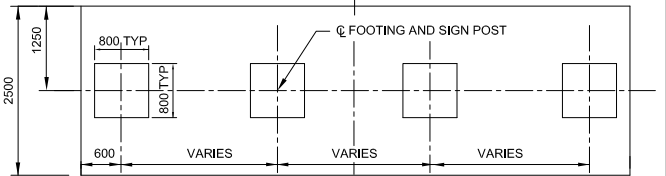


**SECTION A**



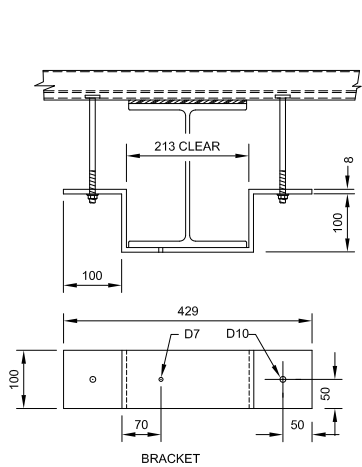
VARIES

Q FOOTING



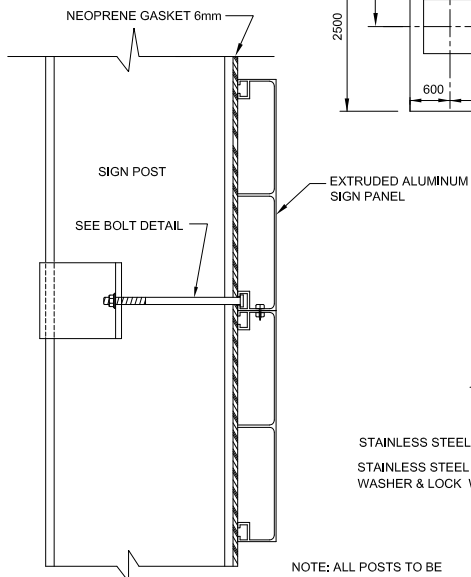
**FOUNDATION PLAN**

NOT TO SCALE

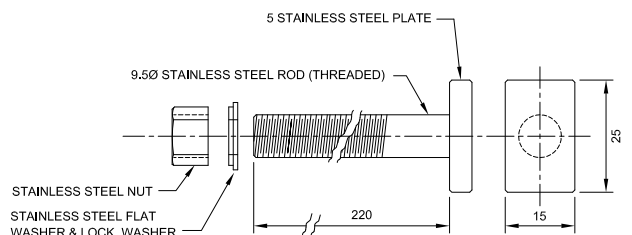


**ASSEMBLY DRAWING**

NOT TO SCALE



NOTE: ALL POSTS TO BE CSA G40-21 GRADE 350W



**BOLT DETAIL**

NOT TO SCALE



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

# SIGN POST INSTALLATION DETAILS TYPE "I"

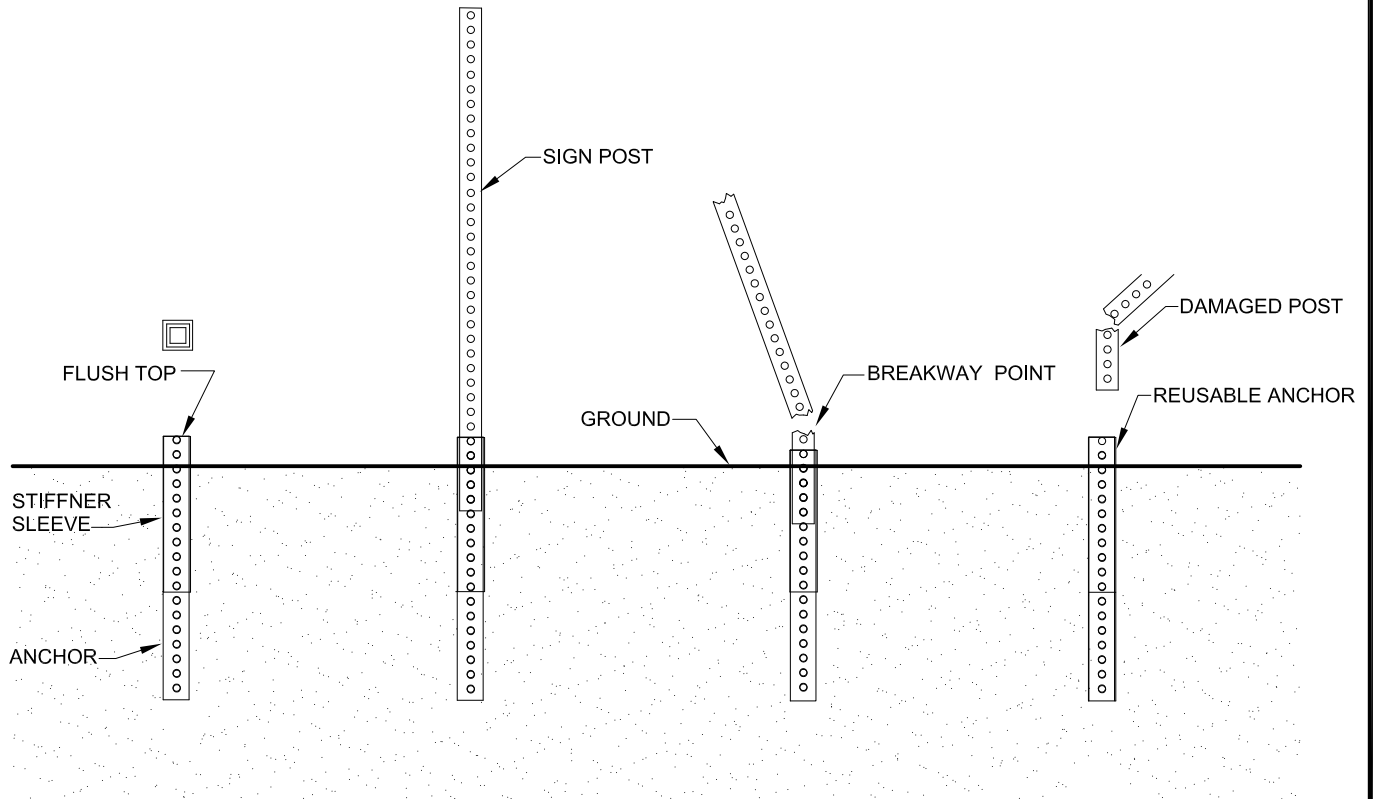
DRAWN BY:

DATE:

REV 09-01-31

NOT TO SCALE

NOTES:  
 ANCHOR IS 914.4mm LONG.  
 STIFFNER SLEEVE IS 457.2mm LONG.  
 SIGNPOST IS 3048mm LONG.



TRANSPORTATION AND WORKS  
 HIGHWAY DESIGN DIVISION

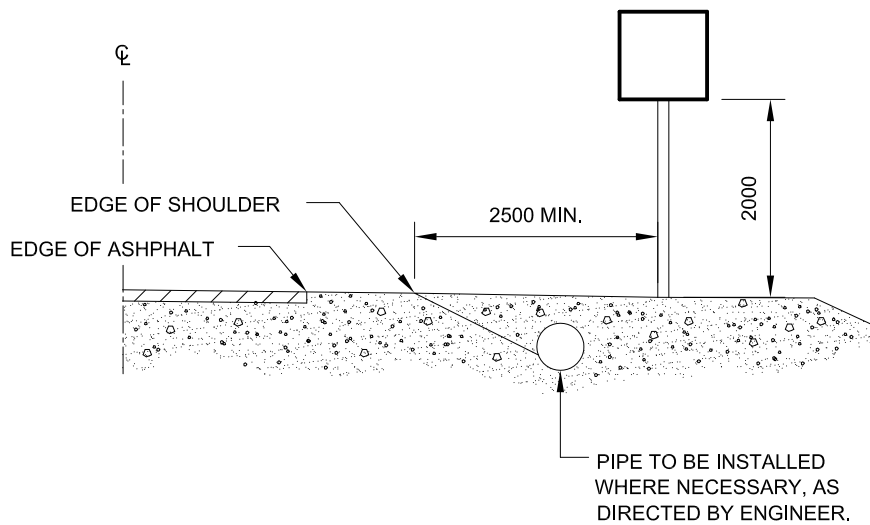
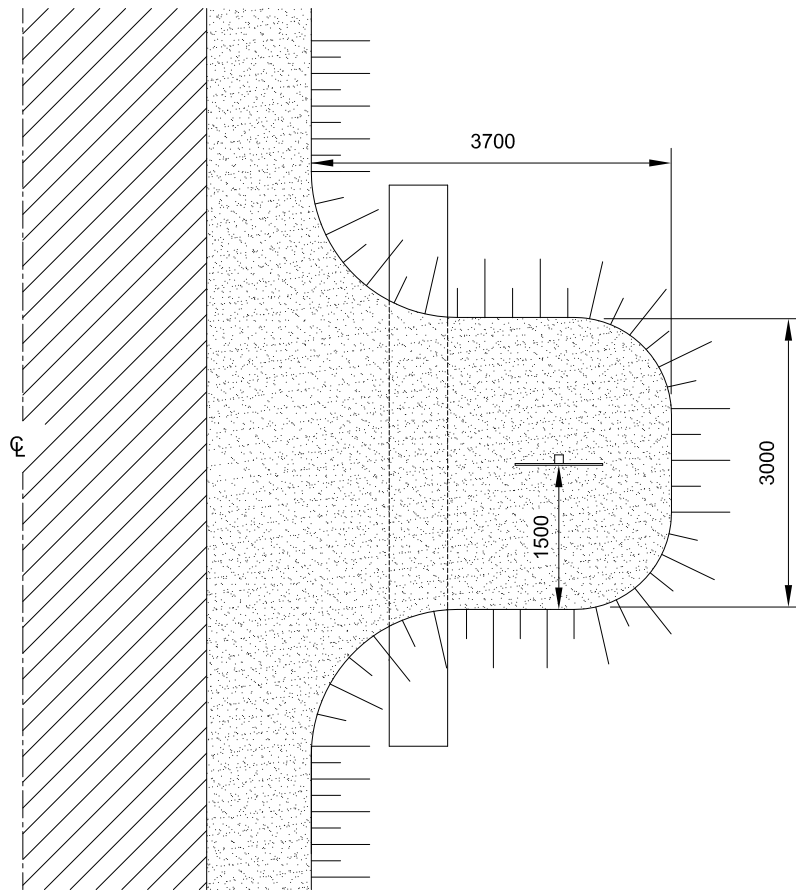
# TELSPAR YEILDING BREAKWAY SYSTEM

DRAWN BY:

DATE:

02-02-13

NOT TO SCALE



TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

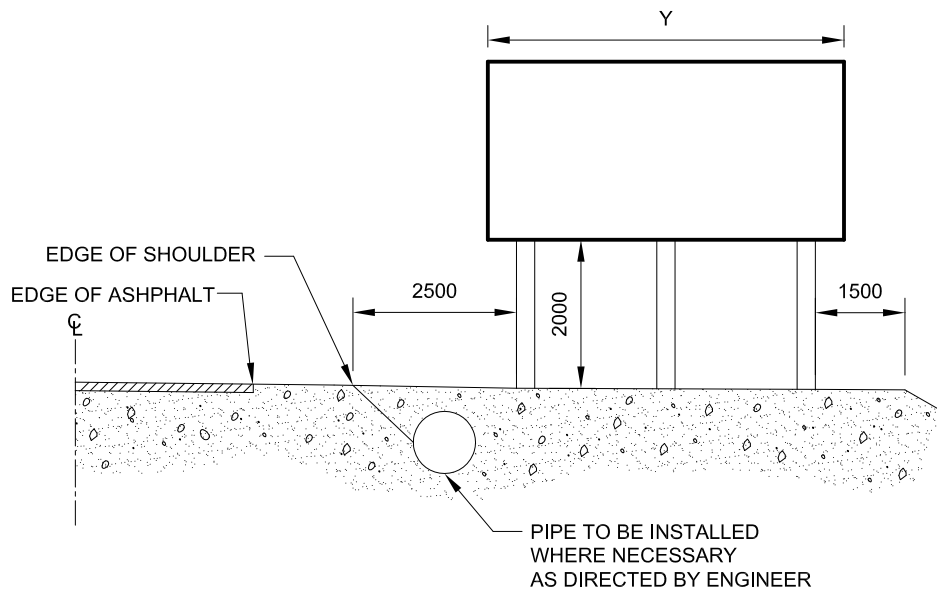
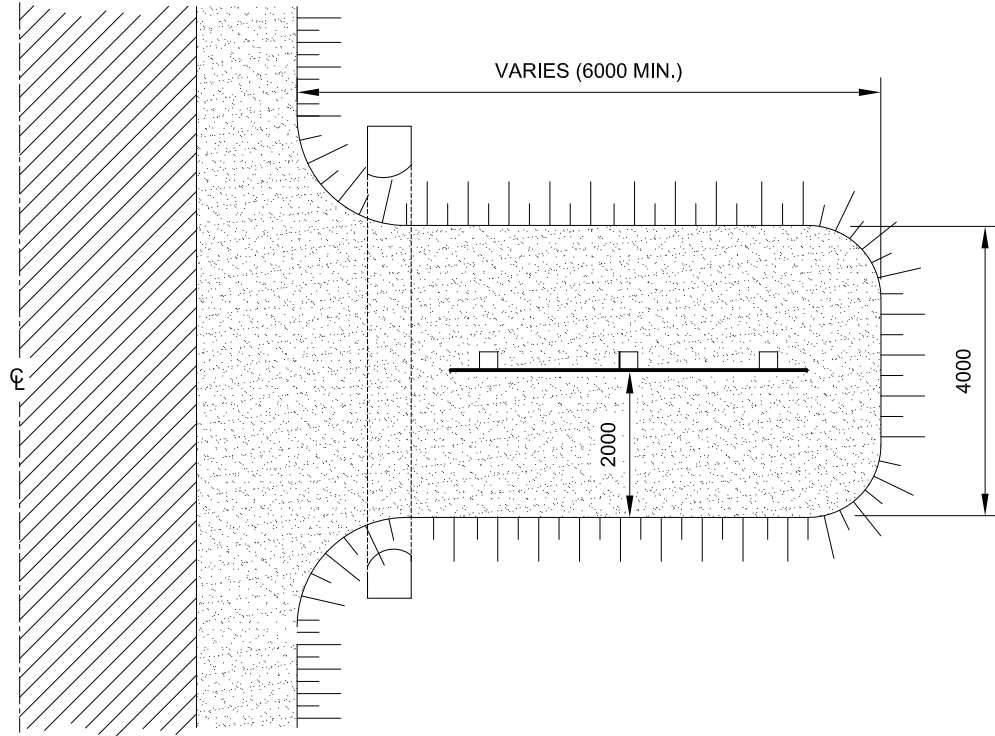
### SUB-GRADE WIDENING FOR TYPE "A" AND "B" SIGN POST INSTALLATIONS

DRAWN BY: DEB KIRBY

DATE: REV 02-01-10

NOT TO SCALE





TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

**SUB-GRADE WIDENING FOR TYPES C, D & E SIGN POST INSTALLATIONS**

DRAWN BY: DEB KIRBY

DATE: REV 02-01-10

NOT TO SCALE

