



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.

## ERRATA

Holders of the Department of Transportation and Works Specifications Book, dated March 2011 with March 2012 Errata are advised to make the following corrections.

### REVISIONS MARCH 2013

1. **Section 190** revised to reorganize structure of layout to 6 Sub-Sections to be more consistent and easier to follow, and include updates to OHS Regulations and clarify resulting requirements of Safety Plans etc. These updates include requirements to do site inspections and hold tool box meetings with documentation. Scaffolding Section has been updated with fall protection requirements and CSA Standards and requirements for inspection documentation. Traffic Control Section has been updated to require documentation of the traffic control plan for the site specific situation and assign modification authority to a specific person on the site. Illumination for work into darkness has also been added to Traffic Control Plans. Heavy Equipment Section added requirement for parking overnight off highway road shoulders. New Sections have been added for: "Working at Height"; "Working Over or Near Water"; "Access, Egress and Walkways"; "Crane Operations"; and "Rigging and Slinging".
2. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.02.01.02.01 Coarse Aggregate** revise Table 1 for Micro Deval Requirements.
3. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.02.01.02.02 Fine Aggregate** revise Table 2 for Micro Deval Requirements.
4. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.02.02.01 General Requirements for Pavement Mixture** revise Table 3 for Sieve Size adjustment.
5. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.05.01 General and Sub-Section 330.06.05.02 Production** revise for temperature adjustment after mixing.
6. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.06.04.01 Establishing a Design Mix Formula (DMF)** revise to add submission requirements.
7. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.06.04.02 Requirements for Design Mix Formula** revise to clarify submission requirements.
8. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.06.04.07 Field Adjustments to the Job Mix Formula** revision to include submission requirements of mix properties for air voids, voids in mineral aggregate and the dust to effective asphalt binder ratio.
9. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.06.09.02 Asphalt Binder Content, Gradation and Air Voids** revise requirements for sample splitting.

10. Section 330 Hot Mix Asphaltic Concrete, **Sub-Section 330.06.09.04.01 Material Application Rate (Rehabilitated Pavements)** revise requirements for acceptance limit for material application rate to apply to each day.
11. Revise **Section 810 Use of Herbicides for Brush Control Operations** to add requirements for contractor to layout the buffer areas within treatment zones.
12. Section 925 Inextensible Mechanically Stabilized Earth (MSE) Structures, **Sub Section 925.09 Frictional Backfill (Within the MSE Earth Volume) Requirements** revised to reflect required gradation, limits of placement and testing (gradation and electrochemical) to be carried out by the contractor for frictional backfill.
13. Section 925 Inextensible Mechanically Stabilized Earth (MSE) Structures, **Sub Section 925.10.05 Backfill and Soil Reinforcing System Placement** revise to reflect requirement for the contractor to establish the Standard Proctor Maximum Dry Density and to be responsible for compaction testing during construction.
14. Section 925 Inextensible Mechanically Stabilized Earth (MSE) Structures, **Sub Section 925.12 Basis for Payment** revise to reflect requirement for submission of frictional backfill testing (electrochemical, gradation, compaction) results prior to the approval of payment for MSE wall installation.
15. Form 1000 page 1000-10 revise to add a footnote to **Section 12-2 Skid Steer Loaders Rubber Tired** to give a rate for attachments for Skid Steer Loaders and increase the hourly rates.
16. Form 1150 updated for revision for OM Backslope Treatment with Benching.
17. Form 1155 update for revision of Typical Rock Backslope with No Benching.
18. Form 1156 update for revision of Typical Rock Backslope with Benching under 10 m Cut Height.
19. Form 1157 update for revision Typical Rock Backslope with Benching over 10 m Cut Height.
20. Form 1298 update for revision of Sub-Grade Widening for Type "A" and "B" Sign Post Installations to increase the width of sign island and change position of the sign.
21. Form 1299 update for revision of Sub-Grade Widening for Types "C", "D" and "E" Sign Post Installations to increase the width of sign island and change position of the sign.
22. Form 1299a update for revision of Sub-Grade Widening for Types "F", "G", "H" and "I" Sign Post Installations to increase the width of sign island and change position of the sign.

## **SECTION 190 OCCUPATIONAL HEALTH AND SAFETY**

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## **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 Site Specific Safety Plan for the owner.
  - .2 It is the responsibility of the General Contractor to submit only one Site Specific Safety Plan that incorporates all relevant portions of their subcontractors safety documentation.
  - .3 A Safety Record Letter from the Occupational Health and Safety Division.
- .3 Acceptance of the Project Site Specific Safety 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 SAFETY PLAN**

### **190.2.1 PROJECT SAFETY PLAN REQUIREMENTS**

The contractor shall:

- .1 Conduct operations in accordance with latest edition of the Newfoundland Occupational Health and Safety (OH&S) Act and Regulations with specific reference to codes and standards referenced therein.
- .2 Prepare a detailed Project Site Specific Safety Plan for the Owner. The plan shall identify, evaluate and control job specific hazards through a detailed hazard assessment of the tendered project outlining phases of the project and hazards/controls associated with specific work, equipment, locations and task associated with the work conducted during each phase of the project. The plan shall also ensure adequate policies; procedures and safe work practices are in place to manage hazards identified in the hazard assessment that cannot be addressed through engineering controls.
- .3 Provide a copy of the project Site Specific Safety Plan to the Owner/Engineer.

### **190.2.2 PROJECT SITE SPECIFIC SAFETY PLAN**

The written Site Specific Safety Plan shall incorporate the following:

- .1 An organizational structure, in the form of an organizational chart with contact information of the key positions, which shall establish the specific chain of command and specify the overall responsibilities of contractors' employees at the work site.
- .2 A comprehensive work plan which shall:
  - .1 Outline the phases of the project and the required tasks, equipment, positions, resources and objectives for each phase.
  - .2 Conduct a detailed hazard assessment of each project phase taking into consideration all of the requirements above (objectives, tasks, equipment, positions, resources, training, etc.)
  - .3 Identify the controls required for all identified hazards and project phases that may include engineering controls, policies, procedures, equipment, safe work practices, training and communication with staff, etc.
  - .4 Establish personnel requirements for implementing the plan and controls, and establish site specific training and notification requirements and schedules.
- .3 A personal protected equipment (PPE) Program refer **Section 190.4.5**.
- .4 An emergency response procedure refer **Section 190.2.3**
- .5 A hearing conservation program in accordance with Part VI, Section 68 of the OHS Regulations.
- .6 A health and safety training program.
- .7 A visitor safety and orientation policy that will include education on hazards, required PPE to be worn by visitors and accompaniment by staff while on site. This program shall also take into consideration the safety of the general public that may come in contact with the work site and appropriate measures for notification and safety.

- .8 General safety rules.
- .9 The Contractor shall ensure the maintenance of all equipment is conducted in accordance with the manufacturers' specifications and/or as required by the CSA standard adopted by the OHS Regulations specific to the equipment.
- .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, including rented and subcontractors equipment. 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...) 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). This shall also include documentation where required of certification in power line hazards. This must be provided in tabular format or spreadsheet, including all of the aforementioned information, and be signed and dated by a member of the Contractor's management team.
- .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 checklist provided below must be included as a component of the site specific hazard assessment completed by the Contractor for all parking sites required for the project. The precise locations must be noted on the checklist along with the date of completion and signature of the individual completing the assessment.

| <b>Project :</b>   | <b>Identify location:</b> |           |                       |                  |                       |                 |
|--|---------------------------|-----------|-----------------------|------------------|-----------------------|-----------------|
|  | <b>Yes</b>                | <b>No</b> | <b>Priority Level</b> | <b>Action By</b> | <b>Date Corrected</b> | <b>Initials</b> |
| <b>Powered Mobile Equipment Parking Areas</b>  |                           |           |                       |                  |                       |                 |
| Potential for Rollover <ul style="list-style-type: none"> <li>• Light vehicle</li> <li>• Heavy equipment</li> <li>• ROPS equipped?</li> <li>• FOPS 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> |                           |           |                       |                  |                       |                 |
| Effect 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.

- .13 Where required for completion of the contract, specific programs and documents may be required to meet basic safety provisions required in the OHS Act and Regulations. These documents may include but are not limited to:

- .1 A diving program which shall contain standard operating procedures to be followed in the

- diving operation.
- .2 In circumstances involving pits and quarries that fall within the jurisdiction of the mining safety additions to the Occupational Health and Safety Regulations 5/12 released March 20<sup>th</sup>, 2012. Contractors may be required to provide the following documents certified by the appropriate professionals in accordance with the regulations:
  - .1 Mine design plan, certified by a professional engineer (where three or more benches are to be mined) (section 519).
  - .2 Ground Control Log Book (section 525)
  - .3 Electrical energy mine plan, certified by a professional engineer (section 679)
- .14 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.
- .15 Implement all requirements of the Project Site Specific Safety Plan.
  - .1 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 Site Specific Safety Plan and the Occupational Health and Safety Act and Regulations. All measures should be immediately communicated to staff.
- .16 The contractor shall:
  - .1 Prepare a detailed Project Site Specific Safety Plan which shall:
    - .1 Contain project phase hazard assessment results
    - .2 Identify engineering and administrative 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.
  - .3 Be solely responsible for investigating, evaluation and managing any report of actual or potential hazards.
  - .4 Retain copies of all completed hazard assessments at the project site and provide a copy to the Engineer/Architect.

### **190.2.3 EMERGENCY RESPONSE PLAN**

- .1 Develop an emergency response plan for the job site and ensure that supervisors and workers are trained in the emergency response plan.
- .2 The emergency response plan shall address, as a minimum:
  - .1 Emergency recognition and evaluation (identification of each potential type of emergency and evaluation of requirements for response)
  - .2 Pre-emergency planning (included the assessment of controls to reduce the likelihood of such an emergency if possible)
  - .3 Personnel roles, lines of authority and communication (include a communication list of all emergency services in the immediate and surrounding areas)
  - .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 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 rehearsal schedules shall be identified along with written rescue plan for high risk emergencies (i.e. fall rescue and confined space entry).
  - .13 For diving operation, refer to **Section 190.5.5**
  - .14 The emergency response procedures shall be part of the overall training program. Separate emergency rescue procedures are to be developed for fall rescues and confined space entry rescues. These rescue plans shall be drilled regularly and separately being

formally documented. The frequency at which all aspects of the emergency response plan will be rehearsed must be stated.

- .15 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.

### **190.3 SAFETY MONITORING**

#### **190.3.1 HEALTH & 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 Site Specific safety Plan or Health and Safety Program. Inspections will include visual inspections of site and documentation, 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 Section 190.
- .3 The general contractor will be responsible to ensure that site inspections have been completed at no less than 1 week intervals. These site inspections shall include risk assessments where the nature of the ongoing work or tasks associated with the work increase in risk or significantly change due to phases in the project or project progression.
- .4 Toolbox meeting shall be held with staff no less than once per week and shall include review of and safety related information that is pertinent to the safety of employees, site and equipment.
- .5 All toolbox meetings, site inspections, risk assessments, OHS Committee meetings and any OHS Directives or reports shall be documented and submitted with the OHS Monthly reports each month.

#### **190.3.2 SUPERVISION**

- .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 Any person assigned to supervisory duties on site shall not conduct significant work in relation to the contract that inhibits them from the ability to properly supervise the work site.
- .3 Assign a sufficient number of supervisory personnel to the work site. Supervisory personnel should also be trained and aware of the requirements in the Traffic Control Manual for signage and ensure the correct signage plan is utilized on site and staff have been notified of the requirements therein. Road signage must be inspected for accuracy by the supervisor upon set-up, each morning prior to work and at any point in which the signage requires change during the work day or life of the contract. A Traffic Control Signage log will be provided by the Department of Transportation and Works and must be submitted with the Contractor Monthly OHS Performance Report.
- .4 Supervisors shall have knowledge and understanding of the principals of trenching and excavation and shall refer to the OHS Regulations and the trenching and excavation safety guide from Service NL prior to and during such work.
- .5 Provide a suitable means of communications for workers required to work alone.

#### **190.3.3 CONTRACTORS SAFETY OFFICER**

- .1 A Contractor's Safety Officer is mandatory and they will be responsible for the implementation and monitoring of the Project Site Specific Safety 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 hazard recognition evaluation and control.
  - .2 Completed training in accident incident investigations.
  - .3 Experience in the development and implementation of safe work practices and procedures.
  - .4 Knowledge, understanding and experience in the use of the Traffic Control Manual
  - .5 Flag persons training certified by the WHSCC.
  - .6 Knowledge and experience in trenching and excavation that includes and understanding of the Occupational Health and Safety Regulations 5/12.
  - .7 Power line hazards training certified by the WHSCC.



- .8 Knowledge and understanding of equipment maintenance and inspections required for preventive safety.
  - .9 Training and experience in the use, care and maintenance of PPE to be used on site.
  - .10 Completed training in Standard First Aid.
  - .11 Complete understanding, knowledge and familiarity with the Site Specific Safety Plan, Applicable codes and standards as well as the Occupational Health and Safety Act and Regulations that include the newly released parts XXVII – XXXIII related to Mining.
- .2 Where the work and/or contract require high risk activities, specific training of the CSO may be necessary in specific areas of safety. The list below is in no way an all encompassing list of required training, though represents some of the areas of high risk encountered in past contracts and the training required to mitigate and control hazards related to the specified activities. The contractor will be responsible through the risk assessment conducted during the development of the site specific safety plan to identify areas of high risk and ensure that the CSO is competent and has adequate knowledge to ensure adequate controls are in place to mitigate the risks to workers and abide by all applicable legislation, codes and standards.
- .1 Completed training in the use, maintenance of fall protection systems certified by the WHSCC.
  - .2 Completed training in the design and construction of scaffolding as referenced in the applicable CSA Standard.
  - .3 Completed training in confined space entry protocols, techniques and rescue plan as certified by the WHSCC.
- .3 With respect to project tasks and elements, the contractor safety officer shall be competent and qualified.

#### **190.3.4 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.
- .4 Provide a copy of all committee minutes with the Contractor Monthly OHS Performance Report.

#### **190.3.5 RESPONSIBILITY**

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
- .3 Where life safety risks exist, the contractor must stop the work until such time as the risk can be mitigated to a safe level.
- .4 Make appropriate steps to ensure that the hazards are mitigated to a safe level, workers are notified of the hazards and how to protect themselves. As well workers must be provided with any new safe work practices or information regarding mitigation of the risk.

#### **190.3.6 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 All workers will be instructed and trained on the hazards associated with work they will be performing and how to protect themselves. This will include a review of all safe work practices, the reporting and documentation of hazards, reporting accidents and injuries

as well as, formal training in areas of high risk (i.e. fall protection, power line hazards, traffic control persons training). This must be documented through on site orientations and copies of these records provided to the Resident Engineer prior to commencing work.

- .3 Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.
- .4 Limitations, use, maintenance and disinfection – decontamination of personal protective equipment associated with completing work.
- .5 Limitations, use, maintenance and care of engineering controls and equipment.
- .6 Limitations and use of emergency notifications and response equipment including emergency response protocol.
- .7 Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.
- .8 Appropriate number of persons trained in emergency and Standard First Aid according to the First Aid Regulations.
- .9 Department of Transportation and Works, Traffic Control Manual.
- .2 Contractors must provide and maintain training of workers, as required, by Federal and Provincial legislation.
- .3 Copies of all training records shall be provided to the Engineer for review, before a worker is to enter the work site. These records must be provided in tabular or spreadsheet format, stating the employee's name, training obtained and expiry dates, and be signed and dated by a member of the Contractor's management team.
- .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 Site Specific Safety 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.
  - .6 Accompanied while on site.

### **190.3.7 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 Service NL and Human Resources Development Canada (HRDC).
- .4 Forward copies of all orders, directions or any other documentation immediately after receipt.

### **190.3.8 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.

### **190.3.9 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 and provide a copy to the Engineer:
  - .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

### **190.3.10 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.

## **190.4 SAFETY REGULATIONS**

### **190.4.1 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. This must be documented as part of the on site orientation and a copy provided to the engineer.
- .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.

### **190.4.2 OVERLOADING**

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

### **190.4.3 FALSEWORK**

- .1 Design and construct falsework in accordance with CSA S269.1.

### **190.4.4 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 protection devices are used by all workers working at elevations of 1.22 meters or greater in accordance with CSA Z259 and CSA S269.2M87.
- .3 All workers performing work at height and who will be required to utilize a fall arrest system must be trained in a fall protection program certified by the WHSCC.
- .4 Scaffolding shall be inspected each day prior to use by a competent inspector. Records and copies of these inspections shall be kept on site and provided upon request to Department of Transportation and Works officials, resident engineer, etc.
- .5 Scaffolding inspection reports may be required to be provided with the monthly OHS performance reports, at the discretion of the resident engineer.

#### **190.4.5 PERSONAL PROTECTIVE EQUIPMENT**

- .1 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.
- .2 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 meeting the CSA Z195 Standard.
  - .2 CSA approved hard hat meeting the CSA Z94.1 Standard.
  - .3 High visibility apparel as defined in Occupational Health and Safety Regulations.
  - .4 Where noise exceeds standards set out in the Occupational Health and Safety Regulations hearing protection shall be worn, and hearing conservation program implemented.
  - .5 Other personal protective equipment, as may be required by the work tasks, hazard assessments or the Contractor, depending on duties being performed.

#### **190.4.6 TRAFFIC CONTROL**

- .1 Provide traffic control measures when working on, or adjacent to, roadways. This will include but is not limited to appropriate signage, traffic control persons and control vehicles.
- .2 Traffic control measures to conform with "Traffic Control Manual for Roadway Work Operations", Department of Transportation and Works.
- .3 Daily completion of the Department of Transportation and Works, contractor daily traffic control signage log. This log is to be completed daily at a minimum and at any point where the signage required changes to ensure accuracy. The log will be submitted monthly with the contractor OHS Monthly performance report and may be inspected randomly by staff of Transportation and works for completion and accuracy.
- .4 Signage utilized on site shall meet the requirements of the Traffic Control Manual. This shall include though is not limited to;
  - .1 Signage shall be a minimum of 1.5 meters (this may include the use of flags)
  - .2 Signage should be in a vertical and highly visible position
  - .3 Only sandbags shall be utilized as an acceptable form of weighting for signage.
  - .4 Contractors shall remove appropriate signage during end of the work day and where required. This shall include but not be limited to speed limit reductions and flag persons signage where required.
- .5 Specific traffic control plans shall be made and provided to the Engineer with accompanying hazard assessments that identify hazards unique to the work. This shall include potential additional decreases in speed, accounting for seasonal heavy equipment, size of lanes and barriers to protect workers from traffic on projects.
- .6 Traffic control plans for all portions of the contract work shall be submitted to the Engineer with site specific safety plans to the Department with accompanying hazards assessments. These traffic control plans must note the location, plan number if referencing a plan contained in the Traffic Control Manual, spacing of signs, location and number of flag persons and be prepared in a professional manner. If the construction situation is not specifically addressed in the Traffic Control Manual then the Contractor must provide the engineer with a site specific traffic control plan addressing all of the items listed above in a professional format.
- .7 The contractor shall ensure that a competent individual is responsible for monitoring, maintaining and adjusting traffic control plans throughout the life of the project. This individual shall have been briefed and provided with a copy of the traffic control plans and must also complete the traffic control signage log to accompany the contractor OHS monthly performance requirements. This individual must be provided with the authority to make changes with respect to signage and have the resources to communicate with the engineer. Training as a traffic control person would be beneficial in this position.
- .8 Contractors should plan their work activities daily to ensure work will not occur in twilight or dark hours. However, if this does occur due to unforeseen circumstances, the Contractor shall

have provisions in place for illumination of the work area and ensure the TCP's are properly equipped as required.

#### **190.4.7 WORKING AT HEIGHT**

- .1 Fall Protection devices in accordance with the regulations are required at a height of 1.22 meters. Where fall protection is inadequate and the work is at a height equal or greater than 3.05 meters fall restraint or fall arrest devices are to be used by all workers in accordance with CSA Z259.
- .2 All workers performing work at height and who will be required to utilize a fall arrest system must be trained in a fall protection program certified by the WHSCC.
- .3 A list of all persons trained in WHSCC certified fall protection training shall be kept and maintained on site and may be combined with other training records as required in a tabular or spreadsheet format listed throughout section 190.
- .4 Regular inspections of all fall protection and fall arrest equipment are required and records shall be maintained and kept on site. Daily inspections of fall restraint and horizontal fall protection/arrest systems shall be conducted. This requirement is to form part of the Contractors' Site Specific Safety Plan.
- .5 Manufacturer's specifications for engineered fall protection/arrest/restraint systems shall be kept on site at all times.
- .6 Anchor points for fall arrest systems shall be identified and certified annually by a professional engineer as per CSA standards.
- .7 Prior to working at height workers shall be instructed in a Contractor SWP for working at height and associated rescue plans for working at height developed specific to the work, locations and risks.
- .8 Rescue equipment for fall rescues shall be kept in close proximity to workers working at height.
- .9 Where necessary the contractor shall ensure that adequate protection from falling debris is addressed in site specific safety plans, this may include debris nets, barriers, etc.

#### **190.4.8 WORKING OVER OR NEAR WATER**

- .1 Where the risk of entering the water is identified and other means of fall protection or rescue are not adequate to prevent the worker from entering the water, rescue from water plans shall be developed and trained with workers on site.
- .2 A list of all persons trained in water rescue will be kept and maintained on site.
- .3 Workers shall be required to wear personal flotation devices where the workers are at a risk of entering the water.
- .4 Life saving equipment shall be available near entry site for water rescue and may include life boats, throw lines, life preservers, etc.

#### **190.4.9 ACCESS, EGRESS AND WALKWAYS**

- .1 All accesses, egresses and walkways shall be continuously monitored for hazards that may include slips, trips, slippery conditions and other hazards.
- .2 Provisions for snow clearing of walkways, accesses and egresses shall be developed.
- .3 All access, egress hatches, holes or other potential hazards of this nature shall be identified, covered and clearly identified to workers.

#### **190.4.10 RIGGING AND SLINGING**

- .1 All workers required to perform work related to rigging and slinging shall be trained and deemed competent in such operations and practices.
- .2 All rigging and slinging equipment on site shall be maintained and inspected according to the manufacturers specifications, CSA Standards and OHS Regulations.
- .3 All rigging and slinging equipment shall have the working load limit marked and visible on the product.
- .4 All rigging and slinging operations shall at a minimum meet the requirements of the OHS act and regulations.
- .5 Any rigging and slinging equipment identified in daily inspections or otherwise identified as damaged, worn or unacceptable to manufactures specifications, appropriate standards or OHS Regulations shall be immediately taken out of service and destroyed.

## **190.5 SAFETY OPERATIONS**

### **190.5.1 EXCAVATION OPERATIONS**

- .1 Protect excavations more than 1.25 meters 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 meters 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) meters, 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.

### **190.5.2 BLASTING OPERATIONS**

#### **When Blasting is Required**

- .1 Valid Blaster's Certificate and Certificates of Qualification acceptable to the OHS Regulations 5/12 under section 419 identifying the Level of Qualification for the project requirements (Journey Persons Blaster Certificate will still be accepted). 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.
- .2 Temporary Magazine License, when required
- .3 Explosives Vehicle Certificate, when required, issued by Transport Canada for transport of explosives regulated under the Transportation of Dangerous Goods Act.
- .4 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.
- .5 Ensure blasting operations are carried out under the direct visual supervision of a certified Blaster either registered with the Industrial Training Division of the Provincial Department of Education or has been issued a certificate from completion of a program approved by the Provincial Department of Government Services. Ensure that the certificate level is appropriate for the blasting activities which will occur. Comply with the requirements of:
  - .1 Explosives Act.
  - .2 Explosives Regulations.
  - .3 Newfoundland Regulation 5/12, Occupational Health and Safety Regulations.
  - .4 Role of certified blaster set out in section 419 of the Occupational Health and Safety Regulations 5/12.
- .6 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. An inventory of explosives shall be kept.
- .7 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)". Vehicle used to transport explosives on site shall be placarded and explosives shall be transported in containers lined with wood (reference section 428 of the Occupational Health and Safety Regulations 5/12 comply with section 42. Detonators shall not be placed in a magazine or daybox with other types of explosives or in a compartment of a vehicle with another type of explosive.

- .8 Use of explosives on site shall comply with the Occupational Health and Safety Regulations 5/12 General Blasting requirements are set out in Part XIX of the Regulations Loaded holes shall be clearly identified with barricades put in place to prevent access to the holes. Drilling shall not be done closer to a loaded bore hole than a distance half the total depth of the hole being drilled and in no case shall drilling be conducted at a distance closer than 6m from a loaded borehole. Drill cuttings shall not be used as stemming material.
- .9 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. Roads and approaches to the danger area are guarded or barricaded to prevent anyone from entering. Loaded holes which have not been fired by the end of the day shall not be left unattended.
- .10 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.
- .11 File an Emergency Response Assistance Plan with the Explosives Branch, Natural Resources Canada.
- .12 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.
  - .5 Keep a field journal concerning the blast activities.

### **190.5.3 HEAVY EQUIPMENT OPERATIONS**

- .1 Ensure mobile equipment used on job site is of the type specified in OH&S Act and Regulations (specific to sections 261-263) shall be fitted with a Roll Over Protective Structure (ROPS) and Falling Object Protective Structures (FOPS).
- .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 meters) 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
- .6 Heavy equipment shall not be parked overnight on road shoulders, where exposure to the public may be present.

### **190.5.4 BRUSH CLEARING OPERATIONS**

- .1 Ensure workers using chain saws are competent and 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
  - .6 Cut resistant gloves
- .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
- .4 A safe work practice (SWP) must be developed, implemented and all workers trained in the SWP prior to undertaking such tasks and utilizing tree and brush clearing equipment.

## 190.5.5 DIVING OPERATIONS

### When Diving is Required

- .1 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-Supplier 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
- .2 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).
- .3 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.
- .4 Certificates of Analysis for quality/purity of breathing air to be used by diver(s).
- .5 Documentation showing that diving life support equipment is in good working order and properly maintained.
- .6 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.
- .7 For diving operations, emergency rescue procedure includes:
  - .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
- .8 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.
- .9 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.



- .10 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.
- .11 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 Possess a Valid Diving Certificate, or equivalent, for a minimum of three (3) years 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.
- .12 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.
- .13 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.
- .14 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
- .15 Diving in free swim mode is not permitted at the work site.
- .16 Provide separate first aid supplies for dive operation. All dive team personnel shall be trained in first aid and cardiopulmonary resuscitation (CPR).
- .17 Provide medical oxygen for emergency response at work site. The dive supervisor shall be trained in administering medical oxygen.

## **190.5.6 CONFINED SPACE OPERATIONS**

### **When Confine Space Entry is Required**

- .1 Copies of confined space entry training certificates acceptable to the WHSCC where entry to confined spaces may be required, as well as, copies of confined space entry programs, confined space assessments, confined space entry permits, safe work practices and rescue plans.
- .2 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.
- .3 All staff required to enter a confined space shall be trained in confined space entry through a program certified by the WHSCC.
- .4 The contractor shall ensure that all appropriate policies, assessments, testing and rescue plans are in place, communicated to workers and utilized prior to confined space entry.

## **190.5.7 CRANE OPERATIONS**

- .1 All training records and certifications for operators of cranes shall be kept on site and maintained. This training shall meet the requirements of the OHS Act and Regulations, CSA standards and identify the operators as competent.
- .2 Manufacturers' specifications for all lifting equipment shall be kept on site.
- .3 All lifting equipment shall be inspected and maintained in accordance with the appropriate CSA standards and manufacturers specifications by a competent and qualified individual.
- .4 All maintenance records for lifting equipment is maintained and available upon request.
- .5 Safe Work Practices for all crane operations and working around cranes shall be developed and reviewed with operators and staff.
- .6 Safe Work Practices for crane operating shall be developed and reviewed with all operators. Additional attention shall be provided for safe work practices related to operations for tandem crane lifts.
- .7 Where tandem crane lifts are required for the construction, maintenance and or repair of a structure, road or bridge a hazards assessment and corresponding plan/procedures shall be developed.
- .8 Operators and signalers shall have radios or other suitable means of communications.
- .9 Where an apprentice crane operator will be operating a crane he/she shall be under the direct supervision of a journey person operator as required by the industrial training division of the Department of Education.
- .10 Load capacity of the crane shall be clearly marked in a visible location.

## **190.6 OWNER'S STATEMENT**

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

# 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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#### **330.06.12.01 Removal and Replacement**

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### **330.06.13 Method of Measurement**

### **330.06.14 Basis of Payment**

#### **330.06.14.01 Basis of Payment for Asphaltic Surface, Asphaltic Base Course, Asphaltic Levelling Course Type I and II, and Patching**

#### **330.06.14.02 Basis of Payment for Asphalt Cement**

#### **330.06.14.03 Basis of Payment for Rejected Mix**

## **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 10 % 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



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shall have full control over the time of sampling. If the Contractor chooses to pre-screen with a 19 mm or larger 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   | 18                                 | 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 in total of all natural occurring fine aggregates plus blending sand in the total combined aggregate shall be 15% (by dry weight). For RLU-80 and below highway classifications the maximum allowable percentage in total of all natural occurring fine aggregates plus blending sand in the total combined aggregate shall be 20% (by dry weight).

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 6 % 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.    | HIGHWAY CLASSIFICATION             |      |                       |
|---|-------------|------------------------------------|------|-----------------------|
|   |             | RAU & RAD-100 RAU & RAD-90, RCU-80 |      | RLU-60, RLU-70 RLU-80 |
|   |             | SURFACE                            | BASE | ALL COURSES           |
| MICRO-DEVAL TEST FOR FINE AGGREGATE - % MAXIMUM | ASTM D 7428 | 18                                 | 20   | 20                    |
| PLASTICITY INDEX                                | ASTM D4318  | 0                                  | 0    | 0                     |
| SAND EQUIVALENT - % MINIMUM                     | ASTM D 2419 | 50                                 | 50   | 50                    |
| FINE AGGREGATE ANGULARITY - % MINIMUM (A)       | ASTM C 1252 | 45                                 | 45   | 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. Contractors should also be aware of material breakdown after crusher production testing for the material being utilized and their plants capabilities in producing the mixture in accordance with Table 3.

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## 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   | 2-6                                      | 2-7                                    |

### 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

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. Blending sand may be either a naturally occurring screened sand or a manufactured sand added to the mix for the purposes of enhancing mix properties.

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 10% for all blend sands.

For RCU-80 and above highway classifications the maximum allowable percentage in total of all natural occurring fine aggregates plus blending sand in the total combined aggregate shall be 15% (by dry weight). For RLU-80 and below highway classifications the maximum allowable percentage in total of all natural occurring fine aggregates plus blending sand in the total combined aggregate shall be 20% (by dry weight).

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

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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 ( $\text{Ca}(\text{OH})_2$ ) 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.
- (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:

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- (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 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.

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- 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.

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                                      | 16-25                         | 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% |

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### 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.

**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                            | 5 400   | ---     |
| (II) FOR HIGHWAY CLASSIFICATIONS RAU & RAD-100, RAU & RAD-90, RCU-80              | 8 000   | ---     |
| MARSHALL FLOW INDEX MM  | 2.5     | 4.25    |
| % AIR VOIDS (A)   |         |         |
| (I) FOR HIGHWAY CLASSIFICATIONS RLU-60, RLU-70, RLU-80                            | 2.5     | 4.5     |
| (II) FOR HIGHWAY CLASSIFICATIONS RAU & RAD-100, RAU & RAD-90, RCU-80              | 3.0     | 5.0     |
| % VOIDS IN COMPACTED MINERAL AGGREGATES   |         |         |
| (I) LEVELING & BASE COURSE  | 14.0    | ---     |
| (II) SURFACE COURSE   | 15.0    | ---     |
| MODIFIED LOTMAN AASHTO T283 - TENSILE STRENGTH RATIO (PLUS VISUAL)                | 0.8     | ---     |
| % RETAINED COATING OF AGGREGATE - BOILING WATER TEST ASTM D3625                   | 95      | ---     |
| 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  $\pm$ 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.

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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.

### 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.



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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 the lower of either; the high end temperature for recommended mixing from the temperature viscosity chart provided by manufacturer/supplier or 165° C.

Quality control tests shall be performed, by the Department, on random samples taken either at the production site or lay-down site.

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.

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### 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.

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.

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### **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.

### **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

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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 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.

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### **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.

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.

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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.

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".

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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.

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".

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### **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.

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.



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### 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 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. The taper length for such keyed joints shall be a minimum of 15m. 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

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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.

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

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from each segment.

**Table 1**  
**Number of Segments per Daily Production**

| DAILY PRODUCTION OF ASPHALT CONCRETE | NUMBER OF SEGMENTS |
|--------------------------------------|--------------------|
| 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, 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

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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.

**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.

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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:

- |   |  |
|---|--|
| <b>1. SEGREGATED AREAS</b>  | <b>6. TIRE MARKS</b>                     |
| <b>2. AREAS OF EXCESS OR INSUFFICIENT ASPHALT CEMENT</b>          | <b>7. IMPROPERLY CONSTRUCTED PATCHES</b> |
| <b>3. ROLLER MARKS</b>  | <b>8. IMPROPER CROSS SLOPE</b>           |
| <b>4. CRACKING OR TEARING</b>                                     | <b>9. FUEL SPILLS ON THE MAT.</b>        |
| <b>5. IMPROPER MATCHING OF LONGITUDINAL AND TRANSVERSE JOINTS</b> |  |

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.

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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**

| 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 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            |         |

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### 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 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.

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**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.

### **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



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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:

**Table 8  
Asphalt Content Acceptance Criteria**

| TYPE OF TEST      | ACCEPTABLE ZONE (%) | PENALTY ZONE (%)                  | REJECTABLE ZONE (%) |
|-------------------|---------------------|-----------------------------------|---------------------|
| INDIVIDUAL SAMPLE | ± 0.25              | -0.26 TO - 0.50<br>+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)**

| Penalty Zone<br>AC Content<br>Déviation % | Unit Price<br>Payment<br>Adjustment<br>Factor % | Penalty Zone<br>AC Content<br>Déviation % | Unit Price<br>Payment<br>Adjustment<br>Factor % | Penalty Zone<br>AC Content<br>Déviation % | Unit Price<br>Payment<br>Adjustment<br>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  | --  | --  |

### 330.05.12.04 Measurement for Payment for Blending Sand

The blending sand will be measured in tonnes, rounded to the nearest whole number.

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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.

### **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.

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### **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.

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**

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### **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.

### **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 2400 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 2400 tonnes of mix remain), the following shall apply:

If the remaining plant production is 600 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 600 and 1200 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 1200 tonnes, but less than 2400 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.

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### **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:

Gradation: Passing 4.75 mm and 75 µm 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 CCIL or AASHTO certified 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. The submitted documentation shall be signed and sealed by a Professional Engineer registered to practice in Newfoundland and Labrador attesting to the validity of the material test data.

### **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. Mix designs shall be based on the asphalt cement content as a percentage of the mixture. As a minimum each mix design shall have five points of asphalt cement content starting at 5.0 % with 0.5% increments to 7.0%. For highway design classifications RAU & RAD-100, RAU & RAD-90 as well as RCU-80 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. While for highway design classifications RLU-80, RLU-70, RLU-60 the design air voids shall be chosen as the lowest value, within the range of 3.0 to 3.5% inclusive, such that all other mix design criteria are met.

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### **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 receipt of the required documentation. 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 acknowledgement of receipt of all required documentation for the DMF from the Engineer.

### **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: 600 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.

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.

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- $\pm 0.2\%$  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). In addition to the target gradation and asphalt binder content each request of JMF change shall provide predicted mix properties for air voids, voids in mineral aggregate and the dust to effective asphalt binder ratio as well as the new Lot upon which the change would be effective. 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.

### **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.

The temperature of the mix immediately after mixing shall not exceed the lower of either; the high end temperature for recommended mixing from the temperature viscosity chart provided by manufacturer/supplier or 165° C. 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.

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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°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, milled asphalt pavements, perimeters of asphalt patches and contact faces of curbs, gutters, manholes, sidewalks bridge structures, as well as any new mat joint having a temperature less than 60°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.

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 Contractors 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.



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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 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. The taper length for such keyed joints shall be a minimum of 15m. 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.

### **330.06.06 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:

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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.

### **330.06.08 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 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.

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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<br>Sieve Analysis<br>Soundness (MgSO <sub>4</sub> )<br>Los Angeles Abrasion<br>Micro Deval<br>Freeze Thaw<br>Petrographic Number<br>Flat & Elongated Particles (4:1)<br>Specific Gravity and Absorption, Coarse Aggregate<br>Specific Gravity and Absorption, Fine Aggregate<br>Fine Aggregate Angularity, Method A<br>Sand Equivalent<br>Crushed Particles<br>Stripping Test, Moisture Induced Damage<br>Boiling Water Test<br>Absorption | ASTM D 75<br>ASTM C 117, C 136<br>ASTM C 88<br>ASTM C 131<br>ASTM D 6928, D 7428<br>CSA A23.2-24A<br>CSA A23.2-15A<br>ASTM D 4791<br>ASTM C 127<br>ASTM C 128 <sup>(1)</sup><br>ASTM C 1252<br>ASTM C 2419<br>ASTM D 5821<br>AASHTO T283 (and visual)<br>ASTM D 3625<br>ASTM C 127 | Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>Preliminary aggregate testing<br>One per mix design formula<br>One per mix design formula<br>Preliminary aggregate testing |
| <b>Aggregate Production</b><br>Sampling<br>Sieve Analysis (Crushed)<br>Sieve Analysis (Blending Sand)<br>Fractured Particles (Coarse)<br>Flat & Elongated (Coarse)<br>Fine Aggregate Angularity, Method A<br>Sand Equivalent  | ASTM D 75<br>ASTM C 136 & C 117<br>ASTM C 136 & C 117<br>ASTM D 5821<br>ASTM D 4791<br>ASTM C 1252<br>ASTM D 2419  | Two coarse & two fine agg per lot<br>One per 300 tonnes<br>One per 1000 tonnes<br>One per 5000 tonnes<br>One per mix design formula<br>One per mix design formula   |
| <b>Cold Feed</b><br>Sampling<br>Sieve Analysis (Combined Gradation)<br>Aggregate Moisture Content<br><b>Hot Bin (Batch Plants)</b><br>Sampling<br>Sieve Analysis  | ASTM D 75<br>ASTM C 136 & C 117<br>ASTM D 2216<br><br>ASTM C 136 & C 117   | Two per lot<br>Two per lot<br>Two per day<br><br>As required  |
| <b>Mix Testing</b><br>Mix Asphalt Binder Content<br>Extracted Aggregate Sieve Analysis<br>Mix Moisture Content<br>Field Formed Marshall Briquettes<br>Flow & Stability<br>Maximum Theoretical Density<br>Stripping Test, Moisture Induced Damage<br>Boiling Water Test  | ASTM D 2172, D 6307<br>ASTM D 5444<br>AASHTO T 329<br>ASTM D 6926<br>ASTM D 6927<br>ASTM D 2041<br>AASHTO T283 (and visual)<br>ASTM D 3625   | Four tests per lot<br>Four tests per lot<br>Four tests per lot<br>Four tests per lot<br>One per every two lots<br>Four tests per lot<br>One per 4000 tonnes<br>One per 4000 tonnes  |
| <b>Other Related Tests</b><br>Bulk Relative Density<br>Void Calculations, Cores or Formed Specimens (B)<br>Temperatures (plant and road)<br>Sampling of Bituminous Mixes (Compaction/Height)<br>Density of Bituminous Concrete (by Nuclear Methods)<br>Random Test Site Locations<br>Correction Factors, Nuclear Moisture-Density<br>Smoothness of Pavements  | ASTM D 2726<br>ASTM D 3203<br><br>ASTM D 5361/ D 3549<br>ASTM D 2950<br><br>ASTM D 3665<br>ASTM D 2950<br>See section 330.06.09.05   | Each core or briquette<br>Each core or briquette<br>Five per day per location<br>Four per lot<br>One per hour<br><br>Each lot<br>Once per contract or as req'd<br>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.

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(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 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.

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The Engineer will provide the Contractor with approximately 30 minutes advance notice of loose sampling requirements, based on projected tonnage/production rates.

Each loose sample will be split into 3 (three) equal portions. One sample portion will be used for QC testing; another for QA and a third portion will be set aside by the Engineer in the event it is required for appeal testing.

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<br>+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<br>AC Content<br>Déviation % | Unit Price<br>Payment<br>Adjustment<br>Factor % | Penalty Zone<br>AC Content<br>Déviation % | Unit Price<br>Payment<br>Adjustment<br>Factor % | Penalty Zone<br>AC Content<br>Déviation % | Unit Price<br>Payment<br>Adjustment<br>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  | --  | --  |

**Table 13**

### Unit Price Adjustment for Marshall Air Voids

| AVERAGE DEVIATION OF AIR VOIDS FROM<br>3.50 or 4.00% *(as per highway classification) | UNIT PRICE ADJUSTMENT<br>(\$ PER TONNE) |
|---|---|
| 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                                  |

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- For highway classifications RAU & RAD-100, RAU & RAD-90 as well as RCU-80 the average deviation of air voids shall be measured from 4.00%. While for highway classifications RLU-80, RLU-70, RLU-60 the average deviation of air voids shall be measured from 3.50%.

**Table 14  
Unit Price Adjustment for Gradation**

| SIEVE SIZE<br>(DESIGNATION)    | AVERAGE DEVIATION OF THE<br>GRADATION<br>FROM THE JOB MIX FORMULA |                                      | UNIT PRICE ADJUSTMENT<br>(\$ PER TONNE) |
|--------------------------------|---|--------------------------------------|---|
|                                | Base & Levelling<br>Type II Course                                | Surface & Levelling<br>Type I Course |   |
| <b>Passing<br/>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<br/>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                                  |

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;

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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 segments cored for the Lot.

**Table 15  
Unit Price Adjustment for Density**

| <b>% OF<br/>MAXIMUM<br/>THEORETICAL<br/>DENSITY</b> | <b>UNIT PRICE<br/>ADJUSTMENT<br/>(\$ PER<br/>TONNE)</b> | <b>% OF<br/>MAXIMUM<br/>THEORETICAL<br/>DENSITY</b> | <b>UNIT PRICE<br/>ADJUSTMENT<br/>(\$ PER<br/>TONNE)</b> | <b>% OF<br/>MAXIMUM<br/>THEORETICAL<br/>DENSITY</b> | <b>UNIT PRICE<br/>ADJUSTMENT<br/>(\$ PER<br/>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  |

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|            |        |      |        |       |        |
|------------|--------|------|--------|-------|--------|
| 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:<br/>           Full payment for at least 3 out of 4 samples meeting the below tolerances<br/>           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<br/>           b) Lift thickness tolerance for base and surface course only</p> <p>Tolerance = 0.20 x specified thickness (base course)<br/>           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> |

### 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 daily tonnage delivered to the paver as recorded by weigh tickets generated by automated scales, divided by the area covered the same day 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 day. 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 each day, below which the days production is rejected. If the application rate of a days production is outside the



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acceptance limit, the days production is rejected automatically regardless of the values of other acceptance parameters.

**Table 17**  
**Daily Adjustments for Material Application Rate**

| Actual Application Rate<br>Expressed as % of<br>Specified Application Rate* | Unit Price Adjustment (\$ per tonne)<br>for all material daily   |   |
|---|--|---|
|   | Lower Lift or Single Lift  | Top Lift of Multiple Lifts  |
| ≥ 110   | -\$6.00 for all material in the day up to 110% and no payment for product in excess of 110.0%            | -\$6.00 for all material in the day 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 |

\*The specified application rate will be based on the asphalt mat thickness as per the highway classification. A 50mm asphalt mat thickness shall have a specified application rate of 117.5 kgs/m<sup>2</sup> while a 60mm asphalt mat thickness shall have a specified application rate of 141.0 kgs/m<sup>2</sup>

### 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:

**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                        |

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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 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<br>( mm / 100m)           | PRICE ADJUSTMENT \$ PER<br>SQUARE METER | PROFILE INDEX PI ( mm / 100m)         | PRICE ADJUSTMENT \$ PER<br>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<br>Vertical Direction | Penalty                                | Bumps / Dips Measured in the<br>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.

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

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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. However, QA 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 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.

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### **330.06.10.02.01 Appeal of Lot Binder Content, Gradation and Air Voids**

If the individual sample or Lot asphalt binder content and/or Lot gradation, and/or Lot 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 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.

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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 330.06.05.05.05 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 the Lot mean of deviations for Asphalt Cement contents are found to be in the penalty zones subsequently described, Asphalt Cement will be paid on actual content only for the individual sublots found to be deficient to the point of being in the penalty or rejectable zone, 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.

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

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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 810

### USE OF HERBICIDES FOR BRUSH CONTROL OPERATIONS

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#### 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.

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### 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.



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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

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Conservation and the manufacturer. The contractor shall be responsible for laying out the buffer zones and ensuring the buffers are respected.

- (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.

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### 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

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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.

### **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. The brush kill is to be inspected near the end of the warranty period in the growing season following the treatment application. If spot checks, after the herbicide treatment is completed, reveals that the 95% brush kill was not achieved at the end of the warranty period, 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.

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 15% of the total payment for herbicide treatment shall be retained for the warranty period and until checking the achievement of the 95% brush kill the following growing season as per Section 810.05.09 of this specification.

**SECTION 925**

**INEXTENSIBLE MECHANICALLY STABILIZED EARTH (MSE) STRUCTURES**

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**925.11 MEASUREMENT FOR PAYMENT**

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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 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 kPa    | (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**

All MSE wall backfill shall be provided from a single source.

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.

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.

The MSE frictional backfill will be a crushed blasted rock with the following gradation

|         |                            |
|---------|----------------------------|
| 100mm   | 100% passing by dry weight |
| 75mm    | 75- 100%                   |
| 4.76mm  | 20-55%                     |
| 1.2mm   | 10- 35%                    |
| 0.3mm   | 5-20%                      |
| 0.075mm | 2-6%                       |

Gradation requirements will be strictly enforced and variances to a coarser or less well graded material will not be approved even if meeting the minimum gradation requirements of the MSE wall supplier.

The frictional backfill will extend at least 500 mm beyond the end of soil reinforcing straps.

The backfill within the R/E volume shall be tested in accordance with AASHTO or ASTM standard methods and meet the following criteria:

| ELECTRO-CHEMICAL<br>PARAMETER              | ELECTRO-CHEMICAL<br>REQUIREMENT | TEST METHOD |       |
|--|---------------------------------|-------------|-------|
|  |                                 | AASHTO      | ASTM  |
| Chlorides (Cl <sup>-</sup> )               | < 100 ppm                       | T 291       | D4327 |
| Sulphates (SO <sub>4</sub> <sup>2-</sup> ) | < 200 ppm                       | T 290       | D4327 |
| Resistivity                                | > 3000 ohm-cm                   | T 288       | G187  |
| pH   | 5 - 10                          | T 289       | D4972 |

At least two weeks prior to start of wall construction the contractor shall identify the source of materials to be used for the MSE wall backfill and provide initial testing for the MSE wall backfill. This testing shall include both gradation and electrochemical testing as a minimum. A copy of these test results shall be provided to the engineer. In addition, the contractor shall provide a letter of conformance from the MSE wall supplier stating that the backfill meets the electro-chemical and geotechnical requirements assumed in the design of the wall.

In addition to this initial testing, the contractor shall sample and test the backfill for conformance with the gradation requirements at least once for every 250 m<sup>3</sup> of material placed.

All sampling shall be carried out in the presence of the resident engineer. Additional gradation testing at the contractors cost maybe required if based upon visual inspection in the field it is evident to the engineer that the gradation of the backfill material has changed.

The contractor shall use professional engineering services and a qualified testing firm licensed in Newfoundland and Labrador for all sampling and testing of the backfill.

In addition to 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.

## **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 Contractor will notify the Engineer a minimum of 7 days prior to the commencement of backfilling operations. The contractor will be responsible for testing to establish the Standard Proctor Maximum Dry Density and will be responsible for having the compaction of each lift of backfill tested for conformance to the compaction requirements. All results will be provided to the engineer as the work progresses

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. 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.

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. There will be no payment for MSE wall installation until all initial testing results and the letter of conformance from MSE wall supplier for the backfill has been submitted to the engineer. Submission of the required gradation and compaction testing results on the backfill will be required as the MSE wall construction progresses prior to the approval of payment for MSE wall installation.

# 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    | \$26.25       |
| 651 - 850 kg             | 55 - 65    | \$28.75       |

| Kilowatts      | Horsepower | Rate Per Hour |
|----------------|------------|---------------|
| 851 - 1100 kg  | 57 - 73    | \$33.50       |
| 1101 - 1400 kg | 82 - 85    | \$37.75       |
| 1401 kg and up | 90 - 94    | \$43.50       |

**Attachments** - Sweeper add \$5.50; Asphalt Cold Planer/Milling device add \$10.50; Hole Auger (up to 300 mm) add \$2.50

## 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

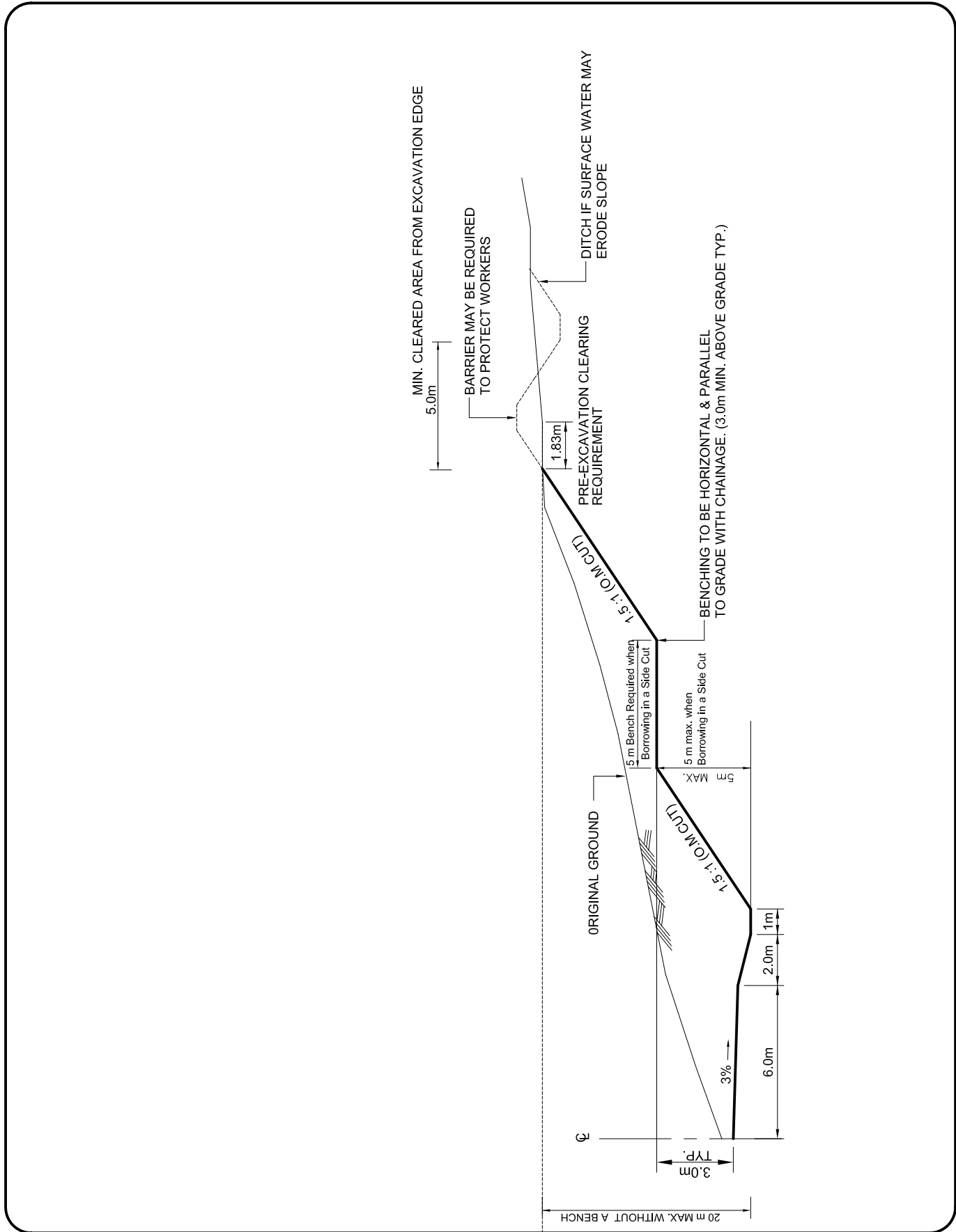
| Millimetres | Inches | Rate Per Hour |
|-------------|--------|---------------|
| 50.8 mm     | 2"     | \$3.25        |
| 76.2 mm     | 3"     | \$5.70        |
| 101.6 mm    | 4"     | \$10.40       |

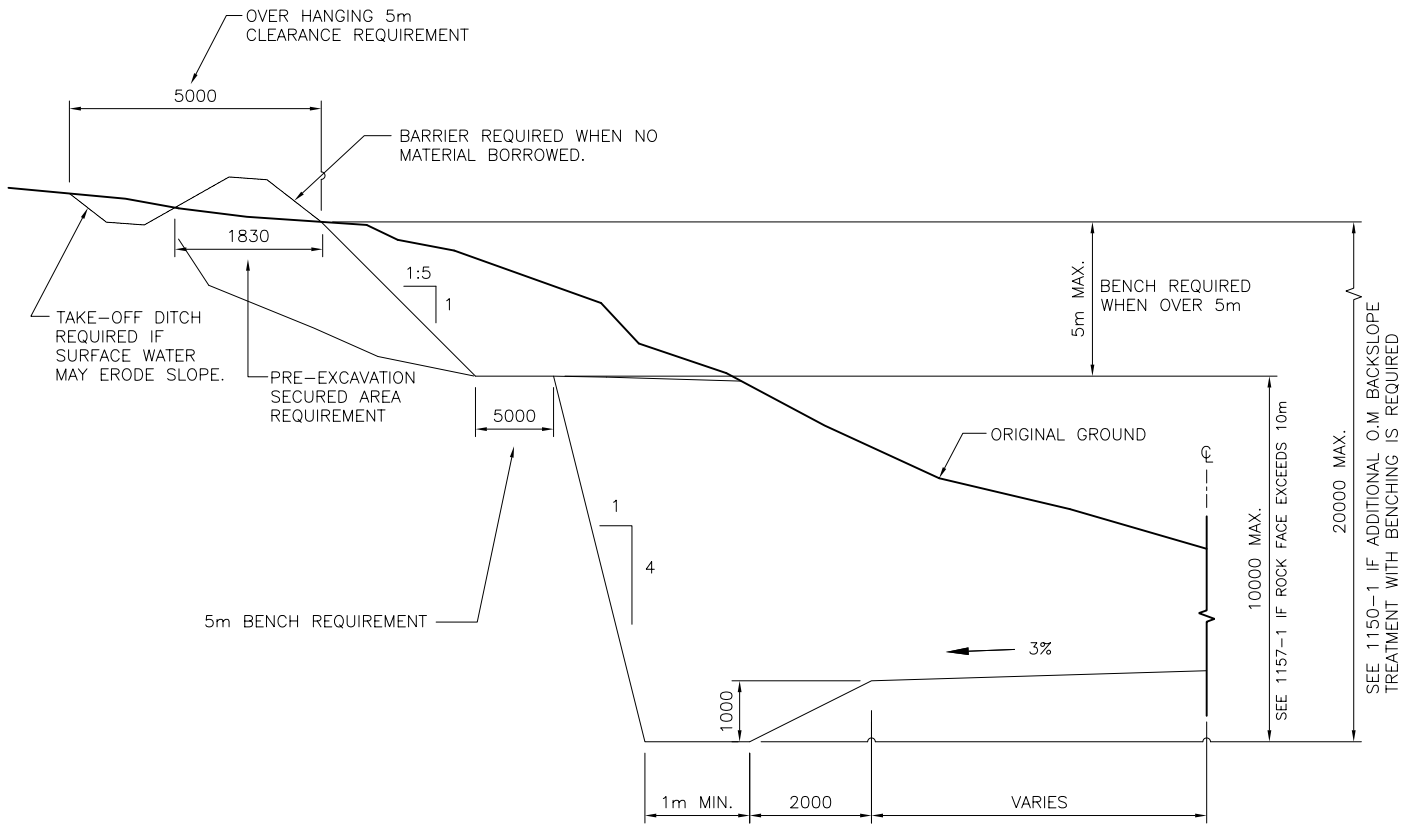
| Millimetres | Inches | Rate Per Hour |
|-------------|--------|---------------|
| 152.4 mm    | 6"     | \$14.65       |
| 203.2 mm    | 8"     | \$25.90       |
| 254.0 mm    | 10"    | \$29.40       |

### 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        |





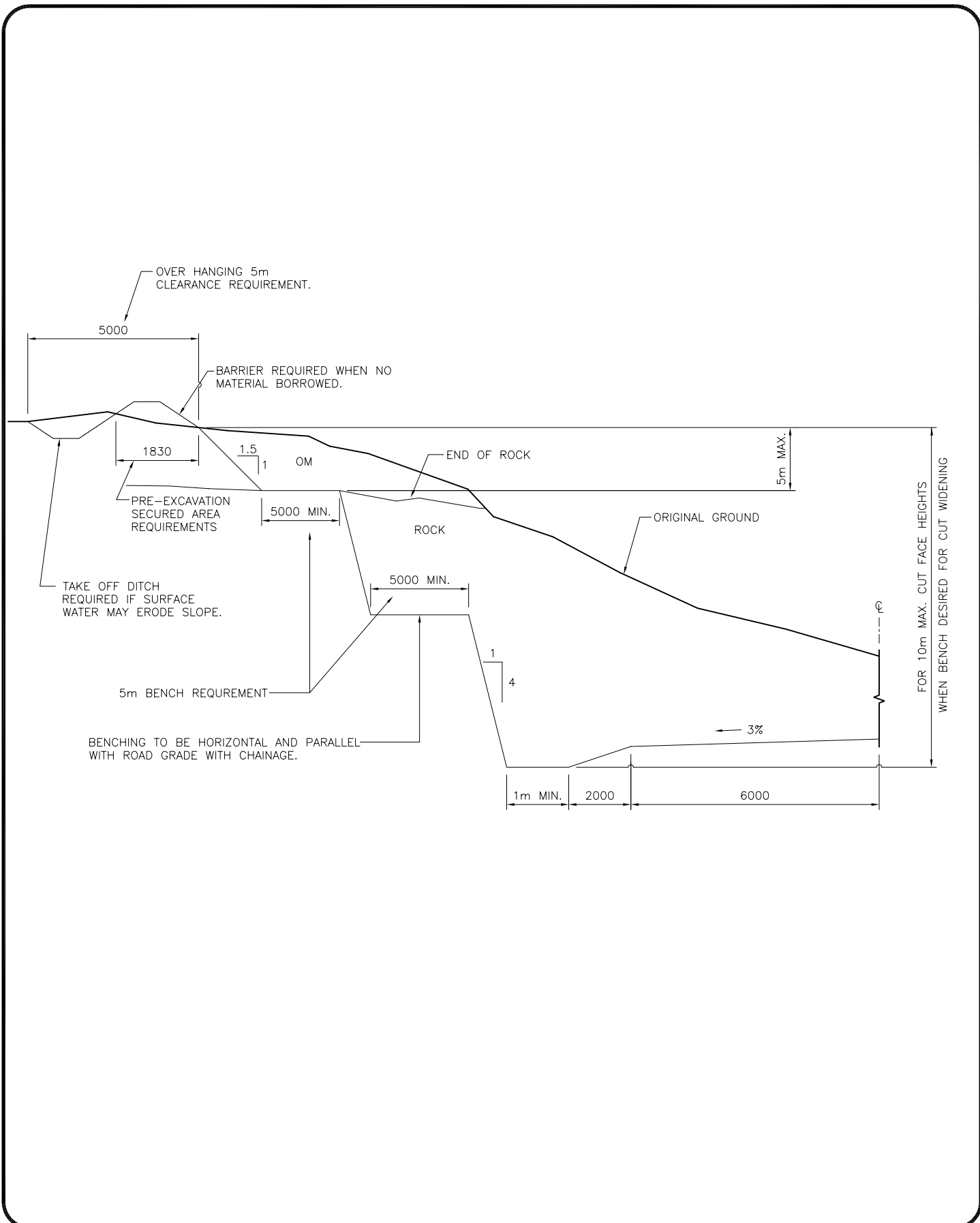
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

## TYPICAL SECTION - ROCK CUT WITH NO BENCHING

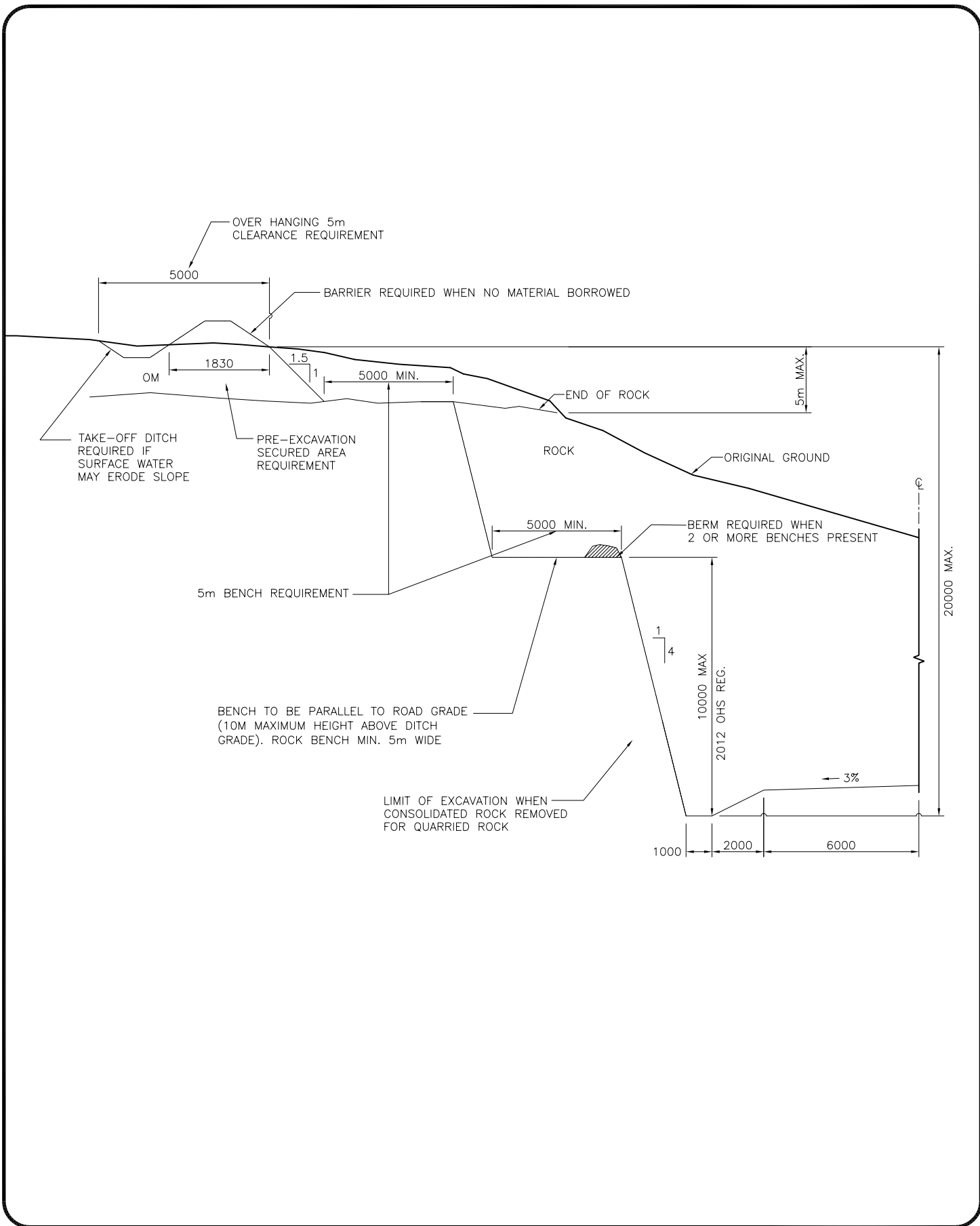
DRAWN BY: M.B

DATE: 01-04-13

SCALE N.T.S.







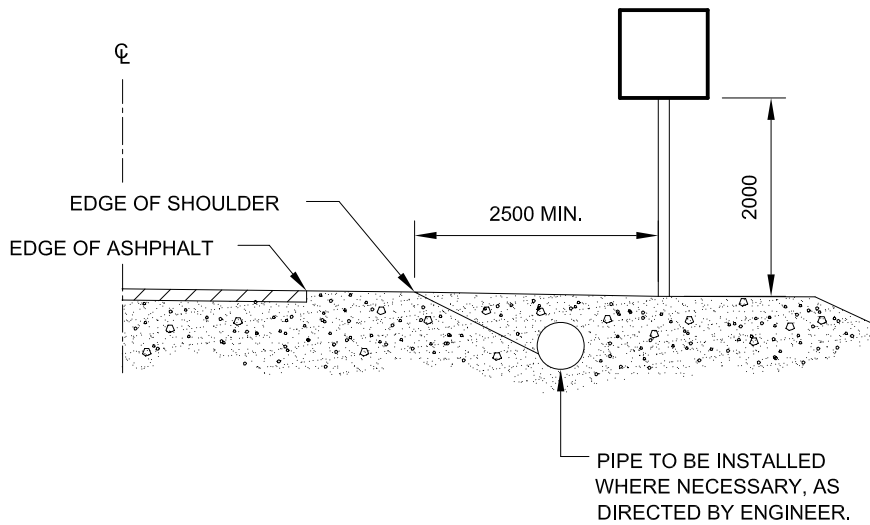
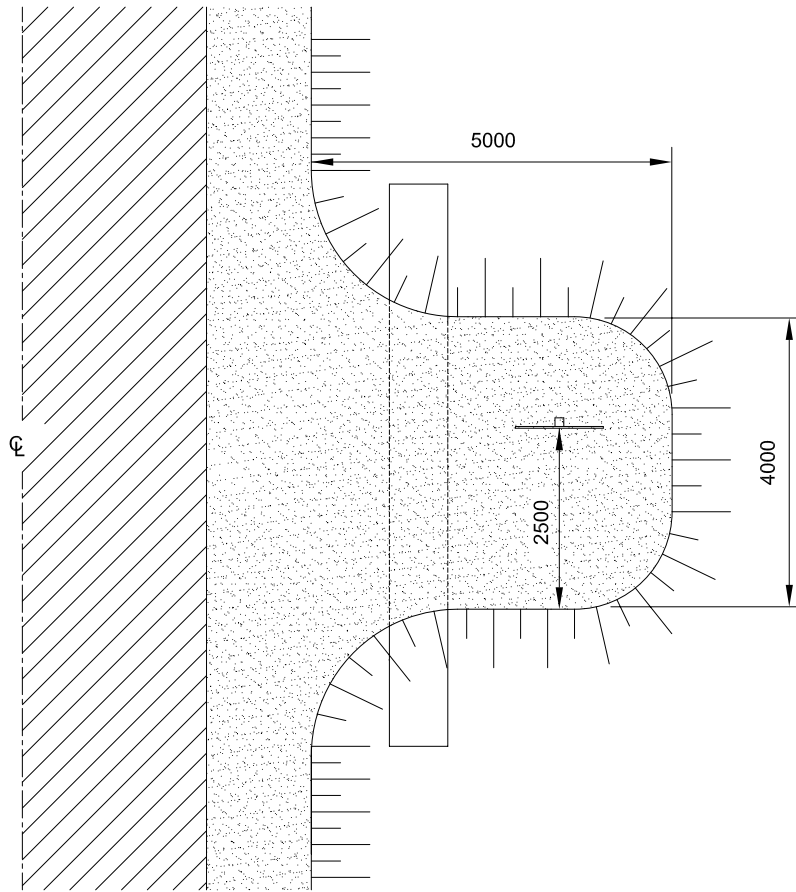
TRANSPORTATION AND WORKS  
HIGHWAY DESIGN DIVISION

**TYPICAL SECTION - ROCK BACKSLOPE  
TREATMENT WITH OVER 10 m CUT HIEGHT**

DRAWN BY: M.B.

DATE: 01-04-13

SCALE N.T.S.



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

