

Skilled Trades 1201



Government of Newfoundland and Labrador
Department of Education

Curriculum Guide (interim)
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Section I:

Program Overview and Rationale

Background

Skilled Trades 1201 is grounded in the Foundation for the Atlantic Canada Technology Education Curriculum. The teacher is directed to the Foundation document for specific information that forms the basis for this course. The Foundation is referenced at appropriate points in this document. As well, the Specific Curriculum Outcomes that form the basis of the course are each referenced to the Key Stage Curriculum Outcomes in the Foundation.

Skilled Trades 1201 has been developed to give students a sense of the prescribed skilled trades and the Red Seal skilled trades. It provides a more detailed depth of treatment for six of the trades by referencing them to standard practices in residential construction.

Rationale

Skilled Trades 1201 is grounded in the Foundation for the Atlantic Canada Technology Education Program. The foundation articulates technology as the human constructed world which consists of knowledge, processes and products, and Technology Education as a program to enable K-12 students to make sense of their technological environment.

Knowledge of needs and wants drives humans to modify their environment to meet those needs and wants. Knowledge of the resources needed to meet the needs and wants enables them to succeed. Use of resources requires knowledge of a wide range of technological processes ranging from the broadest technological problem

solving and design to the most minute detail of how to use a tool.

Technological processes include processing of materials by separating, shaping, combining and finishing them; management of projects; encoding information with assorted text, image and video tools, and following safety protocols.

Technological products are 'visible' aspects of technology. They range from clothes and food to microbes and spaceships. The most visible part of the built world includes buildings, roadways, vehicles, and all those appliances, large and small, that we take for granted.

Much of this highly visible built environment is built and maintained by people working in the skilled trades. This course introduces students to the world of the skilled trades and lets them experience how skilled tradespersons interact with, and employ a wide variety of technological knowledge, processes and products in their daily work.

Purpose of the Curriculum Guide

This curriculum guide serves three broad purposes

- It provides a set of outcomes which articulate a level of expected achievement for students
- It provides teachers with student activities, background information, resources, and references which help them plan and implement the course. In addition it provides recommendations for student assessment which helps to determine how well a student has meet the outcomes

Technological Literacy, Capability, and Responsibility through the Skilled Trades

Most definitions of literacy describe it as being able to read, write and communicate. The standard is not usually defined. However, one may infer that for literacy to be of use, it has to endow the literate person with the skills to read and write with technology and be at least conversant about the issues that vex that society. In a technologically sophisticated society that means being

able to use and understand a wide array of technological systems and resources.

Technology education (Foundation) posits that basic reading and writing is only the beginning of the broader context of literacy. Technological literacy gives people a broader understanding of the issues and impact of technological systems and change and the skill to communicate using various technologies. Technologically literate people

- understand the role and nature of technology
- understand how technological systems are designed, used, and controlled
- critically examine technologies
- respond rationally to ethical dilemmas caused by technology

Technology education further defines technologically capable people as those who

- respond in innovative and inventive ways by employing iterative technological problem solving strategies
- exhibit attitudes and behaviours that are conducive to solving problems when the solutions are not obvious or there are multiple solutions
- rationalize decisions and predict the effects of technological action

A quick look at programmes of studies and workplace activities for any of the skilled trades reveals that the skilled trades person embodies these descriptors for a specific area of technology. They communicate in and about their area of speciality using the lingua franca of that trade (spoken, written and technical drawings). They make decisions and create solutions, sometimes innovatively, and they are held accountable for their actions by their employers and clients and by codes and regulations.

By giving students both a high level understanding all trades, and a look at the details of selected trades, Skilled Trades 1201 lays a foundation for students to develop introductory technological literacy, capability and responsibility in the trades.

Context for Learning and Teaching

Technology education curriculum in Atlantic Canada adheres to certain principles that guide decisions shaping the continuous improvement of learning and teaching. These principles guide the design and implementation of the curriculum and include:

- **Authenticity.** The skilled trades person acquires a particular body of knowledge, skills, and values which, taken together, provide a particular technological literacy and capability essential to work in that trade. This course attempts to replicate selected elements which give the student a feel for the world of work unique to that trade and the relationship of that world of work to formal study leading towards improving chances for success.
- **Unity.** Just as the apprenticeship programs for the skilled trades make connections across different bodies of knowledge and practice, ranging from the academic to the practical, and from personal qualities to interpersonal relationships, so do courses in technology education. Skilled Trades 1201 accomplishes this by setting up individual and group activities which require development of technical knowledge and skills in concert with more reflective and contemplative personal activities.
- **Constructivism.** Learning experiences in this course reflect the reality of the trades. Students engage actively in translating the abstract world of design, descriptions, drawings and discussions into the physical world of structures, circuits, finishes, and plumbing water supplies. By responding to understandings of need and want and translating that into technological structures and systems, they build a deep and rich understanding of technology as intellectual and physical processes
- **Collaboration.** Technology is a collaborative endeavour. It is created, assessed, used, bought, sold, and discarded by individuals and groups. It is a collaborative process that defines our society. The skilled trades are an integral part of that societal process. Skilled workers function in teams on jobs large and small, in shifts and in scheduled and cascaded processes where the work of one trade must be done before another can begin, and when several trades work simultaneously, each co-dependant on the

other. The diversity and complexity of collaborative processes is replicated in controlled ways in Skilled Trades 1201

- **Autonomy.** Learners in Skilled Trades 1201 are engaged in managed and independent learning activities. Students are expected to exercise autonomy commencing with initial simpler activities and concluding with more complex projects that they plan and execute in individual and team settings.
- **Continuous Inquiry.** Technology is in constant flux and is growing logarithmically. New materials, new tools and techniques, new policies and codes are an expected part of the life of the skilled tradesperson, as is the need for constant recertification. Skilled Trades 1201, like all technology education courses embeds continuous inquiry a standard technique in technological problem solving.
- **Continuous Improvement.** Continuous improvement is a learned process. It is fostered in technology education by embedding self-review and any-time revision/updating of a project or activity. At all key phases of a project, mechanisms are embedded to enable and encourage students to understand the consequences of decisions and to revise thinking and practice based on that understanding. Assessment and rubrics reflect this approach
- **Continuous Learning.** As technology changes, our world changes. Our means, and our methods, of communication, travel, play, work, relating to one another, and even living change as well. The need to constantly learn is not just for some, but for all.

Meeting the Needs of all Learners

The Foundation document clearly elaborates a vision for Technology Education in the province of Newfoundland and Labrador, which fosters the development of technologically literate and technologically capable members of society. This vision does not discriminate with respect to ability, race, gender, ethnicity, values, lifestyle, or language. Technology education meets diverse needs of children of all levels of ability by

- providing an environment that reflects those needs through curriculum development,
- fosters attitudes of acceptance and tolerance, and
- provides an expectation of success.

Skilled Trades 1201 blends the development of knowledge, skills and capabilities through a hands-on approach. A significant portion of the students time is spent in a technology lab, engaged in activities that employ a wide variety of tools, equipment and materials. Some of those tools have safety requirements which are managed by requiring 100% responses on written, verbal and performance test for those tools prior to use. This makes for a safe, demanding, but highly rewarding environment, where attention to one's surroundings is of primary importance. Student safety is of paramount importance. The safety regime for the lab requires that proper procedures are understood and implemented by all students.

The outcomes identified in this curriculum guide provide the basis for achievement of key stage and general curriculum outcomes identified in the foundation document. Skilled Trades 1201 meets the needs of a broad cross-section of abilities and may include students that are identified with exceptionalities.

Effective Assessment and Evaluation Practices

Assessment is the systematic process of gathering information on student learning.

Evaluation is the process of analysing, reflecting upon, and summarizing assessment information, and making judgments or decisions based upon the information gathered.

The assessment process provides the data, and the evaluation process brings meaning to the data. Together, these processes improve teaching and learning. If we are

to encourage enjoyment in learning for students, now and throughout their lives, we must develop strategies to involve students in assessment and evaluation at all levels. When students are aware of the outcomes for which they are responsible, and the criteria by which their work will be assessed or evaluated, they can make informed decisions about the most effective ways to demonstrate their learning.

Assessment and evaluation are essential components of learning and teaching in technology education. Without effective assessment and evaluation it is impossible to know whether students have learned, whether teaching has been effective, or how best to address students' learning needs. The quality of assessment and evaluation in the educational process has a profound and well-established link to student performance. Research consistently shows that regular monitoring and feedback are essential to improved student learning. What is assessed and evaluated, how it is assessed and evaluated, and how results are communicated send clear messages to students and others about what is really valued—what is worth learning, how it should be learned, what elements of quality are considered most important, and how well students are expected to perform.

Teacher-developed assessments and evaluations have a wide variety of uses, such as

- providing feedback to improve student learning
- determining whether curriculum outcomes have been achieved
- certifying that students have achieved certain levels of performance
- setting goals for future student learning
- communicating with parents about their children's learning
- meeting the needs of guidance and administrative personnel

[Excerpted from the Foundation for the Atlantic Canada Technology Education Curriculum document (page 32).]

Professional Development

Professional development is a continuous process. Time, experience, and willingness to continuously improve are important elements.

Technology Education teachers need to have multiple proficiencies, ranging from theory to pedagogical practice, from knowledge of course content to capability with the tools and techniques that students are expected to use. Skilled Trades 1201 teachers need to manage shop equipment and the students using that equipment. They need to guide students through open-ended design, planning and fabrication, and be able to demonstrate safe practices for all applications of the tools, equipment and procedures of a trade. They need to manage parallel streams of course content while multiple groups of students engage in different activities.

The technology education lab, is a busy place with many things happening simultaneously. What may seem at first like chaos, is actually quite structured and organized.

Section II:

Curriculum Design and Components

Outcomes Structure

Curriculum content and student activities are defined with respect to a structure of curriculum outcomes (Figure 1). The essential components of the outcomes structure are:

- **EGLs.** Essential Graduation Learnings are statements describing the knowledge, skills, and attitudes expected of all students who graduate from high school.
- **GCOs.** General Curriculum Outcomes are statements that identify what students are expected to know and be able to do upon completion of study in a curriculum area.
- **KSCO's.** Key Stage Curriculum Outcomes provide additional detail for each of the GCOs. There are four Key Stages - Key Stage 1 (K-Grade 3), Key Stage 2 (Grades 4-6), Key Stage 3 (Grades 7-9), and Key Stage 4 (Grades 10-12). Key Stage Curriculum Outcomes provide a means to quickly assess progress in a subject area at the end of a level of schooling.
- **SCO's.** Specific Curriculum Outcomes are statements which describe knowledge, skills, and attitudes, in measurable terms, that students should possess upon completion of a grade level or course.

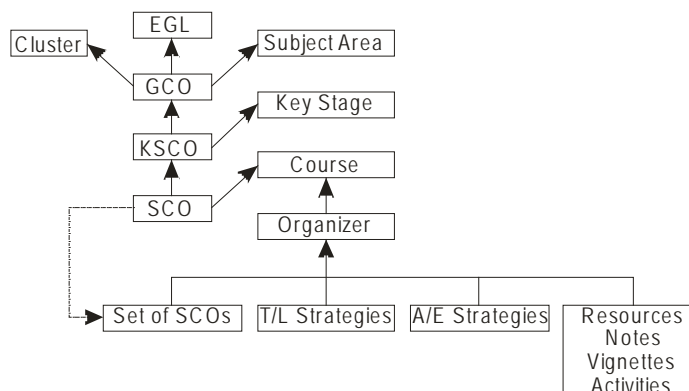


Figure 1 Curriculum Outcome Structure

Essential Graduation Learnings (EGLs)

Essential Graduation Learnings are documented in the Outcomes section of the *Foundation for the Atlantic Canada Technology Education Curriculum (2001)* document. The Essential Graduation Learnings (EGLs) are:

- **Aesthetic Expression.** Graduates will be able to respond with critical awareness to various forms of the arts and be able to express themselves through the arts
- **Citizenship.** Graduates will be able to assess social, cultural, economic, and environmental interdependence in a local and global context.
- **Communication.** Graduates will be able to use the listening, viewing, speaking, reading, and writing modes of language(s), and mathematical and scientific concepts and symbols, to think, learn, and communicate effectively.
- **Personal Development.** Graduates will be able to continue to learn and to pursue an active, healthy lifestyle.
- **Problem Solving.** Graduates will be able to use the strategies and processes needed to solve a wide variety of problems, including those requiring language, and mathematical and scientific concepts.
- **Technological Competence.** Graduates will be able to use a variety of technologies, demonstrate an understanding of technological applications, and apply appropriate technologies for solving problems.

- **Spiritual and Moral Development.** Graduates will be able to demonstrate understanding and appreciation for the place of belief systems in shaping the development of moral values and ethical conduct.

Reference to the *Foundation for the Atlantic Canada Technology Education Curriculum (2001)* document is encouraged

General Curriculum Outcomes (GCOs)

Technology Education curriculum in the Atlantic Provinces is defined in terms of five General Curriculum Outcomes (GCO's). These define the intent and focus of the Technology Education Program and apply from Kindergarten to Grade 12.

They are:

- **GCO 1: Technological Problem Solving.** Students will be expected to design, develop, evaluate, and articulate technological solutions.
- **GCO 2: Technological Systems.** Students will be expected to evaluate and manage technological systems.
- **GCO 3: History and Evolution of Technology.** Students will be expected to demonstrate an understanding of the history and evolution of technology, and of its social and cultural implications.
- **GCO 4: Technology and Careers.** Students will be expected to demonstrate an understanding of current and evolving careers and of the influence of technology on the nature of work.
- **GCO 5: Technological Responsibility.** Students will be expected to demonstrate an understanding of the consequences of their technological choices.

Key Stage Curriculum Outcomes (KSCO's)

The Key Stage Curriculum Outcomes for Technology Education are listed in the Outcomes section of the *Foundation for the Atlantic Canada Technology Education Curriculum (2001)* document. Key Stage Curriculum Outcomes (KSCO's) expand the intent of the GCO's and summarize what is expected of students during each of the four Key Stages. The *Skilled Trades 1201* document adheres to the KSCO's at the Key Stage 4 level (Grades 10-12).

The Key Stage 4 Curriculum Outcomes listed are organized according to each of the five General Curriculum Outcomes (GCO's) for the Atlantic Canada Technology Education Curriculum.

GCO 1:

Technological Problem Solving. Students will be expected to design, develop, evaluate, and articulate technological solutions.

By the end of grade 12, students will have achieved the outcomes for entry to grade 9 and will also be expected to

- [1.401] articulate problems that may be solved through technological means
 - assess diverse needs and opportunities
 - construct detailed design briefs that include design criteria and a work schedule
- [1.402] conduct design studies to identify a technological solution to a problem
 - investigate related solutions
 - document a range of options to solve this problem
 - determine and justify the best option
 - determine resource requirements and availability
 - develop detailed action plans, including technical drawings and sequences of action
- [1.403] develop (prototype, fabricate, make) technological solutions to problems
 - match resources and technical processes for specific tasks
 - construct and test models and prototypes as needed
 - construct the solution with adherence to the design criteria
 - document activities, decisions, and milestones
- [1.404] critically evaluate technological solutions and report their findings
 - develop detailed evaluations of both their own and others' technological solutions, with reference to independently developed criteria
 - employ a continuous assessment methodology with the purpose of continuous improvement of the design
 - document and report their changes, the rationale for change, and conclusions

- [1.405] communicate ideas and information about technological solutions through appropriate technical means
- accurately present technical information by using a representative sample of analog and digital tools, including, for example, two- and three-dimensional, computer-assisted drafting and modelling tools
- create accurately scaled models and prototypes

GCO 2:

Technological Systems. Students will be expected to operate and manage technological systems.

By the end of grade 12, students will have achieved the outcomes for entry-grade 9 and will also be expected to

- [2.401] operate, monitor, and adjust technological systems of increasing complexity
- [2.402] manage technological systems of increasing complexity
- [2.403] modify programming logic and control systems to optimize the behaviour of systems
- [2.404] deconstruct complex technological systems into their simpler systems and components
- [2.405] troubleshoot and maintain systems

GCO 3:

History and Evolution of Technology. Students will be expected to demonstrate an understanding of the history and evolution of technology, and of its social and cultural implications.

By the end of grade 12, students will have achieved the outcomes for entry-grade 9 and will also be expected to

- [3.401] evaluate technological systems in the context of convergence where one system has multiple functions, or divergence where multiple systems have the same function
- [3.402] evaluate the symbiotic roles of technology and science in modern society
- [3.403] analyse the symbiotic relationship between technology and education, including factors that influence standards for technological literacy and capability, and ways that the community responds
- [3.404] critically evaluate the effects of accelerating rates of technological change on self and society
- [3.405] account for effects of cultural diversity on technological solutions
 - critically examine the effects of cultural diversity on market forces and technological products, and vice versa
 - incorporate knowledge of cultural diversity into development of technological solutions

GCO4:

Technology and Careers. Students will be expected to demonstrate an understanding of current and evolving careers and of the influence of technology on the nature of work.

By the end of grade 12, students will have achieved the outcomes for entry-grade 9 and will also be expected to

- [4.401] assess and evaluate employability profiles for a variety of workplaces and careers and determine the level of technological literacy and capability they would need to achieve for job entry
- [4.402] employ design and invention as tools to create entrepreneurial activity
- [4.403] envision their short- and longer-term future and develop a plan for acquiring the technological literacy/capability required to achieve their vision

GCO 5:

Technological Responsibility. Students will be expected to demonstrate an understanding of the consequences of their technological choices.

By the end of grade 12, students will have achieved the outcomes for entry-grade 9 and will also be expected to

- [5.401] demonstrate responsible leadership in employing legal and ethical rules and principles
- [5.402] demonstrate responsible leadership in employing health and safety rules and standards
- [5.403] demonstrate responsible leadership in taking proper measures to manage current and future technological risk

Section 3:

Specific Curriculum Outcomes

Program Components

The Skilled Trades 1201 is an introduction to the designated trades in this province and the inter-provincial Red Seal trades. It looks briefly at the structure of the trades, including the formal schooling aspect of cross-trade courses, and trade specific courses. Some time is spent with technical drawings, one of the key cross-trade capabilities. A significant part of the course focuses on 6 construction related trades

- Carpentry
- Residential Electrician
- Plumber
- Lather
- Painter-Decorator
- Mason

Students examine each trade and develop rudimentary knowledge and skill. A construction project that spans all 6 trades serves to emulate some aspects of on-the-job experiences.

The course has 3 units

- Unit 1 Apprenticeship and the Skilled Trades
- Unit 2 Skills Common to all Trades
- Unit 3 Skill-building in Selected Trades

Timeline for Skilled Trades 1201

Skilled Trades 1201 is a 110 hour two credit course. A suggested breakdown of time for the course follows:

Unit 1 Apprenticeship and the Skilled Trades (6 hours)

- Topic 1 Apprenticeship Program (1 hour)
- Topic 2 The Skilled Trades (1 hour)
- Topic 3 Courses Common to all Skilled Trades (2 hours)
- Topic 4 Focus on 6 Skilled Trades (2 hours)

Unit 2 Skills Common to all Trades (24 hours)

- Topic 1 Technology and the Workplace (3 hours)
- Topic 2 Reading Blueprints and Drawings (18 hours)
- Topic 3 Working in the Technology Lab (3 hours)

Unit 3 Skill-building in Selected Trades (77 hours)

Experiencing the trades modularly

- Topic 1 Carpentry - Floor Construction (7 hours)
- Topic 2 Carpentry - Wall Framing (7 hours)
- Topic 3 Carpentry - Roof Trusses (7 hours)
- Topic 4 Construction Electrician - Circuits (7 hours)
- Topic 5 Construction Electrician - Residential Wiring (7 hours)
- Topic 6 Plumber - Toilet Installation (7 hours)
- Topic 7 Plumber - Sink Installation (7 hours)
- Topic 8 Lather (7 hours)
- Topic 9 Painter-Decorator (7 hours)
- Topic 10 Masonry: Ceramic Wall Tile Installation (7 hours)
- Topic 11 Masonry: Ceramic Floor Tile Installation (7 hours)

Using the Four Column Layout

Skilled Trades 1201 consists of three units of study, each of which is organized into several topics. Each topic is presented in a four column layout that spans 2 pages in the guide. The columns are

- Specific Curriculum Outcomes (SCOs)
- Suggested Teaching-Learning Strategies
- Suggested Assessment Strategies

- Resources

Specific Curriculum Outcomes

Specific curriculum outcomes are statements that specify what the student should know or be able to do on completion of the activities associated with the outcome.

Suggested Teaching-Learning Strategies

Teaching-Learning strategies offers suggestions for ensuring that students meet the requirements of the outcome. This column has two distinct parts—For the Teacher, and For the Student

- **For the Teacher** focuses on what the teacher needs to do in order to address the outcome. This includes advanced preparation and in-class strategies.
- **For the Student** focuses on what the student needs to do in order to achieve the outcome. Typically it takes the form of activities which may be unique to this outcome, or may be part of a larger activity that spans multiple outcomes. Activities can range from research to project-planning to fabrication of physical components.

Suggested Assessment Strategies

Assessment strategies indicate how to determine if the student has achieved an outcome. Since the outcome is addressed through activities and projects, assessment will indicate how to determine that the activity achieved the outcome. It is intended that this be used as an indicator of how to approach the outcome and assessment of the outcome

- Assessment identifies which of the rubrics in Appendix B Rubrics is most relevant for assessment of this outcome

Resources

Resources are of four primary types—References, Drawings, Tools, and Consumables.

- **References:** identify information in texts and on websites. Occasionally, drawings and other material are referenced if they have already appeared in previous outcomes. These items may include student produced work if they are considered a reference for the current outcome.

Resources (cont'd)

- **Drawings:** list drawings in Appendix A Support Materials that have been created specifically to meet the outcome requirements
- **Tools:** is a general reference to the kinds of tools needed for the activity. It will not be a complete list, since different options are available. Rather it should be treated as a reminder of the types of tools required. Tools of the trade will appear in separate lists in Appendix A Support Materials. These tool lists are provided as reference, to indicate the range of standard tools employed in the trade, and not as a required list for this course. Note that many of these tools require safety training. Any use requires testing with 100% accuracy on written/verbal and performance.
- **Consumables:** are considered to be things that are used up in the performance of the activity. Quantities will not be indicated since making that determination is usually part of the activity.

Unit 1 Apprenticeship and the Skilled Trades

Unit 1 Overview

The purpose of this unit is to develop understanding of the scope of the skilled trades, how to enter a trade through the apprenticeship program, and develop a sense of what it is like to work in selected trades

Organization

The unit is organized into four topics.

- Topic 1 Apprenticeship Program examines the apprenticeship program and the Red Seal certification.
- Topic 2 The Skilled Trades examines the Newfoundland and Labrador designated skilled trades and the Red Seal skilled trades
- Topic 3 Courses Common to all Skilled Trades examines the common core courses for the skilled trades in Atlantic Canada
- Topic 4 Focus on 6 Specific Trades examines the apprenticeship programs for 6 construction related trades in more detail. Specifically it looks at the technical courses unique to each, the work experiences unique to each and prospects for employment in each. The 6 trades are
 - Carpentry
 - Residential Electrician
 - Plumber
 - Lather
 - Painter-Decorator
 - Mason (Ceramic Tile)

Assessment

Specific assessment strategies are recommended for each outcome.

Topic 1 Apprenticeship Program

Specific Curriculum Outcomes

Students will be expected to

- 1.1.1 describe the apprenticeship program
[4.401]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to develop understanding of the apprenticeship program, and how to become an apprentice. It also distinguishes between certification for provincially designated trades and Red Seal, or inter-provincial, trades.

As preparation you will need to become familiar with the apprenticeship program. Apprenticeship policy is the jurisdiction of provincial Department of Education, Industrial Training Section. Their Apprenticeship and Certification Website is the primary reference in the resources. The specifics of apprenticeship programs are the mandate of the Provincial Apprenticeship and Certification Board. See the webpage at <http://www.ed.gov.nl.ca/app/pacb.htm> for details of the mandate and specific duties of the board. The full policy manual is available in PDF format at http://www.ed.gov.nl.ca/app/doc_pub/pdf/policymanual.pdf.

The Interprovincial Standards Red Seal programs website (http://www.red-seal.ca/Site/trades/analist_e.htm) will give you the full list of trades. The site will also be useful for the next topic.

Points to emphasize

- Describe what constitutes an apprenticeship
- Review of some of the programs available in Canada and this province
- Relationship between apprentice and journey person
- Designated trades versus red seal trades
- Certification process

For the Student

Using the specific links as reference, describe each of the following

- Apprenticeship
- The apprentice
- How to become an apprentice

Topic 1 Apprenticeship Program

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.

Research

- Students could define the following:
 - Apprenticeship
 - The apprentice
 - How to become an apprentice
 - The journeyperson
 - Provincial designated occupations/ trades
 - Certification (examination) in a designated trade
 - Red Seal trade
 - Certification (examination) in Red Seal trade

Presentation and Research

- Students could find the answers to the following questions:
 - What is the duration of apprenticeship?
 - Who administers the apprenticeship program?
 - Who are the partners to the apprenticeship agreement?
 - What are the roles of each partner?
 - What is the course component?
 - What is the workplace component?
 - What is the purpose of Logbook (Record of Occupational Progress)
 - How do the pay rates for apprentices compare to that of journeypersons?
- This research could be presented to the class as a whole, for different trades researched.

Resources

References

Government of Newfoundland and Labrador website Apprenticeship and Certification (<http://www.ed.gov.nl.ca/app/index.htm>).

Specific links on the site

- General Frequently Asked Questions at http://www.ed.gov.nl.ca/app/faq_gen.htm
- Information for pre-apprentices http://www.ed.gov.nl.ca/app/doc_pub/pdf/app_brochure.pdf
- Apprenticeship benefits at http://www.ed.gov.nl.ca/app/doc_pub/pdf/app-benefits-info-sheet.pdf
- Three paths to certification at http://www.ed.gov.nl.ca/app/doc_pub/pdf/app-paths-info-sheet.pdf
- General conditions governing apprenticeship at http://www.ed.gov.nl.ca/app/doc_pub/pdf/gen_conditions.pdf
- Provincial Apprenticeship and Training (<http://www.ed.gov.nl.ca/edu/post/app.htm>)

Topic 1 Apprenticeship Program

Specific Curriculum Outcomes

Suggested Learning and Teaching Strategies

Students will be expected to

- 1.1.1 describe the apprenticeship program
[4.401]

- The journeyperson
- Provincial designated occupations/ trades
- Certification (examination) in a designated trade
- Red Seal trade
- Certification (examination) in Red Seal trades

Answer the following questions

- What is the duration of apprenticeship?
- Who administers the apprenticeship program?
- Who are the partners to the apprenticeship agreement?
- What are the roles of each partner?
- What is the course component?
- What is the workplace component?
- What is the purpose of Logbook (Record of Occupational Progress)
- How do the pay rates for apprentices compare to that of journeypersons?

Topic 1 Apprenticeship Program

Suggested Assessment Strategies

Resources

- Students could also share these answers with the rest of the class in a presentation style. A group project could be started at this point, with each group of students given a single question or a single trade in which to answer the questions and then present the answers to the class.

Topic 2 The Skilled Trades

Specific Curriculum Outcomes

Students will be expected to

- 1.2.1 identify the Newfoundland and Labrador designated trades and the Red Seal trades

[4.401]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is for students to be aware of the full scope of the skilled and Red Seal trades in the province of Newfoundland and Labrador and in Canada.

Points to emphasize

- The scope of the skilled and Red Seal trades
- The difference between the two in terms of training and certification
- How each applies to inter-provincial employability
- Institutions capable of providing training

For the Student

Using the links provided by your teacher, perform the following tasks:

- Examine and list the types of trades that might be present on a construction site.
- Make a list of the Newfoundland and Labrador designated trades, complete with a one sentence description of each trade.
- Identify each of the designated trades as either a 7200, 5400, or a 4400 hour program.
- Make a list of the Red Seal trades, complete with a one sentence description of each trade
- Identify each of the designated trades as a 7200, 5400, or a 4400 hour program.

Topic 2 The Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.

Research

- Students could do a research project encompassing one or more of the following tasks:
 - Examine and list the types of trades that might be present on a construction site.
 - Make a list of the Newfoundland and Labrador designated trades, complete with a one sentence description of each trade.
 - Identify each of the designated trades as either a 7200, 5400, or a 4400 hour program.
 - Make a list of the Red Seal trades, complete with a one sentence description of each trade
 - Identify each of the designated trades as a 7200, 5400, or a 4400 hour program.

Resources

References

Interprovincial Standards Web Site, specifically:

- List of Red Seal Trades (http://www.red-seal.ca/Site/trades/analist_e.htm)
- Designated Trades Information for NL (<http://www.ed.gov.nl.ca/app/occupations/designatedtrades.htm>)
- Interprovincial Red Seal standards (http://www.red-seal.ca/Site/about/redseal_fall_2005.pdf)

Ellis Chart listing of provincial trades (<http://tableauellis.ca/Welcome.html>)

Skilled trades at <http://www.apprenticetrades.ca>.

- Select Newfoundland and Labrador to get a 30 page listing of analyses of the skilled trades in this province.

Topic 3 Courses Common to all Skilled Trades

Specific Curriculum Outcomes

Students will be expected to

- 1.3.1 identify the common core courses in the skilled trades programs in Atlantic Canada
[4.401] [4.403]

Suggested Learning and Teaching Strategies

For the Teacher

Apprenticeship programs in Atlantic Canada make use of a set of common core courses. These courses are not part of the technical requirement of the trade, but address peripheral knowledge and skills that are related to the trade. As an example, writing skills are assessed because of their ubiquitous use in the communication of information.

Points to emphasize:

- Course work dealing with writing and mathematical skills.
- Quality service as a part of doing business.
- Unions and their function in the skilled trade workplace.
- Methods of searching for and obtaining employment in the skilled trades.
- Entrepreneurship as an alternative to being employed by others.

For the Student

- Review several of the provincially designated trades identified in the last topic. Identify the common core courses that are taught concurrently with the trade.
- Create a table that details the types of knowledge gained in the common core courses.
- Using the information generated in the table, relate the type of knowledge to its use in each of the skilled trades.

Topic 3 Courses Common to all Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.

Research

- Students could review several of the provincially designated trades identified in the last topic and identify the common core courses that are taught concurrently with the trade.

Paper and pencil

- Students could create a table that details the types of knowledge gained in the common core courses.
- Students could then use the information generated in the table, to relate the type of knowledge to its use in each of the skilled trades.

Resources

References

“Plans of Training” for provincial Apprenticeship and Certification and at <http://www.ed.gov.nl.ca/app/plansoftraining/list.htm>

Plans of Training for the 7 courses

- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/carpenter.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/reselectrical.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/reselectrical.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/lather04.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/paintdecorator.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/sheetmetalworker.pdf>
- http://www.ed.gov.nl.ca/app/plansoftraining/pdf/sm_equip_service_tech_jul04.pdf

Workplace Learning and Skills for Life -Human Resources and Skills Development Canada at http://srv600.hrdc-drhc.gc.ca/esrp/awm/main/c_ap_observations_e.shtml

Topic 3 Courses Common to all Skilled Trades

Specific Curriculum Outcomes

Students will be expected to

1.3.2 understand the necessity of effective and well written workplace correspondence.

[4.403]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome addresses the Common Course Workplace Correspondence

Points to Emphasize:

- Writing skills can affect the success of a business/the success of a person working in that business.
- Highlight the importance of being able to convey ideas, thoughts, and to communicate with others.
- Being able to direct writing to a specific audience.
- Being able to emphasize specific points in writing.
- Importance of syntax and spelling mistakes.
- Proofreading and proper revision of documents.
- A business letter and a memo have differing purposes: memos inform, letters are used to convince/influence.
- Applications of workplace correspondence in each of the skilled trades

For the Student

- Review the skilled trades and identify examples of workplace correspondence that the tradesperson needs to respond to
- Review the skilled trades and identify examples of workplace correspondence that the tradesperson needs to create

Topic 3 Courses Common to all Skilled Trades

Suggested Assessment Strategies

Assessment

Research

- Students could review the skilled trades and identify examples of workplace correspondence that the tradesperson needs to respond to
- Students could review the skilled trades and identify examples of workplace correspondence that the tradesperson needs to create.

Paper and pencil

- Students could be asked to write a report on their experiences in the classroom to this point, highlighting how things could be improved as well as those things which have gone well. This report should be written in a methodology that properly reflects what would be a real piece of workplace correspondence.

Resources

References

Writing Professional Business Letters and Memos (<http://owl.english.purdue.edu/handouts/pw/#sub7>)

English text book from high school writing course.

Samples of Good and Bad Business Letters (<http://www.careersonline.com.au/easyway/apply/gbex.html>)

What makes a bad business letter (http://www.jobbankusa.com/business_cover_letter_sample.html)

Sample Letters (http://www2.jobtrak.com/help_manuals/jobmanual/cover.html)

Importance of Writing in the Workplace (http://www.writingcommission.org/prod_downloads/writingcom/writing-ticket-to-work.pdf)

Samples of Poorly Written Memos (<http://planet.tvi.cc.nm.us/ba122/Letters%20and%20Memos/Persuasive.htm>)

Topic 3 Courses Common to all Skilled Trades

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
<p>Students will be expected to</p> <p>1.3.3 demonstrate an understanding of the benefits of high quality of service [4.403] [5.401]</p>	<p>For the Teacher</p> <p>This outcome addresses the Common Course Customer Service</p> <p>Points to emphasize:</p> <ul style="list-style-type: none">• Quality service is the keystone to repeat customer business.• Quality service is key to a successful business.• Quality service is related to positive employee attitude.• Quality service is about the type of treatment given to the customer.• Good listening skills are imperative• Emphasize the importance of empathy• Clarify the difference between a want and a need• Understand the customers wants and needs.• Positive and negative channels of anger <p>You will need to provide copies of Appendix A U1T3 Quality Customer Service Checklist to students.</p> <p>For the Student</p> <p>Using the links provided, explore what is meant by “quality service” and write a paragraph that defines and described this construct in their own words.</p> <ul style="list-style-type: none">• Research and define the terms caveat emptor and caveat venditor. What significance do these terms have in the skilled trades world?• Create a table that lists five poor and five acceptable personal behaviours that influence quality service.• Complete the checklist of attitudes and behaviours provided by the teacher. Review and assess their own personal service level.

Topic 3 Courses Common to all Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.
- Students could use the links provided, to explore what is meant by “quality service” and write a paragraph that defines and described this construct in their own words.
- Students could create a table that lists five poor and five acceptable personal behaviours that influence quality service.

Research

- Students could research and define the terms caveat emptor and caveat venditor. What significance do these terms have in the skilled trades world?
- Students could complete the checklist of attitudes and behaviours provided by the teacher. Review and assess their own personal service level.

Resources

References

Business Today: An Introduction, John D. Kwekkeboom, McGraw Hill Ryerson, 1987. page 354.

United States Small Business Administration—quality of service at <http://www.sba.gov/managing/marketing/customer.html>

Government Standards for Quality Service—Gov’t of Ireland (<http://www.taoiseach.gov.ie/index.asp?docID=800>)

Microsoft Customer Service Education Modules —Microsoft standards (<http://www.microsoft.com/smallbusiness/resources/toolkit/module.aspx?mid=93>)

Appendix A U1T3 Quality Customer Service Checklist

Topic 3 Courses Common to all Skilled Trades

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
1.3.4 relate the role of organized unions to the skilled tradesperson. [4.403] [5.402]	<p>This outcome addresses the Common Course Workplace Skills</p> <p>Points to emphasize:</p> <ul style="list-style-type: none">• Rationale for the existence of labour unions in the workplace.• Historical impact that unions had on labour wages, rights, and benefits.• Relate the role of unions to ensuring a safe and hazard free work site for the skilled tradesperson.• Emphasize the need for participation in, and knowledge of, the respective trade unions.• The various worker protection associations such as:<ul style="list-style-type: none">• Workers compensation• Employment insurance• Occupational health and safety
	For the Student
	<ul style="list-style-type: none">• Examine some of the industry and construction organizations that might be represented on a construction/trades site.• Research the historical role of unions in Atlantic Canada. Using a time line itemize major events in the progress of unionism.• Find a union handbook that cites the regulations, codes, and other information pertaining to the protection of the worker. Have a class discussion about the types of union regulations governing the behaviour of workers.

Topic 3 Courses Common to all Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.

Research

- Students could examine some of the industry and construction organizations that might be represented on a construction/trades site.
- Students could research the historical role of unions in Atlantic Canada. Using a time line itemize major events in the progress of unionism.

Discussion/Group work

- Students could access a union handbook that cites the regulations, codes, and other information pertaining to the protection of the worker. Have a class discussion about the types of union regulations governing the behaviour of workers.

Resources

References

The Birth of Canadian Organized Labour at http://canadianeconomy.gc.ca/english/economy/1873Canadian_Labour_Union.html

Newfoundland Ministry of Labour—role of unions and labour at <http://www.hrle.gov.nl.ca/lra/>

Ontario Ministry of Labour at <http://www.worksmartontario.gov.on.ca/scripts/default.asp?contentID=1-4-1>

Work Safe, role of unions and safety in the workplace at <http://www.worksafesask.ca/startup/contributors.html>

Canada's Unique Social History—history of unionism at <http://www.socialpolicy.ca/cush/>

Canadian Labour History—history of unionism at <http://www.civilization.ca/hist/labour/lab01e.html>

Business Today: An Introduction, John D. Kwekkeboom, McGraw Hill Ryerson, 1987. page 217.

Trades Associations: Koel, unit 2 page 10-15.

UK Health and Safety HandBook for Union Reps at http://www.usdaw.org.uk/getactive/resource_library/files/RLFHandSRepsHbook/HSRepsHBook.pdf

Topic 3 Courses Common to all Skilled Trades

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
<p>Students will be expected to</p> <p>1.3.5 explore the process by which a person can search for prospective employment. [4.401] [4.403]</p>	<p>For the Teacher</p> <p>This outcome addresses the Common Course Job Search Techniques</p> <p>Points to emphasize:</p> <ul style="list-style-type: none">• The need for skilled tradespersons in NL and other parts of Canada.• Agencies responsible for helping locate prospective employment.• The role of the resume in the application process• Interview skills and techniques.• Standards of dress for interviews.• Appropriate language and used for interview responses.• Assessment of skills versus requirements. <p>For the Student</p> <ul style="list-style-type: none">• Search the local papers for advertisements for skilled trades positions. Create a collage that highlights the variety of positions available.• Prepare a cover letter and a resume in standard format as application for one of the jobs located in the previous activity.• Perform a mock interview, with the instructor grading the interview based upon accepted interview criteria.• Test your knowledge, Blankenbaker, page 559.

Topic 3 Courses Common to all Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.
- Prepare a cover letter and a resume in standard format as application for one of the jobs located in the previous activity.

Research

- Students could search the local papers for advertisements for skilled trades positions and create a collage that highlights the variety of positions available.

Interview

- Students could perform a mock interview, with the instructor grading the interview based upon accepted interview criteria.

Resources

References

Blankenbaker, page 535-558

Wagner & Smith, page 729-735.

Careers for Life (Interview section)

Career Development 2201 Curriculum materials

Business Today: An Introduction, John D. Kwekkeboom, McGraw Hill Ryerson, 1987. page 168-175.

Searching for a job. Services Canada. (<http://www.jobsetc.ca/>) In particular, career exploration, training options, Workers rights and benefits.

Seneca Career Resources. (http://ilearn.senecac.on.ca/careers/research/searching_for_employment.html) In particular, how to search for a job, types of employment, how to apply for a job.

Topic 3 Courses Common to all Skilled Trades

Specific Curriculum Outcomes

Students will be expected to

- 1.3.6 evaluate the need for quality assurance in the workplace with respect to codes and standards, quality of materials, and quality of workmanship.
[5.401]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome addresses the Common Course Work Quality Assurance

Points to emphasize:

- Construction codes of NL and Canada.
- Quality and standards of raw materials used on the jobsite.
- Occupational health and safety considerations for health risk to worker.
- Health risk to person assuming ownership of product that was constructed using sub-standard materials.
- Workmanship as a function of adhering to codes and regulations.
- Requirement of quality drawings and documents as a starting point for any job.

For the Student

- Write a paragraph and propose what it might mean to use substandard or cut rate materials in a project. Identify:
 - Structural implications
 - Impact on business and reputation
 - Quality of the job
 - Safety considerations on the work site
- Identify the code and standard setting bodies for Canada and the provinces.
- Review and suggest the potential cost of poor quality workmanship in terms of future costs, i.e.: insurance claims, legal liabilities.

Topic 3 Courses Common to all Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.
- Students could write a paragraph and propose what it might mean to use substandard or cut rate materials in a project. In this paragraph they should identify:
 - Structural implications
 - Impact on business and reputation
 - Quality of the job
 - Safety considerations on the work site

Research

- Students could identify the code and standard setting bodies for Canada and the provinces.
- Students could review and suggest the potential cost of poor quality workmanship in terms of future costs, i.e.: insurance claims, legal liabilities.

Resources

References

Blankenbaker, chapter 8

Feirer, section 2.1

Miller, Miller, & Baker, chapter 5

Wagner & Smith, unit 6

ISO 9001 standardization. Discusses the ISO 9001 protocols for quality assurance, standards of quality, product conformity, product quality - <http://praxiom.com/iso-9001.htm>

Topic 3 Courses Common to all Skilled Trades

Specific Curriculum Outcomes

Students will be expected to

- 1.3.7 understand the potential of entrepreneurial ventures versus regular employment.

[4.401] [4.402] [4.403]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome addresses the Common Course Entrepreneurial Awareness

Points to emphasize:

- Self-employment is a viable option to employment by companies
- Entrepreneurs have these identifiable characteristics:
 - Self-confidence
 - Energetic
 - Resourceful
 - Able to make decisions
 - Leaders
 - Determination
 - Ambition
- A good business plan is a must (business plan can be located at the RED board site)
- Agencies available to assist in planning and funding include
 - Regional Economic Development Board
 - Atlantic Canada Opportunities Agency
 - Business Development Bank of Canada

You will need to supply a sample business plan for one of the activities

For the Student

- Examine a sample business plan provided by the teacher.
- Contact your local RED board and discuss the entrepreneurship process, including:
 - Qualities of an entrepreneur
 - Starting a business
 - The business plan
 - Funding agencies
- Research, or find and interview a famous/successful local entrepreneur. Determine:
 - How they established their business
 - Failures and successes
 - Their mentors

Topic 3 Courses Common to all Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.
- Students could examine a sample business plan provided by the teacher. this could be from a Business Enterprise class.

Research

- Students could contact their local RED board and discuss the entrepreneurship process, including:
 - Qualities of an entrepreneur
 - Starting a business
 - The business plan
 - Funding agencies
- Students could research, or find and interview a famous/successful local entrepreneur. Determine:
 - How they established their business
 - Failures and successes
 - Their mentors

Resources

References

Seneca College - Entrepreneurship test, info on starting your own business, qualities needed to become an entrepreneur (<http://ilearn.senecac.on.ca/careers/entrepreneur/entrepreneurism.html>)

Regional Economic Development Boards—economic initiatives, funding potentials—(<http://www.intrd.gov.nl.ca/intrd/economicboards.htm>)

Atlantic Canada Opportunities Agency (ACOA) funding, business info (<http://www.acoa.ca/>)

ACOA - Sample Business Plan at <http://www.acoa.ca/e/business/tools.shtml>

Sample Business Plan at <http://www.zone-9.com/IWP.asp>

Entrepreneurship (characteristics of entrepreneurs): Wagner & Smith, page 735–736.

Topic 4: Focus on 6 Specific Skilled Trades

Specific Curriculum Outcomes

Students will be expected to

- 1.4.1 identify the technical courses for each of the selected trades, and identify the purpose of each course
[4.401] [4.403]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to develop a “big picture” view of 6 selected trades.

- Carpentry,
- Residential Electrician,
- Plumber,
- Lather,
- Painter-Decorator,
- Sheet Metal Worker,

Each trade has a Plan of Training which shows the full list of courses. Each plan of training has a section that lists the courses and another that gives the contents of each course. For each course, the purpose is usually written as course aims, usually not more than four statements.

Points to emphasize

- Each trade has a specific training plan
- Training plans involve technical, academic, and practical knowledge and skills
- Each course offered has a specific focus

For the Student

For the apprenticeship programs

- Carpentry,
- Residential Electrician,
- Plumber,
- Lather,
- Painter-Decorator,
- Mason,

Complete the following

- Make a list of the technical courses for each trade, organized by year
- Write the purpose of each course, usually included in the course as course aims

Topic 4: Focus on 6 Specific Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.
- Students could make a list of the technical courses for each trade, organized by year for the following apprenticeship programs:
 - Carpentry,
 - Residential Electrician,
 - Plumber,
 - Lather,
 - Painter-Decorator, and
 - Mason.
- For the previous list, students could also write the purpose of each course, usually included as course aims.

Resources

References

Alphabetical listing of the plans of training <http://www.ed.gov.nl.ca/app/plansoftraining/list.htm>

Plans of Training for the 7 courses

- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/carpenter.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/reselectrical.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/reselectrical.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/lather04.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/paintdecorator.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/mason.pdf>

Topic 4: Focus on 6 Specific Skilled Trades

Specific Curriculum Outcomes

Students will be expected to

- 1.4.2 identify and list the work experiences required for apprenticeship in the selected trades

[4.401] [4.403]

Suggested Learning and Teaching Strategies

For the Teacher

The apprenticeship program has significant work experience requirements, and this outcome focuses on that. Information in the Plans of Training identifies these requirements for most, but not all, of the trades. A bit of creative investigation may be in order. Inviting a tradesperson to class to discuss the apprenticeship program may be an option. Most programs have a block of in-school time followed by a block of work experience, followed by an in-school block. Depending on the apprenticeship program, the pattern is repeated over a period of 2 to 5 years.

Points to emphasize

- Each skilled trade has selected skills that an apprentice should experience
- These are elaborated as part of a training plan
- Examine a selection of the training plans for the apprenticeships for selected trades

For the Student

For the apprenticeship programs

- Carpentry,
- Residential Electrician,
- Plumber,
- Lather,
- Painter-Decorator,
- Mason,

Complete the following

- Draw a block diagram of each program showing the in-school and work experience blocks.
- Where information exists, make a list of the work experiences in each work experience block for each apprenticeship program.

Topic 4: Focus on 6 Specific Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.
- Students could draw a block diagram of each program showing the in-school and work experience blocks for the following apprenticeship programs:
 - Carpentry,
 - Residential Electrician,
 - Plumber,
 - Lather,
 - Painter-Decorator, and
 - Mason.
- For the previous list, students could, where information exists, make a list of the work experiences in each work experience block for each apprenticeship program.

Resources

References

Alphabetical listing of the plans of training <http://www.ed.gov.nl.ca/app/plansoftraining/list.htm>

Plans of Training for the 7 courses

- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/carpenter.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/reselectrical.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/reselectrical.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/lather04.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/paintdecorator.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/mason.pdf>

Topic 4: Focus on 6 Specific Skilled Trades

Specific Curriculum Outcomes

Students will be expected to

- 1.4.3 research and report job conditions and employment prospects for the selected trades

[4.401] [4.403]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to enable students to develop a sense of what it is like to work in a particular trade. As in the previous outcome, inviting trades people to class may be an option. You may wish to invite a person in the latter stages of apprenticeship as well as a journey person.

Points to emphasize

- Provide references to begin the research
- Provide criteria for the research and report. The rubric would be a starting point for criteria
- You may wish to present an overview of one trade, or work through the process of conducting the exercise for one trade.

For the Student

For the skilled trades

- Carpenter,
- Residential Electrician,
- Plumber,
- Lather,
- Painter-Decorator,
- Mason,

Complete the following

- Research and describe working conditions for each trade
- Research and describe employment prospects for each trade

Topic 4: Focus on 6 Specific Skilled Trades

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed on this outcome with Appendix B Knowledge Rubric.

Research

- Students could research and describe working conditions for the following apprenticeship programs:
 - Carpentry,
 - Residential Electrician,
 - Plumber,
 - Lather,
 - Painter-Decorator, and
 - Mason.
- For the previous list, students could research and describe employment prospects for each trade.

Resources

References

Labour Market Occupational profiles at <http://www.ed.gov.nl.ca/app/occupations/designatedtrades.htm>

Analysis of Red Seal Trades at http://www.red-seal.ca/Site/trades/analist_e.htm

Unit 2 Skills Common to all Trades

Unit 2 Overview Organization

The purpose of this unit is to develop understanding of the scope of the skilled trades, how one enters a trade through the apprenticeship program, and develop a sense of what it is like to work in selected trades

The unit is organized into three topics.

- Topic 1 Technology and the Workplace looks at the nature of technology, technological literacy and capability, and technological processes. It relates these to the skilled trades and uses troubleshooting as an example of a technological capability.
- Topic 2 Reading Blueprints and Drawings examines technical drawings as the primary communications tool for technical information in the skilled trades. It covers basic principles and applications in each of the 6 trades.
- Topic 3 Working in the Technology Lab examines safety and personal rules of conduct from several perspectives.
 - Personal rules based on shop rules and practices
 - Strategies for team and individual activities
 - Materials processing
 - Tool and equipment usage

Assessment

This unit has a value of 20% of the course. Specific assessment strategies are recommended for each outcome.

Topic 1 Technology and the Workplace

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
<p>Students will be expected to</p> <p>2.1.1 define and describe technology as a function of knowledge, processes, and products [3.403]</p>	<p>For the Teacher</p> <p>The purpose of this SCO is to introduce the concept of technology as the human constructed world.</p> <p>Points to emphasize:</p> <ul style="list-style-type: none">• Technology is how people modify the world around them.• Technology is a process (how we do things), the human constructed world (things that we make), and the knowledge and skills required to do those things.• Technological action has consequences, some good, some bad, some known, some unknown• Technology is inherently engaging in that it involves “doing”• “Technology is human innovation in action that involves the generation of knowledge and process to develop systems that solve problems and extend human capabilities.” (Foundation for the Atlantic Canada Technology Education Curriculum) <p>For the Student</p> <ul style="list-style-type: none">• Using the notes and examples given by the instructor, along with the reference materials provided to the student, write a one sentence definition of the term technology.• Give examples of each and describe technology in terms of:<ul style="list-style-type: none">• Technology as knowledge• Technology as process• Technology as product

Topic 1 Technology and the Workplace

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Knowledge Rubric

Research

- Using the notes and examples given by the instructor, along with the reference materials provided to the student, students could write a one sentence definition of the term technology.
- Students could give examples of each and describe technology in terms of:
 - Technology as knowledge
 - Technology as process
 - Technology as product

Resources

References

- Unit 1, Section 1, Lesson 1 of Communications Technology 2-3104 - (<http://www.cdli.ca/courses/ctecx104/>)
- Unit 1, Section 1, Lesson 1 of Integrated Systems 1205 (<http://www.cdli.ca/courses/isys1205/>)

Topic 1 Technology and the Workplace

Specific Curriculum Outcomes

Students will be expected to

- 2.1.2 describe technological literacy and capability
[3.403]

Suggested Learning and Teaching Strategies

For the Teacher:

The purpose of this sco is to introduce the concepts of technological literacy, technological capability, how technological literacy may lead to technological capability, and the difference between the two constructs.

Point to emphasize:

- Technological literacy is the ability to use technological systems, manage technological activities, and make informed decisions about technological issues.
- Technological literacy can be described as:
 - Knowing about,
 - Understanding,
 - Being able to discuss with understanding,
 - Being able to make informed decisions about technological issues, even complex ones like bio-engineering.
- Technological literacy does not mean that you can engage in those sorts of processes, only that you have knowledge of, even though your input may impact the decision to engage or not engage in such technologies.
- Technological capability is expressed as an action that results in new and innovative solutions through the application of one or more technological problem-solving strategies and the use of technological resources
- Technological capability requires literacy but goes further. It means you have specialized knowledge and skills and a willingness to engage in technological problem solving in the technology in question.
- Technological capability implicitly means engagement.

Topic 1 Technology and the Workplace

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Knowledge Rubric

Research

- Students could define technological literacy and capability.
- Students could identify areas of technology in which they feel they have technological literacy.
- Students could identify areas of technology in which they feel they have technological capability.

Resources

References

Unit 1, Section 1, Lesson 1 of
Communications Technology 2-3104
(<http://www.cdli.ca/courses/ctecx104/>)

Foundation for the Atlantic Canada
Technology Education Curriculum, The
Nature of Technology Section, ([http://
www.ed.gov.nl.ca/edu/sp/foundations/
tech_edu/te_found_nf-lab_full.pdf](http://www.ed.gov.nl.ca/edu/sp/foundations/tech_edu/te_found_nf-lab_full.pdf))

Topic 1 Technology and the Workplace

Specific Curriculum Outcomes

Students will be expected to

2.1.2 describe technological literacy and capability

[3.403]

Suggested Learning and Teaching Strategies

For the Student:

- Define technological literacy and capability.
- Identify areas of technology in which you feel you have technological literacy.
- Identify areas of technology in which you feel you have technological capability.

Topic 1 Technology and the Workplace

Suggested Assessment Strategies

Resources

Topic 1 Technology and the Workplace

Specific Curriculum Outcomes

Students will be expected to

2.1.3 identify technological processes in the skilled trades

[3.402][3.403]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is for students to identify and gain an understanding of the types of technological processes that exist, that are embedded in and are the foundation of the skilled trades.

Points to emphasize:

- Communication processes are
 - Encoding/decoding,
 - Storing/retrieving,
 - Sending/receiving
- Managing processes are
 - Planning,
 - Decision making,
 - Organizing,
 - Staffing,
 - Motivating,
 - Leading,
 - Controlling
- Control processes are
 - Sensing,
 - Switching,
 - Regulating
- Energy-power processes are
 - Conserving,
 - Converting,
 - Transmitting
- Production processes are
 - Separating,
 - Combining,
 - Shaping,
 - Finishing
- Biotechnology processes are
 - Propagating,
 - Growing,
 - Adapting,
 - Treating,
 - Maintaining,

Topic 1 Technology and the Workplace

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Knowledge Rubric

Research

- Students could identify and describe the technological processes by giving examples of each one in the skilled trades.
 - Communication processes of encoding/decoding, storing/retrieving, and sending/receiving
 - Managing processes of planning, decision making, organizing, staffing, motivating, leading, and controlling
 - Control processes of sensing, switching, and regulating
 - Energy-power processes of conserving, converting, and transmitting
 - Production processes of separating, combining, shaping, and finishing
 - Biotechnology processes of propagating, growing, adapting, treating, maintaining, harvesting, and converting

Resources

References

Blankenbaker,

- page 530, page 523
- chapter 2, 9

Mullin, Miller & Stephenson,

- unit 1 page 1
- unit 4, page 64- 66
- unit 6, page 115
- unit 26, page 381
- unit 31, page 459

Wagner & Smith,

- unit 4, 15, 13, 15, 16, 20

Unit 1, Section 1, Lesson 1 of Communications Technology 2-3104 (<http://www.cdli.ca/courses/ctecx104/>)

Unit 1, Section 1, Lesson 1 of Communications Technology 2-3104 (<http://www.cdli.ca/courses/ctecx104/>) (communication model)

Managing the Construction Site. Planning the Job. (http://www.bangor.ac.uk/ohs/safety_pages/inflink/managing_in_construction.htm)

Managing Risk, Disputes, & Other Site Related Info - (<http://www.pwc.com/extweb/industry.nsf/docid/707e1d1bdd3b2e0785256df800185c8c>)

Topic 1 Technology and the Workplace

Specific Curriculum Outcomes

Students will be expected to

2.1.3 identify technological processes in the skilled trades

[3.402][3.403]

Suggested Learning and Teaching Strategies

- Harvesting, and converting
- There are three primary processes in the construction skilled trades
 - Communication,
 - Managing,
 - Production
- Control and energy-power and bio-technology do play a role in the trades
 - Some trades are explicitly about energy-power and/or control systems, for example electrician and plumber

For the Student

Identify and describe the technological processes by giving examples of each one in the skilled trades.

- Communication processes of encoding/decoding, storing/retrieving, and sending/receiving
- Managing processes of planning, decision making, organizing, staffing, motivating, leading, and controlling
- Control processes of sensing, switching, and regulating
- Energy-power processes of conserving, converting, and transmitting
- Production processes of separating, combining, shaping, and finishing
- Biotechnology processes of propagating, growing, adapting, treating, maintaining, harvesting, and converting

Topic 1 Technology and the Workplace

Suggested Assessment Strategies

Resources

Topic 1 Technology and the Workplace

Specific Curriculum Outcomes

Students will be expected to

2.1.4 identify troubleshooting as a critical technological capability for a skilled tradesperson

[2.405]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to help students examine the concept of troubleshooting and relate its importance to the skilled trades workplace.

Points to emphasize:

- Equipment failures occur on a job site.
- Human resource issues may require troubleshooting skills, ie: labour unrest, wage issues, etc.
- Unexpected events can and will happen, and it is the responsibility of the tradesperson to be able to “think on their feet” and solve problems.
- Unexpected problems can crop up at any time.
 - Troubleshooting is also called problem solving which is an integral part of technology in that solutions arise out of the identification of problems, or opportunities. The key elements to troubleshooting are
 - Being able to identify opportunities, problems in scenarios
 - Posing appropriate solutions to those problems.
 - Suggesting appropriate means of evaluating the suitability of the solutions.
- For many systems, troubleshooting strategies are well documented. Typically the documentation will say something like “if this symptom occurs, check these items”.

For the Student

- Using a situation provided by the teacher, develop a solution to problem stating how the solution for the problem was created.
- Discuss the idea of how problem solving/troubleshooting can be considered to be a technological capability.
- Give some examples of typical troubleshooting situations that might arise in the home on a day to day basis.

Topic 1 Technology and the Workplace

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Knowledge Rubric

Problem solving

- Using a situation provided by the teacher, students could develop a solution to problem stating how the solution for the problem was created.

Discussion

- Students could discuss the idea of how problem solving/troubleshooting can be considered to be a technological capability.
- Students could give some examples of typical troubleshooting situations that might arise in the home on a day to day basis.

Resources

References

Wagner & Smith, unit 26, page 677-681

Integrated Systems IS1205, Unit 1, Section 1, Lesson 1. (<http://www.cdli.ca/courses/isys1205/>)

Integrating technology into problem solving (<http://www.uwsa.edu/ttt/morin.htm>)

Problem Solving Model (http://literacy.kent.edu/salt_fork/prob_solv/index.html)

Good Problem Solving Model with Example (<http://www.mediafrontier.com/Article/PS/PS.htm>)

Simple Problem Solving Situations. Use graphics and little text. (<http://www.dushkin.com/online/study/problemsolving.mhtml>)

Problem Solving Unit based upon deductive/inductive reasoning (http://gouchercenter.edu/jcampf/searching_for_solutions.htm)

Topic 1 Technology and the Workplace

Specific Curriculum Outcomes

Students will be expected to

- 2.1.5 assess the uses of information technology in the skilled trades [4.401]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to understand that levels of communication exist in the workplace, that an organized structure for managing those communications is necessary, and that a variety of tools exist to transfer those communications from person to person.

Points to emphasize:

- Information is often immediate and requires rapid distribution.
- Skilled trades work sites may have hundreds of workers in dozens of trades, each providing and asking for specialized information.
- Organization and distribution of information in some organized manner is directly related to the efficiency of the job site.
- Information may be graphical in nature, verbal, or written.
- Technological products and processes can play a role in managing the information of the job site.
- Information technology incorporates tools that disseminate information in a methodical and succinct manner using contracts, blueprints and plans, memos, fact sheets, e-mail, blackberries, cell phones
- There is a need to manage large volumes of information, for example chain of command: site supervisor to specific trade supervisor to foreman to worker.

For the Student

- After reviewing the materials presented by the teacher, discuss and formalize a definition of “information technology”.
- Pick 3 of the 6 trades and discuss how to have effective management of information between the trades on a job site.

Topic 1 Technology and the Workplace

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Knowledge Rubric

Discussion

- After reviewing the materials presented by the teacher, students could discuss and formalize a definition of “information technology”.

Research

- Students could pick 3 of the 6 trades and discuss how to have effective management of information between the trades on a job site.

Resources

References

Managing IT in an organization (http://en.wikipedia.org/wiki/Information_technology)

Paper on Construction Information Technology (http://www.itcon.org/cgi-bin/special/Show?_id=2006emerge)

Database of papers on Information Technology in Construction (<http://itc.fgg.uni-lj.si/>)

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes

Students will be expected to

2.2.1 correctly use the alphabet of lines
[1.401][2.401]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is for students to understand the basic building block of communication in the trades. Sketching is a basic communications skill essential for all the construction trades. Workers use the skill to develop drawings of parts of a project to ensure construction accuracy and to communicate ideas to others. As in all forms of communications, there is a core alphabet. For technical drawings, that begins with the standard forms of lines.

Sketching is a quick form of drawing. Except for the lack of drawing tools (mechanical or CAD), it is the same process as any other form of technical drawing. That is, the same types of drawings are created, both pictorial and orthographic.

It is absolutely critical that sketching take place without the use of mechanical drawing aids. This means no rulers, and no measuring devices. Only one aid is permissible—the use of grid paper to help keep lines straight and as an aid in aligning parts of the drawing. Appendix A U2T2 Orthographic Grid is provided for the purpose

Points to emphasize

- The alphabet of lines and the function of each type of line
- Proper sketching techniques for creating each line using a pencil and grid paper (grid needs to be very light)
- While learning to sketch properly can be time consuming initially, it is one of the most significant skills that crosses all trades
- Technical sketching is a critical communications tool for all the trades, and for all technical industries and professions.

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Using a horizontal/vertical grid paper (for example Appendix A U2T2 Orthographic Grid) to help align the sketch lines, and unlined plain paper with a grid placed beneath, students could sketch a few dozen of each line type, with the purpose of creating straight lines of the correct weight and stroke length
 - Construction line
 - Visible object lines
 - Hidden object lines
 - Centre lines
 - Extension lines
 - Dimension lines
- Students could also sketch a series of shapes using both grid and unlined paper:
 - Box
 - Triangle
 - Circle

Resources

References

CDLI Course Communications
Technology 2-3104, Unit 2, Section 3,
Lesson 2b (<http://www.cdli.ca/courses/ctecx104/>)

Drawings

- Appendix A U2T2 Orthographic Grid

Tools

- Sketching pencils

Consumables

- Copies of Appendix A U2T2 Orthographic Grid
- Other sketching paper

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Student
2.2.1 correctly use the alphabet of lines [1.401][2.401]	<p>Using</p> <ul style="list-style-type: none">• For the first set, a horizontal/vertical grid paper (for example Appendix A U2T2 Orthographic Grid) to help align the sketch lines• For the second set, unlined plain paper, with the grid placed beneath to help align the lines <p>Complete two sets by sketching a few dozen of each line type, with the purpose of creating straight lines of the correct weight and stroke length</p> <ul style="list-style-type: none">• Construction line• Visible object lines• Hidden object lines• Centre lines• Extension lines• Dimension lines <p>Complete two sets by sketching a series of shapes</p> <ul style="list-style-type: none">• Box• Triangle• Circle

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Resources

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
<p>Students will be expected to</p> <p>2.2.2 read and interpret pictorial drawings</p> <p>[1.401][1.402][1.403] [2.401][2.402]</p>	<p>For the Teacher</p> <p>The purpose of this outcome is to develop understanding of the standard method of representing three dimensional objects as drawings where more than one face of the object is visible in the same drawing. While there are a number of types of pictorial drawings, the two most commonly used are cabinet which is an older style, and isometric which is a more modern and more frequently used style.</p> <p>Many students have difficulty visualizing in 3 dimensions. A common approach is to use 3-D physical models to illustrate the relationships between the actual object and the drawing. A series of 3 drawings are provided in Appendix A U2T2 Drawings. Each drawing is based on a single 3-D shape. The sheet contains orthographic, isometric, cabinet projection, and a pattern for constructing the object from paper. For this outcome, you will need to use the isometric, cabinet, and possible the pattern drawings. The references to the Communications technology course include short video clip demonstrations of how to create each type of drawing.</p> <p>For this outcome you will need to:</p> <ul style="list-style-type: none"> • Create physical models of 3-D shapes, Name all of the faces on each model (1, 2, 3, etc). These can be made from wood, polyfoam, or folded paper. For folded paper use the patterns, and be sure to add tabs for gluing. • Print the cabinet projection and isometric drawing for each object. • Demonstrate the relationship between the named faces of the objects and the corresponding parts of the isometric drawings and cabinet projections. <p>You may wish to create a larger set of different, but simple, additional objects and drawings for use with students. The simpler shapes used here help students understand the relationships between the parts of the</p>

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Using models and drawings supplied by the teacher, students could:
 - Match parts of a cabinet projection to named faces on physical models
 - Match parts of isometric drawings to named faces on physical models

Resources

References

CDLI Course Communications
Technology 2-3104, Unit 2, Section 3,
Lesson 2c, 2d, 2e and the video clips
in Lesson 2 activities (<http://www.cdli.ca/courses/ctecx104/>)

Drawings

- Appendix A U2T2 Drawing 1 Isometric and Pattern
- Appendix A U2T2 Drawing 2 Isometric and Pattern
- Appendix A U2T2 Drawing 3 Isometric and Pattern

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes

Students will be expected to

2.2.2 read and interpret pictorial drawings

[1.401][1.402][1.403]
[2.401][2.402]

Suggested Learning and Teaching Strategies

object and how they are shown in different types of drawings. These forms appear in all mechanical drawings including building plans.

Points to emphasize

- Pictorial drawings are the primary method of representing technical information in a 3-D format.
- Cabinet projections combine a flat, front-on view of an object with an extruded depth at an angle of 30, 45, or 60 degrees. The depth is drawn at half the actual size.
- Isometric drawings are approximations of perspective drawings, but simplified so that the three major axes of a box are drawn vertical, and at 30 degrees from horizontal to the left and right. This makes them easy to do with mechanical drafting tools. All faces of an isometric are drawn using actual measurements (or using the same scale)
- Starting with the basic box shape, all objects can be drawn in an isometric layout. Special techniques exist for drawing circular and irregular shapes.
- The basic box has 6 faces. It is a convention (standard practice) to draw it with the longest face to the left.

For the Student

Using models and drawings supplied by the teacher

- Match parts of a cabinet projection to named faces on physical models
- Match parts of isometric drawings to named faces on physical models

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Resources

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
<p>Students will be expected to</p> <p>2.2.3 read and interpret orthographic projections</p> <p>[1.401][1.402][1.403] [2.401][2.402]</p>	<p>For the Teacher</p> <p>The purpose of this outcome is to develop understanding of the method of drawing that represents one face of the object at a time in a drawing. You will need to use the orthographic views from the drawings for this outcome.</p> <p>Six possible faces, or views, are available to represent a cube. In practice only three—labelled front view, right side view, and top view—are typically used. Check with the communications course info for details. Only three are used in the drawings from Appendix A. You will need to properly label the views before using the drawings, or do so with the students. One approach is to</p> <ul style="list-style-type: none"> • Show the 3-D models and review the isometric drawings for them. • Present the orthographic projections for each model and name the three standard views in the drawings. • Identify each named face from the model and related it to the corresponding view in the orthographic drawing • Relate the orthographic projections to the corresponding isometrics by identifying which face of the isometric corresponds to which view of the orthographic <p>Points to emphasize</p> <ul style="list-style-type: none"> • Each view of an orthographic is simply what the object looks like from that side. While there are six views (six faces), it is normal to only show three views. • The location of views is a convention. It is an agreed on way to do things that makes it easy for others to interpret a drawing based on the location of the views. • The labels for the views are also a convention, and it applies to the location, not to the actual object. Front, right side, and top views are the normal.

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Given a set of 3-D models and/or isometric drawings, and a set of orthographic projections students could match orthogonal views to the corresponding faces on the 3-D objects and / or isometric drawings

Resources

References

Wagner & Smith,

- unit 6,
- page 114-142

CDLI Course Communications Technology 2-3104, Unit 2, Section 3, Lesson 2f and the video clips in Lesson 2 activities (<http://www.cdli.ca/courses/ctecx104/>)

Drawings

- Appendix A U2T2 Drawing 1 Isometric and Pattern
- Appendix A U2T2 Drawing 2 Isometric and Pattern
- Appendix A U2T2 Drawing 3 Isometric and Pattern

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes

Students will be expected to

2.2.3 read and interpret orthographic projections

[1.401][1.402][1.403]

[2.401][2.402]

Suggested Learning and Teaching Strategies

The front view may in fact show the side of the object.

- The location of the views corresponds to the faces of the object in the isometric drawing. Measurements on the isometric correspond to measurements on the orthographic views
- Orthographic views are used in all technical drawings, including building plans

For the Student

Given a set of 3-D models and/or isometric drawings, and a set of orthographic projections

- Match orthogonal views to the corresponding faces on the 3-D objects and / or isometric drawings

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Resources

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes

Students will be expected to

2.2.4 sketch pictorial drawings
[1.405][2.402]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is enhance understanding of the relationship of the pictorial drawing to the real object and the orthographic views. Activities for this outcome can be accomplished with the drawings and models from the previous outcome. You will need to supply the isometric grid paper from Appendix A U2T2 ISO Grid. You may also wish to demonstrate use of the grid paper to create isometric sketches.

Points to emphasize

- The isometric grid paper has lines that are at the correct angles
- To use the grid, count spaces.
- Draw directly on the lines
- Alternately the grid can be placed below plain paper, or preferably tracing paper, which will result in cleaner drawings

For the Student

Given a set of 3-D models and corresponding orthographic projections, and using the isometric grid

- Sketch isometric drawings of the models on the isometric grid paper

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Given a set of 3-D models and corresponding orthographic projections, and using the isometric grid students could sketch isometric drawings of the models on the isometric grid paper

Resources

References

Wagner & Smith,

- unit 6, page 114-142

CDLI Course Communications
Technology 2-3104, Unit 2, Section 3,
(<http://www.cdli.ca/courses/ctecx104/>)

- Lesson 2 Activities and the video clips in Lesson 2 activities
- Lesson 3

Drawings

- Appendix A U2T2 Drawing 1 Isometric and Pattern
- Appendix A U2T2 Drawing 2 Isometric and Pattern
- Appendix A U2T2 Drawing 3 Isometric and Pattern
- Appendix A U2T2 ISO Grid

Consumables

- Copies of Appendix A U2T2 ISO Grid

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
2.2.5 sketch orthographic projections [1.405][2.402]	<p>The purpose of this outcome is enhance understanding of the relationship of the orthographic views to the real object and the pictorial.</p> <p>Activities for this outcome can be accomplished with the drawings and models from the previous outcome. You will need to supply the orthographic grid paper from Appendix A U2T2 Orthographic Grid. You may also wish to demonstrate use of the grid paper to create orthographic sketches.</p> <p>Points to emphasize</p> <ul style="list-style-type: none">• The views are aligned vertically and horizontally. The top and front views have the same width. The front and right side views have the same height. The right side view and the top view have the same length or depth• The view labels apply to the view location on the drawing, regardless of what is being drawn• Sketch the outlines first with construction lines and then block in the details with object lines• Views need to be in correct location and properly labelled.• All lines need to be of the correct type, and drawn properly.• All lines need to be of the proper weight and in perfect alignment with the grid. <p>For the Student</p> <p>Given a set of 3-D models and the corresponding isometric drawings, and using the orthographic grid</p> <ul style="list-style-type: none">• Sketch the front, side and top orthographic projections in the proper locations, and label the views

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Given a set of 3-D models and the corresponding isometric drawings, and using the orthographic grid students could sketch the front, side and top orthographic projections in the proper locations, and label the views.

Resources

References

Wagner & Smith, unit 6, page 114-142

CDLI Course Communications
Technology 2-3104, Unit 2, Section 3,
(<http://www.cdli.ca/courses/ctecx104/>)

- Lesson 2 Activities and the video clips in Lesson 2 activities
- Lesson 3

Drawings

- Appendix A U2T2 Drawing 1 Isometric and Pattern
- Appendix A U2T2 Drawing 2 Isometric and Pattern
- Appendix A U2T2 Drawing 3 Isometric and Pattern
- Appendix A U2T2 Orthographic Grid

Consumables

- Copies of Appendix A U2T2 Orthographic Grid

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes

Students will be expected to

2.2.6 correctly interpret drawing units and scale

[1.401][1.402][1.403]
[2.401][2.402]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to help students understand the use of measurement and scale in drawings.

Drawings may larger than, equal to, or smaller than the actual objects they represent. Very few objects are of a size that is convenient to represent actual size in a drawing. Most are smaller than or larger than the drawing. Buildings fall into the latter category.

To accurately represent larger objects in a drawing, a scale must be used. One unit of measure in the drawing represents a larger unit of measure in the real object. In the imperial system, a typical scale for a house plan is 1/4 inch on the drawing represents 1 foot in the real world. For a metric drawing a scale can be 10:1, 20:1 or 50:1. Drawings also use dimensions to indicate actual size.

For this outcome, you will need to use Appendix A U2T2 Scale Drawing

Points to emphasize

- Most drawings use a scale
- While the scale can have any ratio, there are standard ratios used for most drawings, especially for buildings. 1/4 “ to the foot, 20:1. 50:1 and so on.
- Scale ensures that drawings are an accurate representation of the object.
- While dimensions are placed on most drawings, sometimes it is easier to just measure the drawing and convert to the actual size using the scale.

For the Student

Given a partially dimensioned drawing, with a background grid, answer the following questions

- What is the total length and width of the building?
- What is the size of each of the smaller offices?
- What is the size of each window, and what is the distance from the center of each window to the outside edge of the left side of the building.

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Given a partially dimensioned drawing, with a background grid, students could answer the following questions,
 - What is the total length and width of the building?
 - What is the size of each of the smaller offices?
 - What is the size of each window, and what is the distance from the center of each window to the outside edge of the left side of the building.

Resources

References

Wagner & Smith, unit 6, page 114-42

Mullin Miller Stephenson Drawing 5 from the set of drawings with the text.

Drawings

- Appendix A U2T2 Scale Drawing

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes

Students will be expected to

2.2.7 read and interpret floor plans

[1.401][1.402][1.403]
[2.401][2.402]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to provide introductory experiences for students with the range of plans and structural drawings used in the construction trades.

Points to emphasize

- Using a complete set of house plans
- Demonstrate the relationship between the drawings of a house plan and orthographic projections. A floor plan is a top view of a building that has been cut horizontally about midway up the wall.
- Demonstrate a foundation drawing and how it represents the actual foundation
- Demonstrate a floor plan drawing and how it represents the actual house structure and layout
- Demonstrate elevation drawings and how they represent the facade of the house
- Demonstrate a section drawing and how it represents the structure of the building
- Demonstrate a detail drawing and how it represents the construction details of a small component of the building

For the Student

Given a set of house plans

- Read a foundation plan and determine building size and the location of doors, windows and support columns
- Read a floor plan and determine size of each room and location and size of windows and doors and other features
- Read an elevation drawing and identify the relationship of grade to the foundation and the type of siding and roofing.
- Read a section drawing and determine the actual components that make up the foundation, walls, floors and roof and the heights of structural components

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Given a set of house plans, students could
 - Read a foundation plan and determine building size and the location of doors, windows and support columns
 - Read a floor plan and determine size of each room and location and size of windows and doors and other features
 - Read an elevation drawing and identify the relationship of grade to the foundation and the type of siding and roofing.
 - Read a section drawing and determine the actual components that make up the foundation, walls, floors and roof and the heights of structural components

Resources

References

Wagner & Smith, unit 6, page 114-142

Mullin Miller Stephenson, Drawings 1 to 10 from the set of drawings with the text.

Drawings

- Appendix A U2T2 Foundation Plan
- Appendix A U2T2 Floor Plan
- Appendix A U2T2 Elevations
- Appendix A U2T2 Section Drawing
- Appendix A U2T2 Detail Drawing

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes

Students will be expected to

2.2.8 sketch floor plans
[1.405][2.402]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to further develop sketching technique while developing understanding of drawing used in construction. This exercise does not attempt to replicate the complexity of a set of building plans. Using the Appendix A drawings from the previous outcome, give students copies of

- A foundation plan
- A floor plan
- An elevation drawing
- Copies of the Appendix A Orthographic Grid paper.

Points to emphasize

- Proper use of lines is important
- Use of scale, or counting the grid to determine location of lines
- Ensuring that all the key elements of each drawing needs to be present
- Follow a technique of major outlines first with construction lines, followed by blocking in details with object lines
- All elements of the drawings should be included in the sketch
- Sketches should be accurate within the precision of the grid lines
- All lines should be of the correct type and weight
- Dimensions should be included
- The method of drawing should show that the student understands the components of the object being sketched.

For the Student

Working from provided drawings and with the aid of grid paper, sketch

- A foundation plan
- A floor plan
- An elevation drawing

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Working from provided drawings and with the aid of grid paper, students could sketch
 - A foundation plan
 - A floor plan
 - An elevation drawing

Resources

References

Wagner & Smith, unit 6, page 114-142

Mullin Miller Stephenson Drawings, 1 to 10 from the set of drawings with the text.

Drawings

- Appendix A U2T2 Foundation Plan
- Appendix A U2T2 Floor Plan
- Appendix A U2T2 Elevations
- Appendix A U2T2 Orthographic Grid

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
2.2.9 read and interpret electrical drawings [1.401][1.402][1.403] [2.401][2.402]	<p>The purpose of this outcome is to provide an introduction to the basic electrical symbols used on floor plans. Using the Appendix A U2T2 Electrical Drawing, and Drawings 8 and 10 from Mullin Miller Stephenson</p> <ul style="list-style-type: none">• Show examples of the electrical device (wire, switch, receptacle, ...) and sketch the symbol for that device• Demonstrate the electrical drawing and how the symbols represent locations of devices.• Demonstrate the method for showing circuits and the devices on the circuit, and the location of electrical appliances• Demonstrate the method for showing the location of the service entrance and distribution panel <p>Points to emphasize</p> <ul style="list-style-type: none">• The drawing has a reduced symbol set• Review the complete symbol set in the text references and identify those used most frequently• The use of dashed lines on drawing to indicate wire runs. The Appendix A drawing does not show circuit or home runs, only connections from switches to devices. Refer to the Mullen et al drawings for those items• Electrical drawings are used by carpenters to build the structures needed to hold the electrical devices. They are used by electricians to plan circuits and wiring runs, and to place electrical boxes and wires for the electrical rough-ins <p>For the Student</p> <p>Given the Appendix A U2T2 Electrical Drawing , examine it and make a list of the</p> <ul style="list-style-type: none">• Locations and number of 120 volt receptacles• Locations and number of lights• Locations and number of switches and the devices they control, distinguishing single, and three-way switches

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Given the Appendix A U2T2 Electrical Drawing , students could examine it and make a list of the:
 - Locations and number of 120 volt receptacles
 - Locations and number of lights
 - Locations and number of switches and the devices they control, distinguishing single, and three-way switches

Resources

References

Wagner & Smith, unit 6, page 114-142
Mullin Miller Stephenson, Unit 1-2,
Drawings 8 and 10 from the set of drawings with the text.

Drawings

- Appendix A U2T2 Electrical Drawing

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes

Students will be expected to

2.2.10 read and interpret plumbing drawings

[1.401][1.402][1.403]
[2.401][2.402]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to provide an introduction to the symbols and methods of representing plumbing systems on building plans.

Points to emphasize

- Use the Plumbing references to demonstrate how pipe runs, control valves and the like are shown on drawings. Demonstrate the drawing symbols for plumbing components and devices, using samples of actual objects as references where possible. Show
 - Pipe runs on a drawing
 - Controls (valves, shut-offs, pressure regulators, ...)
 - Hot and cold supply systems
 - Drainage systems and venting
 - Outside drainage systems
 - Water appliances
- Use Appendix A U2T2 Floor Plan to show the location of water appliances, and the Appendix A Plumbing drawings to show details of pipe runs. From these, demonstrate how fittings, pipe sizes and lengths, and valves can be determined.

For the Student

Given a set of Plumbing Drawings

- Identify all water appliances
- Identify the location and number of valves and other water control devices
- Assuming that the water main enters the house directly below the hot water tank, calculate the approximate number of feet required of each type of pipe (hot, cold, waste including for vents and water hammer)
- Count the number of fittings (90s, 45s, couplings, etc) needed to install the pipe runs, assuming a pipe length of 10 feet.
- Record the results in a table

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Given a set of plumbing drawings, students could:
 - Identify all water appliances
 - Identify the location and number of valves and other water control devices
 - Assuming that the water main enters the house directly below the hot water tank, calculate the approximate number of feet required of each type of pipe (hot, cold, waste including for vents and water hammer)
 - Count the number of fittings (90s, 45s, couplings, etc) needed to install the pipe runs, assuming a pipe length of 10 feet.
 - Record the results in a table

Resources

References

Blankenbaker, chapter 4-6
Wagner & Smith, unit 6, page 114-142

Drawings

- Appendix A U2T2 Floor Plan
- Appendix A U2T2 Plumbing Waste Water Plan
- Appendix A U2T2 Plumbing Supply Plan
- Appendix A U2T2 Plumbing Waste Isometric
- Appendix A U2T2 Plumbing Supply Isometric

Topic 2 Reading Blueprints and Drawings

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
2.2.11 sketch electrical and plumbing systems on floor plans [1.405][2.402]	<p>The purpose of this outcome is to have students develop a better understanding of the electrical and plumbing devices and their symbols and how they represent the systems on a plan</p> <p>Provide each student with 2 copies of Appendix A U2T2 Floorplan, one for electrical and one for plumbing</p> <p>Create and provide a specification (list) of the electrical devices and where they need to be located. Write different requirements than that which are shown on the Appendix A U2T2 electrical drawing.</p> <p>In the case of plumbing, use the results of the previous outcome for specifications</p> <p>Points to emphasize</p> <ul style="list-style-type: none">• Receptacles need to be spaced about every 12 feet• All lights need to be controlled by a switch. It is customary to connect each switch to the device it controls on the plan using a dashed line• In rooms where there is no overhead light it is customary to control one or more receptacles with a switch. In each case, half of the receptacle is live and the other half is switched• 220 receptacles are all on independent circuits• A maximum of 12 devices may be on a branch circuit <p>For the Student</p> <p>Given 2 floorplans</p> <ul style="list-style-type: none">• Plan the electrical layout by sketching the devices in the correct location on the plan. Show which switches control which devices• Plan the plumbing layout by sketching the devices in the correct location on the plan

Topic 2 Reading Blueprints and Drawings

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric

Given floorplans (2)

- Students could plan the electrical layout by sketching the devices in the correct location on the plan. Show which switches control which devices
- Students could plan the plumbing layout by sketching the devices in the correct location on the plan

Resources

References

Blankenbaker, chapter 4-6
Wagner & Smith, unit 6, page 114-142

Drawings

- Appendix A U2T2 Floor Plan

Consumables

- Copies of Appendix A U2T2 Floor Plan

Topic 3 Working in the Technology Lab

Specific Curriculum Outcomes

Students will be expected to

- 2.3.1 develop personal rules of conduct based on standard practise
[5.401][5.402][5.403]

Suggested Learning and Teaching Strategies

For the Teacher

This topic forms the basis for the safe and orderly operation of the technology education lab for the remainder of the year. Rules and regulations that govern individual and group behaviour are emphasized.

Points to emphasize:

- Material on personal safety in Appendix A U2T3 Personal Safety
- Material on machinery safety in Appendix B Tool Safety Sheets
- Appendix A U2T3 Student Safety Pledge Sheet is an integral part of the process
- Safety is an issue for every class
- Safety requires 100% on tests and performance

For the Student

- Complete a safety checklist (resource) of the lab and insert into the portfolio.
 - Your exit route in case of a fire
 - The location of the eye wash station
 - The location of the fire extinguishers
 - Type of extinguisher (rating) should be noted on the checklist
 - The location of the fire hose
- Identify potentially dangerous situations that can exist in a shop.
- Sign Student Safety Pledge Form agreeing to list of acceptable behaviours, and get your parent/guardian to sign. Give a copy to the teacher and place one in your worklog

Topic 3 Working in the Technology Lab

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric
- Students could complete a safety checklist of the lab. These should include but are not limited to:
 - Your exit route in case of a fire
 - The location of the eye wash station
 - The location of the fire extinguishers
 - Type of extinguisher (rating) should be noted on the checklist
 - The location of the fire hose
- Students must sign a Student Safety Pledge Form agreeing to list of acceptable behaviours, and get your parent/guardian to sign. A copy must go to the teacher and one retained by the student.

Resources

References

Blankenbaker, page. 17.

Wagner & Smith, page. 51.

Workshop Safety (<http://www.inthewoodshop.org/safety/wwd01.shtml>)

Appendix A U2T3 Personal Safety

Appendix B Tool Safety Sheets

Appendix A U2T3 Student Safety Pledge Sheet

Topic 3 Working in the Technology Lab

Specific Curriculum Outcomes

Students will be expected to

2.3.2 develop strategies for managing individual and team activities

[4.401][5.401][5.402][5.403]

Suggested Learning and Teaching Strategies

For the Teacher

Teamwork is a critical factor in a well run technology education lab. Resources will be finite and considerable overlap of projects (individual and team) will place demands on the distribution and use of tools. A policy that establishes individual and team activities is an essential component of the teaching strategy.

Points to emphasize:

- Individual needs must be balanced with the needs of the group
- Use of time management
- Need to share resources
- Place materials and tools in the proper storage locations
- Cooperation within and between groups
- Use of good manners
- Tools and resources may need to be scheduled.
- Different roles of team members
- Why it is necessary to switch roles from time to time
- Team building methods

For the Student

Go through the teambuilding activity supplied by your teacher.

- Write a brief paragraph that states how the needs of the team might differ from the needs of the individual in the skilled trades shop. This answer should refer to:
 - Sharing of resources
 - Time management
 - Being conscious of time when using tools and using them efficiently
 - Proper storage of tools
 - Scheduling the use of tools (sign in/sign out)
 - Planning and communication between groups
 - The different roles that team members can take on

Topic 3 Working in the Technology Lab

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Knowledge Rubric.
- Students could write a brief paragraph that states how the needs of the team might differ from the needs of the individual in the skilled trades shop. This answer should refer to:
 - Sharing of resources
 - Time management
 - Being conscious of time when using tools and using them efficiently
 - Proper storage of tools
 - Scheduling the use of tools (sign in/sign out)
 - Planning and communication between groups
 - The different roles that team members can take on

Resources

References

Building Blocks for Teams (<http://cac.psu.edu/ets/presentations/teams/student/index.html>)

Team Roles (<http://www.betterproductdesign.net/tools/organisation/belbin.htm>)

Shop Management Summary (<http://www.safety-council.org/info/OSH/shop.html#Anchor-Sho-18612>)

Integrated Systems 1205 (<http://www.cdli.ca/courses/isys1205/>)

- Unit 1, Section 1, Lesson 1 of
- Unit 3, section 1, lesson 3 of IS1205 Teambuilding activity

ICT Modules at the Virtual Teacher Centre (<http://www.virtualteachercentre.ca>)

- Leadership Skills
- Teambuilding
- Facilitation Skills
- Collaboration

Topic 3 Working in the Technology Lab

Specific Curriculum Outcomes

Students will be expected to

- 2.3.3 maintain a work log (portfolio) for personal and professional assessment
[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

This SCO sets up one of the critical tools used in apprenticeship programs—the work log. Technology education course normally employ portfolios that students use to document their work. The worklog has a similar function. It is used by apprentices to document their activities and certifications. It is reviewed by their supervisor, typically a journey person, and is used to certify the apprentice for each stage of the process and for journey person status.

As an emulation of that practice, students will maintain a worklog for activities in the remainder of the course

Points to emphasize:

- Worklog is a means of assessing the preparedness of an individual to complete tasks.
- Standard method of documenting and signing off when skills are acquired.
- A worklog is the standard tool in the apprenticeship program
- Used to document jobs done, time on task, and has to be signed off by a journey person in the respective skilled trade.
- The worklog will be a standard tool that the student will use in an ongoing fashion to document their work

For the Student

Using the work log template provided by the instructor, and your work from the previous outcome, complete your first work log entry

Topic 3 Working in the Technology Lab

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric.

Work log

- Students could, as this is their inaugural entry in their work log outline all of the skills and information they have been presented in the previous outcomes.

Resources

References

Sample Log Book Template (<http://www.cnc.bc.ca/apprenticetoolkit/pdf/recordbook.pdf>)

Appendix A U2T2 Worklog

Topic 3 Working in the Technology Lab

Specific Curriculum Outcomes

Students will be expected to

2.3.4 use accuracy and precision when processing materials

[1.404][1.405]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome will be primarily addressed through the remainder of the course. Activities below are mainly to acquaint students with the concept. When it is being employed in the rest of the course it is mainly skill-building. In the activities below it is knowledge-building

Points to emphasize:

- Resources are scarce and shared
- Wasteful cutting/usage limits the access of others.
- Good resource usage is a keystone to an effective and cost efficient skilled trades site.
- Tools used to obtain accuracy when laying out on material:
- Ruler, scribe, protractor, templates, etc.
- “Measure twice, cut once” policy

You will need to provide project plans and materials lists for the activity.

For the Student

Given a drawing and a list of available materials, develop a plan for the most economical use of the materials.

Topic 3 Working in the Technology Lab

Suggested Assessment Strategies

Assessment

Paper and pencil

- Students could be assessed for this activity with Appendix B Skills Rubric.
- The skill-building aspect of this outcome will be implemented throughout the fabrication activities during the remainder of the course.

Research

- Given a drawing and a list of available materials, students could develop a plan for the most economical use of the materials.

Resources

References

Blankenbaker, page 101, suggested activity 2.

Comm Tech 2-3104 - Course Portfolio, Unit 1, Unit Project, Part 3 (<http://www.cdli.ca/courses/ctecx104/unit01/project/indexproj.html>)

Drawings

- Drawings as needed for the activities

Tools

- Tools as needed for the activities

Consumables

- Materials as needed for the activities

Topic 3 Working in the Technology Lab

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
2.3.5 qualify for use of tools and machinery [5.401][5.402][5.403]	<p>This is one of the critical training requirements for the ST1201 course. Students must have an excellent understanding of the safety requirements and proper operating parameters of all tools, in particular power tools. Injury is an issue with any type of tool.</p> <p>Performance tests (Appendix B Tool Safety Sheets) assess the students overall competence and capability in the use of all tools.</p> <p>Students will not necessarily be tested for all pieces of equipment. It is conceivable that in some cases, testing for equipment use may be limited to specific members of a project team.</p> <p>Testing for capability is a long term issue that will take place over the course of the year. Just in time training will be required at specific points in the life of the activities and major project. Certification and training then needs to be provided by the instructor as needed.</p> <p>Points to emphasize:</p> <ul style="list-style-type: none">• Skill acquisition for a tool is assessed by the teacher by written and observed assessments.• A 100% pass score is the only acceptable grade.• Skill acquisition is documented in the work log, dated and signed off by the teacher. <p>It may be useful to do a complete demonstration of all tools at this time. This will acquaint students with available tools and give them an overview of their use.</p> <p>For the Student</p> <ul style="list-style-type: none">• Complete the written and performance test with 100% accuracy for any piece of equipment that you wish to use.

Topic 3 Working in the Technology Lab

Suggested Assessment Strategies

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable. Assessment will normally take place on an as-needed basis, prior to initial first independent use of the tool by the student.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the tools and devices used in a ceramic tile project.

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

Blankenbaker, chapter 2, page 51.

Wagner & Smith,

- unit 3, page 55,
- unit 4, page 75,
- unit 5, page 101.

CDLI Course Integrated System 1205, Unit 3, Section 3, Lesson 1 Materials Processing (Covers forming, separating, combining, conditioning, and finishing. Includes a number of video clips)

Appendix B Tool Safety Sheets

Tools

- See Appendix B Tool and Equipment Lists

Topic 3 Working in the Technology Lab

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
2.3.6 observe demonstrations for each of the construction activities in Unit 3 [5.401][5.402][5.403]	<p>Within the modular approach to instruction is an assumption that there will be time to do demonstrations of each of the activities students are expected to undertake. Some of this will occur as the individual modules start, but a quick overview of the activities should be undertaken before any of the modules begin. The purpose of this outcome is to create an opportunity to go over these activities as a whole before the module rotation begins. The module activities are listed below and in more detail in Unit 3.</p> <p>Topic 1 - Carpentry - Floor Construction Topic 2 - Carpentry - Wall Framing Topic 3- Carpentry - Roof Trusses Topic 4 - Construction Electrician - Circuits Topic 5 - Construction Electrician - Residential Wiring Topic 6 - Plumber - Toilet Installation Topic 7 - Plumber - Sink Installation Topic 8 - Lather Topic 9 - Painter-Decorator Topic 10 - Masonry: Ceramic Wall Tile Installation Topic 11 - Masonry: Ceramic Floor Tile Installation</p> <p>This could be presented a second time as the modules reach their half-way rotation as a refresher for students.</p>
	For the student
	<ul style="list-style-type: none">• Students could be expected to make a report on the demonstrations and should be encouraged to make copious notes. In small groups they could present their own demonstrations of how each module should be completed, or as part of their own module learning make a short presentation to the next group that is to rotate into their place.

Topic 3 Working in the Technology Lab

Suggested Assessment Strategies

Assessment

Presentation

- Students could be expected to make a report on the demonstrations and should be encouraged to make copious notes. In small groups they could present their own demonstrations of how each module should be completed, or as part of their own module learning make a short presentation to the next group that is to rotate into their place.

Resources

Tools

- See Appendix B Tool and Equipment Lists
- All tools and equipment used in the modules should be demonstrated here.

Consumables

- Consumables as required for proper demonstration.

Topic 3 Working in the Technology Lab

Specific Curriculum Outcomes

Students will be expected to

- 2.3.7 identify the trades required for each component of the construction sequence [4.401]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to get a 'big picture' understanding of how a construction site is managed and sequenced. The role of the trades should be identified as key factors in scheduling their appearance on the job.

Points to emphasize

- Although obvious, all buildings are constructed from the ground up. Site prep, layout, and excavation are prerequisites. Footing installation especially the degree to which it is dead level makes subsequent work easier or more difficult.
- Each component has a logical and critical function. Regulations and codes control specify material type, sizing, and spacing to ensure a safe structure. Changes in codes and regs occur from time to time as new materials and techniques are employed.
- Because the drawings are meant to simplify, they illustrate traditional materials, ie., solid wood. Many buildings, including houses are built with engineered wood, especially for girders, floor joists, and sheathing. Demonstrate samples of those as well.
- The order of construction dictates when each of the trades is required on site. Also the inspection process affects scheduling of the trades. For example, electrical and plumbing rough-in needs to be inspected before the wall cavities are closed in.
- Some trades have to come to the site multiple times. For example, electricians and plumbers have to show up to do the rough-ins and then come back after the inside painting is complete to install the receptacles, switches, lights, and water appliances.

For the Student

Given the construction sequence

- Identify the trade that is responsible for each task
- Construct a schedule of trades that shows the sequence as they are required on the construction site.
- Create an appropriate entry in the Worklog

Topic 3 Working in the Technology Lab

Suggested Assessment Strategies

Assessment

Research

- Students could identify the trade that is responsible for each task and construct a schedule of trades that shows the sequence as they are required on the construction site.

Work log

- Students could create an appropriate entry in the Worklog.

Resources

References

Appendix A U3T2 Construction Sequence

Plans of Training for the 7 courses

- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/carpenter.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/reselectrical.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/reselectrical.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/lather04.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/paintdecorator.pdf>
- <http://www.ed.gov.nl.ca/app/plansoftraining/pdf/mason.pdf>

Student produced design brief

Drawings

- Appendix A U3T2 Section Drawing
- Appendix A U3T2 Detail Drawing
- Student produced drawings and sketches

Unit III: Skill-building in Selected Trades

Unit 3 Overview

The purpose of this unit is to develop understanding of the six designated trades in the context of a single construction project. The unit has two parallel strategies. After an initial research and preparatory task, the unit alternates between developing knowledge and skill related to a specific trade, followed by reflection and job site clean-up. This pattern is repeated for the remaining 5 trades.

This approach is intended to emulate a job site experience to the extent possible in the school technology lab.

Organization

The unit is organized into eleven topics. Each topic represents a specific module of instruction for the student. They are all based on seven hours, 2 hours of background, research and preparation, 4 hours of fabrication activities and 1 hour of reflection.

- Topic 1 Carpentry - Floor Construction
- Topic 2 Carpentry - Wall Framing
- Topic 3 Carpentry - Roof Trusses
- Topic 4 Construction Electrician - Circuits
- Topic 5 Construction Electrician - Residential Wiring
- Topic 6 Plumber - Toilet Installation
- Topic 7 Plumber - Sink Installation
- Topic 8 Lather
- Topic 9 Painter-Decorator.
- Topic 10 Masonry - Ceramic Wall Tile Installation
- Topic 11 Masonry - Ceramic Floor Tile Installation

Assessment

This unit has a value of 70% of the course. Specific assessment strategies are recommended for each outcome.

Topic 1 Experiencing the Trades Modularly

Specific Curriculum Outcomes

Students will be expected to

- 3.1.1 review positions of all learning modules within the Fabrication Lab environment
[2.401][2.402][2.405][3.401][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

This is an opportunity for students to become familiar with all the modules for the Skilled Trades 1201 course. In the previous two outcomes, 2.3.6 and 2.3.7 students were introduced to the six trades they will become familiar with during this course. They were also shown demonstrations of what was needed to be done to successfully complete each of the modules. In this outcome, students must familiarize themselves with the fabrication lab, position of modules, possible hazards, and location of tools and materials they may need to accomplish their tasks.

Points to emphasize

- This is a facilitated environment, where students will accomplish tasks with assistance from their teacher rather than specifically directed by them
- There could be as many as eleven modules in operation at any one time and students must be cognizant of what else is going on around them.
- Safety in the fabrication lab should take on new meaning at this point, as it is no longer about them personally, but also about what is going on around them.
- Being able to find tools and materials in a timely fashion will decrease wasted time and allow students to complete their assigned modular tasks in plenty of time.

For the student

- Students could draw a quick diagram of the fabrication lab as a whole. In this diagram each module position should be laid out, tool and materials storage should be indicated and potential access routes identified.

Topic 1 Experiencing the Trades Modularly

Suggestions for Assessment

Assessment

Pencil and Paper

- Students could draw a diagram of the fabrication lab. This diagram should include the position of all materials, tools and individual module stations.

Work log

- Students could list all the module stations and their general positions in their work log.

Resources

References

Modular Layout Document

Skilled Trades 1201 Teacher Guide

Tools

- See Appendix A U3T2 Tool and Equipment List. Some of these tools require safety tests.

Consumables

- As appropriate to the task at hand

Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

- 3.2.1 review and demonstrate safe practices for use of standard hand, portable power, and stationary power tools for floor construction
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome will be interwoven with the rest of the carpentry outcomes, over the life of the trade related topics. Working with a wide variety of tools is at the heart of carpentry skills. The ones in this sample may be considered the basics.

For power tools in particular, a means of ensuring students are properly certified to use them is essential. Normal practice is to use a combination of written and performance testing for each student for each tool. It is a good idea to maintain a chart of who is qualified for what tools. You may wish to provide class wide instruction on tools, followed by individual testing.

Points to emphasize

- Safety is not just a set of rules. Safety is a way of life. It is a set of ideas, attitudes, behaviours and practices that are essential to the workplace. Safe practice does not eliminate risk, but it reduces risk. Safe practice is risk management.
- Safe use of tools is primarily using them in the prescribed manner, with the proper adjustments and usage procedures. It is also avoidance of clearly understood unsafe practices. In particular shortcuts and quick work-a rounds often increase the risk
- Only students who are qualified will be allowed to use a particular tool. Tool qualification can occur on an as-needed basis.
- Tool qualification has no margin of error. Only 100% on written/verbal/performance tests are acceptable for qualification.
- Each tool is different, but all tools have commonalities. Point out the commonalities with other tools when demonstrating a tool's function, adjustments and operating procedures.

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Resources

References

Feirer, chapter 5-11

Wagner & Smith, unit 2-5, page 51-113.

Appendix B Tool Safety Sheets

Drawings

- As appropriate to the task at hand

Tools

- See Appendix A U3T2 Tool and Equipment List. Some of these tools require safety tests.

Consumables

- As appropriate to the task at hand

Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

- 3.2.1 review and demonstrate safe practices for use of standard hand, portable power, and stationary power tools for floor construction
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

- It may be useful to take one class and do an overview demonstration of all tools. Include
 - Function of the tool
 - Parts of the tool
 - Adjustments that can be made and the correct procedure for completing them
 - Safe usage of the tool for performing the common tasks
 - Procedures to follow in instances where the tool is not functioning or functioning outside the specs

For the Student

- Complete the safety program for each tool that requires it, and that you intend to use
- State and describe the safe operating procedure for using a tool at 100% accuracy
- Demonstrate safe use of a tool with 100% accuracy
- Record certification for tool in the work log and have the teacher initial it
- Use tools as needed, in accordance with accepted safe practices,
- Create an appropriate entry in the Worklog

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Resources

Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

- 3.2.2 identify various types of floor framing systems and describe the advantages & disadvantages of various materials
[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the Teacher

Points to emphasize

- The two main types of floor framing involve platform and post and beam construction.
- Post and beam construction involve continuous posts from the basement to the roof. The stud- ding material for the walls run the full height of the house, and the floor materials are tied into the beam structures, rather than forming a part of the wall structure itself. This is not a common practice today, due to the costs of timbers and long run studs of this type.
- Platform framing makes the floor an integral part of the construction of the walls. Walls sit on the floor platform for each storey of the house. The floor platform forms the basis of the structure of the house.
- Flooring platforms are created by using long run horizontal beams (commonly called stringers) and then creating the platform at right angles to the beam. In the past the platform would rest on the stringer, but with the advent of joist hangers, the platform would but the stringer on either side. The lumber used to create the platform at right angles (called joists) will then form the basis for the floor and be sheathed.
- Most often the floor joists are 300 mm (12 inches) or 400 mm (16 inches) apart. This is commonly referred to as 12 or 16 inch centers. As well cross-bridg- ing, nailed between joists from the top of one to the bottom of the other, is used to stiffen the floor to transfer loads.

For the Student

- Students can differentiate between the house-fram- ing types and how this impacts the floor framing. This could involve a discussion of when they see the post and beam construction being most appropriate.

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Assessment

Research

- Students could prepare a report comparing the various types of floor framing systems, listing the advantages and disadvantages of each. This should be done by researching the different floor frames in online and text sources.

Presentation

- Students could do research into one flooring system and then present to the group as a whole.

Paper and Pencil

- Students could label a diagram of common floor types, indicating the various parts of each floor framing system.

Resources

Feirer, chapter 20

Wagner & Smith, chapter 8

Hometime - Flooring DVD

www.hometime.com

Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

- 3.2.2 identify various types of floor framing systems and describe the advantages & disadvantages of various materials
[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

- students could differentiate between the beam (stringer), and the joist and what materials they are usually constructed of.
- a discussion around the use of manufactured joists could be undertaken at this point.
- students could also note why cross-bridging is necessary and why it is more preferable than blocking, as well they could understand where holes should be cut in a joist, how large they should be and how important the spacing of these holes are for the strength of the joists

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Resources

Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

3.2.3 define live and dead loads and state the important load considerations for floor framing

[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the Teacher

Live and dead loads differentiate between the weights a floor will take on a daily basis and the weights it has to take just for the structure of the building itself. They are designated in different areas within the residential construction.

Points to emphasize:

- Dead loads are based on the mass of the structure being supported itself. A dead load in floor construction would be the weight of the floor sheathing, walls, partitions, and roof for example.
- Live loads are based on the designed use of the structure. A live load in floor construction would include the weight of appliances, furniture, inhabitants, fixtures, wall hangings, and even snow on the roof.
- For floor framing, the use of the room in question will determine how structurally stiff the floor has to be. It may be a consideration in whether floor joists will be placed at 300 mm or 400 mm (12 or 16 inch) centers. It may also mean a larger nominal size of joist will be used.

For the Student

- Students could layout a floor framing project. While doing the layout, consideration of what the dead load and live load will be for the particular floor should be taken into account. The floor underneath a wall partition would have a dead load consideration, while the floor in the center of a room with have a number of live load considerations.

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Resources

Assessment

Pencil and paper

- Students could layout a floor framing project. This should be done on a work plan diagram involving a floor plan or plan for this module.
- Students could indicate, on the layout, consideration of what the dead load and live load will be for the particular floor. The floor underneath a wall partition would have a dead load consideration, while the floor in the center of a room with have a number of live load considerations.

Research

- Students could research the different floor framing systems and examine how they handle live and dead loads. A comparison of the framing method should show the fundamental differences in the two constructions.

Work Log

- Students could make an entry in their work log discussing the nuances of live and dead loads, and why it is crucial to incorporate them into any house framing project.

Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

- 3.2.4 identify the various types of floor sheathing and the advantages and disadvantages of each [1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the Teacher

When the term sheathing is used, we are usually considering the sub-floor covering for a floor. In residential construction this is what is found under the hardwood, carpet, or vinyl floor.

For the purposes of this outcome, the three main floor sheathing types are:

- Match lumber (tongue and groove lumber, ship lap)
- Tongue and groove plywood
- Oriented strand board (OSB)

The differences between each will identify their advantages and disadvantages.

Points to emphasize

- Match lumber is primarily 19 mm x 166 mm (1 inch x 7 inch nominally) board with a tongue on one side and a groove on the other. This will permit tight placement of boards and reduce separation on the floor. It is thicker than most other sheathing types.
- Disadvantages include the number of boards required to cover a floor space, that separation does occur although not gaps, and the amount of time for installation.
- Tongue and groove (t&g) plywood comes in a variety of thicknesses in 1200 mm x 2400 mm (4 ft x 8 ft) sheets, with a tongue on one of the long ends and a groove on the other. Once again it permits tight placement of the plywood and reduces separation on the floor.
- The major disadvantage of plywood is its cost. T&g plywood is the among the most expensive wood sheathing material on the market. Due to this factor a thinner grade is usually selected for flooring, although plywood comes in a variety of widths.

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Assessment

Pencil and Paper

- Students could do a comparison chart of each of the sheathing materials. This chart would include the advantages and disadvantages and how each of the sheathings address each others failings.

Research

- Students could research a variety of alternative sheathing methods, those not presented in this outcome, and indicate their applicability to residential construction in Newfoundland and Labrador.

Resources

Feirer, pgs 382

Wagner & Smith, pgs 197-199

Hometime - Flooring DVD

www.hometime.com

Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

- 3.2.4 identify the various types of floor sheathing and the advantages and disadvantages of each [1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

- OSB comes in a variety of lengths and widths, which is one of its main advantages. Sheets as large as 1200 mm x 4800 mm are available (larger sizes are manufactured but are impractical for most fabrications). OSB is rigid throughout its area, and has positive environmental considerations.
- The major disadvantage of OSB is its vulnerability to moisture. Non-sealed edges within the sheet can absorb moisture and expand.

For the student

- Students could do a comparison chart of each of the sheathing materials. This chart would include the advantages and disadvantages and how each of the sheathings address each others failings.
- Students could research a variety of alternative sheathing methods, those not presented in this outcome, and indicate their applicability to residential construction in Newfoundland and Labrador.

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Resources

Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

3.2.5 create a work plan for the structural component of the floor construction project

[1.402][1.405][4.402][4.403]

Suggested Learning and Teaching Strategies

For the Teacher

To meet this outcome, students are expected to develop a work plan dealing with floor construction

The work plan is an essential first step in any construction activity. It ensures that workers understand what they have to do, and how to do it. To complete the plan, students will need to reference the previous topics. Use Appendix A Planning Guide: Information for Fabrication Planning as a guideline for this outcome.

Points to emphasize

- Review the drawings for the floor construction, and make any additional sketches as needed during the remainder of the planning process
- Make a list of all the structural components that make up the structure of the floor construction, including their dimensions. Include sub-floor and sheathing.
- Determine how the materials will need to be measured and marked for cutting, how they will be cut, and how they will be assembled. Identify tools and equipment needed, including for fastening parts together
- Identify the construction sequence, listing what needs to be done in the order it needs to be done.
- Identify tools and equipment needed to perform the tasks. Identify items that they are not qualified to use and plan to get certification.

For the student

Students could identify the tools and equipment they will use. At this time it is important to ensure that any qualifications needed for those tools are obtained.

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Assessment

Achieving this sco requires the application of knowledge and skills acquired from work in previous topics and outcomes.

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could draw a diagram to scale of the project to be undertaken in this module. This drawing should be mated with a description of the tools and techniques utilized in this section.

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

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Topic 2 Carpentry - Floor Construction

Specific Curriculum Outcomes

Students will be expected to

- 3.2.6 construct and sheath a floor frame based on the technical drawings supplied by the instructor
[1.403][1.404][1.405][2.401]
[2.402][2.405][4.402][5.401]
[5.402][5.403]

Suggested Learning and Teaching Strategies

For the Teacher

Construction and sheathing of a floor frame is the first of the modules presented in this guide. It is not intended that all students in your class will be doing this project simultaneously, but rather that each group will be doing their own module while this one is going on. Spacing for this project will be needed, it is expected that they will create a floor frame and sheath it.

For the purposes of this outcome, a 1200 mm (4 foot) square floor section would be sufficient. Once a class is over, the floor frame can be stood on one end and placed away from the work area for storage.

Points to emphasize:

- Materials for the construction exercise should be laid out and fitted as fabrication progresses. Layouts are necessary to insure that cuts are made properly. The adage measure twice and cut once is an important part of the carpentry trade.
- All tools utilized must be qualified for before use
- All tools utilized must be returned to their proper place once class is complete
- Clean-up of materials and work spaces should be complete before the end of class
- Workspace should be kept free of clutter during the fabrication exercise
- Once completed assessment of the project should be made on the basis of how closely it resembles the plan, and whether or not it has been fabricated using proper techniques and methodology.
- The floor section created in this exercise will have to be broken down during the reflection class

For the Student

- Using the technical drawing and work plan as guidance, build the floor section complete with sub-floor (sheath).
- Create appropriate entry in the WorkLog and have teacher sign off.

Topic 2 Carpentry - Floor Construction

Suggestions for Assessment

Assessment

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could build the floor section complete with sub-floor (sheath), using the technical drawing and work plan as guidance.
- Assess this outcome with Appendix B Skills Rubric

Resources

References

Appendix A U3T2 Carpentry Tools

Appendix B Tool Safety Sheets

Drawings

- Appendix A U3T2 Cutting Plan Drawing

Tools

- Layout tools (rules, squares)
- Separating tools (saws, planes, drills)
- Combining tools (hammers, screw-drivers, pneumatic nailers)

Consumables

- 2 by 4 lumber
- Nails
- Screws
- Construction Adhesive

Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.3.1 review safe practices for use of standard hand, portable power, and stationary power tools for wall framing
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome will be interwoven with the rest of the carpentry outcomes, over the life of the trade related topics. Working with a wide variety of tools is at the heart of carpentry skills. The ones in this sample may be considered the basics.

For power tools in particular, a means of ensuring students are properly certified to use them is essential. Normal practice is to use a combination of written and performance testing for each student for each tool. It is a good idea to maintain a chart of who is qualified for what tools. You may wish to provide class wide instruction on tools, followed by individual testing.

Points to emphasize

- Safety is not just a set of rules. Safety is a way of life. It is a set of ideas, attitudes, behaviours and practices that are essential to the workplace. Safe practice does not eliminate risk, but it reduces risk. Safe practice is risk management.
- Safe use of tools is primarily using them in the prescribed manner, with the proper adjustments and usage procedures. It is also avoidance of clearly understood unsafe practices. In particular shortcuts and quick work-a rounds often increase the risk.
- Only students who are qualified will be allowed to use a particular tool. Tool qualification can occur on an as-needed basis.
- Tool qualification has no margin of error. Only 100% on written/verbal/performance tests are acceptable for qualification.
- Each tool is different, but all tools have commonalities. Point out the commonalities with other tools when demonstrating a tool's function, adjustments and operating procedures.

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Resources

References

Appendix A U3T2 Carpentry Tools

Appendix B Tool Safety Sheets

Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.3.1 review safe practices for use of standard hand, portable power, and stationary power tools for wall framing
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

- It may be useful to take one class and do an over-view demonstration of all tools. Include
 - Function of the tool
 - Parts of the tool
 - Adjustments that can be made and the correct procedure for completing them
 - Safe usage of the tool for performing the common tasks
 - Procedures to follow in instances where the tool is not functioning or functioning outside the specs

For the Student

- Complete the safety program for each tool that requires it, and that you intend to use
- State and describe the safe operating procedure for using a tool at 100% accuracy
- Demonstrate safe use of a tool with 100% accuracy
- Record certification for tool in the work log and have the teacher initial it
- Use tools as needed, in accordance with accepted safe practices,
- Create an appropriate entry in the Worklog

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Resources

Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.3.2 list and describe types of wall framing
[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the teacher

This outcome will address the difference between platform framing and post and beam construction. Students will be expected to know the differences in the two types of construction.

Points to emphasize

- Post and beam construction involve continuous posts from the basement to the roof. The studding material for the walls run the full height of the house. This type of construction call for fewer but larger pieces of wood spaced further apart than those used in conventional platform framing. This is not a common practice today, due to the costs of timbers and long run studs of this type.
- Platform framing is the most common method of framing currently used. Each level of the house is constructed separately. The floor is a platform built separately from the walls. Each wall is assembled flat on the subfloor and then tilted into place.
- Spacing varies based on whether the wall frame is intended for interior/exterior, bearing or non-bearing partitions. Common stud spacings are 400 mm (16 inch) for interior and 600 mm (24 inch) for exterior.
- Stud sizes vary between 38 mm x 89 mm (2 inch x 4 inch nominally) for interior walls and 38 mm x 140 mm (2 inch x 6 inch nominally) for exterior walls.
- These spacings allow for easy application of 1200 mm x 2400 mm (4 ft. x 8 ft.) sheets of sheathing material.

For the student

- Students can differentiate between the house-framing types and how this impacts the wall framing. This could involve a discussion of when they see the post and beam construction being most appropriate.
- Students could research a variety of stud materials, indicating those which would be most suitable for the Newfoundland and Labrador climate.

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Assessment

Research

- Students could prepare a report comparing the various types of wall framing solutions, listing the advantages and disadvantages of each. This should be done by researching the different wall frames in online and text sources.

Presentation

- Students could do research into one wall framing system and then present to the group as a whole.

Paper and Pencil

- Students could label a diagram of common wall framing solutions, indicating the various parts of each system.

Resources

References

Feirer, pgs 349-353

Wagner & Smith, pgs 205-214

Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the teacher
3.3.3 identify the important loading conditions to be considered when framing walls [1.401][1.402][2.401][3.401]	<p>The primary consideration for loading conditions is whether a wall frame will be load-bearing or non-bearing. Load bearing means that the wall is supporting the weight of a the structure above it and is in turn supported by the sub-structure below it. Loading conditions cover the following wall framing components: sole plates, top plates, studs, headers (lintel), and sheathing. Different loading conditions will dictate that the nominal sizes of these various materials may change.</p> <p>Points to emphasize</p> <ul style="list-style-type: none">• Wall framing can be done using 38 mm x 89 mm (2 inch x 6 inch nominally) or 38 mm x 140 mm (2 inch x 6 inch nominally) lumber depending on the structure being built. There are strict limitations on where these materials can be used such as in load bearing and non-load bearing walls.• Headers support structural loads above openings and transfers the load to the framing on either side of the openings. Headers can be made of solid lumber with spacers or engineered materials. <p>For the student</p> <ul style="list-style-type: none">• Students could identify what a header is and when it is appropriate to use.• Students could identify various types of alternative stud material and their applicability for load bearing partitions.

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Assessment

Pencil and paper

- Students could layout a wall framing project. This should be done on a work plan diagram involving a floor plan or plan for this module.
- Students could indicate, on the layout, consideration of what the loads for that particular wall.

Research

- Students could research the different wall framing systems and examine how they handle loads. A comparison of the framing method should show the fundamental differences in the two constructions.

Resources

References

Feirer, pgs 396

Wagner & Smith, pgs 205-214

Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.3.4 identify the various types of wall sheathing and the advantages and disadvantages of each [1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the teacher

There are several products available to be used for wall sheathing depending on the wall construction being used. For the purposes of this outcome, we will concentrate on exterior sheathing, as interior sheathing will be covered in the lathing section.

To answer the question why sheathe?

- Sheathing strengthens the wall frame and adds rigidity to the house structure.
- Sheathing provides a solid nailing base for wall coverings.
- It seals the house and reduces air flow through the walls.
- It ties wall framing to floor framing again increasing the rigidity of the structure.

The most common sheathing products are:

- Match lumber (tongue and groove lumber, ship lap)
- Plywood
- Oriented strand board (OSB)

The differences between each will identify their advantages and disadvantages.

Points to emphasize

- Match lumber is primarily 19 mm x 166 mm (1 inch x 7 inch nominally) board with a tongue on one side and a groove on the other. This will permit tight placement of boards and reduce separation on the wall. It is thicker than most other sheathing types, increasing structure rigidity.
- Disadvantages include the number of boards required to cover a wall space, that separation does occur although not gaps, and the amount of time for installation.
- Plywood comes in a variety of thicknesses in 1200 mm x 2400 mm (4 ft x 8 ft) sheets. Once again it permits tight placement and reduces separation on the wall.

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Assessment

Pencil and Paper

- Students could do a comparison chart of each of the sheathing materials. This chart would include the advantages and disadvantages and how each of the sheathings address each others failings.

Research

- Students could research a variety of alternative sheathing methods, those not presented in this outcome, and indicate their applicability to residential construction in Newfoundland and Labrador.

Resources

References

Feirer, Chapter 21

Wagner & Smith, Unit 9

Hometime - Construction Basics DVD

www.hometime.com

Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.3.4 identify the various types of wall sheathing and the advantages and disadvantages of each [1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

- The major disadvantage of plywood is its cost. Plywood is among the most expensive wood sheathing material on the market. Due to this factor a thinner grade is usually selected for walls, although plywood comes in a variety of widths.
- OSB comes in a variety of lengths and widths, which is one of its main advantages. Sheets as large as 1200 mm x 4800 mm are available (larger sizes are manufactured but are impractical for most fabrications). OSB is rigid throughout its area, and has positive environmental considerations.
- The major disadvantage of OSB is its vulnerability to moisture. Non-sealed edges within the sheet can absorb moisture and expand.

For the student

- Students could do a comparison chart of each of the sheathing materials. This chart would include the advantages and disadvantages and how each of the sheathings address each others failings.
- Students could research a variety of alternative sheathing methods, those not presented in this outcome, and indicate their applicability to residential construction in Newfoundland and Labrador.

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Resources

Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes

Students will be expected to

3.3.5 create a work plan for the structural component of the wall framing project

[1.402][1.405][4.402][4.403]

Suggested Learning and Teaching Strategies

For the Teacher

To meet this outcome, students are expected to develop a work plan dealing with wall framing project.

The work plan is an essential first step in any construction activity. It ensures that workers understand what they have to do, and how to do it. To complete the plan, students will need to reference the previous topics. Use Appendix A Planning Guide: Information for Fabrication Planning as a guideline for this outcome.

Points to emphasize

- Review the drawings for the wall framing, and make any additional sketches as needed during the remainder of the planning process
- Make a list of all the structural components that make up the structure of the wall framing, including their dimensions.
- Determine how the materials will need to be measured and marked for cutting, how they will be cut, and how they will be assembled. Identify tools and equipment needed, including for fastening parts together
- Identify the construction sequence, listing what needs to be done in the order it needs to be done.
- Identify tools and equipment needed to perform the tasks. Identify items that they are not qualified to use and plan to get certification.

For the student

Students should identify the tools and equipment they will use. At this time it is important to ensure that any qualifications needed for those tools are obtained.

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Assessment

Achieving this sco requires the application of knowledge and skills acquired from work in previous topics and outcomes.

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could draw a diagram to scale of the project to be undertaken in this module. This drawing should be mated with a description of the tools and techniques utilized in this section.

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

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Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
<p>Students will be expected to</p> <p>3.3.6 construct and sheathe a wall frame based on the technical drawings supplied by the instructor [1.403][1.404] [1.405][2.401] [2.402][2.405] [4.402][5.401] [5.402][5.403]</p>	<p>For the teacher</p> <p>Construction and sheathing of a wall frame is one of the modules presented in this guide. It is not intended that all students in your class will be doing this project simultaneously, but rather that each group will be doing their own module while this one is going on. Spacing for this project will be needed, it is expected that they will create a wall frame and sheathe it.</p> <p>For the purposes of this outcome, a 1200 mm (4 foot) square wall section would be sufficient. Once a class is over, the wall frame can be stood on one end and placed away from the work area for storage.</p> <p>To meet this outcome students are expected to build a wall of a specified size based on a supplied technical drawing. In a group of 2 students will be expected to select the proper materials based on proper nominal lumber size and based on lumber quality. They will measure and cut the selected material to proper sizes using their technical drawing. Once they have assembled their wall section, with proper blocking, they will then choose their wall sheathing of choice. There are many different materials to choose from but our selection is lumber, plywood, or OSB. They will choose their wall sheathing, measure and cut the wall sheathing to the appropriate size, and then attach the wall sheathing to the studded wall.</p> <p>Points to emphasize:</p> <ul style="list-style-type: none">• Materials for the construction exercise should be laid out and fitted as fabrication progresses. Layouts are necessary to insure that cuts are made properly. The adage measure twice and cut once is an important part of the carpentry trade.• All tools utilized must be qualified for before use• All tools utilized must be returned to their proper place once class is complete

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Assessment

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could build the wall section complete with sheath, using the technical drawing and work plan as guidance.
- Assess this outcome with Appendix B Skills Rubric

Resources

References

Feirer, Chapter 21

Wagner & Smith, Unit 9

Appendix A U3T2 Carpentry Tools

Appendix B Tool Safety Sheets

Drawings

- Appendix A U3T2 Cutting Plan Drawing

Tools

- Layout tools (rules, squares)
- Separating tools (saws, planes, drills)
- Combining tools (hammers, screw-drivers, pneumatic nailers)

Consumables

- 2 by 4 lumber
- Nails
- Screws
- Construction Adhesive

Topic 3 Carpentry - Wall Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.3.6 construct and sheathe a wall frame based on the technical drawings supplied by the instructor
[1.403][1.404] [1.405][2.401]
[2.402][2.405] [4.402][5.401]
[5.402][5.403]

Suggested Learning and Teaching Strategies

- Clean-up of materials and work spaces should be complete before the end of class
- Workspace should be kept free of clutter during the fabrication exercise
- Once completed assessment of the project should be made on the basis of how closely it resembles the plan, and whether or not it has been fabricated using proper techniques and methodology.
- The wall section created in this exercise will have to be broken down during the reflection class

For the Student

- Using the technical drawing and work plan as guidance, build the wall section complete with sheath.
- Create appropriate entry in the worklog and have teacher sign off.

Topic 3 Carpentry - Wall Framing

Suggestions for Assessment

Resources

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.4.1 review safe practices for use of standard hand, portable power, and stationary power tools for roof truss fabrication
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome will be interwoven with the rest of the carpentry outcomes, over the life of the trade related topics. Working with a wide variety of tools is at the heart of carpentry skills. The ones in this sample may be considered the basics.

For power tools in particular, a means of ensuring students are properly certified to use them is essential. Normal practice is to use a combination of written and performance testing for each student for each tool. It is a good idea to maintain a chart of who is qualified for what tools. You may wish to provide class wide instruction on tools, followed by individual testing.

Points to emphasize

- Safety is not just a set of rules. Safety is a way of life. It is a set of ideas, attitudes, behaviours and practices that are essential to the workplace. Safe practice does not eliminate risk, but it reduces risk. Safe practice is risk management.
- Safe use of tools is primarily using them in the prescribed manner, with the proper adjustments and usage procedures. It is also avoidance of clearly understood unsafe practices. In particular shortcuts and quick work-a rounds often increase the risk.
- Only students who are qualified will be allowed to use a particular tool. Tool qualification can occur on an as-needed basis.
- Tool qualification has no margin of error. Only 100% on written/verbal/performance tests are acceptable for qualification.
- Each tool is different, but all tools have commonalities. Point out the commonalities with other tools when demonstrating a tool's function, adjustments and operating procedures.

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Resources

References

Feirer, chapter 5-11

Wagner & Smith, unit 2-5, page 51-113

Smart Guide Roofing

Appendix B Tool Safety Sheets

Drawings

- As appropriate to the task at hand

Tools

- See Appendix A U3T2 Tool and Equipment List. Some of these tools require safety tests.

Consumables

- As appropriate to the task at hand

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.4.1 review safe practices for use of standard hand, portable power, and stationary power tools for roof truss fabrication
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

- It may be useful to take one class and do an over-view demonstration of all tools. Include
 - Function of the tool
 - Parts of the tool
 - Adjustments that can be made and the correct procedure for completing them
 - Safe usage of the tool for performing the common tasks
 - Procedures to follow in instances where the tool is not functioning or functioning outside the specs

For the Student

- Complete the safety program for each tool that requires it, and that you intend to use
- State and describe the safe operating procedure for using a tool at 100% accuracy
- Demonstrate safe use of a tool with 100% accuracy
- Record certification for tool in the work log and have the teacher initial it
- Use tools as needed, in accordance with accepted safe practices,
- Create an appropriate entry in the worklog

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Resources

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.4.2 list and describe different roof styles
[1.401][1.402][2.401][3.401]

Suggested Learning and Teaching Strategies

For the teacher

To meet this outcome students are expected to demonstrate knowledge of the various roof styles that are used in construction. Even though there are many styles the various roof styles to be explored are flat, gable, hip, and gambrel.

Points to emphasize

- Flat roof: Supported on joists that also carry ceiling material on the underside. It may have a slight pitch to provide drainage.
- Gable roof: Two surfaces slope from the centerline of the structure. This forms two triangular shaped ends called gables.
- Hip: All four sides slope from a central point or ridge. The angles created when two sides meet are called hips.
- Gambrel: In this type of the gable roof, each slope is broken, usually near the center or ridge.

For the student

- Students could do a comparison of roof types in an visual assignment, indicating the differences between the roofs through diagrams.
- Students could discuss the differences between the roof types and which ones are most applicable given the climate in Newfoundland and Labrador.

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Assessment

Research

- Students could prepare a report comparing the various types of roofing styles, listing the advantages and disadvantages of each. This should be done by researching the different roof styles in online and text sources.

Presentation

- Students could do research into one roofing system and then present to the group as a whole.

Paper and Pencil

- Students could label a diagram of common roof solutions, indicating the various parts of each system.

Resources

References

Feirer, Chapter 24

Wagner & Smith, unit 10

Smart Guide Roofing

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.4.3 explain construction and installation techniques for different types of roof frames
[1.401][1.402][2.401][3.401]

Suggested Learning and Teaching Strategies

For the teacher

This outcome deals specifically with two types of roof frames; conventional “stick-built” rafters and the truss rafter. “Stick-built” rafters are built on site. The ceiling joists and rafters are laid out, cut, and installed one at a time. Trusses are engineered and prefabricated assemblies that are usually factory built and delivered to the work site.

Points to emphasize

- “Stick-built” rafters, as the name might suggest, are built one piece at a time using a ridge board and rafters. The ridge board is installed first as a center piece and the common rafters are then tied into the ridge board and the top plate of the wall frame.
- Trusses are one piece constructs, whose design is based on the rigidity of the triangle. Triangular shapes are built into the truss such that the strain is parallel to the members making up the truss. This gives added strength and stability, making the trusses self-supporting.
- Trusses can also be made up on site.

For the student

- Students could explore the different methods of constructing roof frames.
- Students could discuss the differences between the two methods of roof framing, and how trusses eliminate the need for load bearing partitions in some instances

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Assessment

Research

- Students could explore the different methods of constructing roof frames.

Discussion

- Students could discuss the differences between the two methods of roof framing, and how trusses eliminate the need for load bearing partitions in some instances

Resources

References

Feirer, Chapter 24

Wagner & Smith, unit 10

Smart Guide Roofing

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.4.4 identify the various types of roof sheathing and the advantages and disadvantages of each [1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the teacher

There are several products available to be used for roof sheathing depending on the roof construction being used.

The most common sheathing products are:

- Match lumber (tongue and groove lumber, ship lap)
- Plywood
- Oriented strand board (OSB)

The differences between each will identify their advantages and disadvantages.

Points to emphasize

- Match lumber is primarily 19 mm x 166 mm (1 inch x 7 inch nominally) board with a tongue on one side and a groove on the other. This will permit tight placement of boards and reduce separation on the roof. It is thicker than most other sheathing types, increasing structure rigidity.
- Match lumber must be nailed securely to minimize movement in the boards so as to reduce distortion in roof shingles.
- Disadvantages include the number of boards required to cover a wall space, that separation does occur although not gaps, and the amount of time for installation.
- Plywood comes in a variety of thicknesses in 1200 mm x 2400 mm (4 ft x 8 ft) sheets. Once again it permits tight placement and reduces separation on the roof.
- Plywood should be laid with the face grain perpendicular to the rafters.
- The major disadvantage of plywood is its cost. Plywood is among the most expensive wood sheathing materials on the market.
- OSB comes in a variety of lengths and widths, which is one of its main advantages. Sheets as large as 1200 mm x 4800 mm are available (larger sizes

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Assessment

Pencil and Paper

- Students could do a comparison chart of each of the sheathing materials. This chart would include the advantages and disadvantages and how each of the sheathings address each others failings.

Research

- Students could research which of the roof sheathing types are most commonly used in Newfoundland and Labrador and why.
- Students could research a variety of alternative sheathing methods, those not presented in this outcome, and indicate their applicability to residential construction in Newfoundland and Labrador.

Resources

References

Feirer, Chapter 24

Wagner & Smith, unit 10

Smart Guide Roofing

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

- 3.4.4 identify the various types of roof sheathing and the advantages and disadvantages of each [1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

are manufactured but are impractical for most fabrications). OSB is rigid throughout its area, and has positive environmental considerations.

- The major disadvantage of OSB is its vulnerability to moisture. Non-sealed edges within the sheet can absorb moisture and expand. On roofs the expansion can lead to bunching of shingles and leak issues.

For the student

- Students could research the different types of roof sheathing, identifying the advantages and disadvantages of each.
 - Match lumber (tongue and groove lumber, ship lap)
 - Plywood
 - Oriented strand board (OSB)
- Students could also research which of the roof sheathing types are most commonly used in Newfoundland and Labrador and why.

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Resources

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

3.4.5 given the span, develop a layout for a standard “w” roof truss

[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

There are many different ways to construct a roof. Rafters and truss are the most common. While trusses are mostly purchased ready made, there are times when it is more economical to make them on site. Since they are a primary system in a house, this outcome is an exercise in understanding how they are constructed.

Trusses come in many shapes and styles, with the standard “w” or Fink truss being the most common.

Points to emphasize

- A truss owes its strength to the triangular structure of the components. It is very rigid in the vertical plane, but if it is twisted, it loses its strength.
- The chords and webs are joined with a plate on each side of the joint. Factory made trusses use gang nails which must be pressed on. Driving with a hammer bends them and they are useless. Site made trusses use plywood gussets on each side of the joint. They are nailed in place.
- Demonstrate the span measurement from outside to outside of the walls.
- Demonstrate roof slope (pitch) in terms of rise and run, and point out the standard slopes in use.

For the Student

Given a 9.75 m (32 foot) span for a roof truss, and assuming a 1:4 pitch, perform the following

- Calculate the length of the major chords, allowing for a 3 foot (1m) eave overhang
- Calculate the location of the web-chord intersections
- Using a grid paper, create a properly scaled sketch of the truss
- Create an appropriate entry in the worklog

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Pencil and paper

- Students could draw a diagram of a w-truss, indicating span, chords and pitch.

Work log

- Students could make an entry in their work log, containing a diagram of the truss and the nominal sizes.

Resources

References

Feirer

Wagner & Smith, unit 10, page 259-263

Smart Guide Roofing

Drawings

- Appendix A U3T2 Standard (Fink) Truss
- Appendix A U2T2 Orthographic Grid

Tools

- If the model is constructed, layout tools and utility knives

Consumables

- Copies of Appendix A U2T2 Orthographic Grid
- Scale lumber for truss

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
3.4.6 create a work plan for the roof truss project [1.402][1.405][4.402] [4.403]	<p>To meet this outcome, students are expected to develop a work plan dealing with roof framing project.</p> <p>The work plan is an essential first step in any construction activity. It ensures that workers understand what they have to do, and how to do it. To complete the plan, students will need to reference the previous topics. Use Appendix A Planning Guide: Information for Fabrication Planning as a guideline for this outcome.</p> <p>Points to emphasize</p> <ul style="list-style-type: none">• Review the drawings for the roof framing, and make any additional sketches as needed during the remainder of the planning process• Make a list of all the structural components that make up the structure of the roof framing, including their dimensions.• Determine how the materials will need to be measured and marked for cutting, how they will be cut, and how they will be assembled. Identify tools and equipment needed, including for fastening parts together• Identify the construction sequence, listing what needs to be done in the order it needs to be done.• Identify tools and equipment needed to perform the tasks. Identify items that they are not qualified to use and plan to get certification. <p>For the student</p> <p>Students should identify the tools and equipment they will use. At this time it is important to ensure that any qualifications needed for those tools are obtained.</p>

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Assessment

Achieving this sco requires the application of knowledge and skills acquired from work in previous topics and outcomes.

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could draw a diagram to scale of the project to be undertaken in this module. This drawing should be mated with a description of the tools and techniques utilized in this section.

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

3.4.7 construct and sheath a roof section based on the technical drawings supplied by the instructor

[1.403][1.404][1.405][2.401]
[2.402][2.405][4.402][5.401]
[5.402][5.403]

Suggested Learning and Teaching Strategies

For the teacher

To meet this outcome students will be expected to construct a “w” truss using their design created in 3.3.5. In groups of 2, students will be expected to select the proper materials based on proper nominal lumber size and based on lumber quality. They will measure and cut the selected material to proper sizes using their technical drawing. Once they have assembled their roof truss they will attach them to the existing shed structure. There are many different materials to choose from but our selection is either lumber or plywood. The students will then choose their roof sheathing, measure and cut the roof sheathing to the appropriate size, and then attach the roof sheathing to the roof trusses. For the purposes of this outcome, a 600 mm x 2400 mm roof section would be sufficient (2 foot x 8 foot). Once a class is over, the roof frame can be stood on one end and placed away from the work area for storage.

Points to emphasize:

- Materials for the construction exercise should be laid out and fitted as fabrication progresses. Layouts are necessary to insure that cuts are made properly. The adage measure twice and cut once is an important part of the carpentry trade.
- All tools utilized must be qualified for before use
- All tools utilized must be returned to their proper place once class is complete
- Clean-up of materials and work spaces should be complete before the end of class
- Workspace should be kept free of clutter during the fabrication exercise
- Once completed assessment of the project should be made on the basis of how closely it resembles the plan, and whether or not it has been fabricated using proper techniques and methodology.
- The roof section created in this exercise will have to be broken down during the reflection class

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Assessment

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could build the roof section complete with sheath, using the technical drawing and work plan as guidance.
- Assess this outcome with Appendix B Skills Rubric

Resources

References

Feirer, Chapter 24, 25

Wagner & Smith, Unit 11

Appendix A U3T2 Carpentry Tools

Appendix B Tool Safety Sheets

Drawings

- Appendix A U3T2 Cutting Plan Drawing

Tools

- Layout tools (rules, squares)
- Separating tools (saws, planes, drills)
- Combining tools (hammers, screw-drivers, pneumatic nailers)

Consumables

- 2 by 4 lumber
- Nails
- Screws
- Construction Adhesive

Topic 4 Carpentry - Roof Framing

Specific Curriculum Outcomes

Students will be expected to

3.4.7 construct and sheath a roof section based on the technical drawings supplied by the instructor

[1.403][1.404][1.405][2.401]
[2.402][2.405][4.402][5.401]
[5.402][5.403]

Suggested Learning and Teaching Strategies

For the Student

- Using the technical drawing and work plan as guidance, build the roof frame section complete with sheath.
- Create appropriate entry in the worklog and have teacher sign off.

Topic 4 Carpentry - Roof Framing

Suggestions for Assessment

Resources

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
<p>Students will be expected to</p> <p>3.5.1 discuss safe practices when working with electricity. [2.401][2.402][2.405][3.401] [5.402]</p>	<p>For the Teacher</p> <p>This outcome addresses safety in the workplace when working with electricity. The teacher is expected to demonstrate the safe practices in the work environment, as well as test the student in those practices.</p> <p>Safe practices start with ensuring that the electrical circuit being worked on or tested is not energized. For this reason, the operation of metering devices and /or circuit tester such as a multi-meter should be emphasized.</p> <p>Points to emphasize</p> <ul style="list-style-type: none">• Check to make sure the circuit is not energized before working on it• Follow proper protocols for handling conductors, stripping insulation, and attaching them to devices• Ensure all devices are attached to ground as specified <p>For the Student</p> <ul style="list-style-type: none">• Demonstrate the safe and proper operation of the following tools and devices, integral to safe practice with electricity:<ul style="list-style-type: none">• Multimeter• Circuit tester• Create an appropriate entry in the worklog.

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Assessment

Paper and pencil

- Students could do up a list of general safety rules that deal with working with electricity. These are overriding concerns for any electrical work and not specific to a task.

Work log

- Students could create an appropriate entry in their work logs, discussing what has been learned in this instance.

Practical activity

- Students could demonstrate the proper use of a multimeter and circuit tester as a means of working with electricity safely.

Resources

References

- Smart Guide Wiring pg. 4
Wagner & Smith, Chapter 26
Feirer, Unit 8, Chapter 39

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes

Students will be expected to

- 3.5.2 demonstrate safe practices for use of hand tools common in the creation of electrical circuits
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies For the Teacher

This outcome addresses the safe use of tools in electrical circuit creation. The teacher is expected to demonstrate the safe use of any tool operated in the work environment, as well as test the student in that use.

Even though the last outcome dealt specifically with safe practices, this is still important when dealing with safe use of electrical tools. Safe tool use starts with ensuring that the electrical circuit being worked on or tested is not energized. For this reason, the operation of metering devices such as a multi-meter should be emphasized.

Points to emphasize

- Check to make sure the circuit is not energized before working on it
- Use tools only for the task intended, and in the manner intended
- Follow proper protocols for handling conductors, stripping insulation, and attaching them to devices
- Ensure all devices are attached to ground as specified
- It will be necessary to demonstrate usage of all tools and electrical devices to be used in the course. Demonstrations may occur during this topic, or some may be deferred until the electrical fabrication topic.

For the Student

- Demonstrate the safe and proper operation of the following tools and devices:
 - Wire cutters
 - Wire strippers
 - Multimeter
 - Circuit tester
 - Screwdrivers
- Create an appropriate entry in the worklog.

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the following tools and devices:
 - Wire cutters
 - Wire strippers
 - Multimeter
 - Circuit tester
 - Screwdrivers

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

- Smart Guide Wiring pg. 4
- Wagner & Smith, Chapter 26
- Feirer, Unit 8, Chapter 39

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes

Students will be expected to

- 3.5.3 define electricity and electrical terms
[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

The electrician's job, indeed safety on the job, is dependant on understanding the nature of electricity and how electrical systems work. It is important to understand the terminology of electricity in order to communicate about electricity. Understanding begins with the atomic structure that underlies electricity

Points to emphasize:

- Terminology of electricity:
 - Resistance, abbreviated R
 - Current, abbreviated I
 - Power, abbreviated P
 - Electrical components
 - Conductors,
 - Resistors,
 - Alternating and direct current.
- Units of electrical measure
 - Volt, symbol V
 - Ohms, symbol
 - Ampere, symbol A
 - Watt, symbol W
 - Joules, symbol J
- Electrical current as the net movement of electrons
- A circuit requires:
 - A load which uses the electricity to do something
 - A source of electrical energy
 - A pathway or conductor
 - A control device, for example a switch
- The circuit has to have one complete path through which electrons can flow (control device included)
- Drawings using a simple set of schematic symbols are typically used to describe a circuit.

The activity on sketching circuits will result in nearly identical schematics. That is deliberate, with the intent of having students realize that circuit schematics may be similar regardless of the power consumed by the load.

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Paper and pencil

- Students could create a table and match the following terms to their corresponding unit:
 - Terms
 - Resistance, Current, Power
 - Units
 - Volts, Ohms, Ampere (amp), Watt.

Research

- Students could do an assignment describing function of each of the following basic components of a circuit, and give examples of each:
 - A source,
 - A conductor,
 - A control, and
 - A load

Layout

- Students could sketch a diagram that illustrates electricity in terms of electron flow through a group of atoms.
- Students could sketch a schematic of each of the following circuits
 - A flashlight bulb powered by a single cell and a controlled with a switch
 - A ceiling light in a room controlled by a wall switch

Resources

References

CDLI course Communications Technology, Unit 4, Section 1, lessons 1 to 9.

Comm Tech 2-3104, Unit 4, section 1, Electronics: Schematic Symbols found here. (<http://www.cdli.ca/courses/ctecx104/unit04/section01/indexsect01.html>)

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Student
3.5.3 define electricity and electrical terms [1.405]	Complete the following series of activities <ul style="list-style-type: none">• Create a table and match the following terms to their corresponding unit:<ul style="list-style-type: none">• Terms<ul style="list-style-type: none">• Resistance, Current, Power• Units• Volts, Ohms, Ampere (amp), Watt.• Sketch a diagram that illustrates electricity in terms of electron flow through a group of atoms.• Describe function of each of the following basic components of a circuit, and give examples of each:<ul style="list-style-type: none">• A source,• A conductor,• A control, and• A load• Sketch a schematic of each of the following circuits<ul style="list-style-type: none">• A flashlight bulb powered by a single cell and a controlled with a switch• A ceiling light in a room controlled by a wall switch• Create a suitable entry in the worklog

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Resources

Work log

- Students could create a suitable entry in the work-log dealing with the terms they have learned in this section.

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes

Students will be expected to

3.5.4 describe the components of a standard residential electrical system

[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome addresses the structural subsystems in a residential electrical system.

Points to consider

- Demonstrate the purpose and function of each component
 - The service entrance
 - The electrical meter
 - The distribution panel
 - The branch circuits
 - Speciality electrical systems (multimedia distribution, networks, security)

Showing the physical objects, especially if they are assembled as a demo unit would be useful.

For the Student

- State the purpose and function of each of the following components of the service entrance.
 - The service entrance
 - The electrical meter
 - The distribution panel
 - The branch circuits
 - Speciality electrical systems (multimedia distribution, networks, security)
- Complete the following questions from the Mullin, Miller, & Stephenson textbook: page 432, # 1 to 3.
- Create a suitable entry in the worklog

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Research

- Students could research the purpose and function of each of the following components of the service.
 - The service entrance
 - The electrical meter
 - The distribution panel
 - The branch circuits
 - Speciality electrical systems (multimedia distribution, networks, security)

Work log

- Students could create a suitable entry in the work log dealing with the components of the electrical service.

Resources

References

Mullin, Miller, & Stephenson, unit 28, page 400-446

Wagner & Smith

- unit 8-19, page 179-556
- unit 15, page 429-462
- unit 20, page 557-580
- unit 26, page 673-676

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
3.5.5 list the electrical code requirements for residential lighting and receptacle circuits. [1.405]	<p>This sco deals with the regulatory bodies that govern the installation of electrical components in any type of construction venue in Canada and in the Provinces.</p> <p>Regulation of building and electrical codes is a provincial jurisdiction. Each province regulates by passing laws which mandate a standard set of codes and regulations. Some provinces write their own codes, some do not. The Standards Council of Canada is a federal crown corporation, which has advisors from all the provinces, that creates a set of standards and the codes for many areas of construction, including electrical. Where provinces write their own, they are based on this standard and modified to suit local conditions. Other provinces use the Standards Council codes.</p> <p>Newfoundland and Labrador uses the Canadian Building Codes as the authority.</p> <p>Regulations that govern the electrical trades are:</p> <ul style="list-style-type: none">• Canadian Electrical Code• Provincial Electrical Code (for some)• Municipal Electrical Code• CSA and UL• Insurance regulations <p>Points to emphasize</p> <ul style="list-style-type: none">• Electrical equipment manufacture and installation of electrical equipment has significant public safety issues, and is tightly regulated by standards and codes• The Canadian Electrical Code has multiple parts. One deals with equipment, one deals with residential installation, and others deal with industrial and commercial applications• The Canadian Electrical Code sets a national standard to which provincial and local codes and regulations adhere

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Assessment

Research

- Students could identify each of the provincial and Canadian electrical regulating bodies and how they interact with the electrical code.
- Students could briefly describe the function of each regulating body.

Paper and pencil

- Students could identify the basic codes that regulate branch circuits in a residence and wiring to electrical appliance receptacles in a residence.

Resources

References

Mullin, Miller, & Stephenson, unit 1, pg. 12

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes

Students will be expected to

3.5.5 list the electrical code requirements for residential lighting and receptacle circuits.

[1.405]

Suggested Learning and Teaching Strategies

- Provinces set out which codes and regulations will be employed by passing laws.
- Codes specify which devices can go where in a building, how they have to be installed, how they have to be wired, how they have to be protected with fuses and breakers, how many and what type of devices can be on a circuit.
- Provincial and municipal regulations specify who can perform electrical installations and the training and certification they need

For the Student

- Identify each of the provincial and Canadian electrical regulating bodies
- Briefly describe the function of each regulating body
- Look in Mullin et al., starting on page 52, and identify the basic codes that regulate branch circuits in a residence
- Look in Mullin et al., starting on page 52, and identify the basic codes that regulate wiring to electrical appliance receptacles in a residence

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Resources

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes

Students will be expected to

3.5.6 configure and test low voltage circuits in common residential use

[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

This topic deals with common low voltage applications that may or may not be installed during a residential construction project.

Each of these circuits may be installed by the electrician, usually at the time of construction. It is expected that only one or two of these systems will be used as skill building activities.

Points to emphasize

- Each of the systems in this section has unique requirements with respect to the way the cabling is installed, the kinds of equipment attached to the cabling, and the way that is used by the homeowner
- The cost of installation when a house is under construction is minimal compared to installing after the house is completed. Labour is the major cost for most installations after the building is complete
- There is a trend towards “smart” or “wired” houses where a communications infrastructure is installed in the house. This lets sensors in the house communicate with central control systems, and with the homeowner. Regulation of HVAC (heating, ventilation and air conditioning), lighting and security can be as automated as the homeowner wants. As well, whole house entertainment with video, music and TV piped to any room in the house from a central computer is becoming more mainstream.
- Because the system is low voltage does not mean it has no hazards or difficulties for installation. Knowledge of the equipment specifications, how it inter-operates and how to install it correctly can mean the difference between a clean fully functional installation and one that doesn't work well. At some point it also connects to line voltage for its power.

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Skills Rubric

Practical Activity

- Students could select, configure, install and test the following electrical circuits:
 - single pole switch to a light
 - two receptacles in series
 - two x three way switches to a light
 - switch controlled receptacle

Work log

- Students could create an appropriate entry in the work log, outlining the skills they have used.

Resources

References

Smart Guide Wiring

Mullin, Miller, & Stephenson

- Unit 25, page 356-380
- Unit 27, page 390-399

Appendix B Tool Safety Sheets

Drawings

- Teacher produced Electrical Schematics and Pictorials

Tools

- Electrical tools as per Appendix A Electrical Tools

Consumables

- Electrical supplies for the low-voltage circuit specified

Topic 5 Construction Electrician - Circuits

Specific Curriculum Outcomes

Students will be expected to

3.5.6 configure and test low voltage circuits in common residential use

[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

It is suggested that a sample of these systems be mounted and installed on some sort of frame for demonstration purposes.

You may wish to create schematics and pictorials for each circuit you want students to set up.

For the Student

- Select, configure, and install one of the following electrical circuits:
 - single pole switch to a light
 - two receptacles in series
 - two x three way switches to a light
 - switch controlled receptacle
- Test the system.
- Create an appropriate entry in the worklog.

Topic 5 Construction Electrician - Circuits

Suggestions for Assessment

Resources

Topic 6 Construction Electrician - Residential Wiring

Specific Curriculum Outcomes

Students will be expected to

- 3.6.1 review safe practices when working with electricity.
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome is intended to be a refresher for SCO 3.5.1, as it addresses safety in the workplace when working with electricity. The teacher is expected to demonstrate the safe practices in the work environment, as well as test the student in those practices.

Safe practices start with ensuring that the electrical circuit being worked on or tested is not energized. For this reason, the operation of metering devices and /or circuit tester such as a multi-meter should be emphasized.

Points to emphasize

- Check to make sure the circuit is not energized before working on it
- Follow proper protocols for handling conductors, stripping insulation, and attaching them to devices
- Ensure all devices are attached to ground as specified

For the Student

- Demonstrate the safe and proper operation of the following tools and devices, integral to safe practice with electricity:
 - Multimeter
 - Circuit tester
- Create an appropriate entry in the worklog.

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Assessment

Paper and pencil

- Students could do up a list of general safety rules that deal with working with electricity. These are overriding concerns for any electrical work and not specific to a task.

Work log

- Students could create an appropriate entry in their work logs, discussing what has been learned in this instance.

Practical activity

- Students could demonstrate the proper use of a multimeter and circuit tester as a means of working with electricity safely.

Resources

References

- Smart Guide Wiring pg. 4
- Wagner & Smith, Chapter 26
- Feirer, Unit 8, Chapter 39

Topic 6 Construction Electrician - Residential Wiring

Specific Curriculum Outcomes

Students will be expected to

- 3.6.2 demonstrate safe practices for use of hand and power tools common in the installation of residential electrical circuits
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies For the Teacher

This outcome addresses the safe use of tools in residential wiring. The teacher is expected to demonstrate the safe use of any tool operated in the work environment, as well as test the student in that use. This outcome differs from SCO 3.5.2 in that power tools are a common tool used in residential wiring.

Safe tool use starts with ensuring that the electrical circuit being worked on or tested is not energized. For this reason, the operation of metering devices such as a multi-meter should be emphasized.

Points to emphasize

- Check to make sure the circuit is not energized before working on it
- Use tools only for the task intended, and in the manner intended
- Follow proper protocols for handling conductors, stripping insulation, and attaching them to devices
- Ensure all devices are attached to ground as specified
- It will be necessary to demonstrate usage of all tools and electrical devices to be used in the course. Demonstrations may occur during this topic, or some may be deferred until the electrical fabrication topic.

For the Student

- Demonstrate the safe and proper operation of the following tools and devices:
 - Wire cutters
 - Wire strippers
 - Multimeter
 - Circuit tester
 - Screwdrivers
 - Drills
 - Saws
- Create an appropriate entry in the worklog.

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the following tools and devices:
 - Wire cutters
 - Wire strippers
 - Multimeter
 - Circuit tester
 - Screwdrivers

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

- Smart Guide Wiring pg. 4
- Wagner & Smith, Chapter 26
- Feirer, Unit 8, Chapter 39

Topic 6 Construction Electrician - Residential Wiring

Specific Curriculum Outcomes

Students will be expected to

- 3.6.3 review electricity and electrical terms
[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

These terms have been introduced in SCO 3.5.3. This outcome is present as a review, to insure that students are familiar with all the important terms. It is important to understand the terminology of electricity in order to communicate about electricity.

Points to emphasize:

- Terminology of electricity:
 - Resistance, abbreviated R
 - Current, abbreviated I
 - Power, abbreviated P
 - Electrical components
 - Conductors,
 - Resistors,
 - Alternating and direct current.
- Units of electrical measure
 - Volt, symbol V
 - Ohms, symbol
 - Ampere, symbol A
 - Watt, symbol W
 - Joules, symbol J
- Electrical current as the net movement of electrons
- A circuit requires:
 - A load which uses the electricity to do something
 - A source of electrical energy
 - A pathway or conductor
 - A control device, for example a switch
- The circuit has to have one complete path through which electrons can flow (control device included)
- Drawings using a simple set of schematic symbols are typically used to describe a circuit.

The activity on sketching circuits will result in nearly identical schematics. That is deliberate, with the intent of having students realize that circuit schematics may be similar regardless of the power consumed by the load.

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Paper and pencil

- Students could create a table and match the following terms to their corresponding unit:
 - Terms
 - Resistance, Current, Power
 - Units
 - Volts, Ohms, Ampere (amp), Watt.

Research

- Students could do an assignment describing function of each of the following basic components of a circuit, and give examples of each:
 - A source,
 - A conductor,
 - A control, and
 - A load

Layout

- Students could sketch a diagram that illustrates electricity in terms of electron flow through a group of atoms.
- Students could sketch a schematic of each of the following circuits
 - A flashlight bulb powered by a single cell and a controlled with a switch
 - A ceiling light in a room controlled by a wall switch

Resources

References

CDLI course Communications Technology, Unit 4, Section 1, lessons 1 to 9.

Comm Tech 2-3104, Unit 4, section 1, Electronics: Schematic Symbols found here. (<http://www.cdli.ca/courses/ctecx104/unit04/section01/indexsect01.html>)

Topic 6 Construction Electrician - Residential Wiring

Specific Curriculum Outcomes

Students will be expected to

- 3.6.3 review electricity and electrical terms
[1.405]

Suggested Learning and Teaching Strategies

These activities are based on students being introduced to this topic for the first time. It is assumed that students will be involved in a different set of activities for each of the outcomes in this section.

For the Student

Complete the following series of activities

- Create a table and match the following terms to their corresponding unit:
 - Terms
 - Resistance, Current, Power
 - Units
 - Volts, Ohms, Ampere (amp), Watt.
 - Sketch a diagram that illustrates electricity in terms of electron flow through a group of atoms.
 - Describe function of each of the following basic components of a circuit, and give examples of each:
 - A source,
 - A conductor,
 - A control, and
 - A load
 - Sketch a schematic of each of the following circuits
 - A flashlight bulb powered by a single cell and a controlled with a switch
 - A ceiling light in a room controlled by a wall switch
 - Create a suitable entry in the worklog

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Resources

Work log

- Students could create a suitable entry in the work-log dealing with the terms they have learned in this section.

Topic 6 Construction Electrician - Residential Circuits

Specific Curriculum Outcomes

Students will be expected to

3.6.4 identify and describe the devices used in a residential electrical system

[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to ensure the student can visually identify and describe the purpose of each of the devices in use in residential electrical systems.

Points to consider

- Using the list from the student activity, demonstrate each item to the students and describe the function of each and how each is deployed

As with the previous outcome, a demo setup containing all the devices would facilitate this outcome.

For the Student

- Create a table with two columns. List the items in column 1, describe the purpose/function of each of the items in column 2.
 - Breakers and fuses
 - Wires, (types and sizes)
 - Octagon and outlet boxes
 - Receptacles
 - Switches
 - Lighting fixtures
 - Appliances
 - Connectors
 - GFCI
 - Ballasts
 - Thermostats
 - Transformers
 - Smoke detectors
 - Low voltage relay
 - Telephone/data wiring
 - Chime and doorbell transformers
- For each of the items, examine the device and determine how wire is connected
- Create a suitable entry in the work log.
- Provinces set out which codes and regulations will be employed by passing laws.

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Research

- Students could create a table with two columns, listing the following items in column 1, describing the purpose/function of each of the items in column 2.
 - Breakers and fuses
 - Wires, (types and sizes)
 - Octagon and outlet boxes
 - Receptacles
 - Switches
 - Lighting fixtures
 - Appliances
 - Connectors
 - GFCI
 - Ballasts
 - Thermostats
 - Transformers
 - Smoke detectors
 - Low voltage relay
 - Telephone/data wiring
 - Chime and doorbell transformers
- For each of the items, examine the device and determine how wire is connected.

Work log

- Students could create a suitable entry in the work log.

Resources

References

Miller, chapter 8

Herman, unit 10, page 305-331

Mullin, Miller, & Stephenson, unit 2-8, page 20-165

Topic 6 Construction Electrician - Residential Circuits

Specific Curriculum Outcomes

Students will be expected to

3.6.4 identify and describe the devices used in a residential electrical system

[1.405]

Suggested Learning and Teaching Strategies

- Codes specify which devices can go where in a building, how they have to be installed, how they have to be wired, how they have to be protected with fuses and breakers, how many and what type of devices can be on a circuit.
- Provincial and municipal regulations specify who can perform electrical installations and the training and certification they need

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Resources

Topic 6 Construction Electrician - Residential Circuits

Specific Curriculum Outcomes

Students will be expected to

3.6.5 list the electrical code requirements in the installation of cables and wiring.

[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

This SCO deals with the regulatory bodies that govern the installation of electrical components in any type of construction venue in Canada and in the Provinces.

Regulation of building and electrical codes is a provincial jurisdiction. Each province regulates by passing laws which mandate a standard set of codes and regulations. Some provinces write their own codes, some do not. The Standards Council of Canada is a federal crown corporation, which has advisors from all the provinces, that creates a set of standards and the codes for many areas of construction, including electrical. Where provinces write their own, they are based on this standard and modified to suit local conditions. Other provinces use the Standards Council codes.

Newfoundland and Labrador uses the Canadian Building Codes as the authority.

Regulations that govern the electrical trades are:

- Canadian Electrical Code
- Provincial Electrical Code (for some)
- Municipal Electrical Code
- CSA and UL
- Insurance regulations

Points to emphasize

- Installation of electrical equipment has significant public safety issues, and is tightly regulated by standards and codes
- The Canadian Electrical Code has multiple parts. One deals with equipment, one deals with residential installation, and others deal with industrial and commercial applications
- The Canadian Electrical Code sets a national standard to which provincial and local codes and regulations adhere

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Assessment

Research

- Students could identify each of the provincial and Canadian electrical regulating bodies and how they interact with the electrical code.
- Students could briefly describe the function of each regulating body.

Paper and pencil

- Students could identify the basic codes that regulate branch circuits in a residence and wiring to electrical appliance receptacles in a residence.

Resources

References

Mullin, Miller, & Stephenson, unit 1, pg. 12

Smart Guide Wiring pg. 4

Topic 6 Construction Electrician - Residential Circuits

Specific Curriculum Outcomes

Students will be expected to

3.6.6 list the electrical code requirements in the installation of cables and wiring.

[1.405]

Suggested Learning and Teaching Strategies

- Provinces set out which codes and regulations will be employed by passing laws.
- Codes specify which devices can go where in a building, how they have to be installed, how they have to be wired, how they have to be protected with fuses and breakers, how many and what type of devices can be on a circuit.
- Provincial and municipal regulations specify who can perform electrical installations and the training and certification they need

For the Student

- Identify each of the provincial and Canadian electrical regulating bodies
- Briefly describe the function of each regulating body
- Look in Mullin et al., starting on page 52, and identify the basic codes that regulate branch circuits in a residence
- Look in Mullin et al., starting on page 52, and identify the basic codes that regulate wiring to electrical appliance receptacles in a residence

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Resources

Topic 6 Construction Electrician - Residential Circuits

Specific Curriculum Outcomes

Students will be expected to

3.6.7 create a work plan for the installation of a residential electrical circuit

[1.402][1.405][4.402][4.403]
[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

The work plan is an essential first step. It ensures that students understand what they have to do, and how to do it. Planning and fabrication should be undertaken as a team effort.

In the previous topic on electricity, one outcome addressed the two general sets of components (service and electrical devices) that might be installed in a residential construction in the production process. A work plan should be developed for the installation sequence of the identified components. These are listed below. Students need to review the original drawings for the project that they chose from the two options, and plan the sequence of activities related to installing the electrical aspect of the project, commencing with the common components. The residential service will not be completed, but will have been demonstrated by the teacher. Each successive trade will construct its own work plan.

Students should also identify the tools and equipment they will use. A materials list will be a natural component in addition to the work plan. At this time it is important to ensure that any qualifications needed for those tools are obtained. Use Appendix A Planning Guide: Information for Fabrication Planning as a guideline for this outcome.

Points to emphasize

- Review the drawings for the project, and the structure that has been built and sketch electrical drawings and schematics for the project to include
 - One lighting branch, switched using two three way switches
 - Two receptacles,
 - One receptacle should be split with the top half controlled using a SPST switch, and bottom half non-switched
 - One exterior GFI receptacle

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Assessment

Achieving this sco requires the application of knowledge and skills acquired from work in previous topics and outcomes.

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could draw a diagram to scale of the project to be undertaken in this module. This drawing should be mated with a description of the tools and techniques utilized in this section.

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

Topic 6 Construction Electrician - Residential Circuits

Specific Curriculum Outcomes

Students will be expected to

3.6.7 create a work plan for the installation of a residential electrical circuit

[1.402][1.405][4.402][4.403]
[1.405]

Suggested Learning and Teaching Strategies

- Make a list of all the electrical circuits
- Make a list of the components for each circuit, including wiring
- Identify tools and equipment needed, including for fastening parts together
- Identify the installation sequence, listing what needs to be done in the order it needs to be done.
- Identify items that they are not qualified to use and plan to get certification.
- At this time it is important to ensure that any qualifications needed for those tools are obtained.

For the Student

- Based on the drawings provided, and keeping the design brief in mind
 - Identify the individual circuits
 - Make a list of the electrical components for each circuit
 - Make a sketch of the installation sequence indicating wire runs, where holes need to be bored, and the location of outlet boxes
 - Identify tools and equipment required and note any additional knowledge/skills needed to complete the work and make provisions with the teacher to obtain that qualification
- Create appropriate entry in the WorkLog and have teacher sign off.

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Resources

Topic 6 Construction Electrician - Residential Circuits

Specific Curriculum Outcomes

Students will be expected to

3.6.8 install a residential electrical circuit based on the technical drawings supplied by the instructor

[1.403][1.404][1.405][2.401]
[2.402][2.405][4.402][5.401]
[5.402][5.403]

Suggested Learning and Teaching Strategies

For the Teacher

Points to emphasize

- Electrical safety and the need to ensure a circuit is not energized when working on it. This constitutes the major safety issue for using electrical tools
- The wiring plans should be reviewed while examining the structure to ensure no changes are required. If changes are needed, the plan needs to be modified accordingly
- Circuits and devices need to be marked out on the framing as per the wiring plan
- Electrical boxes are installed next
- Wiring runs are laid out next and holes drilled for wire
- Wires are pulled for all the circuits and outer casing stripped before wires are put into boxes
- The electrical work will need to be done in several phases
 - Phase 1 is rough-in and it can be completed at this time
 - Phase 2 is installation of receptacles, switches and electrical device/appliances and it gets completed after the interior work by the carpenters, lathers, and painters.

For the Student

Using the electrical plans you created in the previous activity, and Appendix A U2T2 Electrical Drawing as a reference, complete the following task for the electrical systems installation of the major project:

- Mark out branch circuits on the structure
 - One lighting branch,
 - Two receptacles, One exterior GFI receptacle
- Install outlet and octagon boxes
- Bore holes for wire runs
- Pull wires for each circuit
- Install receptacles and lights

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Skills Rubric

Practical Activity

- Students could use the electrical plans created in the previous activity, and Appendix A U2T2 Electrical Drawing as a reference, to complete the following task for the electrical systems installation of the major project:
 - Mark out branch circuits on the structure
 - One lighting branch,
 - Two receptacles, One exterior GFI receptacle
 - Install outlet and octagon boxes
 - Bore holes for wire runs
 - Pull wires for each circuit
 - Install receptacles and lights

Work log

- Students could create an appropriate entry in the work log, outlining the skills they have used.

Resources

References

Miller 130-133

Mullin, Miller, & Stephenson

- Unit 25, page 356-380
- Unit 27, page 390-399

Appendix B Tool Safety Sheets

Drawings

- Teacher produced Electrical Schematics and Pictorials

Tools

- Electrical tools as per Appendix A Electrical Tools

Consumables

- Electrical supplies for the low-voltage circuit specified

Topic 6 Construction Electrician - Residential Circuits

Specific Curriculum Outcomes

Students will be expected to

3.6.8 install a residential electrical circuit based on the technical drawings supplied by the instructor

[1.403][1.404][1.405][2.401]
[2.402][2.405][4.402][5.401]
[5.402][5.403]

Suggested Learning and Teaching Strategies

- Light should be switched using two three way switch
- One receptacle should be split with the top half controlled using a SPST switch, and bottom half non-switched.
- Install other devices including low voltage systems
- Have inspection performed by teacher
- Test electrical system
- Finalize finish for next stage of construction.
- Complete appropriate cleanup and restoration of site for next trade sequence.
- Create appropriate entry in the WorkLog and have teacher sign off.

Topic 6 Construction Electrician - Residential Wiring

Suggestions for Assessment

Resources

Topic 7 Plumber - Toilet Installation

Specific Curriculum Outcomes

Students will be expected to

3.7.1 demonstrate safe practices for use of hand and power tools common in toilet installation procedures.

[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Plumbing, like most specialized trades, employs specialized tools that are used to cut, shape, and fit pipe and fittings in the plumbing phase of a residential construction project. The activity for this section will be carried out during the activities in remaining plumbing topics and SCOs.

Most of the plumbing tools are basic in terms of their operating requirements, and can be demonstrated quickly. One should not assume, however, that because they are simple, students automatically know how to use them, and that there are no safety requirements.

Points to emphasize

- Plumbing tools are designed for specific tasks. Using the wrong tool can often damage the plumbing part, which can be an expensive mistake
- Some tools are intended to be used in a specific way (adjustable wrenches for example are intended to be torqued in one direction), and will eventually be damaged if used incorrectly
- Safe practices must be observed at all times
- Demonstrate the operation of the tools in the student activity

Modify the Appendix A Tool List for the student activities as needed. The activity is restricted to knowledge about the tools, and assessment is as well. If you wish to modify the activity to skill building, plumbing components will need to be supplied so that students manipulate them with the tools.

For the Student

- Using the plumbing tool list in Appendix A Tool List, identify each item and become familiar with the use and operation of the tool.
- A suitable entry should be made in the student work log

Topic 7 Plumber - Toilet Installation

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the tools and devices used in a toilet installation.

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

Blankenbaker,

- chapter 2, page 51
- chapter 7, page 132-136
- chapter 9, page 145-153

Appendix A Tool List

Appendix B Tool Safety Sheets

Tools

- As needed. See Appendix A U3T6 Plumbing Tools.

Consumables

- As required by the activity in which tools are being used

Topic 7 Plumber - Toilet Installation

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
<p>Students will be expected to</p> <p>3.7.2 identify, describe, and give the function of the components of a residential water supply system for a toilet</p> <p>[1.401][1.402] [2.401][3.401]</p>	<p>For the Teacher</p> <p>The supply side of the plumbing system begins with the cold water source from a well or a municipal water supply. The supply line is usually pressurized, and can be from 3/4 inch (1.9cm) to 1 1/2 inch (3.8cm) diameter. The size of the pipe is reduced for the distribution lines in the house. The first branch is to the hot water heater. Two parallel branches of hot and cold supply are run to the appliances in the house.</p> <p>The toilet supply is a single pipe, and is only cold water. This is one of the few instances in residential plumbing that a single supply pipe is used.</p> <p>Supply systems may be installed with branch circuits in series or in parallel, or a combination of both. The manner of distribution affects pressure, rate of flow, and how long it takes for hot water to reach a particular appliance. The ideal for water flow is to have shorter paths. See Appendix A U3T6 Series Distribution and Appendix A U3T6 Parallel Distribution for a basic layout of each</p> <p>Points to emphasize</p> <ul style="list-style-type: none"> • The water supply in a house is a managed pressure system • Pipe sizing is used to control pressure in the distribution throughout the house • Valves are used to control supply at critical points, for example a valve is installed at the point of connection to all water appliances so that they may be serviced without shutting off the water supply to the house. • Compression chambers are used to control pressure fluctuations at critical points, for example at faucets to prevent water hammer • Two basic branch distribution methods are employed for water supply—parallel and series. Either

Topic 7 Plumber - Toilet Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Research

- Students could identify and describe the function of each of the following:
 - Rural water supply
 - Water main (or well)
 - Types of wells that can supply water
 - Possible pumping sources to deliver the water
 - Types of storage tanks for well systems
 - Municipal water supply
 - Main water line and control valve
 - Cold water supply
 - Hot water supply, including heating system
 - Pipe runs and rises
 - Stops, valves and faucets
- Students could describe what happens when “water hammer” occurs. Students could also explain how an air chamber dampens this phenomenon.

Paper and pencil

- Students could identify all the plumbing installations that have only a single pipe source, either hot or cold, and how this adds to the complexity of a plumbing plan.

Work log

- Students could make a suitable entry in their work log.

Resources

References

Blankenbaker,

- chapter 11, page 169
- chapter 20, page 345

Wagner & Smith, unit 27, page 685

<http://www.lowes.com/lowes/lkn?action=howTo&p=Improve/HousePlumb.html#1>

http://www.bobvila.com/HowTo_Library/Plumbing_Basics-Miscellaneous-A1895.html

http://www.popularmechanics.com/home_improvement/smart_consumer/1274641.html?page=1&c=y

Drawings

- Appendix A U3T6 Series Distribution
- Appendix A U3T6 Parallel Distribution
- Appendix A U2T2 Plumbing Supply Plan
- Appendix A U2T2 Plumbing Supply Isometric

Tools

- For demonstration purposes,
 - Shop made parallel and series plumbing distribution mockups on small plywood panels
 - Shop made display panels showing components

Consumables

- Not applicable

Topic 7 Plumber - Toilet Installation

Specific Curriculum Outcomes

Students will be expected to

3.7.2 identify, describe, and give the function of the components of a residential water supply system for a toilet

[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

one may be used, and in some instances both are used simultaneously in the same branch

For the Student

- Identify and describe the function of
 - Rural water supply
 - Water main (or well)
 - Types of wells that can supply water
 - Possible pumping sources to deliver the water
 - Types of storage tanks for well systems
 - Municipal water supply
 - Main water line and control valve
 - Cold water supply
 - Hot water supply, including heating system
 - Pipe runs and rises
 - Stops, valves and faucets
- Describe what happens when “water hammer” occurs. Explain how an air chamber dampens this phenomenon.
- Students could identify all the plumbing installations that have only a single pipe source, either hot or cold, and how this adds to the complexity of a plumbing plan.
- A suitable entry should be made in the student work log

Topic 7 Plumber - Toilet Installation

Suggestions for Assessment

Resources

Topic 7 Plumber - Toilet Installation

Specific Curriculum Outcomes

Students will be expected to

3.7.3 identify, describe, and give the function of the components of a waste water drainage system for a toilet

[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the Teacher

The waste water drainage system is separate from the supply side. Where the supply side had to be concerned with pressure reduction and water hammer, the drainage system has to prevent sewer gasses from entering the house. Apart from being unpleasant, if there is sufficient methane gas build up, it can be explosive. Gasses are vented through the roof with carefully placed vent pipes. Gases are prevented from entering the house through the use of traps with standing water in them.

Points to emphasize

- Drainage of waste water depends on gravity for flow, so all waste pipes have a slope towards the exterior sewer system
- Every waste system has build-up of sewer gases, so two controls are used
- Venting through the roof of the building at each point of waste origin, for example sink, toilet or washer.
- Traps at each water appliance that hold standing water to prevent gases back into the building
- The distinctness of toilets with regards to waste water (built in traps, large waste water pipe, no trap on the pipe) should also be emphasized here.

For the Student

- Create a table with two headings. Label the headings: Drainage System Component, Description / Function. Complete the table by describing each of the following and
 - Municipal sewer disposal
 - Septic field systems
 - Sand traps
 - Grease pits
 - Drain pipe
 - Cleanouts
 - Back flow valves

Topic 7 Plumber - Toilet Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Research

- Students could create a table with two columns, listing the following items in column 1, describing the purpose/function of each of the items in column 2.
 - Municipal sewer disposal
 - Septic field systems
 - Sand traps
 - Grease pits
 - Drain pipe
 - Cleanouts
 - Back flow valves
 - Floor flange
 - Traps (p-trap systems/floor traps)
 - Sewer branches
 - Waste and vent stacks
 - Sump pumps
- Students could then itemize which of the specific waste water components are at work with a toilet system.

Work Log

- Students could create an entry in their work log, discussing the terms introduced in this section.

Resources

References

Blankenbaker,

- chapter 17, page 281
- chapter 18, page 299
- chapter 19, page 317
- chapter 23, page 405
- chapter 24, page 419

Smith,

- unit 11-37, page 109-276
- unit 53, page 391
- unit 55, page 401

Drawings

- Appendix A U2T2 Plumbing Waste Water Plan
- Appendix A U2T2 Plumbing Waste Isometric

Tools

- For demonstration purposes
 - Shop made waste and vent mock-up on small plywood panel
 - Shop made display panels showing components

Topic 7 Plumber - Toilet Installation

Specific Curriculum Outcomes

Students will be expected to

3.7.3 identify, describe, and give the function of the components of a waste water drainage system for a toilet

[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

- Floor flange
- Traps (p-trap systems/floor traps)
- Sewer branches
- Waste and vent stacks
- Sump pumps
- Students could then itemize which of the specific waste water components are at work with a toilet system.
- A suitable entry should be made in the student work log

Topic 7 Plumber - Toilet Installation

Suggestions for Assessment

Resources

Topic 7 Plumber - Toilet Installation

Specific Curriculum Outcomes

Students will be expected to

3.7.4 identify the different types of fixtures, tubing, pipes, connectors, and fittings used in toilet installation

[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome enables students to get a glimpse of the variety of plumbing options that are available for supply and waste systems

Points to emphasize

- The drainage system was traditionally constructed from cast iron. Most houses are now plumbed with ABS drainage pipe.
- Likewise copper pipe is the traditional choice for hot and cold water supply. Many houses are now being plumbed with PEX (cross linked high-density poly ethylene) pipe.
- Copper is joined using adhesion (soldering).
- ABS and PVC are joined using cohesion (solvents).
- PEX is joined using mechanical fittings. The system uses a copper manifold at the point of entry of the water main, and a separate pipe to each water appliance. PEX pipe slips on over a nipple on the manifold and a compression fitting secures it.

For the Student

- Create a table with two columns. Label the headings: Item, and Description. Identify and examine each of the following components. In the table, describe, and cite the function of
 - Compression fittings
 - PEX plastic hot and cold supply: pipe, fittings, adapters to connect to copper manifold, copper manifold
 - Plastic drainage: elbows (ell - 90°, 60°, 45°, 22.5°), tees, caps, couplings
- Students could itemize which of these components is used specifically in a toilet installation.

Topic 7 Plumber - Toilet Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Research

- Students could create a table with two columns. They should label the headings: Item, and Description. Each of the following components should be identified and described. The list should include
 - Compression fittings
 - PEX plastic hot and cold supply: pipe, fittings, adapters to connect to copper manifold, copper manifold
 - Plastic drainage: elbows (ell - 90°, 60°, 45°, 22.5°), tees, caps, couplings
- Students could itemize which of these components is used specifically in a toilet installation.

Resources

References

Blankenbaker,

- chapter 13, page 199
- chapter 14, page 213
- chapter 15, page 245
- chapter 16, page 257

Residential Plumbing and Piping systems <http://www.chilipepperapp.com/ps.htm>

PEX pipe configuration <http://www.lowes.com/lowes/lkn?action=howTo&p=Improve/PEX.html>

Cross-linked Polyethylene (PEX) Water supply piping <http://www.toolbase.org/techinv/techDetails.aspx?technologyID=296>

PEX Faq <http://www.ppfahome.org/pex/faqpex.html>

Drawings

- Appendix A U2T2 Plumbing Supply Plan
- Appendix A U2T2 Plumbing Supply Isometric
- Appendix A U2T2 Plumbing Waste Water Plan
- Appendix A U2T2 Plumbing Waste Isometric

Topic 7 Plumber - Toilet Installation

Specific Curriculum Outcomes

Students will be expected to

3.7.5 install components in a toilet tank

[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the teacher

This SCO covers the installation of the internal components of a toilet tank. Installation and replacement of the internal components of a toilet tank is one of the common tasks a plumber would undertake.

The teacher will demonstrate the proper installation technique of each part:

- ballcock,
- flush valve, and
- lever arm.

During this demonstration the teacher should also discuss the function of each of these parts. A working demonstration would be best, such that if it is possible students should be shown how the toilet parts work together.

Points to emphasize

- Rubber gaskets and washers that provide a water tight seal for the tank are important.
- The flush lever has a reverse thread.
- When choosing a toilet assembly, it is important to consider the availability of replacement parts over time.

For the student

- Students will be expected to reassemble the components of a toilet tank.
- They will be assessed on their ability to label and properly reinstall the components of the tank.
- The teacher will visually inspect the completed tank assembly and orally quiz the students to assess their knowledge base.

Topic 7 Plumber - Toilet Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Skills Rubric

Practical Activity

- Students will be expected to reassemble the components of a toilet tank.
- They will be assessed on their ability to label and properly reinstall the components of the tank.
- The teacher will visually inspect the completed tank assembly and orally quiz the students to assess their knowledge base.

Work log

- Students could create an appropriate entry in the work log, outlining the skills they have used.

Resources

References

Blankenbaker, chapter 28, page 465-499

Tools

- Plumbing tools as required for the mechanisms being repaired, including wrenches for removing valve seats

Consumables

- A repair kit for each mechanism (normally reusable for this activity)

Topic 7 Plumber - Toilet Installation

Specific Curriculum Outcomes

Students will be expected to

3.7.6 install a toilet, including supply and waste lines, using manufacturers instructions

[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Plumbing is one of the major jobs in the construction of the residential structure. Often, this trade operates concurrently with the carpentry, electrical, and lathing trades. There are three phases of plumbing that need to be emphasized because of their relationship to the total construction sequence. These are: rough above and below ground work, rough in within the structure, and finished plumbing. Each phase coincides and overlaps with the tasks of other trades, and is often reliant upon the completion of those trade specific tasks. The Plumber provides the waste, drainage, and supply systems (interior and exterior).

Points to emphasize

- Work from the drawings and plan
- Layout the drainage rough-in first
- Install drainage system
- Layout cold supply
- Install cold supply
- Use proper techniques and precautions as covered in the previous topic

For the Student

Using the brief and the work plan you completed in the previous outcome as guidance, and following this procedure

- Mark out the locations for the DWV and supply systems
- Prepare the rough in for the interior/exterior systems by boring appropriate holes and creating mounting points.
- Measure, cut, and dry install rough-in components.
- Get teacher to inspect

Topic 7 Plumber - Toilet Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Skills Rubric

Practical Activity

- Students could use the brief and the work plan completed in the previous outcome as guidance, and following this procedure
 - Mark out the locations for the DWV and supply systems
 - Prepare the rough in for the interior/exterior systems by boring appropriate holes and creating mounting points.
 - Measure, cut, and dry install rough-in components.
 - Get teacher to inspect

Work log

- Students could create an appropriate entry in the work log, outlining the skills they have used.

Resources

References

- Design brief completed in U3T1
- Student material list from activity in previous outcome

Appendix B Tool Safety Sheets

Drawings

- Appendix A U2T2 Floor Plan
- Appendix A U2T2 Plumbing Waste Water Plan
- Appendix A U2T2 Plumbing Supply Plan
- Appendix A U2T2 Plumbing Waste Isometric
- Appendix A U2T2 Plumbing Supply Isometric
- One of
 - Appendix A U3T1 Design Plan Option 1, and
 - Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric
- Appendix A U2T2 Orthographic Grid
- Student drawings from planning activity in previous outcome

Topic 8 Plumber - Sink Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.8.1 demonstrate safe practices for use of hand and power tools common in sink installation procedures.
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Plumbing, like most specialized trades, employs specialized tools that are used to cut, shape, and fit pipe and fittings in the plumbing phase of a residential construction project. The activity for this section will be carried out during the activities in remaining plumbing topics and SCOs.

Most of the plumbing tools are basic in terms of their operating requirements, and can be demonstrated quickly. One should not assume, however, that because they are simple, students automatically know how to use them, and that there are no safety requirements.

Points to emphasize

- Plumbing tools are designed for specific tasks. Using the wrong tool can often damage the plumbing part, which can be an expensive mistake
- Some tools are intended to be used in a specific way (adjustable wrenches for example are intended to be torqued in one direction), and will eventually be damaged if used incorrectly
- Safe practices must be observed at all times
- Demonstrate the operation of the tools in the student activity

Modify the Appendix A Tool List for the student activities as needed. The activity is restricted to knowledge about the tools, and assessment is as well. If you wish to modify the activity to skill building, plumbing components will need to be supplied so that students manipulate them with the tools.

For the Student

- Using the plumbing tool list in Appendix A Tool List, identify each item and become familiar with the use and operation of the tool.
- A suitable entry should be made in the student work log

Topic 8 Plumber - Sink Installation

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the tools and devices used in a sink installation.

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

Blankenbaker,

- chapter 2, page 51
- chapter 7, page 132-136
- chapter 9, page 145-153

Appendix A Tool List

Appendix B Tool Safety Sheets

Tools

- As needed. See Appendix A U3T6 Plumbing Tools.

Consumables

- As required by the activity in which tools are being used

Topic 8 Plumber - Sink Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.8.2 identify, describe, and give the function of the components of a residential water supply system for a sink
[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the Teacher

The supply side of the plumbing system begins with the cold water source from a well or a municipal water supply. The supply line is usually pressurized, and can be from 3/4 inch (1.9cm) to 1 1/2 inch (3.8cm) diameter. The size of the pipe is reduced for the distribution lines in the house. The first branch is to the hot water heater. Two parallel branches of hot and cold supply are run to the appliances in the house.

This is the main place that a sink installation and water supply differ from that of the toilet. A sink water supply system has to have both hot and cold water sources. This the parallel branching system is in use here.

Supply systems may be installed with branch circuits in series or in parallel, or a combination of both. The manner of distribution affects pressure, rate of flow, and how long it takes for hot water to reach a particular appliance. The ideal for water flow is to have shorter paths. See Appendix A U3T6 Series Distribution and Appendix A U3T6 Parallel Distribution for a basic layout of each

Points to emphasize

- The water supply in a house is a managed pressure system
- Pipe sizing is used to control pressure in the distribution throughout the house
- Valves are used to control supply at critical points, for example a valve is installed at the point of connection to all water appliances so that they may be serviced without shutting off the water supply to the house.
- Compression chambers are used to control pressure fluctuations at critical points, for example at faucets to prevent water hammer
- Two basic branch distribution methods are employed for water supply—parallel and series. Either

Topic 8 Plumber - Sink Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Research

- Identify and describe the function of
 - Rural water supply
 - Water main (or well)
 - Types of wells that can supply water
 - Possible pumping sources to deliver the water
 - Types of storage tanks for well systems
 - Municipal water supply
 - Main water line and control valve
 - Cold water supply
 - Hot water supply, including heating system
 - Pipe runs and rises
 - Stops, valves and faucets
- Describe what happens when “water hammer” occurs. Explain how an air chamber dampens this phenomenon.
- Students could identify all of the plumbing installations that require parallel pipe supply, and the complexity this introduces into residential plumbing planning.

Work log

- Students could make an appropriate entry in their work log.

Resources

References

Blankenbaker,

- chapter 11, page 169
- chapter 20, page 345

Wagner & Smith, unit 27, page 685

<http://www.lowes.com/lowes/lkn?action=howTo&p=Improve/HousePlumb.html#1>

http://www.bobvila.com/HowTo_Library/Plumbing_Basics-Miscellaneous-A1895.html

http://www.popularmechanics.com/home_improvement/smart_consumer/1274641.html?page=1&c=y

Drawings

- Appendix A U3T6 Series Distribution
- Appendix A U3T6 Parallel Distribution
- Appendix A U2T2 Plumbing Supply Plan
- Appendix A U2T2 Plumbing Supply Isometric

Tools

- For demonstration purposes,
 - Shop made parallel and series plumbing distribution mockups on small plywood panels
 - Shop made display panels showing components

Topic 8 Plumber - Sink Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.8.2 identify, describe, and give the function of the components of a residential water supply system for a sink
[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

one may be used, and in some instances both are used simultaneously in the same branch

For the Student

- Identify and describe the function of
 - Rural water supply
 - Water main (or well)
 - Types of wells that can supply water
 - Possible pumping sources to deliver the water
 - Types of storage tanks for well systems
 - Municipal water supply
 - Main water line and control valve
 - Cold water supply
 - Hot water supply, including heating system
 - Pipe runs and rises
 - Stops, valves and faucets
- Describe what happens when “water hammer” occurs. Explain how an air chamber dampens this phenomenon.
- Students could identify all of the plumbing installations that require parallel pipe supply, and the complexity this introduces into residential plumbing planning.
- A suitable entry should be made in the student work log

Topic 8 Plumber - Sink Installation

Suggestions for Assessment

Resources

Topic 8 Plumber - Sink Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.8.3 identify, describe, and give the function of the components of a waste water drainage system for a sink
[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

For the Teacher

The waste water drainage system is separate from the supply side. Where the supply side had to be concerned with pressure reduction and water hammer, the drainage system has to prevent sewer gasses from entering the house. Apart from being unpleasant, if there is sufficient methane gas build up, it can be explosive. Gasses are vented through the roof with carefully placed vent pipes. Gases are prevented from entering the house through the use of traps with standing water in them.

Points to emphasize

- Drainage of waste water depends on gravity for flow, so all waste pipes have a slope towards the exterior sewer system
- Every waste system has build-up of sewer gases, so two controls are used
- Venting through the roof of the building at each point of waste origin, for example sink, toilet or washer.
- Traps at each water appliance that hold standing water to prevent gases back into the building
- A sink installation involves the most common aspects of waste water in the system. It is the most frequent style of installation in the residential plumbing system.

For the Student

- Create a table with two headings. Label the headings: Drainage System Component, Description / Function. Complete the table by describing each of the following and
 - Municipal sewer disposal
 - Septic field systems
 - Sand traps
 - Grease pits
 - Drain pipe
 - Cleanouts

Topic 8 Plumber - Sink Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Research

- Students could create a table with two columns, listing the following items in column 1, describing the purpose/function of each of the items in column 2.
 - Municipal sewer disposal
 - Septic field systems
 - Sand traps
 - Grease pits
 - Drain pipe
 - Cleanouts
 - Back flow valves
 - Floor flange
 - Traps (p-trap systems/floor traps)
 - Sewer branches
 - Waste and vent stacks
 - Sump pumps
- Students could then itemize which of the specific waste water components are at work with a sink system.

Work log

- Students could make a suitable entry in their work log

Resources

References

Blankenbaker,

- chapter 17, page 281
- chapter 18, page 299
- chapter 19, page 317
- chapter 23, page 405
- chapter 24, page 419

Smith,

- unit 11-37, page 109-276
- unit 53, page 391
- unit 55, page 401

Drawings

- Appendix A U2T2 Plumbing Waste Water Plan
- Appendix A U2T2 Plumbing Waste Isometric

Tools

- For demonstration purposes
 - Shop made waste and vent mock-up on small plywood panel
 - Shop made display panels showing components

Topic 8 Plumber - Sink Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.8.3 identify, describe, and give the function of the components of a waste water drainage system for a sink
[1.401][1.402] [2.401][3.401]

Suggested Learning and Teaching Strategies

- Back flow valves
- Floor flange
- Traps (p-trap systems/floor traps)
- Sewer branches
- Waste and vent stacks
- Sump pumps
- Students could then itemize which of the specific waste water components are at work with a sink system.
- A suitable entry should be made in the student work log

Topic 8 Plumber - Sink Installation

Suggestions for Assessment

Resources

Topic 8 Plumber - Sink Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.8.4 identify the different types of fixtures, tubing, pipes, connectors, and fittings used in sink installation
[1.401][1.402][2.401][3.401]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome enables students to get a glimpse of the variety of plumbing options that are available for supply and waste systems

Points to emphasize

- The drainage system was traditionally constructed from cast iron. Most houses are now plumbed with ABS drainage pipe.
- Likewise copper pipe is the traditional choice for hot and cold water supply. Many houses are now being plumbed with PEX (cross linked high-density poly ethylene) pipe.
- Copper is joined using adhesion (soldering).
- ABS and PVC are joined using cohesion (solvents).
- PEX is joined using mechanical fittings. The system uses a copper manifold at the point of entry of the water main, and a separate pipe to each water appliance. PEX pipe slips on over a nipple on the manifold and a compression fitting secures it.

For the Student

- Create a table with two columns. Label the headings: Item, and Description. Identify and examine each of the following components. In the table, describe, and cite the function of
 - Compression fittings
 - PEX plastic hot and cold supply: pipe, fittings, adapters to connect to copper manifold, copper manifold
 - Plastic drainage: elbows (ell - 90°, 60°, 45°, 22.5°), tees, caps, couplings
- Students could itemize which of these components is used specifically in a sink installation.

Topic 8 Plumber - Sink Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Knowledge Rubric

Research

- Students could create a table with two columns. They should label the headings: Item, and Description. Each of the following components should be identified and described. The list should include
 - Compression fittings
 - PEX plastic hot and cold supply: pipe, fittings, adapters to connect to copper manifold, copper manifold
 - Plastic drainage: elbows (ell - 90°, 60°, 45°, 22.5°), tees, caps, couplings
- Students could itemize which of these components is used specifically in a sink installation.

Resources

References

Blankenbaker,

- chapter 13, page 199
- chapter 14, page 213
- chapter 15, page 245
- chapter 16, page 257

Residential Plumbing and Piping systems <http://www.chilipepperapp.com/ps.htm>

PEX pipe configuration <http://www.lowes.com/lowes/lkn?action=howTo&p=Improve/PEX.html>

Cross-linked Polyethylene (PEX) Water supply piping <http://www.toolbase.org/techinv/techDetails.aspx?technologyID=296>

PEX Faq <http://www.ppfahome.org/pex/faqpex.html>

Drawings

- Appendix A U2T2 Plumbing Supply Plan
- Appendix A U2T2 Plumbing Supply Isometric
- Appendix A U2T2 Plumbing Waste Water Plan
- Appendix A U2T2 Plumbing Waste Isometric

Topic 8 Plumber - Sink Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.8.5 install a sink and faucets, including supply and waste lines, using manufacturers instructions
[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Plumbing is one of the major jobs in the construction of the residential structure. Often, this trade operates concurrently with the carpentry, electrical, and lathing trades. There are three phases of plumbing that need to be emphasized because of their relationship to the total construction sequence. These are: rough above and below ground work, rough in within the structure, and finished plumbing. Each phase coincides and overlaps with the tasks of other trades, and is often reliant upon the completion of those trade specific tasks. The Plumber provides the waste, drainage, and supply systems (interior and exterior).

Points to emphasize

- Work from the drawings and plan
- Layout the drainage rough-in first
- Install drainage system
- Layout hot and cold supply
- Install hot and cold supply
- Use proper techniques and precautions as covered in the previous topic

For the Student

Using the brief and the work plan you completed in the previous outcome as guidance, and following this procedure

- Mark out the locations for the DWV and supply systems
- Prepare the rough in for the interior/exterior systems by boring appropriate holes and creating mounting points.
- Measure, cut, and dry install rough-in components.
- Get teacher to inspect

Topic 8 Plumber - Sink Installation

Suggestions for Assessment

Assessment

- Assess this outcome with Appendix B Skills Rubric

Practical Activity

- Students could use the brief and the work plan completed in the previous outcome as guidance, and following this procedure
 - Mark out the locations for the DWV and supply systems
 - Prepare the rough in for the interior/exterior systems by boring appropriate holes and creating mounting points.
 - Measure, cut, and dry install rough-in components.
 - Get teacher to inspect

Work log

- Students could create an appropriate entry in the work log, outlining the skills they have used.

Resources

References

- Design brief completed in U3T1
- Student material list from activity in previous outcome

Appendix B Tool Safety Sheets

Drawings

- Appendix A U2T2 Floor Plan
- Appendix A U2T2 Plumbing Waste Water Plan
- Appendix A U2T2 Plumbing Supply Plan
- Appendix A U2T2 Plumbing Waste Isometric
- Appendix A U2T2 Plumbing Supply Isometric
- One of
 - Appendix A U3T1 Design Plan Option 1, and
 - Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric
- Appendix A U2T2 Orthographic Grid
- Student drawings from planning activity in previous outcome

Topic 9 Lather

Specific Curriculum Outcomes

Students will be expected to

- 3.9.1 research and demonstrate safe practices for the use of Lather tools
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome is addressed in two separate ways. The first part is to develop knowledge about the tools. That is accomplished in the student activities below. The second part is to use the tools properly and safely. That part is addressed in subsequent activities in this topic and in the fabrication topic that follows.

Students will be tested on the use of the tools as the need arises, typically as they are performing the related tasks. Lather tools are listed in Appendix A Tool Lists.

Points to emphasize:

- Safety and safe handling of tools.
- Safety and health issues that might arise from the use of the tools (dust/respiratory irritants generated)
- Proper technique makes the work easier, faster, and more efficient
- Demonstrations should be given for each of the tools/techniques.

For the Student

- Working from the list of tools supplied by the teacher, identify each and describe the proper techniques for usage.
- A suitable entry should be made in the student worklog

Topic 9 Lather

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the tools and devices used in a lather project.

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

Wagner & Smith, unit 15, page 429-462

Hometime Construction Basics DVD

Appendix A Lather Tools

Appendix B Tool Safety Sheets

Tools

- As required for activity

Consumables

- As required for the activity

Topic 9 Lather

Specific Curriculum Outcomes

Students will be expected to

- 3.9.2 describe the properties, advantages and disadvantages, of various wall sheathing
[1.405]

Suggested Learning and Teaching Strategies

For the teacher

For the purposes of this outcome three interior wall sheathes will be considered:

- concrete backer board
- green board
- gypsum drywall

The most common of these is gypsum drywall, but the other two sheathes have application in humid environments such as bathrooms or around hot tubs.

Points to emphasize

- Green board is just gypsum drywall with a wax coating on the outside to prevent moisture from leaching in. Although still in use in some areas, it has become less popular over the past few years.
- Concrete backer board has a solid concrete hub and is armored with fiberglass mesh. Due to this armoring it is ideal for humid areas. It is also costly and difficult to cut and shape.
- Gypsum board or sheet rock or drywall as it is known, is the most versatile of all these choices. It is easiest to cut, cheaper and lighter. Its disadvantages are that it is more susceptible to humidity or water damage.
- Material thickness of drywall/fire ratings.

For the student

- Students could do a comparison chart of each of the sheathing materials. This chart would include the advantages and disadvantages and how each of the sheathings address each others failings.
- Students could research a variety of alternative sheathing methods, those not presented in this outcome, and indicate their applicability to residential construction in Newfoundland and Labrador.

Topic 9 Lather

Suggestions for Assessment

Assessment

Pencil and Paper

- Students could do a comparison chart of each of the sheathing materials. This chart would include the advantages and disadvantages and how each of the sheathings address each others failings.

Research

- Students could research a variety of alternative sheathing methods, those not presented in this outcome, and indicate their applicability to residential construction in Newfoundland and Labrador.

Resources

References

Feirer, Chapter 21

Wagner & Smith, unit 15, page 429-462

Hometime Construction Basics DVD

Topic 9 Lather

Specific Curriculum Outcomes

Students will be expected to

- 3.9.3 create a workplan for installing drywall sheathing, green board, or concrete backerboard [1.405]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome should be addressed in conjunction with the next topic on Lather. Use Appendix A Planning Guide: Information for Fabrication Planning as a guideline for this outcome.

Points to emphasize

- Interior sheathing is installed after electrical and plumbing rough-ins.
- Planning has to identify materials, installation sequence, plastering sequence and cut-outs for electrical and plumbing.
- Part of the planning sequence is to ensure that there is something to nail the sheathing to. Non-bearing partitions frequently present problems for ceiling installations.

For the Student

Working from the previous drawings, and measurements taken from the structure, develop a plan that

- Applies sheathing to the interior wall and ceiling structures
- Accommodates electrical and plumbing rough-ins
- Accommodates odd shaped sections

The plan must include

- Materials list with items, and quantity of each,
- Tools and equipment
- Training/certification required to use a material or tool
- A list of the construction sequence indicating layout, cutting and installation, and plastering sequences

As well

- Create appropriate entry in the WorkLog and have teacher sign off.

Topic 9 Lather

Suggestions for Assessment

Assessment

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could draw a diagram to scale of the project to be undertaken in this module. This drawing should be mated with a description of the tools and techniques utilized in this section.

Work log

- Students could include their workplan in their log books.

Resources

References

CDLI course Integrated Systems 1205
Unit 3, Section 3, Lesson 2

Appendix A Planning Guide: Information for Fabrication Planning

The Design Brief completed in U3T1

Appendix A U3T9 Lather Planning Guide

Student plans from previous fabrication topics

Drawings

- Appendix A U2T2 Design Section “A-A”
- Appendix A U2T2 Design Detail B
- One of
 - Appendix A U3T1 Design Plan Option 1, and
 - Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric
- Appendix A U3T13 Flashing Drawing
- Appendix A U2T2 Orthographic Grid

Topic 9 Lather

Specific Curriculum Outcomes

Students will be expected to

3.9.4 install drywall to framed walls
[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Drywall is a sheet material made of a sandwich of gypsum and two layers of paper. Typically the two long edges are tapered to allow for a plastered seam.

Points to emphasize:

- Types of fasteners and adhesives available to installers
- Proper distancing for fasteners (drywall screws or nails should be placed every six inches).
- Methods of cutting or scoring drywall
- Issues related to strapping versus installation on rough stud surfaces.
- Locations of studs should be marked in such a way as to allow them to be easily found once the wall or ceiling board is in place.
- Drywall is hung starting on the ceiling, and is hung perpendicular to the joists or trusses.
- In a wall installation, drywall must be propped up tight to the ceiling, so that any space is left at the bottom.

For the Student

- Students could install drywall on a partition. It is suggested that the partition should be at least 1800 mm in height (6 ft), not be 1200 mm x 2400 mm (4 ft x 8 ft) and should contain an interior or exterior corner.
- A suitable entry should be made in the student worklog

Topic 9 Lather

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could install drywall on a partition. It is suggested that the partition should be at least 1800 mm in height (6 ft), not be 1200 mm x 2400 mm (4 ft x 8 ft) and should contain an interior or exterior corner.

Resources

References

Feirer, Chapter 21

Hometime Construction Basics DVD

Wagner & Smith, unit 15, page 429-462

Installing Drywall (http://www.mygreathome.com/fix-it_guide/drywall.htm)

Ace (<http://www.acehardware.com/sm-installing-drywall--bg-1299080.html>)

Installing Drywall Mudding and Taping (<http://ezinearticles.com/?Installing-Drywall:-Mudding-and-Taping&id=51266>)

Tools

- As required to install drywall,

Consumables

- Drywall

Topic 9 Lather

Specific Curriculum Outcomes

Students will be expected to

3.9.5 install corner beading
[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Corner beading is installed on outside corners to provide extra strength against bumps and knocks and to create a smooth, even edge to shape the plaster.

Points to emphasize:

- Corner bead can be paper with metal, metal or plastic.
- Corner bead has a rounded edge, ranging from about 3mm radius to 20mm radius
- Means of fastening each type of beading.
- Advantages and disadvantages in adhering to wall-board.

This activity may be deferred. The fabrication activity in the next topic may be substituted.

For the Student

- Set up two pieces of drywall, 1' width x 2' length, to an outside corner construction.
- Using the same dimensions, prepare an inside corner as well.
- Attach appropriate beading to the corners
- A suitable entry should be made in the student worklog

Topic 9 Lather

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could set up two pieces of drywall, 1' width x 2' length, to an outside corner construction and attach appropriate beading to the corners.
- Students could also, using the same dimensions, prepare an inside corner as well and attach appropriate beading to the corners.

Resources

References

Feirer, Chapter 21

Hometime Construction Basics DVD

Wagner & Smith, unit 15, page 429-462

How to Install a Corner Bead - eHow.com (http://www.ehow.com/how_4144_install-corner-bead.html)

Tools

- Layout (measuring tape, level)
- Separating (snips, utility knife)
- Combining (hammer, electric screw-driver)

Consumables

- Assorted corner bead

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

- 3.10.1 research and demonstrate safe practices for the handling of painting materials and various hand tools used in the preparation and painting of a surface
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome is addressed in two separate ways. The first part is to develop knowledge about the tools. That is accomplished in the student activities below. The second part is to use the tools properly and safely. That part is addressed in subsequent activities in this topic and in the fabrication topic that follows.

Students will be tested on the use of the tools as the need arises, typically as they are performing the related tasks. Painting tools are listed in Appendix A Tool Lists.

Points to emphasize:

- Safety and safe handling of tools.
- Safety and health issues that might arise from the use of the tools (dust/respiratory irritants generated)
- Proper technique makes the work easier, faster, and more efficient
- Demonstrations should be given for each of the tools/techniques.

For the Student

- Working from the list of tools supplied by the teacher, identify each and describe the proper techniques for usage.
- A suitable entry should be made in the student worklog

Topic 10 Painter-Decorator

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Knowledge Rubric.

Research

- Students could, working from the list of tools supplied by the teacher, identify each and describe the proper techniques for usage.

Work log

- Students should make a suitable entry should be in their worklog describing the tools used in this section.

Resources

References

Feirer, Chapter 41

Wagner & Smith, Chapter 20, page 557-577

Hometime Construction Basics DVD

Tools

- Layout (measuring tape, level)

Consumables

- Assorted paints and coverings

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

- 3.10.2 demonstrate safe practices in the use of hand and power tools commonly used in the application and finishing of a plaster surface [1.405]

Suggested Learning and Teaching Strategies

For the Teacher

Hand and power tool use require a means of ensuring students are properly certified. Normal practices is to use a combination of written and performance testing for each student for each tool. It is a good idea to maintain a chart of who is qualified for what tools. You may wish to provide class wide instruction on tools, followed by individual testing.

Points to emphasize

- Safety is not just a set of rules. Safety is a way of life. It is a set of ideas, attitudes, behaviours and practices that are essential to the workplace. Safe practice does not eliminate risk, but it reduces risk. Safe practice is risk management.
- Safe use of tools is primarily using them in the prescribed manner, with the proper adjustments and usage procedures. It is also avoidance of clearly understood unsafe practices. In particular shortcuts and quick work-a rounds often increase the risk.
- Only students who are qualified will be allowed to use a particular tool. Tool qualification can occur on an as-needed basis.
- Tool qualification has no margin of error. Only 100% on written/verbal/performance tests are acceptable for qualification.
- Each tool is different, but all tools have commonalities. Point out the commonalities with other tools when demonstrating a tool's function, adjustments and operating procedures.
- It may be useful to take one class and do an overview demonstration of all tools. Include
 - Function of the tool
 - Parts of the tool
 - Adjustments that can be made and the correct procedure for completing them
 - Safe usage of the tool for performing the common tasks

Topic 10 Painter-Decorator

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the tools and devices used in a painter-decorator project.

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

Feirer, Chapter 41

Wagner & Smith, Chapter 20, page 557-577

Hometime Construction Basics DVD

Tools

- Layout (measuring tape, level)

Consumables

- Assorted paints and coverings

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

3.10.2 demonstrate safe practices in the use of hand and power tools commonly used in the application and finishing of a plaster surface [1.405]

Suggested Learning and Teaching Strategies

- Procedures to follow in instances where the tool is not functioning or functioning outside the specs

For the Student

- Complete the safety program for each tool that requires it, and that you intend to use
- State and describe the safe operating procedure for using a tool at 100% accuracy
- Demonstrate safe use of a tool with 100% accuracy
- Record certification for tool in the work log and have the teacher initial it
- Use tools as needed, in accordance with accepted safe practices,
- Create an appropriate entry in the worklog

Topic 10 Painter-Decorator

Suggestions for Assessment

Resources

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

3.10.3 describe methods for cleaning and preparing surfaces to receive paint or other coverings

[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this SCO is to provide a series of processes and procedures that accomplish the task of cleaning and preparing a variety of surfaces for the application of a finish.

Points to emphasize:

- Walls—drywall:
 - Preparation process is based on whether a new or existing structure.
 - Remove wall coverings, ornamental objects, from wall/door/window structures.
 - Clean wall with detergent (bleach & Water/TSP).
 - Fill or repair wall defects (nail holes, etc)
 - Remove loose materials such as paint, dust.
 - Roughen surface lightly to provide a good surface to adhere primer (lightly sanded with fine grit sand paper)
 - Remove dust from finished wall (tack cloth used to remove dust from sanding/preparing)
 - Prime wall with a suitable base coat (with primer/base suitable for paint type - alkyd or latex, better adhesion of paint).
- Wood:
 - If necessary, strip wood surface with chemical/mechanical means.
 - Repair defects, blemishes, flaws
 - Clean the surface using chemical/mechanical means.
 - Sand surface to improve adhesion of new finish
 - Match finish material to old finish (alkyd to alkyd, latex to latex)
- Metal:
 - Strip old finish using chemical/mechanical/air-blown abrasives.
 - Repair defects, blemishes, flaws by reshaping or filling

Topic 10 Painter-Decorator

Suggestions for Assessment

Assessment

- Students could be assessed for this outcome with Appendix B Knowledge Rubric.

Paper and pencil

- Students could list the methods of preparing a wall for paint and other coverings. This could be done in a chart listing the possible covering and the steps of preparation necessary.

Work log

- Students could record the information in their worklog.

Resources

References

Wagner & Smith, unit 20, page 564-565

Types of Paint Strippers http://www.hsia.org/paint_stripping/epa_cpssc/types.htm

Consumer Product Safety Commission
What You Should Know About Using
Paint Strippers <http://www.cpsc.gov/cpsc/pub/pubs/423.html>

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

3.10.4 describe the variety of finishes available for application to prepared surfaces.

[1.405]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this SCO is to highlight and discuss the range of finishes available to a painter, and to distinguish the relationship between type of surface and specific finish.

Sample web resources are listed for many of the finish materials. Many of them are commercial sites, but they are informative with respect to products and their properties and application of the product.

Points to emphasize:

- A finish material protects against moisture and sometimes ultraviolet light
- Wood finishes come in two basic types
 - Film forming finishes, which sit on the surface and form a protective layer. These are generally paints and clear finishes
 - Penetrating finishes, which penetrate into the pores and cells of the wood. These are generally stains, but also include some clear finishes
- Finishes for other materials tend to be of the film type
- Paints contain
 - Pigments for colour
 - Binders to hold pigments together. The binder evaporates during curing leaving a film of pigment
 - Carrier liquid to keep everything in suspension and spread out during application. It usually evaporates
- Oil paints use oil binder in a mineral spirit carrier as the carrier liquid.
 - Oil binder can be natural such as linseed oil or synthetic such as alkyd
 - Brushes made from natural hair bristles work best
- Latex paints use latex binder suspended in water
 - Acrylic latex is a common form

Topic 10 Painter-Decorator

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome with Appendix B Knowledge Rubric

Paper and pencil

- Students could create a table and describe the types of each finish that is commercially available, as well as where each application might be applied in a residential building.
 - Paint, stains, varnish
 - Plaster, stucco
 - Wallpaper (plain, embossed, vinyl, pre-pasted, self-adhering)
 - Asphalt
 - Preservatives
 - Waterproofing
 - Wax

Work log

- Students could make a suitable entry in their work-log

Resources

References

Wagner & Smith, unit 20, page 557-577

Feirer, chapter 41

Exterior finishes for wood <http://web1.msue.msu.edu/imp/mod02/01500571.html>

Types of Paint http://www.hytechsales.com/howtopaint/paint_types.html

Facts about paint http://www.cdnpaint.org/facts_e.html#whatispaint

Environmental information on paints http://www.wasteonline.org.uk/resources/Wasteguide/mn_wastetypes_paint.html

Different types of household paints <http://www.energymanagertraining.com/paints/Differenttypesofhouseholdpaints.htm>

Interior Design and Decorating Finishes for the Home All You Need to Know About Paint (lot of advertising, but multiple pages of info) http://www.interiordezine.com/index.cfm/Interior_Design_Finishes/Paint_12

Types of Preservative http://www.cwc.ca/products/treated_wood/preservatives/types.php

Thompson's® Water Seal® Advanced Clear Multi-Surface Waterproofer (application notes) <http://www.thompsonswaterseal.com/products/productFocus.asp?products.data=002>

SoyGuard® Wood Protection Premium Water Repellent and Sealer Product

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

3.10.4 describe the variety of finishes available for application to prepared surfaces.

[1.405]

Suggested Learning and Teaching Strategies

- Brushes made from synthetic bristles work best. Natural hair bristles absorb the water, swell, and soften
- Penetrating finishes penetrate into wood pores and fibres
 - They may be clear or contain pigments
 - They may be Latex, oil, or alcohol based
- Wood preservatives work by killing the organisms that destroy wood fibres, including fungi and insects.
- Wood preservatives available for products used as decks and the like around homes, since 2004, are one of two types, both using copper as the main active ingredient. Each is water based and uses additional ingredients to combat organisms that are resistant to copper. They are
 - Alkaline Copper Quaternary (ACQ)
 - Copper Azole (CA)
- Waterproofing wood treatments are generally penetrating solutions that encapsulate wood cells and fibres, preventing water penetration. They tend to have a limited lifespan of 2 -3 years and must be reapplied. If water beads on the surface, recoating is not necessary. If water is absorbed into the surface, it is time to recoat.
- Waterproofing membranes are made from a variety of compounds with elastic properties. They are used in a variety of interior and exterior applications, for example, on exterior concrete walls, on shower floors below the finish tiles, below roof shingles as ice shields, over existing roofing materials as a roof refinish. A common low elasticity membrane is the vapor barrier used exterior insulated walls and ceilings. Membranes are engineered to be used alone and in tandem with other coatings.
- Asphalt is made from crude oil. In the raw form it is solid or semi-solid. In application form it contains solvents like naphtha or toluene, binders, hardening

Topic 10 Painter-Decorator

Suggestions for Assessment

Resources

Information and Application Instructions
http://72.14.209.104/search?q=cache:sMQeFyHaa6QJ:www.biopreserve.com/products/SoyGuardPremSealerAppInst.pdf+%22waterproofing+wood%22&hl=en&gl=ca&ct=clnk&cd=21&lr=lang_en&client=firefox-a

Waterproofing membranes <http://www.allwaterproofing.com/membrane.html>

Waterproofing membrane <http://www.epoxysystems.com/419.htm>

Special Purpose Coatings (US Army)
<http://www.usace.army.mil/publications/armytm/tm5-618/chap10.pdf>

Gardner Innovative Asphalt Coatings
http://www.apoc.com/Gardner-5-02/index_ga.htm

What is Stucco <http://architecture.about.com/library/blgloss-stucco.htm>

Plasterers and stucco masons <http://www.bls.gov/oco/ocos210.htm>

Stucco <http://www.cement.org/stucco/>

Ingredients - waxes <http://sci-toys.com/ingredients/wax.html>

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

3.10.4 describe the variety of finishes available for application to prepared surfaces.

[1.405]

Suggested Learning and Teaching Strategies

- agents, and bonding agents. Asphalt coatings are made in a variety of forms
 - Liquid coatings
 - Semi-liquid patches
 - Adhesives
 - Liquid sealers
 - Reinforcing fabrics
 - Paints
- Stucco is a combination of cement (binder), sand and fine aggregate, and water. Pigments, coloured cement, and aggregate size can be controlled to modify the final result. Method of application also affects appearance.
- Wax are natural substances containing alcohols and fatty acids. Beeswax is well known. Shellac is mainly made from wax exuded by the lac beetle. Synthetic waxes made from heavy hydrocarbons are not really waxes, but exhibit many of the properties of wax and add additional ones. Wax is applied to a surface to provide a protective coating and enhance the visual properties.

For the Student

- Create a table and describe the types of each finish that is commercially available, as well as where each application might be applied in a residential building.
 - Paint, stains, varnish
 - Plaster, stucco
 - Wallpaper (plain, embossed, vinyl, pre-pasted, self-adhering)
 - Asphalt
 - Preservatives
 - Waterproofing
 - Wax
- A suitable entry should be made in the student worklog

Topic 10 Painter-Decorator

Suggestions for Assessment

Resources

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

- 3.10.5 create a work plan for the preparation and finishing of the interior/exterior surfaces of the project.
[1.402][1.405][4.402][4.403]

Suggested Learning and Teaching Strategies

For the Teacher

This outcome should be addressed in conjunction with the previous topic on Painter-Decorator. The Painter-Decorator fabrication work plan is a continuation of the design brief and follows the plan for previous trades. Use Appendix A Planning Guide: Information for Fabrication Planning as a guideline for this outcome.

Points to emphasize

- Finishes will be restricted to latex based.
- Sketches are common method of planning a interior colour scheme.
- Coloured markers or pencils can be used. Reference should be made to colour chips for the paint.
- Planning the sequence from preparation to cleanup is important to ensure that no steps are missed
- Identify finish materials that will the desired finish
- Identify the application sequence for finish materials

For the Student

- Based on the drawings provided, and keeping the design brief in mind:
 - Make a list of the finishing materials needed appropriate to the dimensions of the structure.
 - Make a list of the areas requiring finishing and provide quick sketches of each.
 - Identify possible problem areas in the installation of the finish, ie: specialized materials, areas difficult to access.
 - Make a list of the finishing sequence indicating preparation and order of finish.
 - Identify tools and equipment required and note any additional knowledge/skills needed to complete the work and make provisions with the teacher to obtain that qualification
- Create appropriate entry in the WorkLog and have teacher sign off.

Topic 10 Painter-Decorator

Suggestions for Assessment

Assessment

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could:
 - make a list of the finishing materials needed appropriate to the dimensions of the structure.
 - make a list of the areas requiring finishing and provide quick sketches of each.
 - identify possible problem areas in the installation of the finish, ie: specialized materials, areas difficult to access.
 - make a list of the finishing sequence indicating preparation and order of finish.
 - identify tools and equipment required and note any additional knowledge/skills needed to complete the work and make provisions with the teacher to obtain that qualification

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

Topic 10 Painter Decorator

Specific Curriculum Outcomes

Students will be expected to

3.10.6 prepare, tape and plaster drywall joints and corners

[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Drywall compound is usually applied in three coats, allowing sufficient drying time between coats. For many of the compounds, the material shrinks as it dries. The amount of sanding between coats is dependant on the skill of the plasterer

Points to emphasize:

- Drywall tape can be paper, or mesh fabric. The paper tape is usually applied into wet plaster. The mesh is usually self adhesive
- Drywall joints and corners need to be free of loose debris and not project beyond the plane of the surface
- Drywall compound needs to be applied quickly and evenly. Repeated trowelling beyond the “plastic” stage will result in a poor surface texture.

This activity may be deferred. The fabrication activity in the next topic may be substituted.

For the Student

- Using the corner section constructed in the corner beading step, prepare, plaster and finish the corner sections.
- Assemble two 1' x 16" sections, butted on studding. Prepare, plaster, and finish this joint
- A suitable entry should be made in the student worklog

Topic10 Painter Decorator

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could use the corner section constructed in the corner beading step, to prepare, plaster and finish the corner sections.
- Students could assemble two 1' x 16" sections, butted on studding and then prepare, plaster, and finish this joint.

Resources

References

Wagner & Smith, unit 15, page 429-462

Hometime Construction Basics DVD

Taping Drywall Tutorial (http://www.easy2diy.com/cm/easy/diy_ht_index.asp?page_id=35720195)

Taping Drywall Joints information at DoItYourself.com the Largest Online Home Improvement and Repair Center (<http://www.doityourself.com/stry/tapingdrywalljoints>)

Video Tip Taping Drywall Seams (<http://www.taunton.com/finehomebuilding/pages/hvt050.asp>)

Tools

- Combining (Taping knife, Plastering trowel)

Consumables

- Drywall compound

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

3.10.7 prepare surfaces for paint or coverings

[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this outcome is to gain practical experience in preparing different surfaces for application of a finish.

Samples of each material will need to be available for student use. As well finish materials, brushes, rollers and clean up materials will be needed.

Points to emphasize

- Start with surface examination and determine preparation requirements
- Prep surfaces and clean thoroughly

For the Student

- Prepare the following surfaces for finishing. When completed, surfaces should be of a suitable condition to apply a wall covering.
 - Plaster walls
 - Painted surfaces
 - Wood
 - Metal
 - Masonry / concrete
- A suitable entry should be made in the student worklog

Topic 10 Painter-Decorator

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could prepare the following surfaces for finishing. When completed, surfaces should be of a suitable condition to apply a wall covering.
 - Plaster walls
 - Painted surfaces
 - Wood
 - Metal
 - Masonry / concrete

Resources

References

Wagner & Smith, unit 20, page 557-577

Hometime Construction Basics DVD

Appendix B Tool Safety Sheets

Topic 10 Painter-Decorator

Specific Curriculum Outcomes

Students will be expected to

3.10.8 apply finishes using proper techniques

[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

The purpose of this SCO is to experience the range of methods that are available for the application of finishes.

Points to emphasize:

- The specific mechanical process of applying a finish is directly related to the type of finish used.
- Each finish will require a specific tool for application (ie: paint-brush/roller, plaster-trowel)
- Use drop cloths and safety precautions
- Employ proper techniques
- Clean applicators and put all materials away when finished

If desired, this activity may be postponed in favour of the painter fabrication in the next topic

For the Student

- Research and provide the type of finish that is associated with each of the following techniques. Creating a table will help to organize the work. Each technique may be used to apply more than one finish. Create a column that contains a brief description of the steps used in the technique.
 - Wiped/rubbed
 - Brushed
 - Rolled
 - Sprayed
 - Sponged
 - Trowelled
 - Wallpapered
- Using materials supplied by the teacher, and a suitable surface prepared in previous activities, prepare and finish the surface using the appropriate materials and tools.
- A suitable entry should be made in the student worklog

Topic 10 Painter-Decorator

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Research

- Students could create a table to provide the type of finish that is associated with each of the following techniques. A column could be created that contains a brief description of the steps used in the technique.
 - Wiped/rubbed
 - Brushed
 - Rolled
 - Sprayed
 - Sponged
 - Trowelled
 - Wallpapered

Practical activity

- Using materials supplied by the teacher, and a suitable surface prepared in previous activities, students could prepare and finish the surface using the appropriate materials and tools.

Resources

References

Wagner & Smith, unit 20, page 557-577

Appendix B Tool Safety Sheet

Tools

- Finish (paint brushes, rollers, stir sticks, roller pans, drop cloths, trowel)

Consumables

- Paint
- Plaster

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.11.1 demonstrate safe practices for use of standard hand, portable power, and stationary power tools for ceramic tile installation
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Hand and power tool use require a means of ensuring students are properly certified. Normal practices is to use a combination of written and performance testing for each student for each tool. It is a good idea to maintain a chart of who is qualified for what tools. You may wish to provide class wide instruction on tools, followed by individual testing.

Points to emphasize

- Safety is not just a set of rules. Safety is a way of life. It is a set of ideas, attitudes, behaviours and practices that are essential to the workplace. Safe practice does not eliminate risk, but it reduces risk. Safe practice is risk management.
- Safe use of tools is primarily using them in the prescribed manner, with the proper adjustments and usage procedures. It is also avoidance of clearly understood unsafe practices. In particular shortcuts and quick work-a rounds often increase the risk.
- Only students who are qualified will be allowed to use a particular tool. Tool qualification can occur on an as-needed basis.
- Tool qualification has no margin of error. Only 100% on written/verbal/performance tests are acceptable for qualification.
- Each tool is different, but all tools have commonalities. Point out the commonalities with other tools when demonstrating a tool's function, adjustments and operating procedures.
- It may be useful to take one class and do an overview demonstration of all tools. Include
 - Function of the tool
 - Parts of the tool
 - Adjustments that can be made and the correct procedure for completing them
 - Safe usage of the tool for performing the common tasks

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the tools and devices used in a ceramic tile project.

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Appendix B Tool Safety Sheets

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes

Students will be expected to

3.11.1 demonstrate safe practices for use of standard hand, portable power, and stationary power tools for ceramic tile installation
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

- Procedures to follow in instances where the tool is not functioning or functioning outside the specs

For the Student

- Complete the safety program for each tool that requires it, and that you intend to use
- State and describe the safe operating procedure for using a tool at 100% accuracy
- Demonstrate safe use of a tool with 100% accuracy
- Record certification for tool in the work log and have the teacher initial it
- Use tools as needed, in accordance with accepted safe practices,
- Create an appropriate entry in the worklog

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Resources

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.11.2 describe methods for preparing walls for installation of ceramic tile
[1.402]

Suggested Learning and Teaching Strategies

For the teacher

To complete this SCO students will explore the methods of preparing walls for tile installation. There are generally three types of material used as backing material for the installation of wall tile. They are:

- drywall,
- greenboard (moisture resistant drywall), or
- concrete backerboard.

All three are acceptable assuming they meet the following conditions: the wall is a flat surface, it is solid, and it is well secured. If any of these conditions are not present then the wall material should be replaced or repaired to meet those standards.

Points to emphasize:

- Loose paint must be removed and smooth paint should be roughed up with sandpaper to allow for better adhesion.
- Wall paper should be scraped off and any glue removed before installing tile.
- Always ensure the surface is clean and free of dust or debris before installing tile over it.

For the student:

- Students can differentiate between the three types of backerboard and how the proper wall preparation affects the finish product. This could involve a discussion of a variety of wall defects and how they affect the tiling project.

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Assessment

- Students could be assessed for this outcome with Appendix B Knowledge Rubric.

Paper and pencil

- Students could differentiate between the three types of backerboard and how the proper wall preparation affects the finish product. This could involve a discussion of a variety of wall defects and how they affect the tiling project.

Work log

- Students could record the information in their worklog.

Resources

References

- Hometime Ceramic Tile DVD
- Smart Guide: Ceramic Tile

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the teacher
3.11.3 describe various materials used for installation of ceramic tile on a wall [1.401][1.402][2.401][3.401]	<p>There are several materials necessary for the installation of tile on a wall. These include the tile itself and tile adhesive.</p> <p>As far as size goes, the most popular tile sold is still the 4-1/4" square wall tile. However tiles also come in 6 x 6 and 6 x 8 and these are quite popular as well. Wall tile will typically be of the smaller variety. Small one inch tiles are also common. These are called mosaic tile because you can mix different colors to create borders, patterns, and even pictures. These are usually joined together in 12"x12" or 12"x24" sheets to make them easier and quicker to set.</p> <p>Adhesives generally come in two types; thinset mortars and pre-mixed adhesives. Pre-mixed adhesives are generally used for wall tile because they start gripping the wall tile before they are fully cured.</p>
	For the student
	<ul style="list-style-type: none">• Students can research and compile a comparison chart showing the proper usage and the advantages and disadvantages of each type of tile adhesive. This could give examples of where and where not to use each adhesive type.

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome with Appendix B Knowledge Rubric

Research

- Students could research and compile a comparison chart showing the proper usage and the advantages and disadvantages of each type of tile adhesive. This could give examples of where and where not to use each adhesive type.

Work log

- Students could make a suitable entry in their work-log

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the Teacher
3.11.4 describe proper ways of installing backing material [1.402][1.405]	<p>This outcome is a partial review of section 9, Lather</p> <p>Points to emphasize</p> <ul style="list-style-type: none">• Interior sheathing is installed after electrical and plumbing rough-ins.• Planning has to identify materials, installation sequence, plastering sequence and cut-outs for electrical and plumbing.• Part of the planning sequence is to ensure that there is something to nail the sheathing to. Non-bearing partitions frequently present problems for ceiling installations. <p>For the Student</p> <p>Working from the previous drawings, and measurements taken from the structure, describe the installation methods to:</p> <ul style="list-style-type: none">• Apply sheathing to the interior wall and ceiling structures• Accommodate electrical and plumbing rough-ins• Accommodate odd shaped sections• Prepare surface for ceramic tile• Consideration for ceramic tile installation <p>The methodology must include</p> <ul style="list-style-type: none">• Materials list with items, and quantity of each,• Tools and equipment• Training/certification required to use a material or tool• A list of the construction sequence indicating layout, cutting and installation, and plastering sequences <p>As well</p> <ul style="list-style-type: none">• Create appropriate entry in the WorkLog and have teacher sign off.

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Assessment

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Research

- Students could outline the various ways that interior sheathing could be installed. When doing so they could include such things as:
 - ease of use
 - ease of preparing and shaping for structural needs
 - methods for creating holes for receptacles and switches
 - how each of the different types of sheathing deals with the above.

Work log

- Students could include their workplan in their log books.

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.11.5 given the nominal size, develop a work plan for the installation of ceramic tile simulating a bathtub installation
[1.402][1.405][4.402] [4.403]

Suggested Learning and Teaching Strategies

For the teacher

To complete this outcome students will be expected to create a plan for the proper layout of tile in an area simulating a bath tub installation. Students will be instructed on proper methods of laying out a wall area to ensure a symmetrical layout is achieved. Students should be aware of terminology such as symmetrical layout, jury stick, or tile stick. This activity can be done using grid paper to allow students to try several different layout options. When they have chosen their preferred layout they can the proceed to layout their walls using the tile size and grout line size specified by the instructor.

Points to emphasize:

- A symmetrical layout generally starts in the middle of a wall so that any cut tiles will be the same size on either end of the wall. The most basic principle is that you want full tiles in the most visible areas and cut tiles in the less visible areas.
- You never want the last tile to be less than 1/2 the width of a full tile. If it is, adjust the center line 1/2 the width of a tile in either direction. This means instead of having the grout line at the center, you will have a full tile centered on your center line. Then draw a new vertical reference line where the grout joint of the center tile falls.

For the Student

- Students will use the knowledge attained thus far to complete a set of scale drawings to demonstrate the proper layout for their wall tile. These drawing could also include a description of how to layout their reference lines to obtain the best results.
- Create appropriate entry in the worklog and have teacher sign off.

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Assessment

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could use the knowledge attained thus far to complete a set of scale drawings to demonstrate the proper layout for their wall tile. These drawing could also include a description of how to layout their reference lines to obtain the best results.

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.11.6 Layout the proper tile spacing for tile installation on a bathroom wall
[1.402][1.405] [4.402][4.403]

Suggested Learning and Teaching Strategies

For the teacher

It is difficult to lay out tiles on a wall so a jury stick or tile stick is the preferred choice. This is simply a stick that has the proper tile spacing marked on it which can then be used to transfer the tile spacing to the wall. It is essential that all vertical tile spacing are straight and true and that all horizontal spacing is consistent from wall to wall. Uneven tile spacing will become very evident and it detracts for the finished product.

Points to emphasize

- A symmetrical layout generally starts in the middle of a wall so that any cut tiles will be the same size on either end of the wall. The most basic principle is that you want full tiles in the most visible areas and cut tiles in the less visible areas.
- For this type of layout, first find the center of that wall section and draw a vertical plumb line using a level. Use the jury stick to mark the spacing of the tiles horizontally. Start with a grout joint on the center line and mark tile spacing to the end of the tile section. Do not fit the tiles tightly into the corners. Leave about a ¼” gap, which will be filled later with caulk.
- You never want the last tile to be less than 1/2 the width of a full tile. If it is, adjust the center line 1/2 the width of a tile in either direction. This means instead of having the grout line at the center, you will have a full tile centered on your center line. Then draw a new vertical reference line where the grout joint of the center tile falls.

For the student

- Using the technical drawing and work plan as guidance, layout the wall section with proper reference lines to aid in the installation of the ceramic tile. Students should make use of a jury stick or tile stick to aid in the creation of these reference lines.
- Create appropriate entry in the worklog and have teacher sign off.

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Assessment

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could, using the technical drawing and work plan as guidance, layout the wall section with proper reference lines to aid in the installation of the ceramic tile. Students should make use of a jury stick or tile stick to aid in the creation of these reference lines.

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes

Students will be expected to

3.11.7 Install ceramic tile on a wall using industry standards and practices
[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the teacher

To achieve this outcome students will be expected to install ceramic tile on their wall sections using proper techniques. They will need to select the proper tile and adhesive, trowel the adhesive onto the wall, set their tile and then ensure that the tiles surfaces and grout lines are free of adhesive.

Points to emphasize

- Ensure that the wall area is clean and free of dirt or debris
- Check to ensure that the tile adhesive chosen is correct for the intended application.
- Trowel the adhesive onto the wall in sections that you feel confident that you can complete in the given time frame. Ensure that the adhesive is combed onto the surface with a consistent height which will ensure that the tiles are level. Hold the trowel at a 45 degree angle to get the best results.
- Install tiles from the bottom and the center working outward and upward. Check often to ensure that your tile spacing stays consistent. Check the first tile to ensure good adhesion. 80% coverage of adhesive to tile is a good benchmark.

For the student

- Using the reference lines and the work plan as guidance, tile the wall section. Once tiled, students should properly clean up their completed tile to prepare for the grouting. Students should take special care to safely use all tools and to ensure tools are properly cleaned at the end of the tiling process.
- Create appropriate entry in the worklog and have teacher sign off.

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could, using the reference lines and the work plan as guidance, tile the wall section. Once tiled, students should properly clean up their completed tile to prepare for the grouting. Students should take special care to safely use all tools and to ensure tools are properly cleaned at the end of the tiling process.

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Appendix B Tool Safety Sheets

Drawings

- Student/teacher technical drawings
- Student layout

Tools

- notched trowel
- grout float
- drill
- mortar mixing paddle
- tile spacers
- tile cutter

Consumables

- Thinset mortar
- Ceramic wall tile

Topic 11 Masonry - Ceramic Wall Tile Installation

Specific Curriculum Outcomes

Students will be expected to

3.11.8 Grout ceramic tile using industry standards and practices
[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the teacher

To achieve this outcome students will be expected to select the proper grouting material for the tile installed in the previous SCO. Students will select their proper color grout, based on their tile color, and then mix the grout to the proper consistency. There are two types of grout used in industry: sanded and un-sanded. For the grouting of wall tile students will be using un-sanded grout. The color of the grout can go a long way in emphasizing the overall look of your tile. Contrasting colors will help accent the geometric layout of your tile. Choosing a light colored grout for high traffic areas wouldn't be a good idea because it will probably discolor over time.

Points to emphasize

- Grout should be mixed to the suggested manufacturers recommendations. Always follow the instructions to achieve best results.
- Use a padded grout float to force the grout into the spaces between the tiles. Grout should be pushed diagonally across the joints to force it into the gaps.
- Clean off the excess grout with a damp sponge and clean water. This will take several cleanings to get the tile totally clean.
- Sealing the grout is also an option. You can get sealer additives to be mixed with the grout or you can seal the grout after it is dried.

For the student

- Following the manufacturers recommended specification students should mix and grout their completed wall tile section cleaning up the tile to complete the project.
- Students should also take special care to properly use any tools needed for the grouting process and to clean any tools used during the grouting process.
- Create appropriate entry in the worklog and have teacher sign off.

Topic 11 Masonry -Ceramic Wall Tile Installation

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Following the manufacturers recommended specification students could mix and grout their completed tiled wall cleaning up the tile to complete the project. Students should also take special care to properly use any tools needed for the grouting process and to clean any tools used during the grouting process.

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Appendix B Tool Safety Sheets

Drawings

- Student/teacher technical drawings
- Student layout

Tools

- notched trowel
- grout float
- drill
- mortar mixing paddle
- tile spacers
- tile cutter

Consumables

- Thinset mortar
- Ceramic wall tile
- Grout

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.12.1 review safe practices for use of standard hand, portable power, and stationary power tools for ceramic tile installation
[2.401][2.402][2.405][3.401][5.402]

Suggested Learning and Teaching Strategies

For the Teacher

Hand and power tool use require a means of ensuring students are properly certified. Normal practices is to use a combination of written and performance testing for each student for each tool. It is a good idea to maintain a chart of who is qualified for what tools. You may wish to provide class wide instruction on tools, followed by individual testing.

Points to emphasize

- Safety is not just a set of rules. Safety is a way of life. It is a set of ideas, attitudes, behaviours and practices that are essential to the workplace. Safe practice does not eliminate risk, but it reduces risk. Safe practice is risk management.
- Safe use of tools is primarily using them in the prescribed manner, with the proper adjustments and usage procedures. It is also avoidance of clearly understood unsafe practices. In particular shortcuts and quick work-a rounds often increase the risk.
- Only students who are qualified will be allowed to use a particular tool. Tool qualification can occur on an as-needed basis.
- Tool qualification has no margin of error. Only 100% on written/verbal/performance tests are acceptable for qualification.
- Each tool is different, but all tools have commonalities. Point out the commonalities with other tools when demonstrating a tool's function, adjustments and operating procedures.
- It may be useful to take one class and do an overview demonstration of all tools. Include
 - Function of the tool
 - Parts of the tool
 - Adjustments that can be made and the correct procedure for completing them
 - Safe usage of the tool for performing the common tasks

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Assessment

Only 100% on the written and performance components of the test for each tool is acceptable.

Pencil and Paper

- Assess tool safety and use with Tool Safety Quizzes from Skilled Trades Safety Guide. This is assessment for learning, and students must repeat the quizzes until 100% is attained. No tool use is permitted before successful completion of the quizzes.

Practical Activity

- Students must demonstrate the safe and proper operation of the tools and devices used in a ceramic tile project.

Work log

- Students could create an appropriate entry in the worklog itemizing the tools they have qualified for.

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Appendix B Tool Safety Sheets

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

3.12.1 review safe practices for use of standard hand, portable power, and stationary power tools for ceramic tile installation
[2.401][2.402][2.405][3.401]
[5.402]

Suggested Learning and Teaching Strategies

- Procedures to follow in instances where the tool is not functioning or functioning outside the specs

For the Student

- Complete the safety program for each tool that requires it, and that you intend to use
- State and describe the safe operating procedure for using a tool at 100% accuracy
- Demonstrate safe use of a tool with 100% accuracy
- Record certification for tool in the work log and have the teacher initial it
- Use tools as needed, in accordance with accepted safe practices,
- Create an appropriate entry in the worklog

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Resources

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

3.12.2 describe methods for preparing walls for installation of ceramic tile [1.402]

Suggested Learning and Teaching Strategies

For the teacher

To complete this SCO students will explore the methods of preparing floors for tile installation. A strong base is the most important part of any tile installation. The floor must be flat, free of defects, and well bonded to the sub structure. A floor thickness of 1 1/8 would be a recommended thickness.

The most common materials used as floor underlayment are plywood and concrete backerboard. Both of these materials are acceptable but concrete backerboard would be the ideal choice, especially in areas where moisture is a concern. Both of these products would require similar installation principles. Those are

Ensure the underlayment is flat and free of defects. The underlayment should be attached to the subfloor using galvanized nails or screws which should extend into the floor joist below. They should be spaced every 4-6 inches around the perimeter and every 6-8 inches in the field. Space your sheets approximately 1/8 inch apart and avoid joining two sheets in the same spot.

Points to emphasize:

- Always ensure the surface is clean and free of dust or debris before installing tile over it.
- Any damaged flooring should be replaced before installing tile.

For the student

- Students can differentiate between the three types of backerboard and how the proper floor preparation and material affects the finish product. This could involve a discussion of the various floor underlayment materials and a comparison chart listing the advantages and disadvantages of each and how they affect the tiling project.

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Assessment

- Students could be assessed for this outcome with Appendix B Knowledge Rubric.

Paper and pencil

- Students could differentiate between the three types of backerboard and how the proper floor preparation and material affects the finish product. This could involve a discussion of the various floor underlayment materials and a comparison chart listing the advantages and disadvantages of each and how they affect the tiling project.
-

Work log

- Students could record the information in their worklog.

Resources

References

- Hometime Ceramic Tile DVD
- Smart Guide: Ceramic Tile

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.12.3 describe various materials used for installation of ceramic tile on a floor [1.401][1.402][2.401][3.401]

Suggested Learning and Teaching Strategies

For the teacher

There are several materials necessary for the installation of tile on a floor. These include the tile itself and tile adhesive. As far as size goes, the most popular tile used on floors would be 12x12s and even as large as 18 x18s. It's tough for a do-it-yourselfer to install anything bigger than this because the underlayment has to be absolutely even and level. Floor tiles are classified using the following rating;

The Porcelain Enamel Institute hardness ratings are:

- Group I - Light Traffic: residential bathroom floors where bare or stocking feet are the norm.
- Group II - Medium Traffic: home interiors where little abrasion occurs. Don't use in kitchens or entries.
- Group III - Medium-Heavy Traffic: any home interior.
- Group IV - Heavy Traffic: homes or light to medium commercial areas.
- Group V- Extra Heavy Traffic: use it anywhere.

Points to emphasize:

- Adhesives generally come in two types; thinset mortars and pre-mixed adhesives.
- Thinset mortars are generally used for floor tile installation. They come in powder form and have to be mixed to manufacturers specifications.
- Thinsets have a stronger bond and are more flexible than pre-mixed adhesives. They can also support a lot of weight, so they're often used for floor installations. Thinsets can be used in wet areas as well as those exposed to heat.

For the student

- Students could identify the various types of tiling used in floor tile installation. This could involve a visual identification as well as a discussion of the properties of each that may it a good choice. Stu-

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome with Appendix B Knowledge Rubric

Research

- Students could identify the various types of tiling used in floor tile installation. This could involve a visual identification as well as a discussion of the properties of each that may it a good choice.

Discussion

- Students could discuss the differences between wall tile adhesive and floor tile thinset. This discussion could cover the various properties of each that make it most suitable for the specific application

Work log

- Students could make a suitable entry in their work-log

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

3.12.3 describe various materials used for installation of ceramic tile on a floor [1.401][1.402][2.401][3.401]

Suggested Learning and Teaching Strategies

Students could also discuss the differences between wall tile adhesive and floor tile thinset.

- This discussion could cover the various properties of each that make it most suitable for the specific application

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Resources

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.12.4 given the nominal size, develop a work plan for the installation of ceramic tile simulating a floor installation [1.402][1.405][4.402][4.403]

Suggested Learning and Teaching Strategies

For the teacher

To complete this outcome the student will be expected to create a plan for the proper layout of tile in an area simulating a floor installation. Students will be instructed on proper methods of laying out a floor to ensure the best layout is achieved. Tiles look best when they are laid out in straight lines and square to the walls. This activity can be done using grid paper to allow students to try several different layout options. When they have chosen their preferred layout they can then proceed to layout their floor using the tile size and grout line size specified by the instructor.

Points to emphasize:

- Have students draw a scaled drawing of the floor area to be tiled on grid paper. Students should then sketch out a grid simulating the tile size and spacing. They can then do overlays to line up their tile spacing to get the most effective spacing for their given area.
- Tiles should be laid square to the most visible wall. Also full tiles should be laid in the most visible areas with but tiles being laid in less visible areas. Cut tiles should be more than half the width of the full tiles if at all possible.

For the Student

- Students will use the knowledge attained thus far to complete a set of scale drawings to demonstrate the proper layout for their floor tile. These drawing could also include a description of how to layout their reference lines to obtain the best results.
- Students should identify the tools and equipment they will use. At this time it is important to ensure that any qualifications needed for those tools are obtained.

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Assessment

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could use the knowledge attained thus far to complete a set of scale drawings to demonstrate the proper layout for their floor tile. These drawing could also include a description of how to layout their reference lines to obtain the best results.

Research

- Students could identify the tools and equipment they will use. At this time it is important to ensure that any qualifications needed for those tools are obtained.

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes	Suggested Learning and Teaching Strategies
Students will be expected to	For the teacher
3.12.5 Layout the proper tile spacing for tile installation on a floor area [1.402][1.405] [4.402][4.403]	<p>To complete this outcome students will be expected to create reference lines that will aid them in the installation of their floor tile. These reference lines will be created using the knowledge of proper layout gained in the previous SCO. Students should try a variety of floor tile layouts before deciding on the best layout option for their particular floor. This would involve physically placing the tiles on the floor with the proper spacing to get a visual representation of what the finished product would look like. Once a layout is selected students will take care to snap their chalk lines to allow for the installation of their tile with the appropriate tile spacing given to them by the instructor.</p> <p>For the student</p> <ul style="list-style-type: none">• Students will be expected to safely use all tools needed for the creating of their floor layout. Care must be taken to ensure that these tools are left in proper working order. Students will create their reference lines which will be vital to the successful completion of the floor tile installation.• Create appropriate entry in the worklog and have teacher sign off.

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Assessment

Pencil and paper

- Assess this outcome with Appendix B Design Part 2 Planning Rubric

Workplan/layout

- Students could, using the technical drawing and work plan as guidance, layout the floor section with proper reference lines to aid in the installation of the ceramic tile. Students will have to create their reference lines which will be vital to the successful completion of the floor tile installation.

Work log

- Students could include their workplan in their log books.

Resources

References

Appendix A Planning Guide: Information for Fabrication Planning

Student made materials

- Drawings completed as part of the planning

Drawings

Appendix A U2T2 Section Drawing

Appendix A U2T2 Detail Drawing

One of these 2 sets

- Appendix A U3T1 Design Plan Option 1 and
- Appendix A U3T1 Design Option 1 Isometric

Or

- Appendix A U3T1 Design Plan Option 2 and
- Appendix A U3T1 Design Option 2 Isometric

Appendix A U3T3 Flashing Drawing

Appendix A U2T2 Orthographic Grid

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

- 3.12.6 Install ceramic tile using industry standards and practices on a floor area
[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the teacher

To achieve this outcome students will be expected to install ceramic tile on their floor sections using proper techniques. They will need to select the proper tile and thinset, trowel the thinset onto the floor, set their tile and then ensure that the tiles surfaces are level and the grout lines are free of adhesive.

Points to emphasize

- Ensure that the floor area is clean and free of dirt or debris
- Check to ensure that the thinset chosen is correct for the intended application.
- Trowel the thinset onto the floor in sections that you feel confident that you can complete in the given time frame. Ensure that the adhesive is combed onto the surface with a consistent height which will ensure that the tiles are level. Hold the trowel at a 45 degree angle to get the best results.
- Install tiles in sections to ensure best results and to gauge the use of your thinset. Check often to ensure that your tile spacing stays consistent. Check the first tile to ensure good adhesion. 80% coverage of thinset to tile is a good benchmark.

For the student

- Using the reference lines and the work plan as guidance, tile the floor section. Once tiled, students should grout the floor tile and properly clean up their completed tile to finish the job. Students should take special care to safely use all tools and to ensure tools are properly cleaned at the end of the tiling process.
- Create appropriate entry in the worklog and have teacher sign off.

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Students could, using the reference lines and the work plan as guidance, tile the floor section. Once tiled, students should properly clean up their completed tile to prepare for the grouting. Students should take special care to safely use all tools and to ensure tools are properly cleaned at the end of the tiling process.

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Appendix B Tool Safety Sheets

Drawings

- Student/teacher technical drawings
- Student layout

Tools

- notched trowel
- grout float
- drill
- mortar mixing paddle
- tile spacers
- tile cutter

Consumables

- Thinset mortar
- Ceramic floor tile

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

3.12.7 Grout ceramic tile using industry standards and practices
[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the teacher

To achieve this outcome students will be expected to select the proper grouting material for the proper grouting of the tile installed in the previous SCO. Students will select their proper color grout, based on their tile color, and then mix the grout to the proper consistency.

There are two types of grout used in industry: sanded and un-sanded. For the grouting of the floor tile students will be using sanded grout. Sanded grout has sand added to it to give the grout added strength to hold up to the wear and tear that is associated with the foot traffic involved.

The color of the grout can go a long way in emphasizing the overall look of your tile. Contrasting colors will help accent the geometric layout of your tile. Choosing a light colored grout for high traffic areas wouldn't be a good idea because it will probably discolor over time.

Points to emphasize

- Grout should be mixed to the suggested manufacturers recommendations. Always follow the instructions to achieve best results.
- Use a padded grout float to force the grout into the spaces between the tiles. Grout should be pushed diagonally across the joints to force it into the gaps.
- Clean off the excess grout with a damp sponge and clean water. This will take several cleanings to get the tile totally clean.
- Sealing the grout is also an option. You can get sealer additives to be mixed with the grout or you can seal the grout after it is dried.

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Assessment

Paper and pencil

- Students could be assessed for this outcome using the Appendix B Skills Rubric

Work log

- Students could make an entry in their work log, outlining the skills and techniques they used to complete this task

Practical activity

- Following the manufacturers recommended specification students could mix and grout their completed tiled floor cleaning up the tile to complete the project. Students should also take special care to properly use any tools needed for the grouting process and to clean any tools used during the grouting process.

Resources

References

Hometime Ceramic Tile DVD

Smart Guide: Ceramic Tile

Appendix B Tool Safety Sheets

Drawings

- Student/teacher technical drawings
- Student layout

Tools

- notched trowel
- grout float
- drill
- mortar mixing paddle
- tile spacers
- tile cutter

Consumables

- Thinset mortar
- Ceramic floor tile
- Grout

Topic 12 Masonry - Ceramic Floor Tile Installation

Specific Curriculum Outcomes

Students will be expected to

3.12.7 Grout ceramic tile using industry standards and practices
[1.401][1.402][1.403][1.404]
[1.405][2.401][2.402][5.402]

Suggested Learning and Teaching Strategies

For the student

- Following the manufacturers recommended specification students should mix and grout their completed tile floor. After the floor is grouted students should clean up the tile to complete the project. Students should also take special care to properly clean any tools used during the grouting process.
- Create appropriate entry in the worklog and have teacher sign off.

Topic 12 Masonry -Ceramic Floor Tile Installation

Suggestions for Assessment

Resources

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Appendix A

Support Materials

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Sample Tools, Listed by Trade	50

Print Resources

Blankenbaker, E. Keith, Modern Plumbing, The Goodheart-Willcox Company, Inc.,2005

Feirer, Mark, D. & Feirer, John, L., Carpentry & Building Construction, Glencoe/McGraw-Hill, 2004

Mullin, Ray C., Miller, Gary & Stephenson, Paul, Electrical Wiring Residential, Thomson Nelson, 2003

Wagner, Willis H. & Smith, Howard Bud, Modern Carpentry, The Goodheart-Willcox Company, Inc.,2003

Creative Homeowner - Smart Guide Series

Roofing

Plumbing

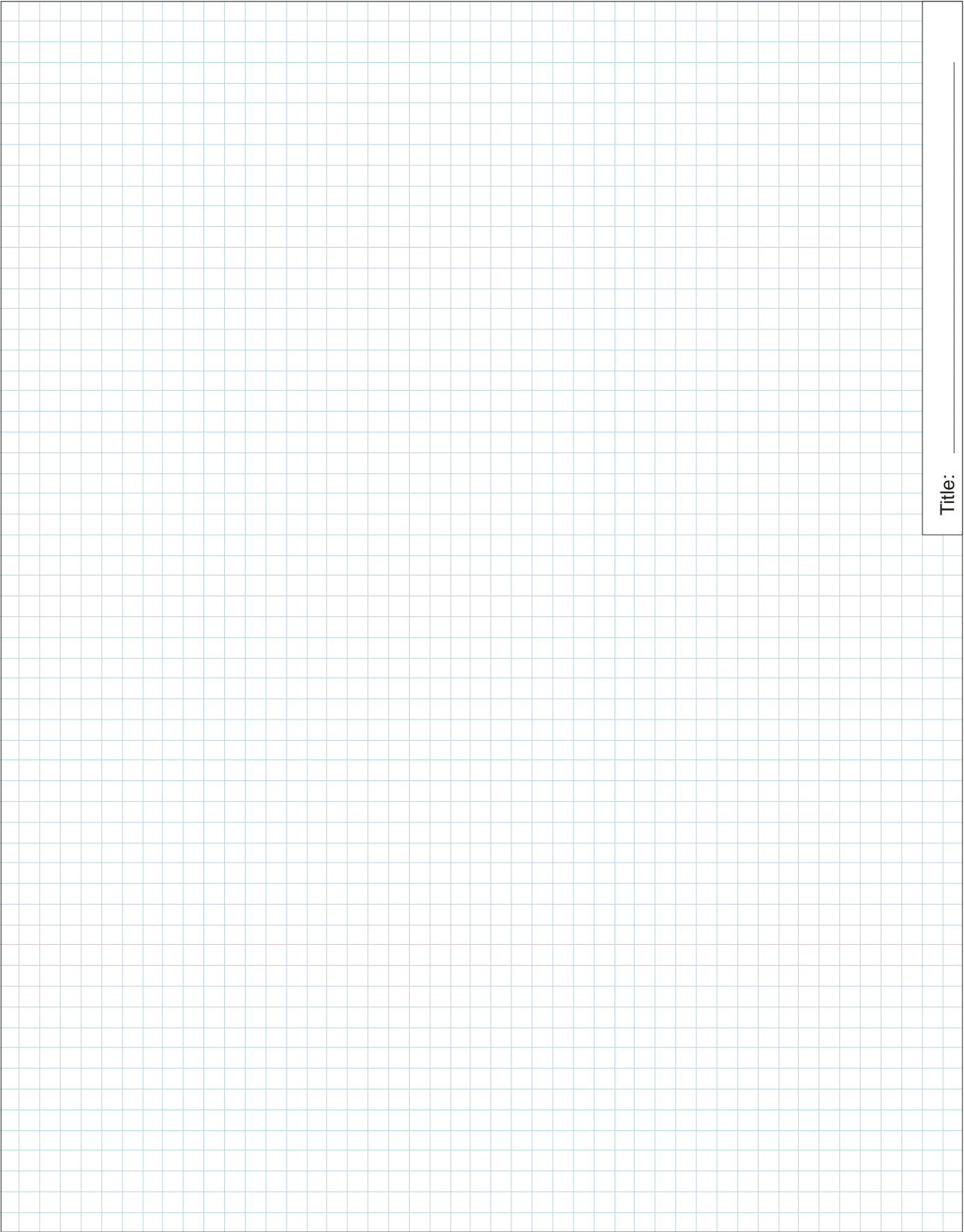
Wiring

Ceramic Tile

Stairs and Railings

Drawings

These drawings are produced for use with the activities in the course. The first two, Orthographic and Isometric grids, are for duplication for use by students in a number of different activities. The others are specific to activities.

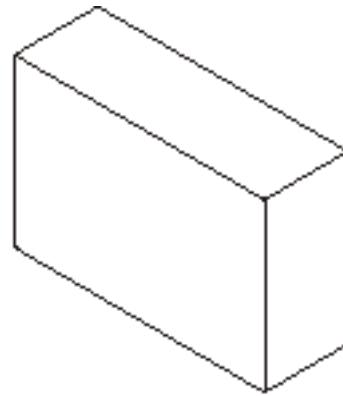


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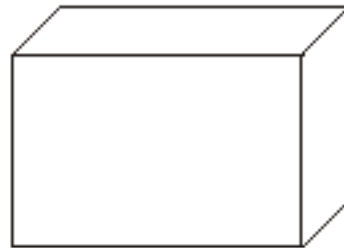
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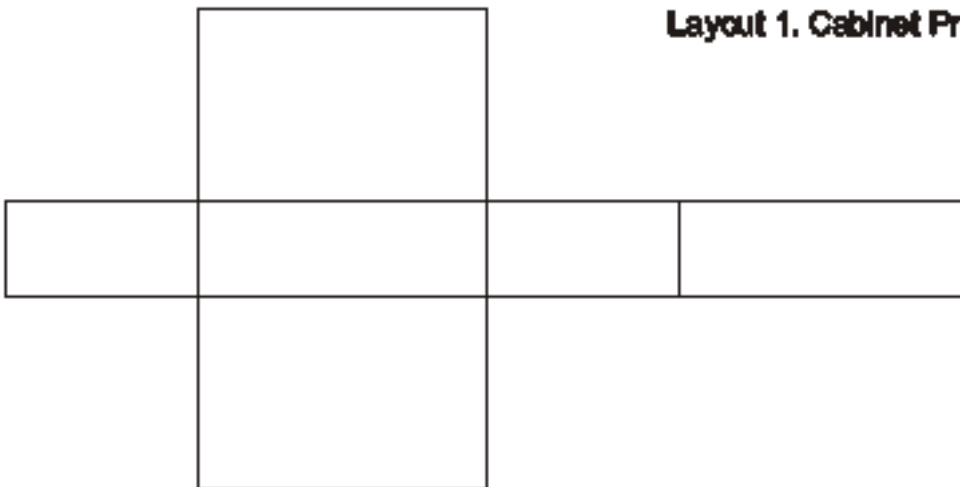
Layout 1. Orthographic



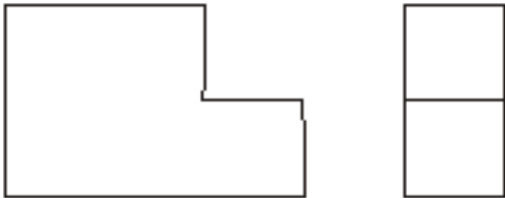
Layout 1 Isometric



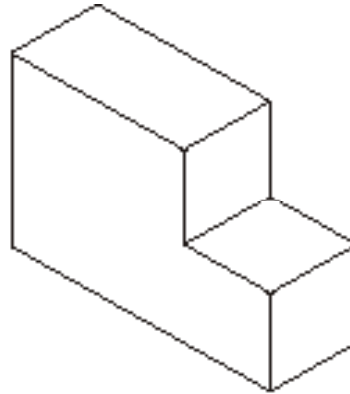
Layout 1. Cabinet Projection



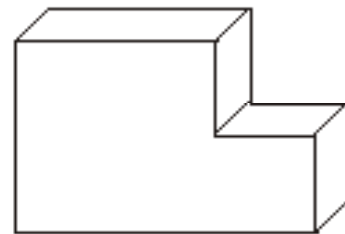
Layout 1. Pattern



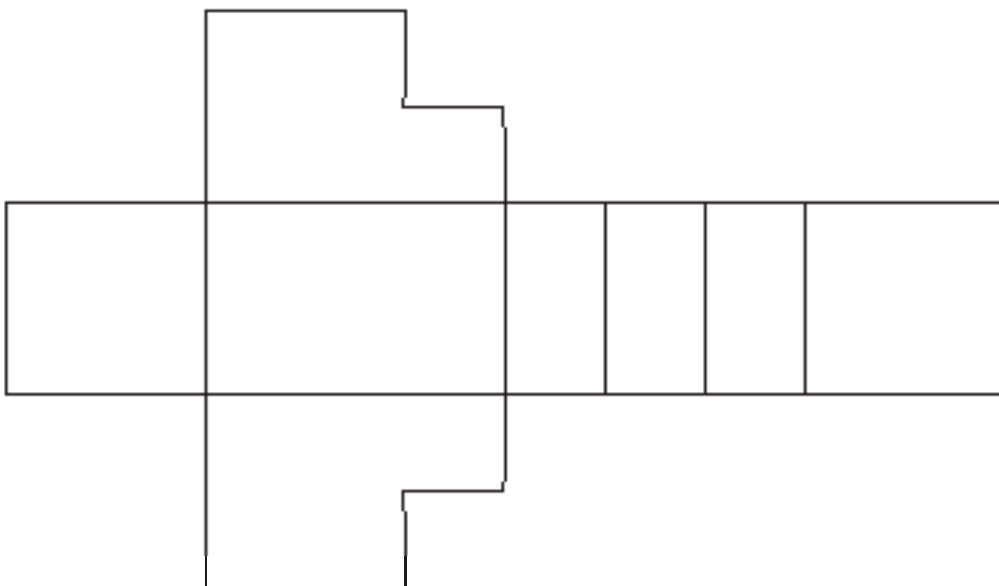
Layout 2. Orthographic



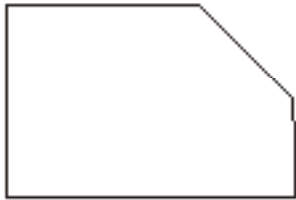
Layout 2. Isometric



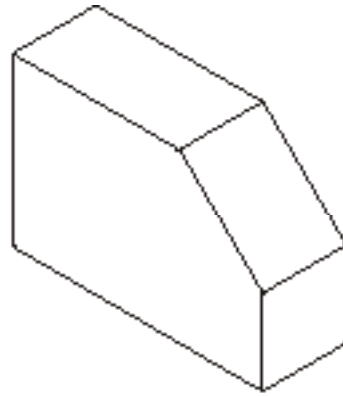
Layout 2. Cabinet Projection



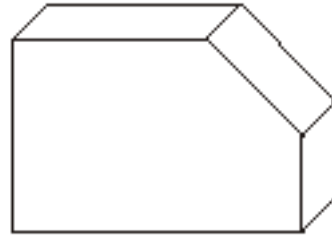
Layout 2. Pattern



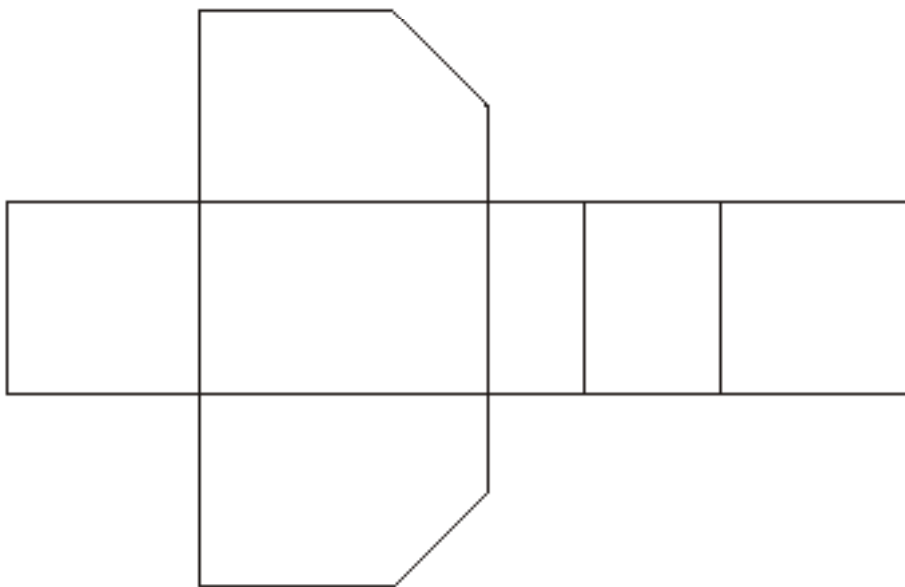
Layout 3. Orthographic



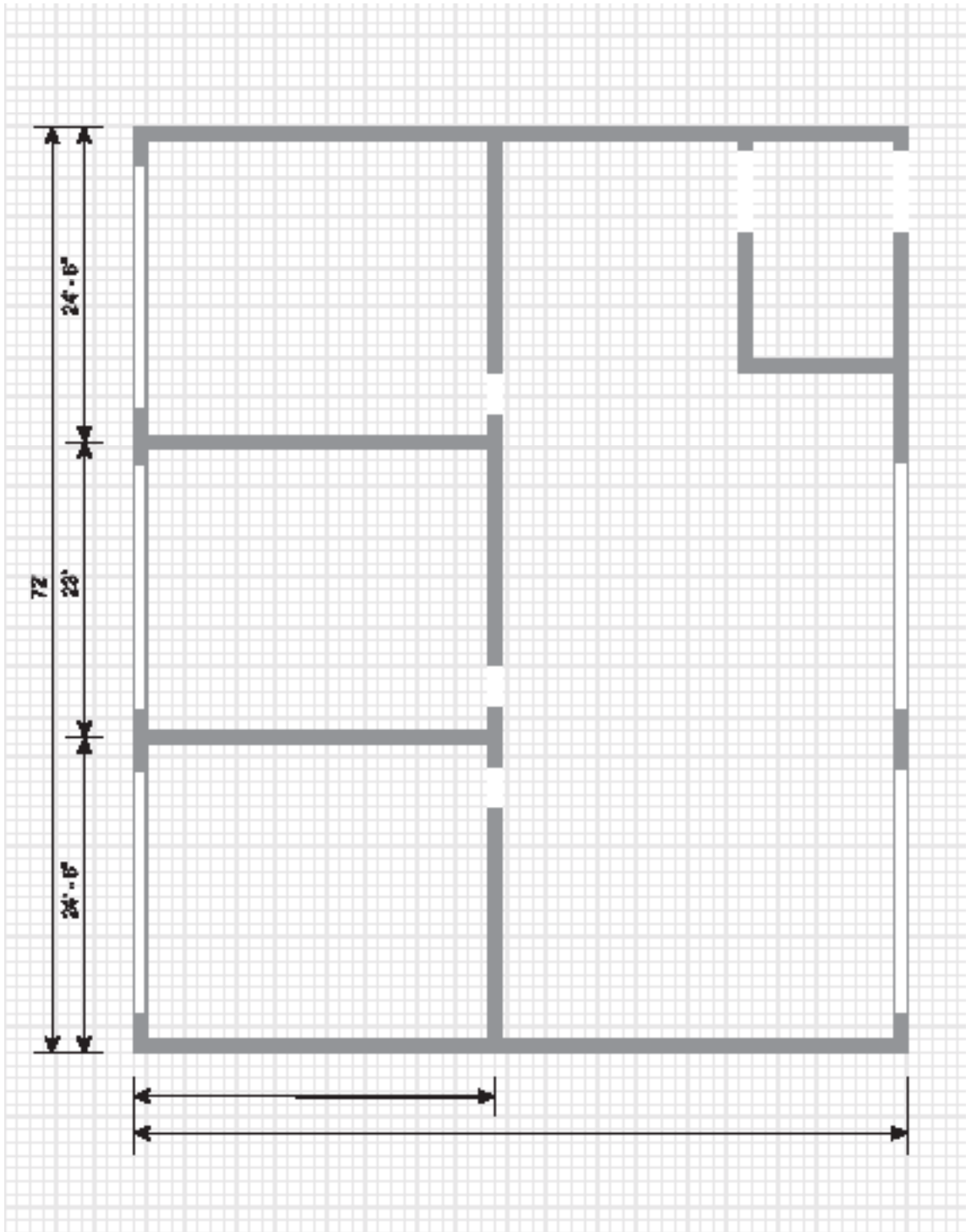
Layout 3. Isometric



Layout 3 Cabinet Projection

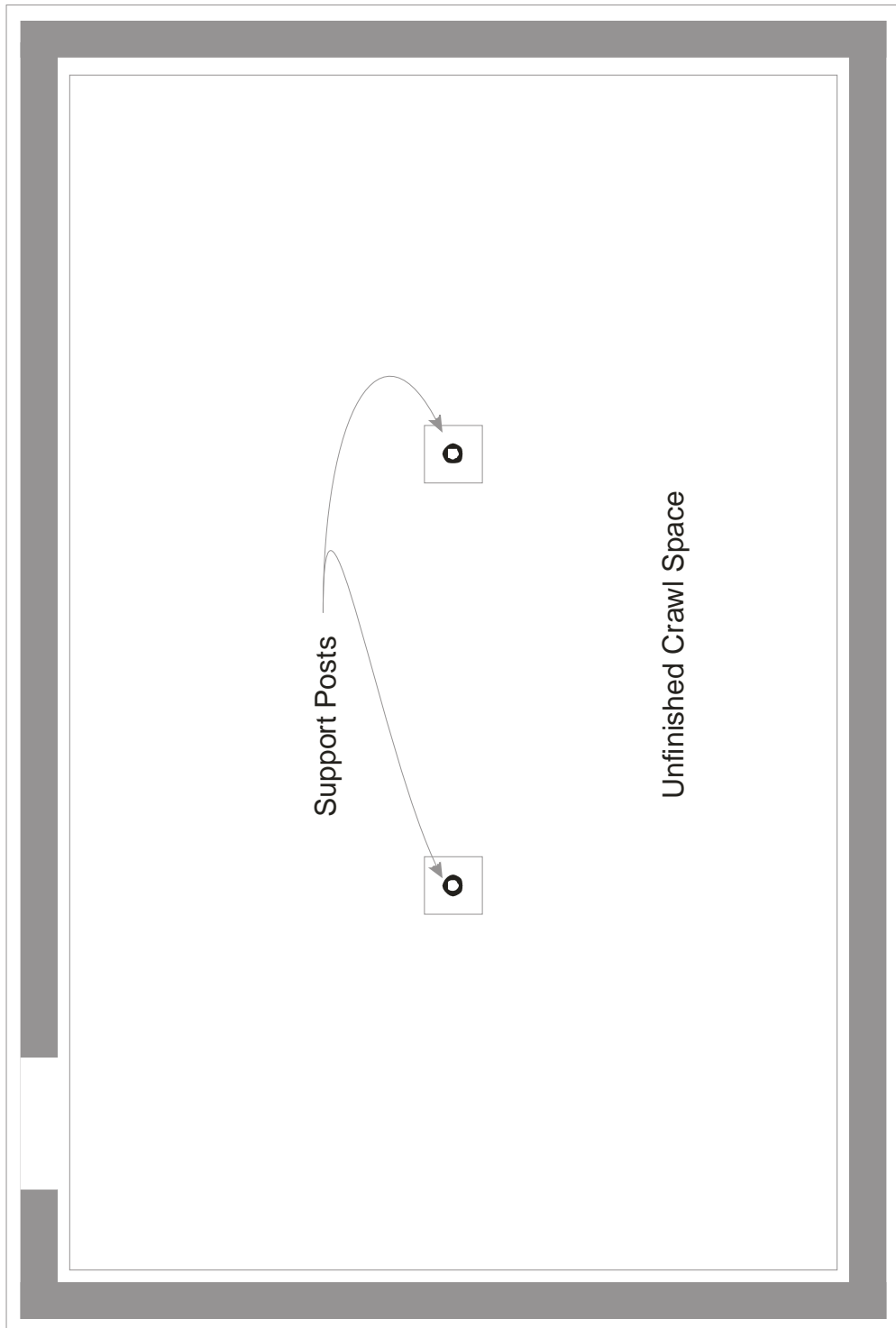


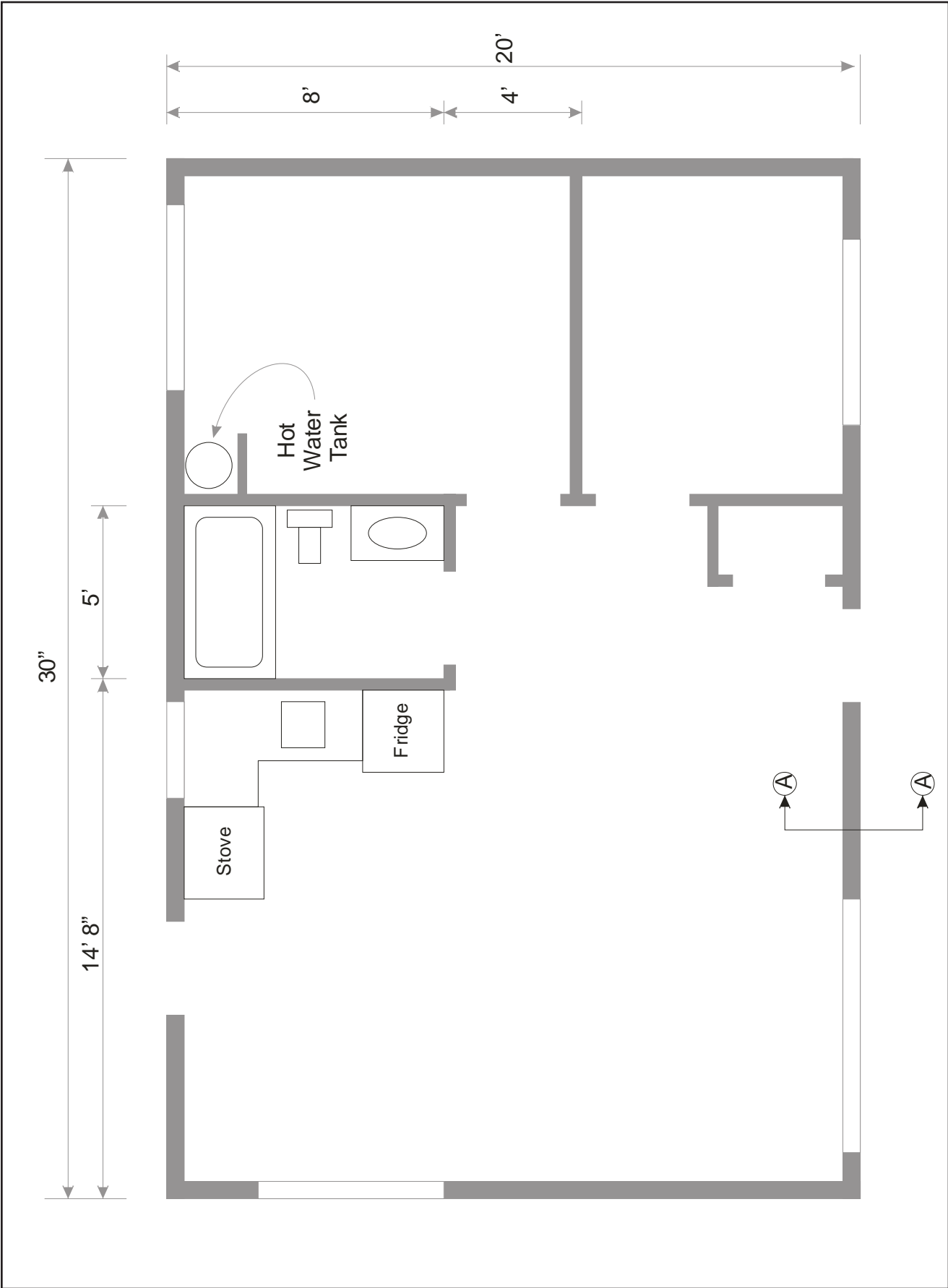
Layout 3. Pattern



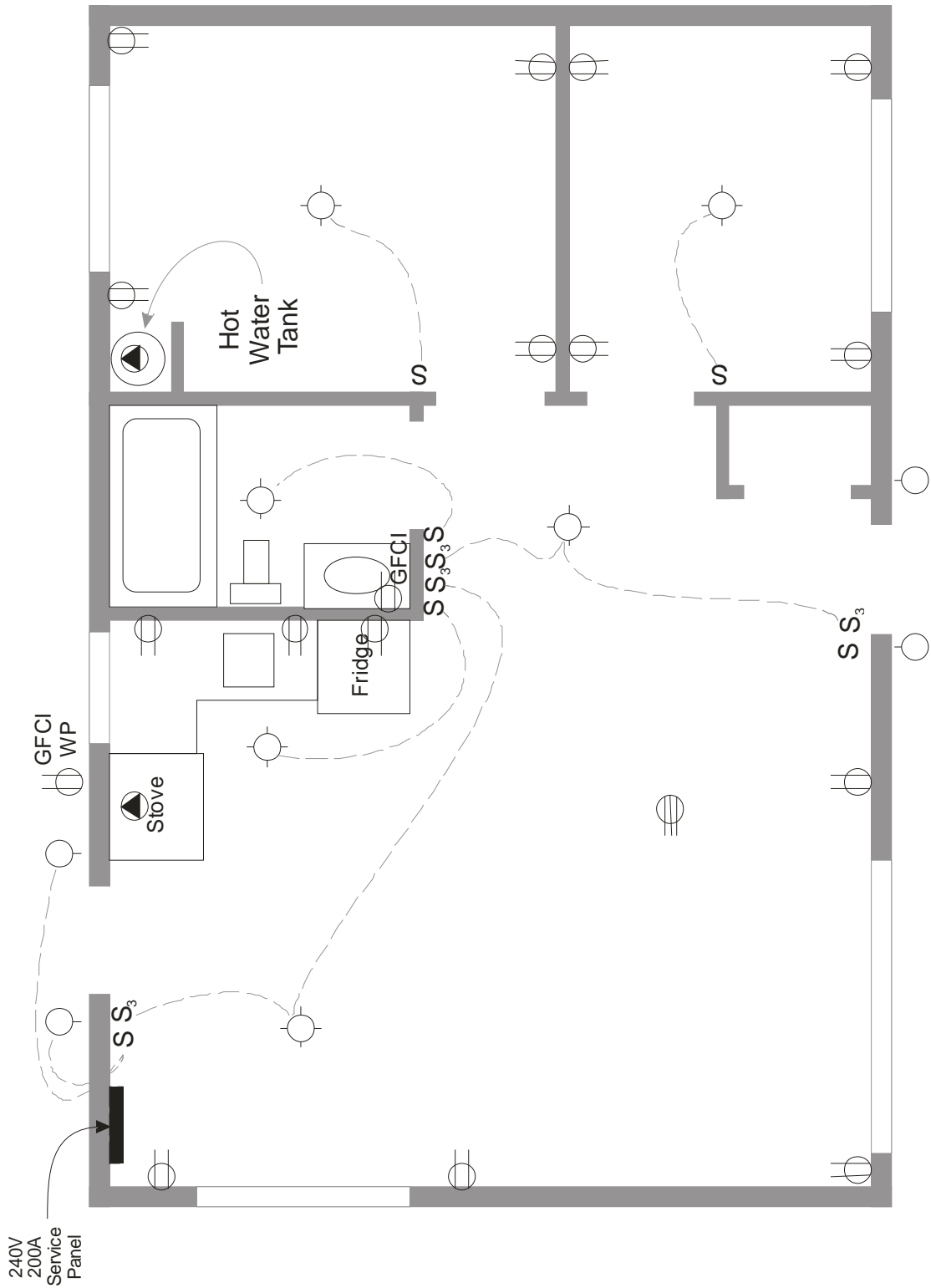
U2T2 Scale

Scale: 1 square = 1 Foot

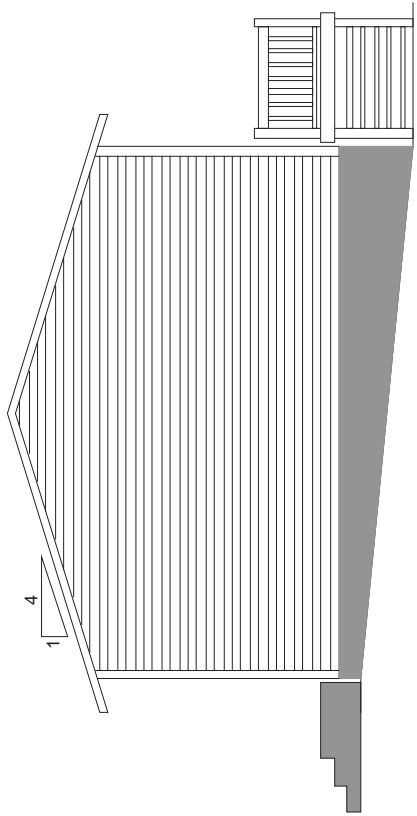




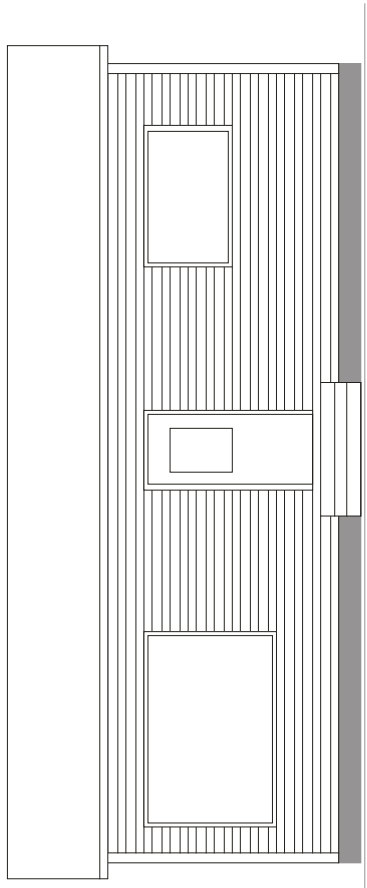
U2T2 Floor Plan



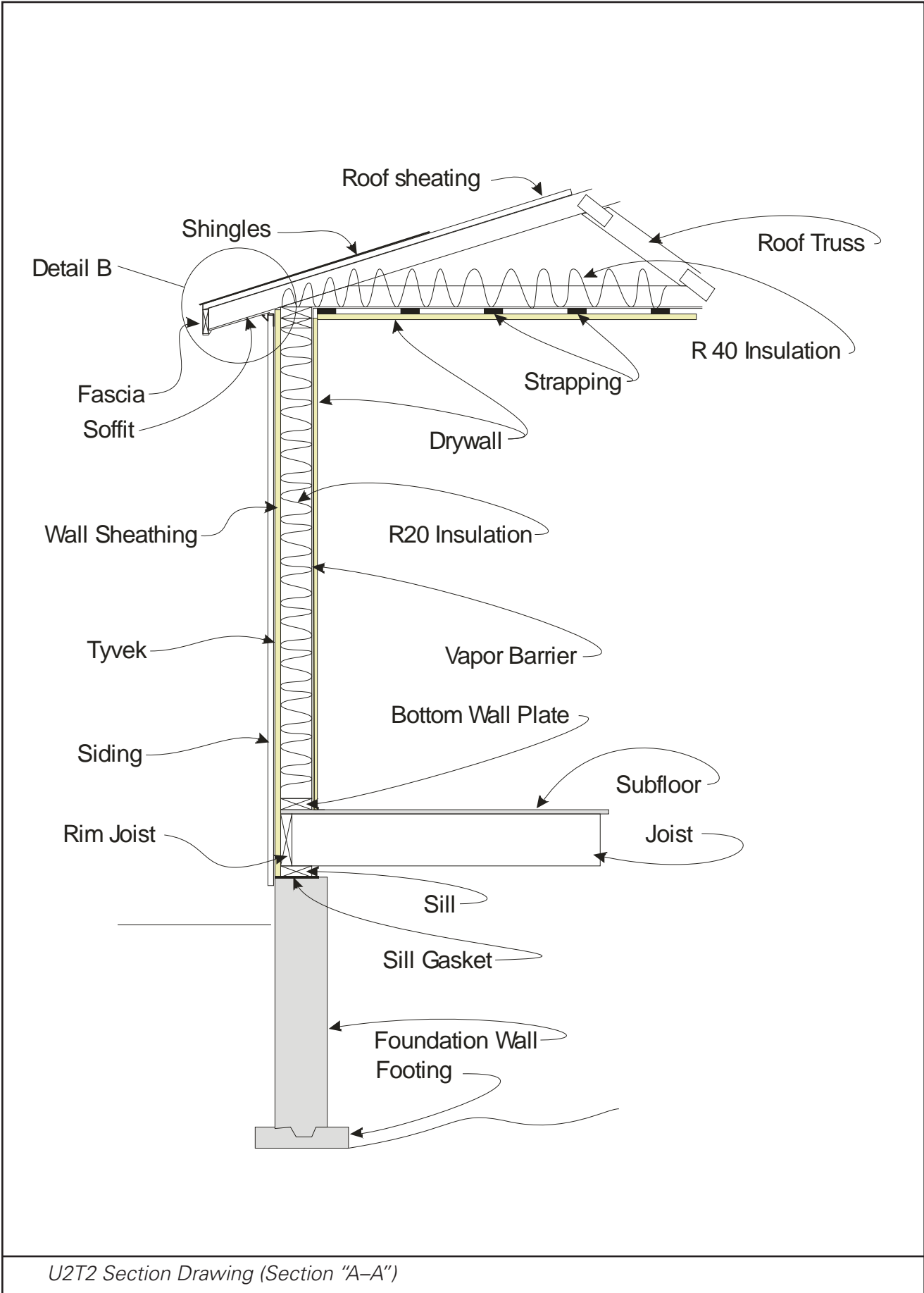
U2T2 Electrical Plan

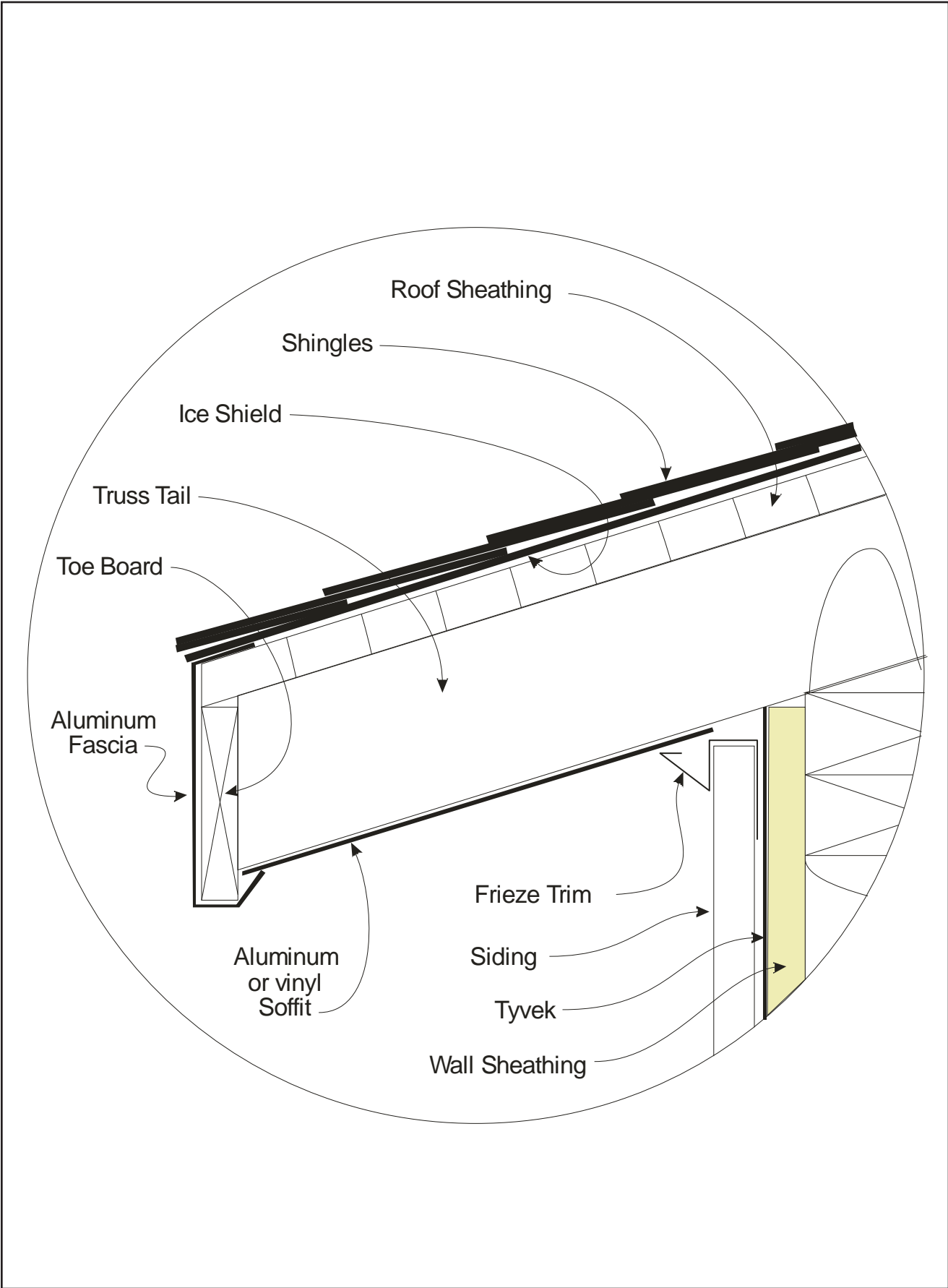


Right Side elevation

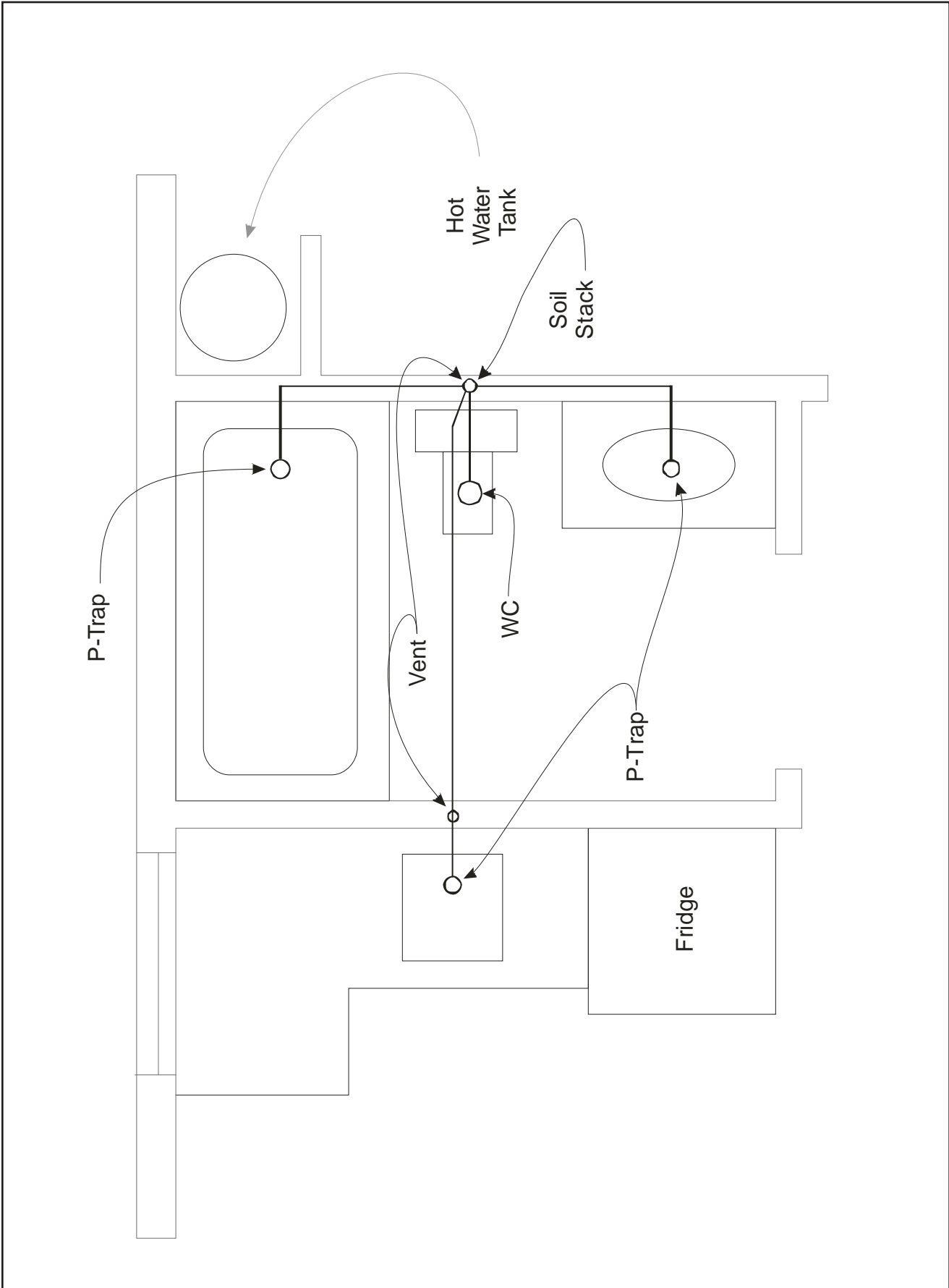


Front Elevation

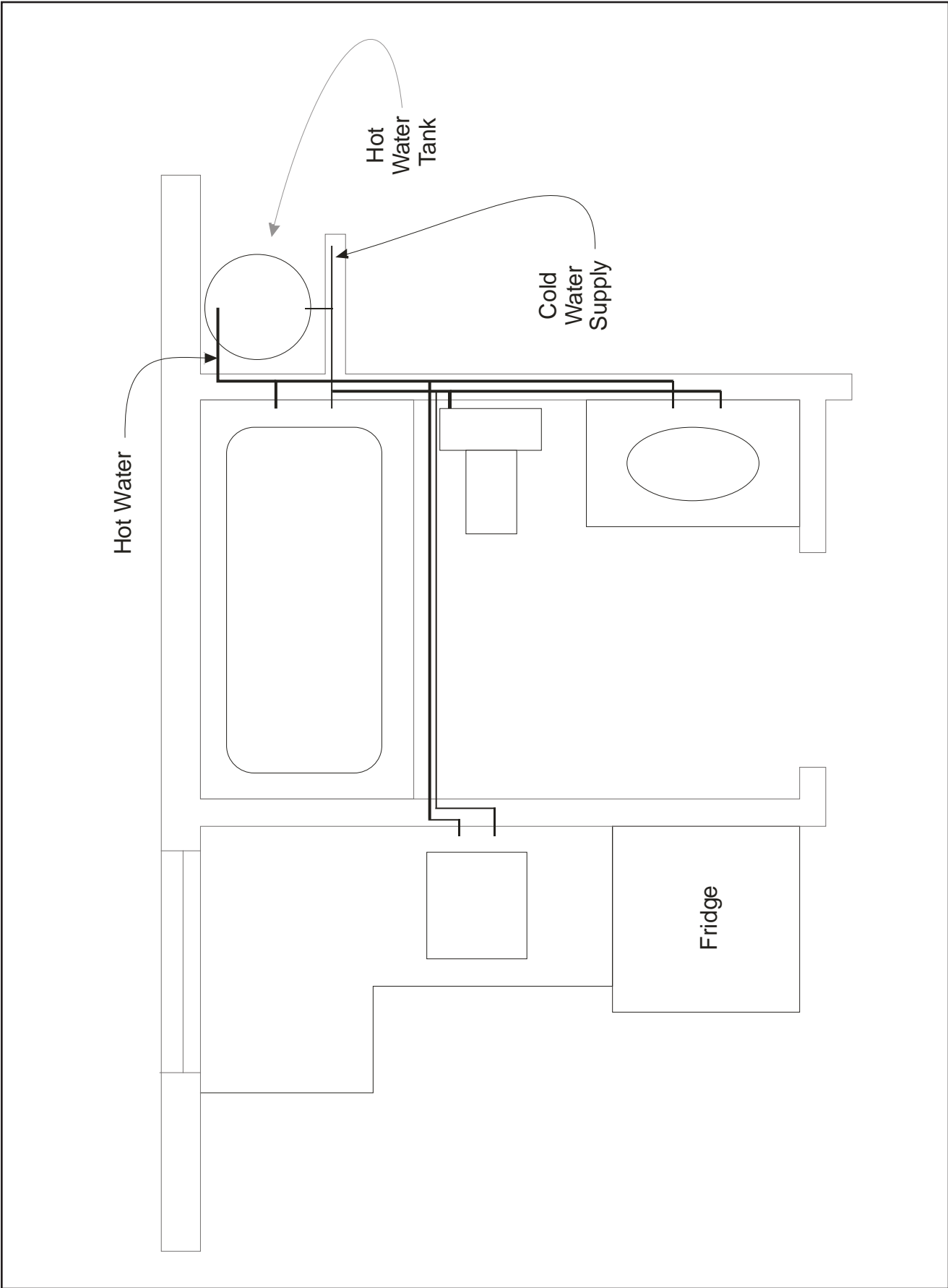




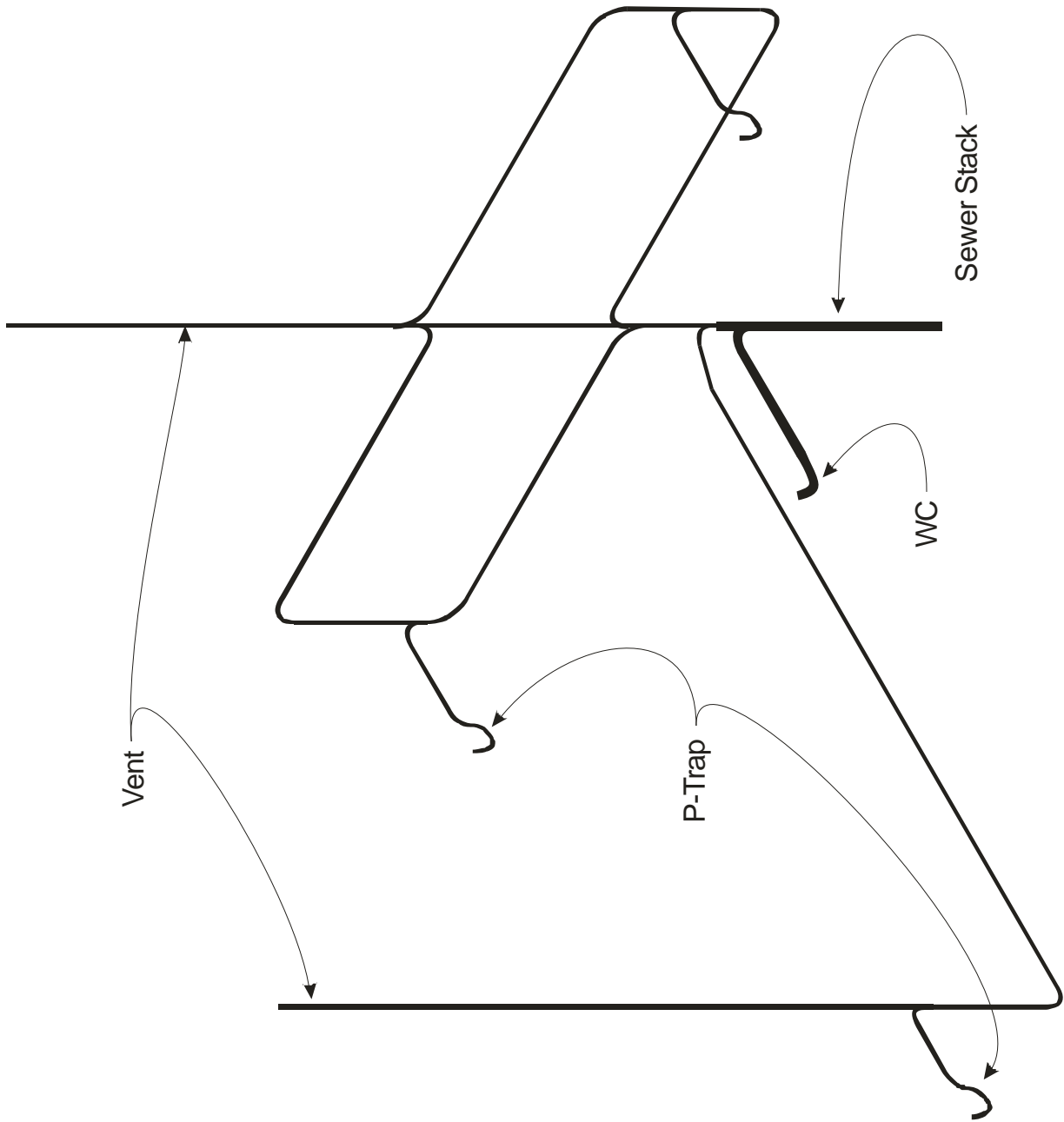
U2T2 Detail Drawing (Detail B)



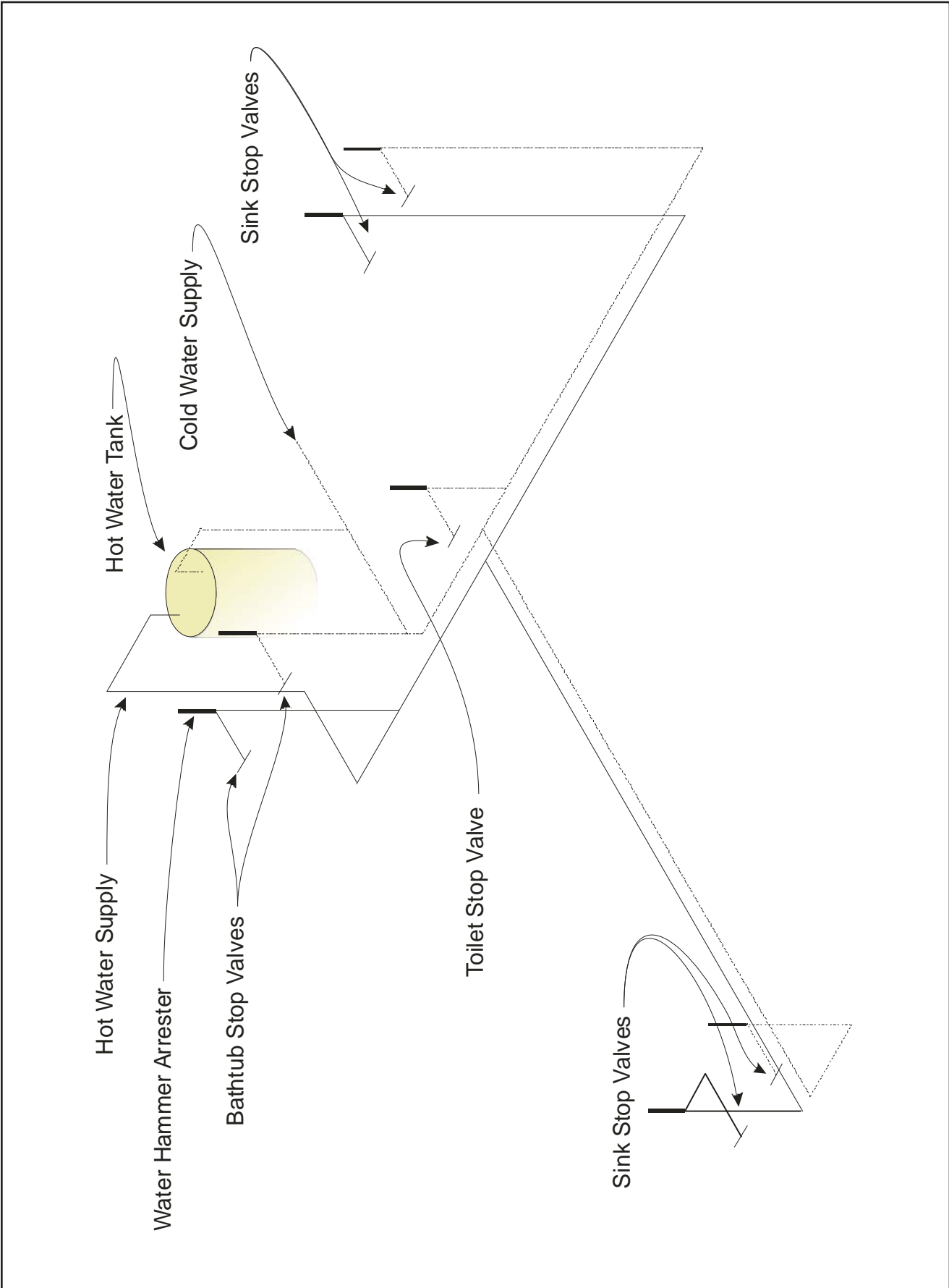
U2T2 Plumbing Waste Water Plan (DWW)



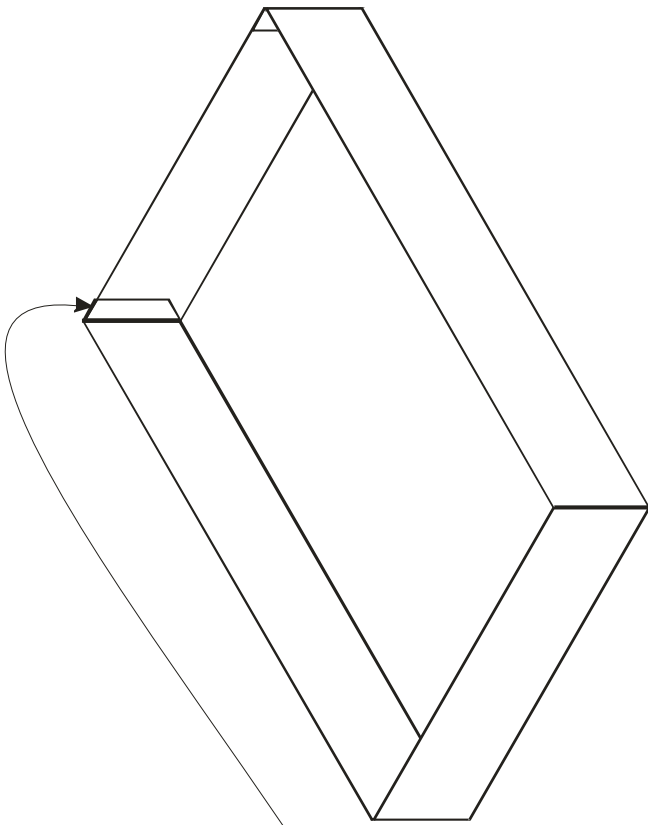
U2T2 Plumbing Supply Plan (Hot and Cold)



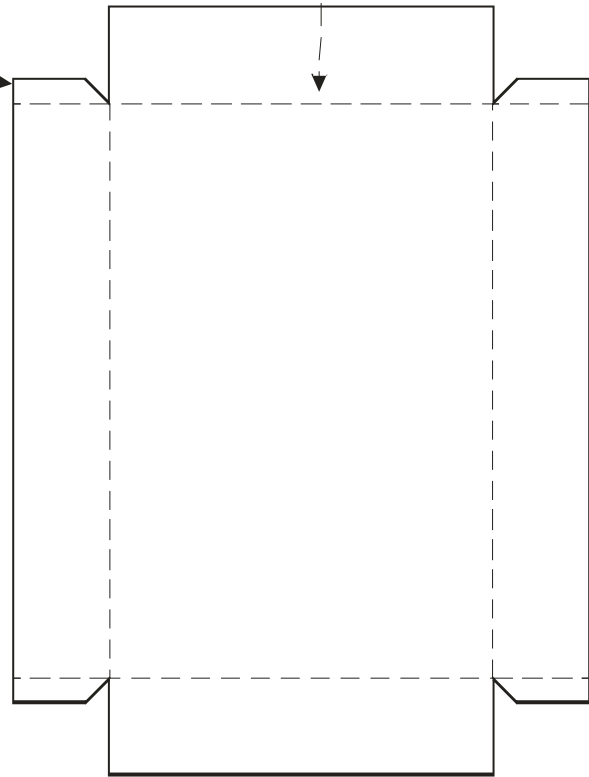
U2T2 Plumbing Waste Isometric



U2T2 Plumbing Supply Isometric



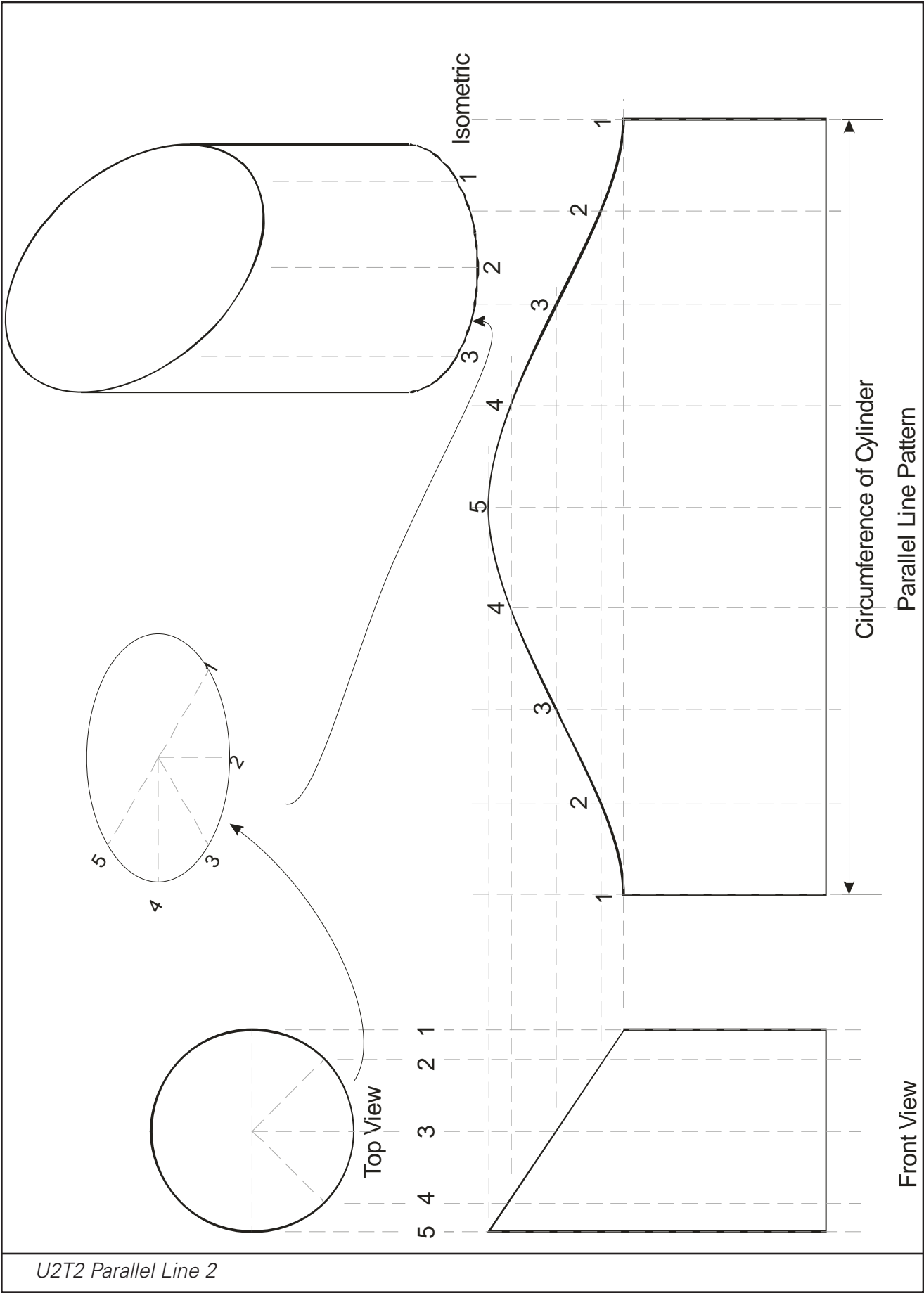
Parallel Line Layout 1 Isometric



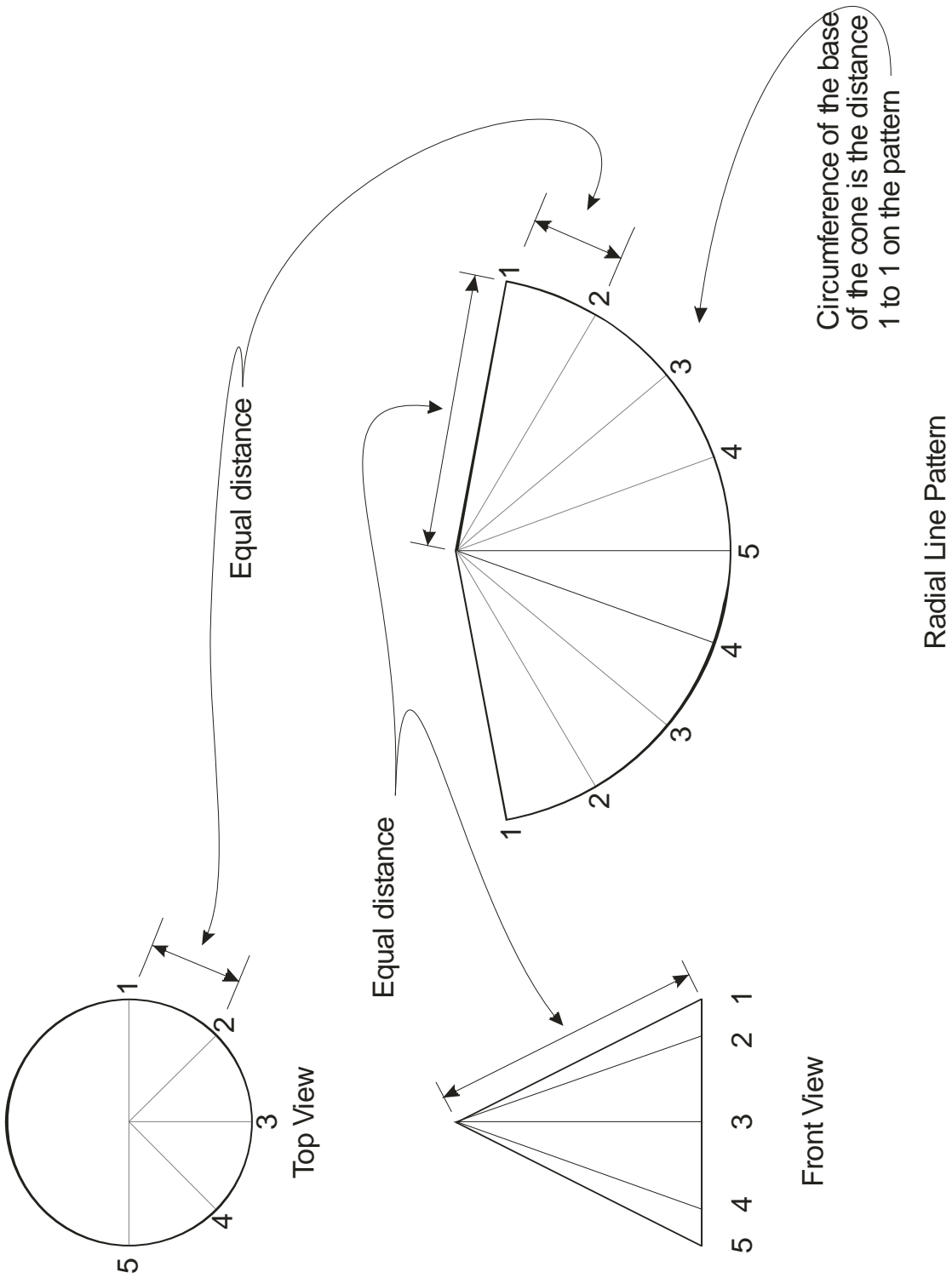
Folding (Bending) Lines

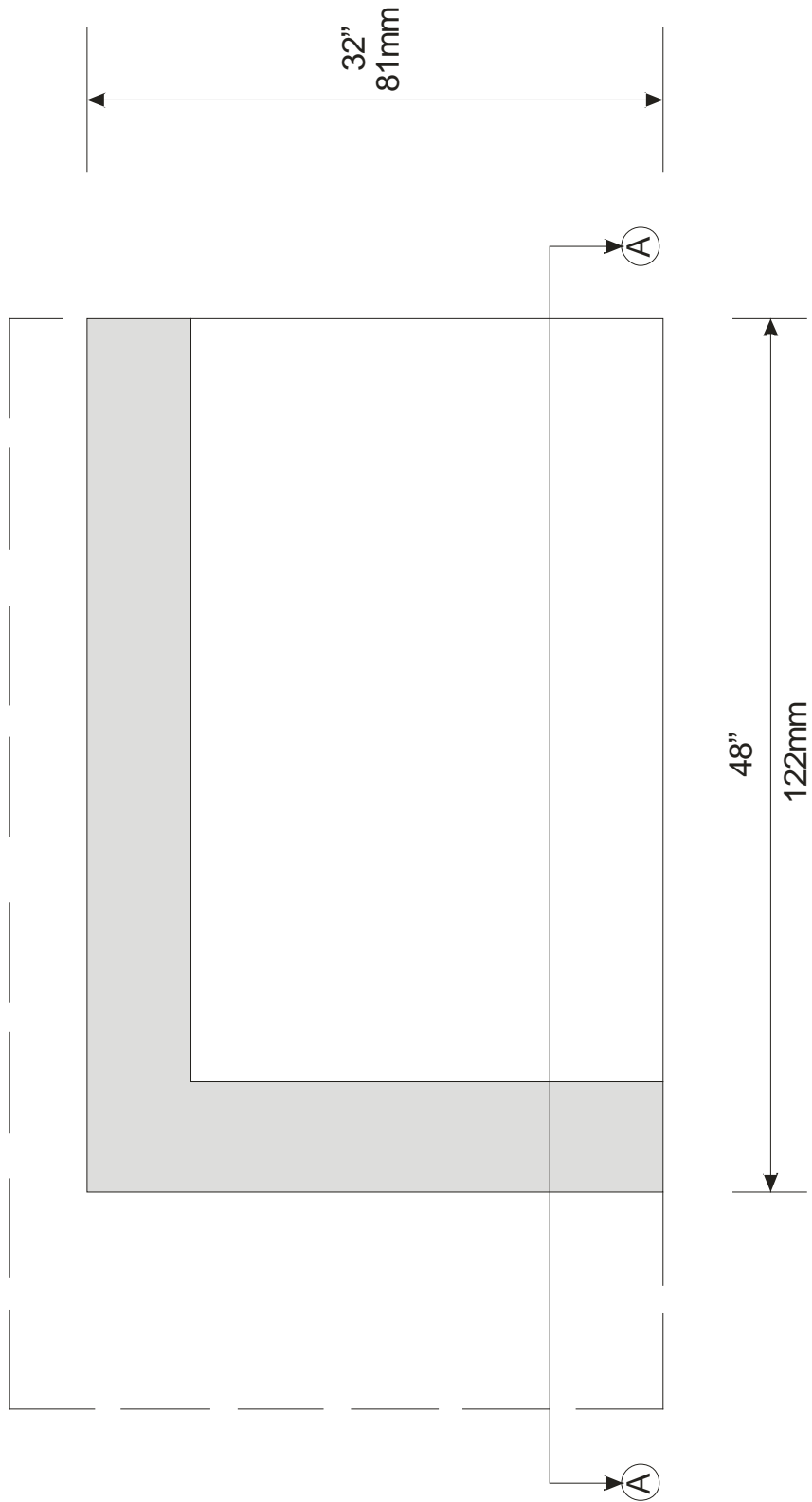
Tabs

Parallel Line Layout 1 Pattern View



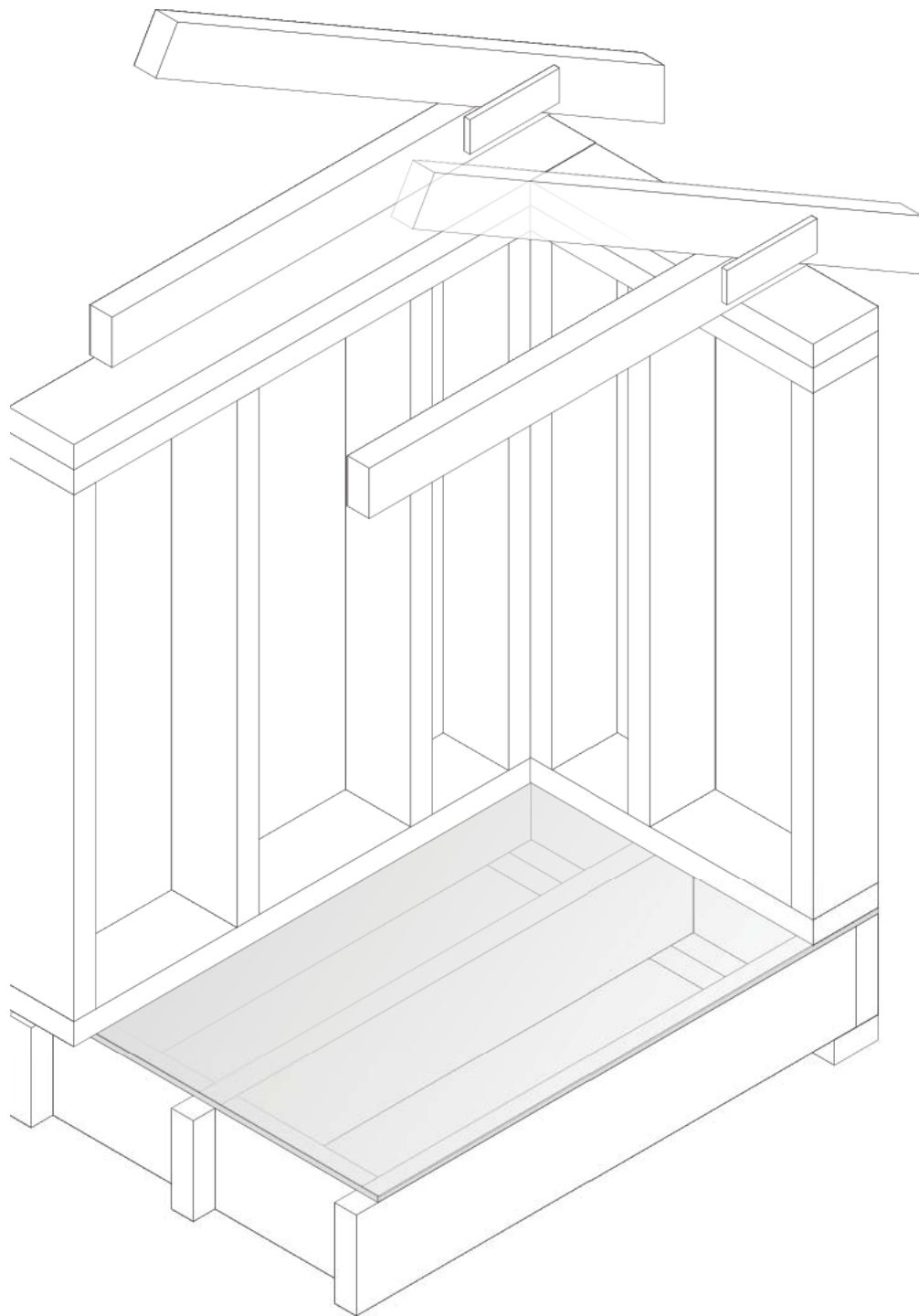
U2T2 Parallel Line 2



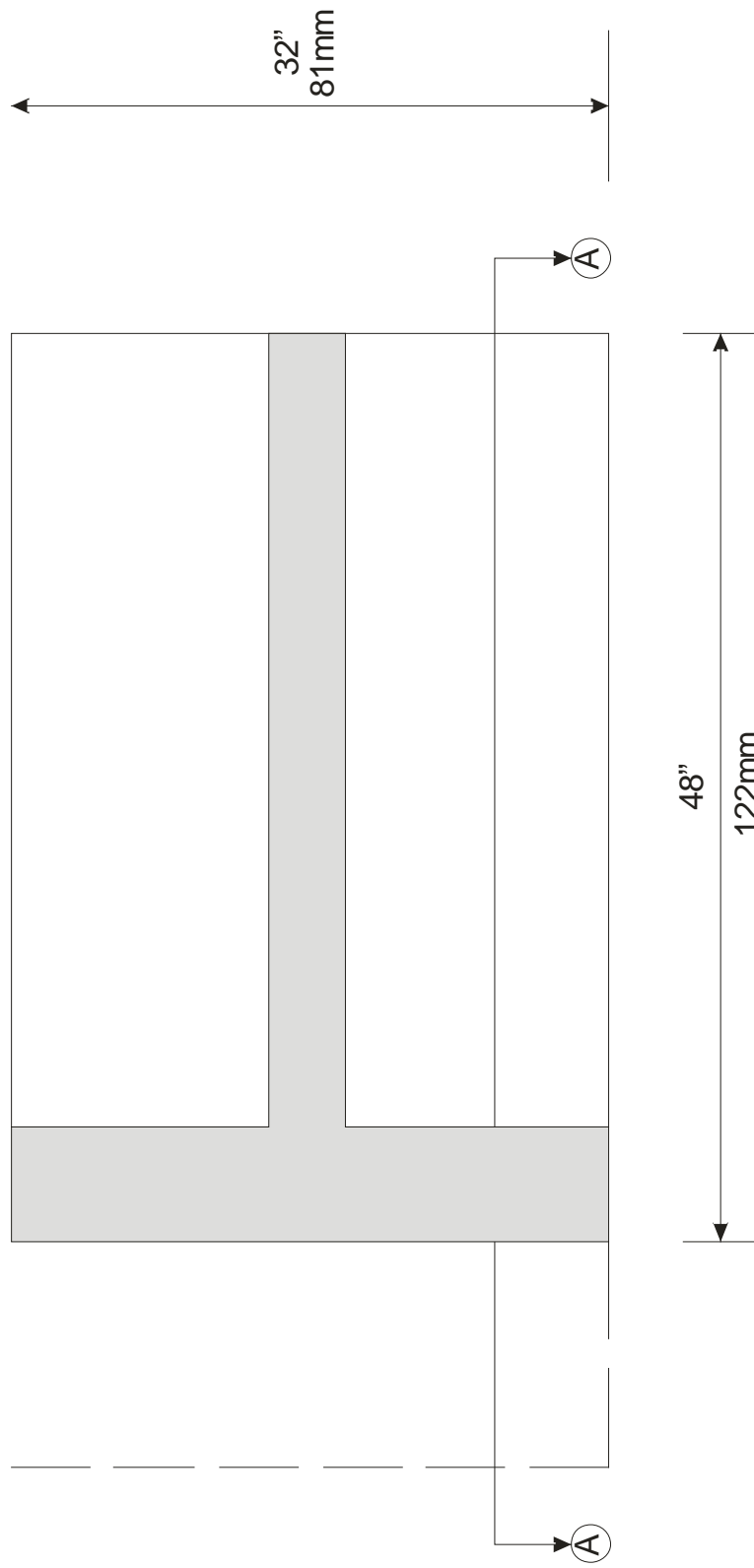


Design Option 1 Floor Plan

Corner layout with two exterior walls.
 Walls at 4 feet or 122 mm high.
 Roof section with 1 foot eave overhang and 6
 inch extension over gable

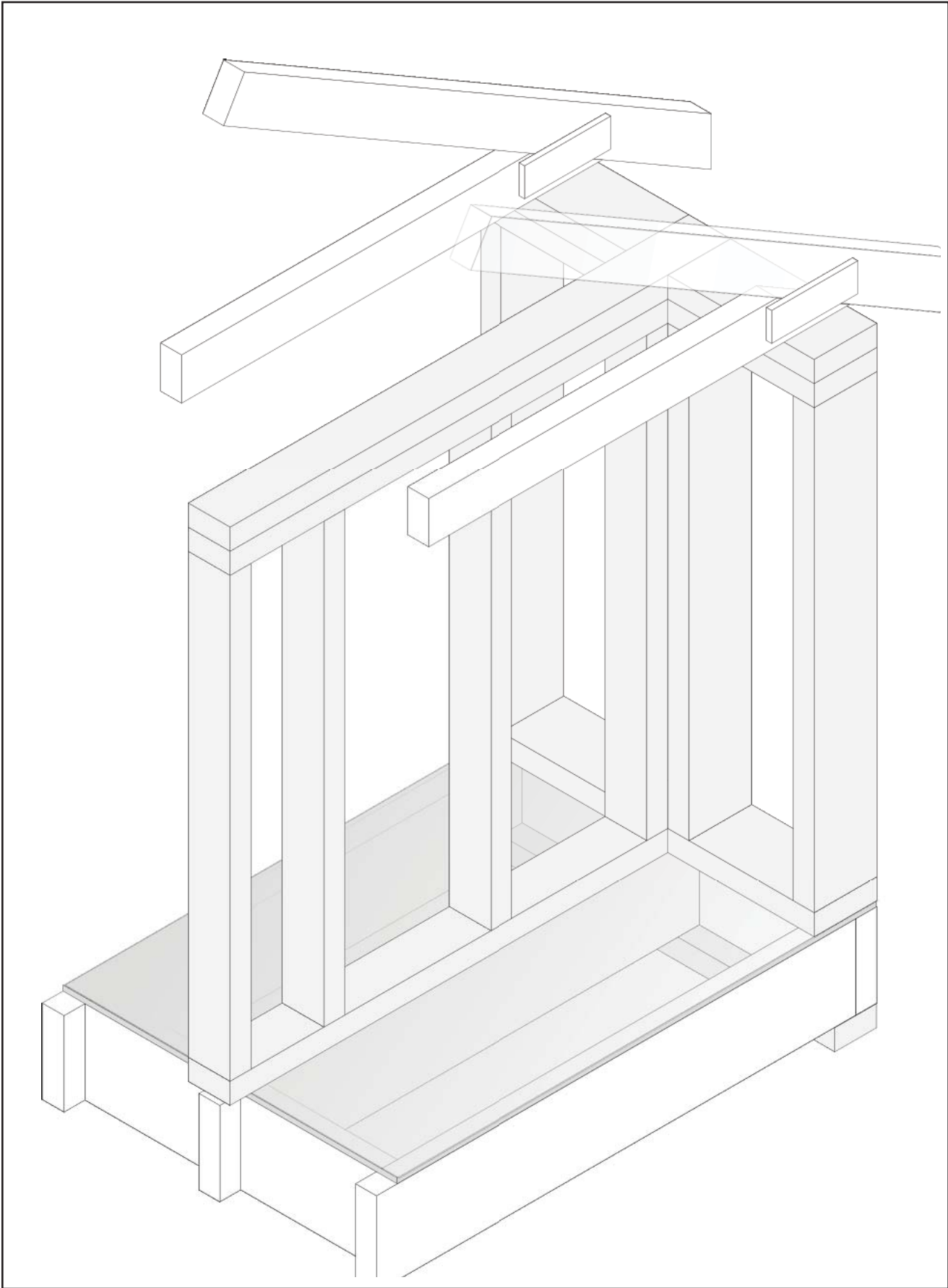


U3T1 Design Option 1 Isometric

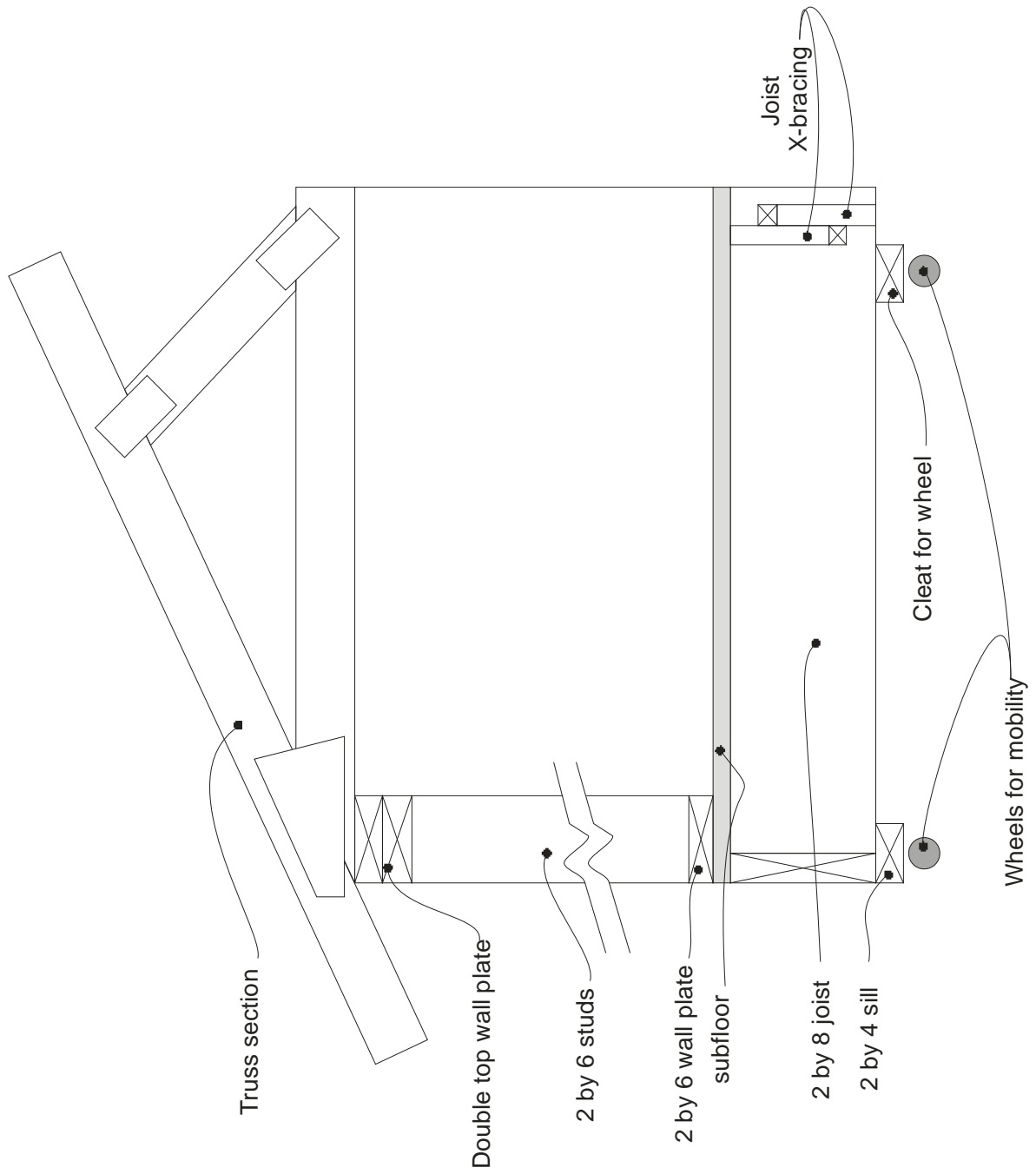


Design Option 2 Floor Plan

Layout with one exterior and one interior wall.
 Walls at 4 feet or 122 mm high.
 Roof section with 1 foot eave overhang

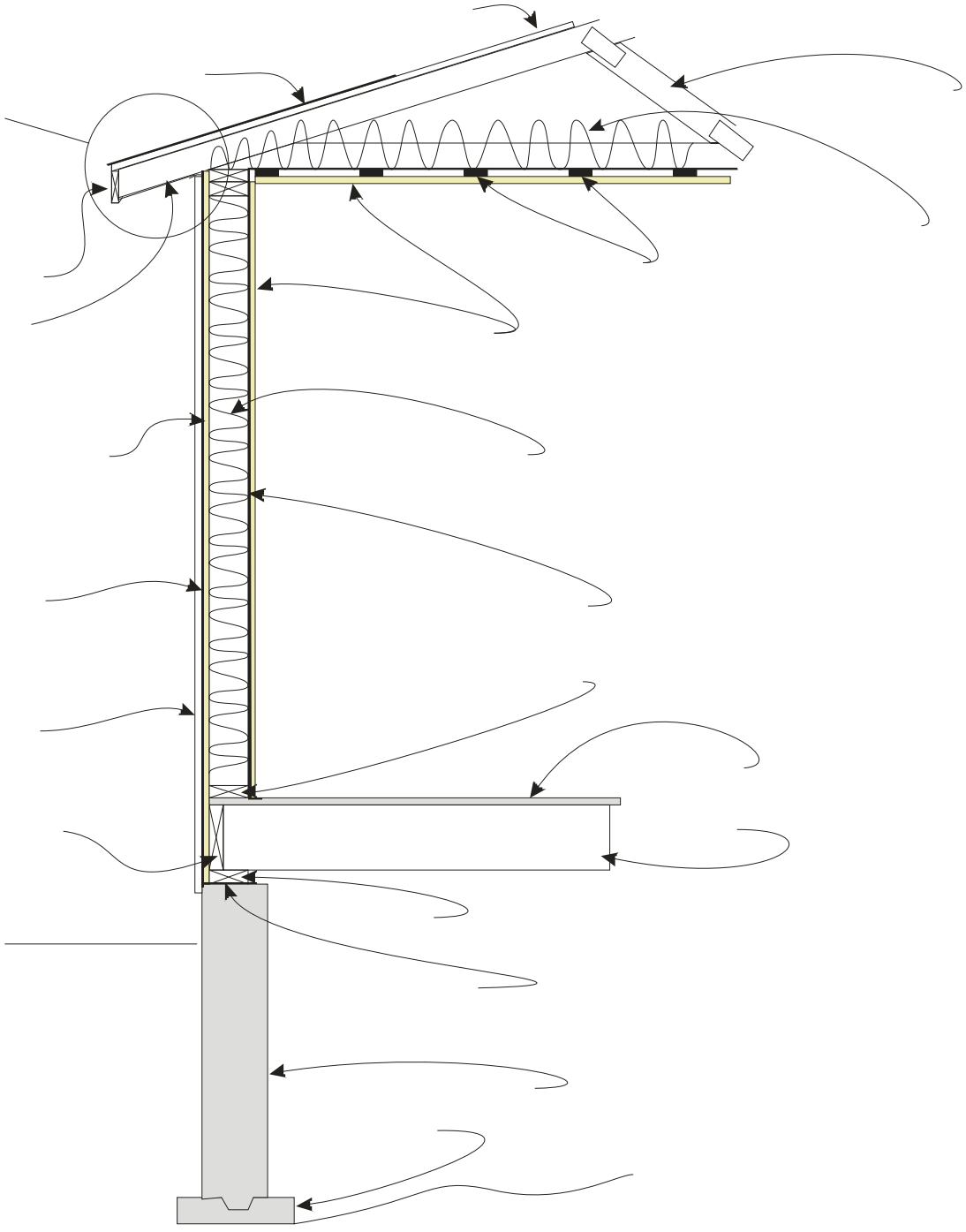


U3T1 Design Option 2 Iso

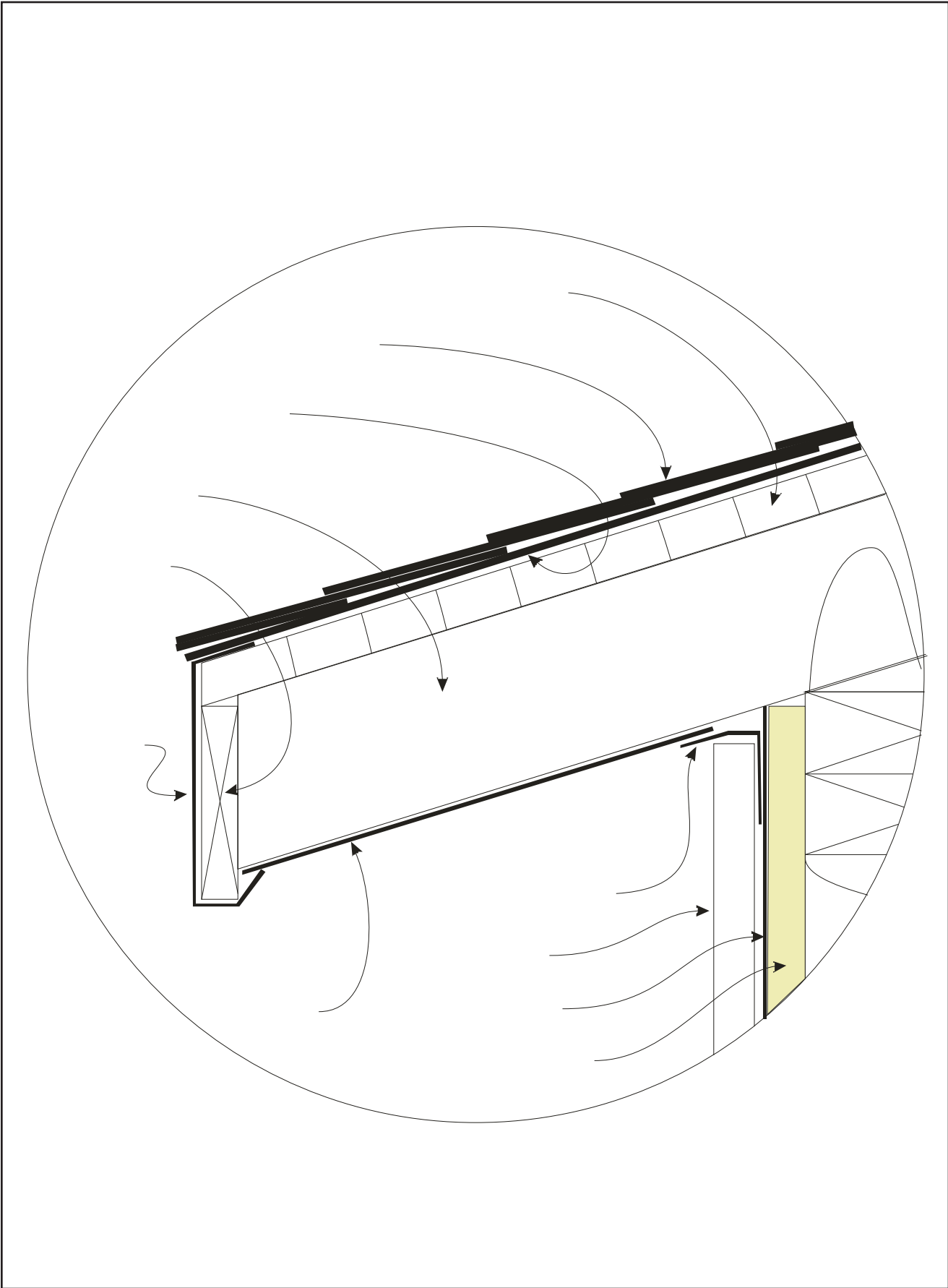


U3T1 Design Section "A-A" (Options 1 and 2)

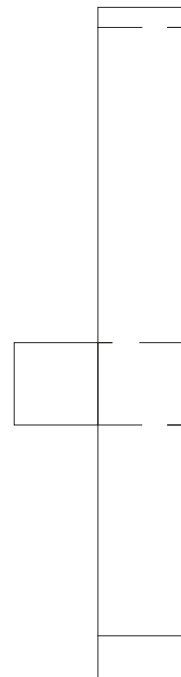
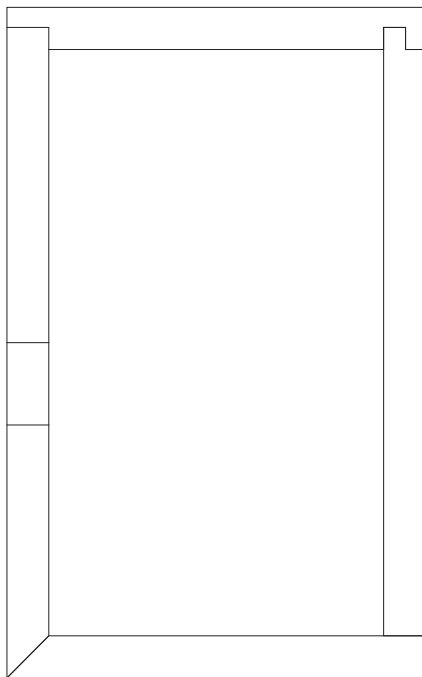
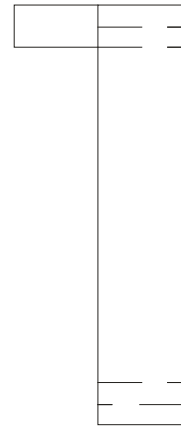
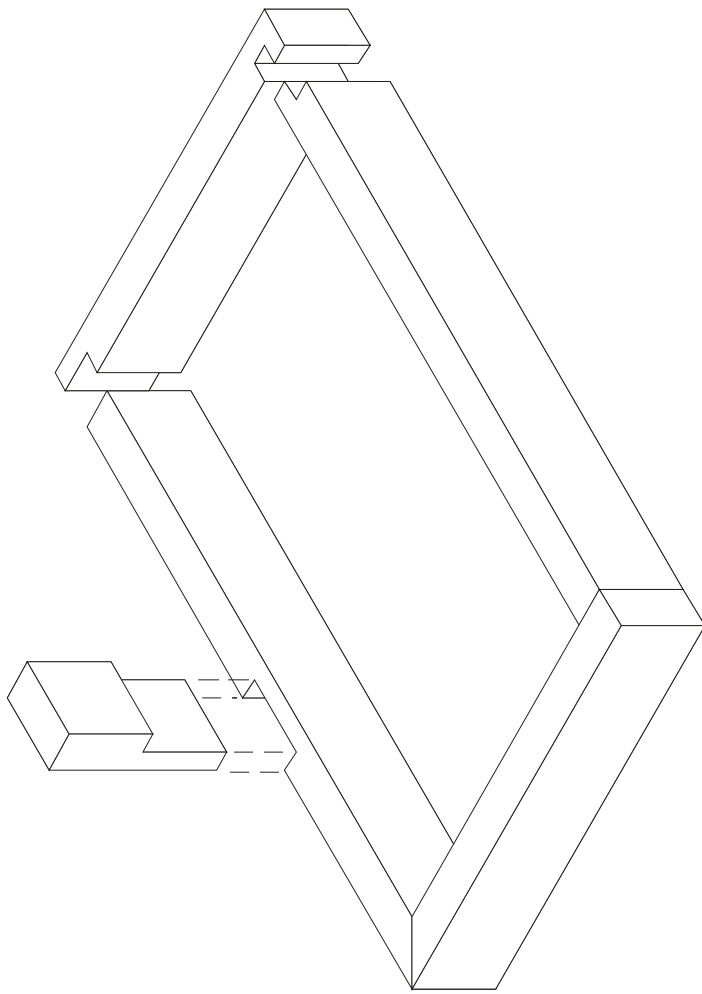
Detail B



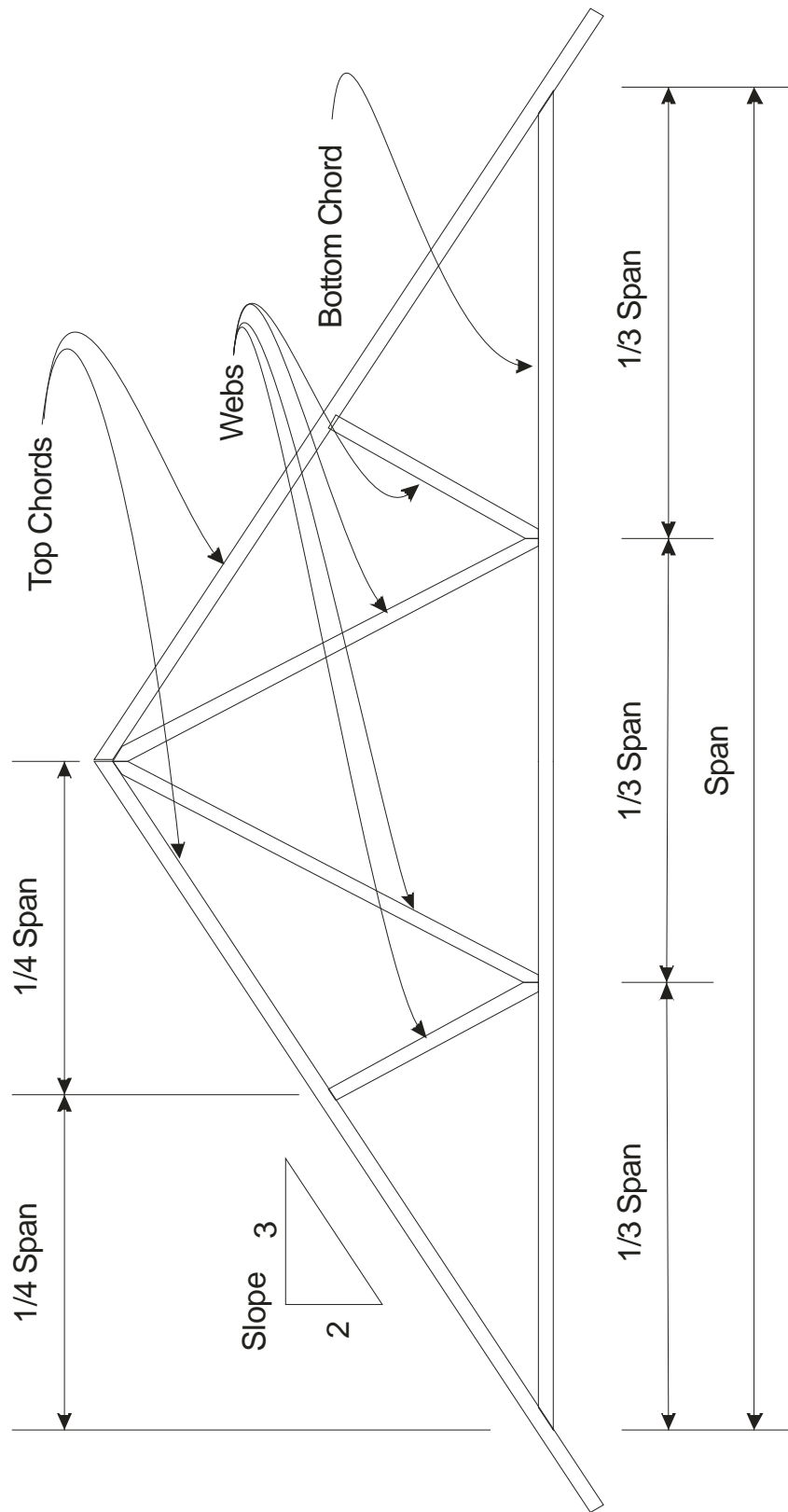
U3T2 Section Drawing for Component List Activity



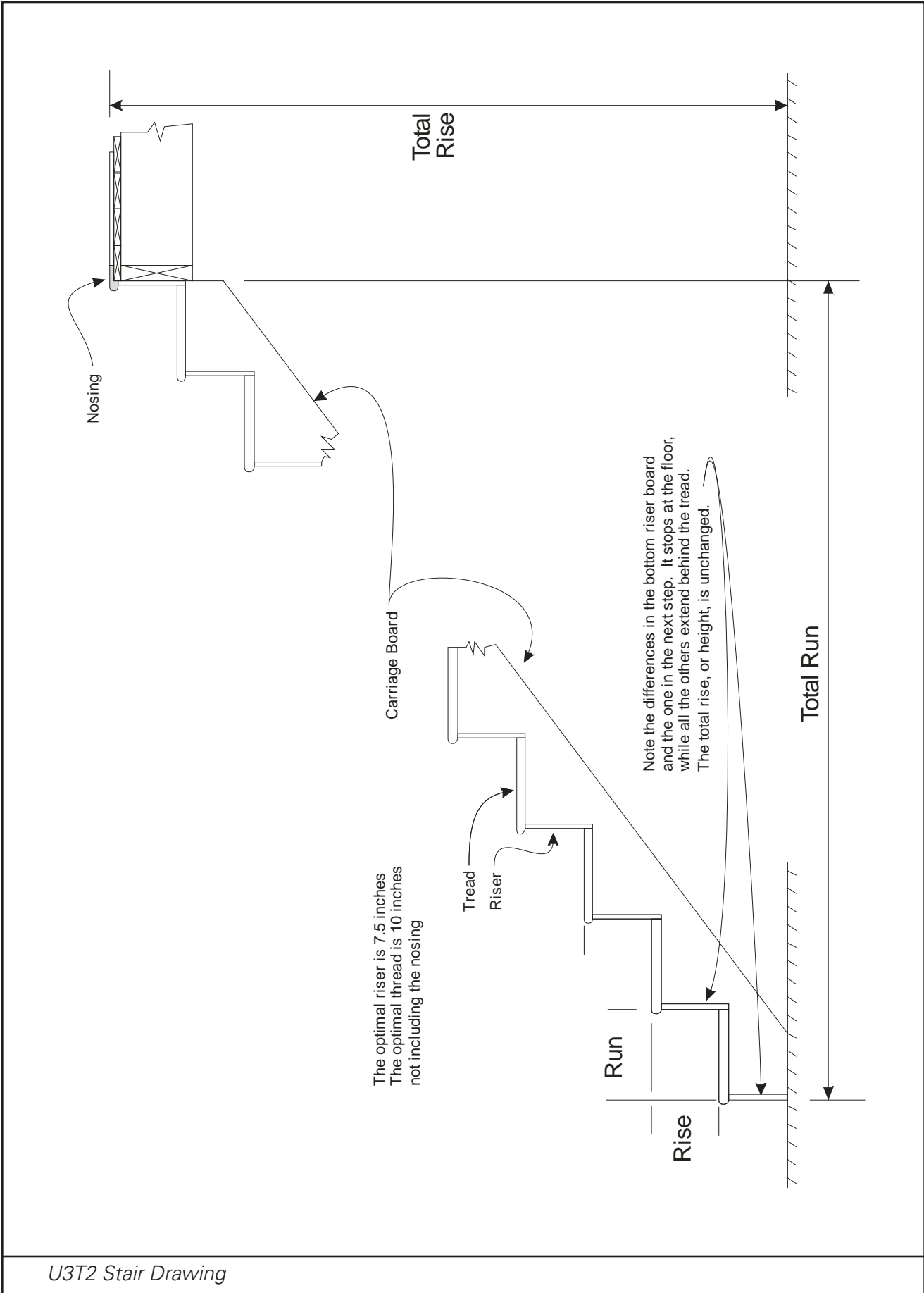
U3T2 Detail Drawing for Component List Activity



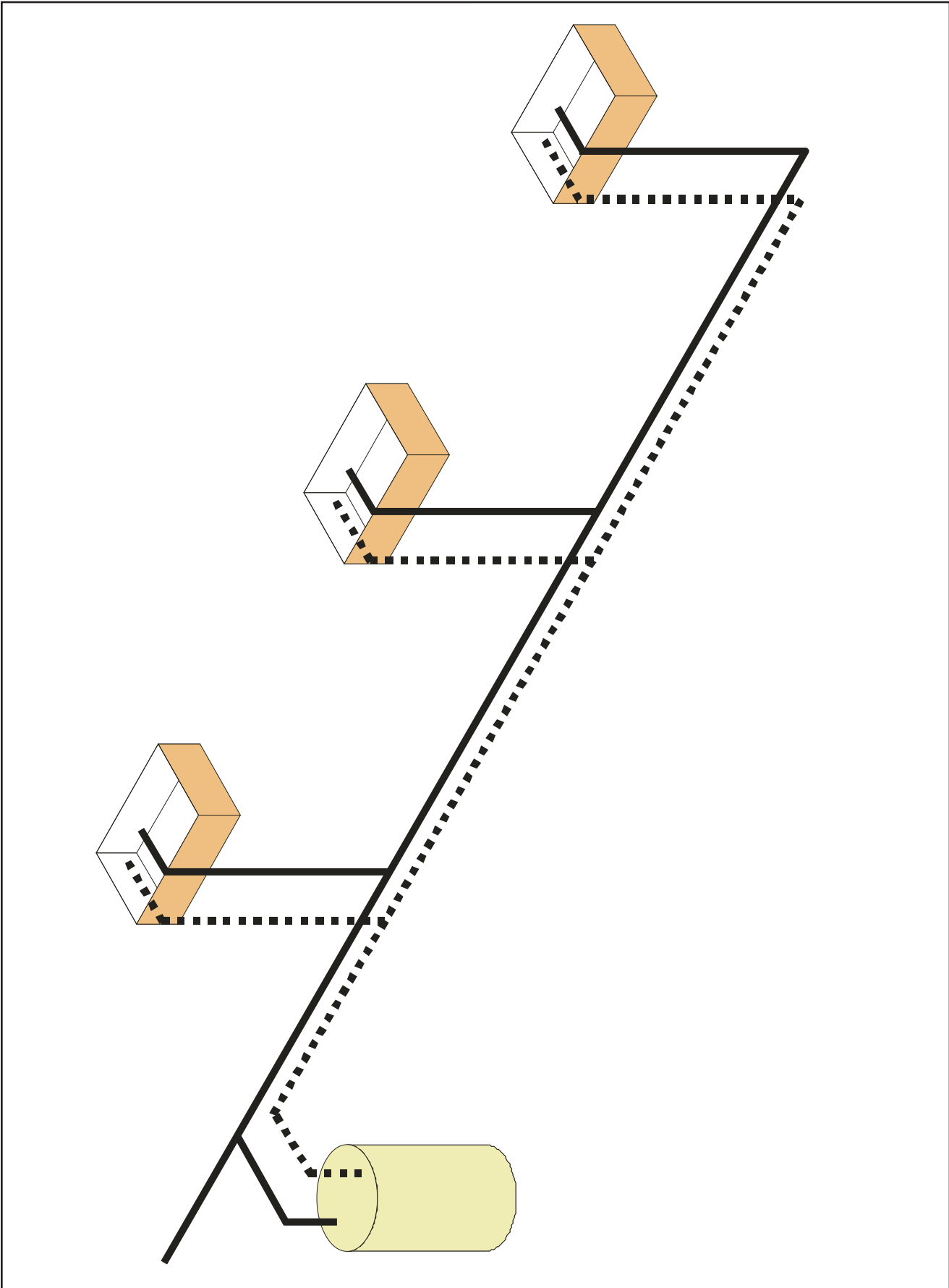
U3T2 Cutting Plan Drawing



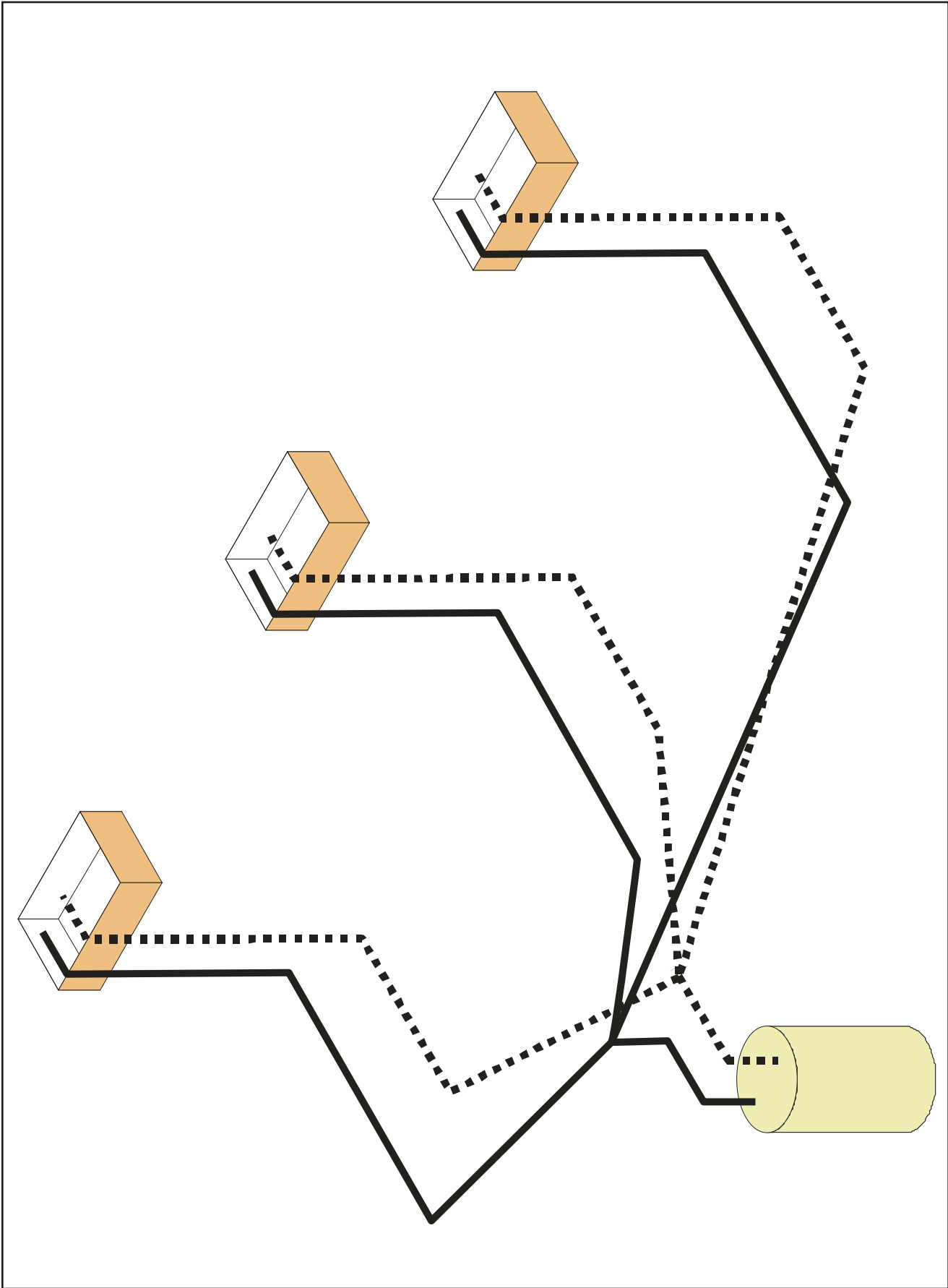
U3T2 Standard (Fink) Truss



U3T2 Stair Drawing



U3T6 Series Distribution



U3T6 Parallel Distribution

Design and Planning

Design is a problem solving strategy that is employed in all technology education courses. It is based on standard practice in industry and commerce. It provides a standardized methodology for developing technological solutions to problems. Design, as used in this course has these components

- Project identification/selection
- Development of a design brief
- Planning each of the major components of the project
- Fabricating each of the major components of the project

The following are included in this section

- Design Brief: Information for developing a brief
- Design Brief Template
- Planning Guide

Design Brief

Information for Developing a Brief

Project Description

The workplace for the construction trades can be emulated by fabricating a model structure in the school shop, complete with electrical, plumbing and other components.

Task Statement

Design and fabricate a construction simulation that includes elements of these trades

- Carpenter
- Electrician
- Plumber
- Lather
- Painter-decorator
- Sheet metal worker

Project Includes

The project needs to include these components from each of the trades

- Carpenter
 - Rough framing (floor, walls, roof, ceiling strapping)
 - Exterior (siding, roof covering)
 - Interior (trim)
- Electrician
 - Electrical rough-in (1 receptacle, 1 split receptacle with 1 half switched, 1 3-way switched overhead light, one outdoor GFI receptacle, and wiring)
 - Installation of receptacles, switches, and lights
- Plumber
 - Plumbing waste water rough-in (drainage system with toilet flange, sink trap, and vents for both)
 - Plumbing hot and cold supply rough-in (toilet supply, tap supply, with appropriate stops)

- Insulation and vapour barrier
- Lather
 - Drywall installation
 - Drywall plaster
- Painter-Decorator
 - Painting prep
 - Painting
- Sheet Metal Worker
 - Forming of soffit, fascia, rain gutter
 - Installation of soffit, fascia, rain gutter

Conditions Affecting the Project

Conditions affecting the project are availability of resources, including time, space, materials, tools, and information. Other conditions are codes and regulations from the various trades that are addressed in the project.

What the Solution must Do

The solution needs to emulate, as much as possible a job site setting. It needs to illustrate practices and techniques, and complete work according to accepted standards in each of the trades. It is not expected that students will attain the level of knowledge, skill and precision of a trades person. Accepted standards will be a sliding scale that the teacher has to judge.

Design Brief Template

Date _____

Name _____

Group _____

Project Description

Task Statement

Project Includes

Conditions Affecting the Project

What the Solution must Do

Planning Guide

Information for Fabrication Planning

The major project for the course is based on development of a solution to a design problem. The solution is developed using a six stage process, with one stage for each of the six trades

- Carpenter
- Residential Electrician
- Plumber
- Lather
- Painter-Decorator
- Sheet Metal Worker

Each stage has two separate components

- Planning
- Fabrication

Planning

Planning is a method of identifying the tasks that need to be done, the resources and tools required to do them, and putting it all into a logical sequence of actions.

Planning allows you to, for example

- Identify potential problems and develop ways to deal with them
- Determine best use of resources and time
- Be more productive and get better results
- Share work equitably among team members
- Identify skills you need to acquire

Planning, in this course, begins with the design brief. The brief sets the overall conditions, and identifies what needs to be done. The brief says nothing about how to actually develop the solution, only what the solution must accomplish. The brief in this course is a bit more specific than in many cases in that it identifies the general parameters of the solution.

Since the solution will be implemented in six stages, one for each trade, planning will need to be

done six times, once for each trade. The trades are sequenced in the order that they first need to be implemented. Carpentry will not be completed until the initial work from electrical, plumbing, and lather is done. Electrical will not be completed until initial work from plumbing, lather and painter-decorator is done.

Planning Sequence

For all 6 of the trades, the following planning sequence is recommended. It is recommended that you chance with the teacher as work progresses to determine if things are missing and to keep the teacher informed of your plans.

- Review the design brief to identify what is required
- Identify all the systems, subsystems and components required to construct them
- Create sketches to ensure that you understand the systems, how they are built and how they work and interconnect with one another.
- Create a materials list
 - Identify each type of material or component
 - Identify the different dimensions or sizes of each
 - Make a list that sorts them by type, size and quantity of each size
- Make a list of ways that each of the materials or components need to be processed (modified). Processing will fall under these categories
 - Layout (measuring and marking for further processing)
 - Separated (modified by removing materials such as cutting, sawing, planing, sanding, filing)
 - Shaped/formed (modified without removing material such as bending, twisting, compressing, stretching)

- Combined (joining together by mechanical [nails, screws, overlapping joints], adhesive [glues, soldering], or cohesive [welding, solvents] means
- Finished (covering with a protective layer)
- Make a list of the fabrication sequence.
 - Determine the logical sequence. What needs to be done first? What needs to be done last? What are the steps to get from first to last task? Are there some tasks that need to be done before others can be done?
 - Write up the list of steps. Rearrange them as necessary as you review and think about the logic of the sequence.
- Make a list of tools and equipment needed to do the fabrication.
 - Materials processing can only be done with tools and equipment. After making a materials list and planning a fabrication sequence, you should have a good idea of the processes that need to be applied to the materials
 - Look at each step in the sequence, identify the processes that need to be applied to the materials and identify the tools and equipment needed to perform the tasks
- Identify training and certification needed to use the tools
 - Have you used this tool? Don't assume that you know how to use it effectively just because it may be a familiar tool. Safe use is not always obvious. Efficient use (best results for least effort) is seldom obvious even for simple tools. Sometimes the two are synonymous, sometimes they are not. Safe, efficient use is the goal
 - From the list of required tools and equipment, identify who in the group will be using which ones.
 - Make a three column list that has name, tool, training/certification. Indicate for each name, which tool and if training/certification is needed.
- When the plan is complete, do a review to determine if you understand everything
- Have the plan reviewed by your teacher for authorization to move to fabrication

Student Safety

Student safety is a multi-level issue. It requires

- Clearly stated rules of conduct
- Clearly stated operating procedures for use of any tools, equipment and materials
- Obvious, effective, and consistent modeling of safe procedures by the teacher
- Rigorous teaching and assessment of student knowledge and performance with respect to safety and safe operation of tools, equipment and materials
- Consistent enforcement of safe practices
- Consistent and appropriate use of safety protection such as safety glasses and hearing protectors.

References

In addition to the references in the guide, these sites offer excellent information on shop and tool safety

- Workshop safety rules at <http://www.technologystudent.com/health1/safetyr1.htm>
- Safety in mechanical workshops at <http://www.shef.ac.uk/safety/mech/mech1.html>
- Safety PDF links at <http://www.leeds.ac.uk/safety/library/mach.htm>
- Workplace safety toolkit (checklists) at <http://www.nonprofitrisk.org/ws-ps/topics/popt/toolschk2-ps.htm>

Safety Instructions for the Tech Ed Lab

1. All activities must be approved by your instructor before work proceeds on any project.
2. You must be evaluated and score 100% pass before you are allowed to use any tool or machinery.
3. Report all injuries to the instructor regardless of how small or slight.
4. Wear eye and ear protection around all machinery and whenever using any tool.
5. Tie/fasten hair back in such a fashion that it doesn't block your vision, and it is not a hazard for entanglement in machinery.
6. Wear suitable clothing in the lab. Long or loose sleeves, sweaters and coats are not permitted around machinery. Remove any loose item that might present a hazard, such as, necklaces, pendants, watches, rings etc.
7. Obey the operating instructions of the machinery that you are using.
8. Notify the instructor if people are exhibiting unsafe behavior.
9. Bring any faulty or improperly operating equipment to the attention of the instructor.
10. Maintain a safe working area around machinery.
11. Keep tools and materials from projecting over the edge of benches.
12. Immediately clean up and dispose of chips, dust, and waste generated from projects.
13. Keep the floor clear of dust, scraps, litter and debris.
14. Immediately wipe up or clean spilled liquid materials.
15. Place oily rags and other combustible materials into approved disposal containers.

Safety Rules For Using Power Equipment

1. Do not operate any machinery until you have received proper instruction and certification on that machine, and have been approved by the instructor to use it. Be sure to obtain permission each time you use the machine.
2. Wear proper eye and hearing protection at all times.
3. Have the instructor check your work setup before starting any activity.
4. Check and make all adjustments to your machinery before turning on the power.
5. Make sure that all persons are outside the work zone for the machine before starting or beginning work.
6. Guards must be in place and functioning properly. NEVER disable a guard on a piece of machinery.
7. Only one person should be using a piece of machinery unless the process requires a helper. Helpers should operate in the designated safe location. The operator should control the workpiece at all times
8. Start and stop your own machinery and never leave the machinery until it comes to a full stop.
9. Do not leave a piece of machinery running unattended.
10. Disconnect all power sources before performing any type of cleaning or maintenance.
11. Keep your hands, fingers, and limbs a safe distance from moving parts, as designated by the regulations for that machine.
12. Keep machinery clear of all tools and other items. The machinery should not be used as a storage surface.
13. Keep the floor around the machinery clear of all liquids, dust, or scraps to prevent slipping.
14. Keep you attention on the task at hand. Don't talk or become distracted while operating machinery. Do not distract or interrupt anyone operating machinery.
15. Notify the instructor of any malfunctioning machinery or tool.

Student Safety Pledge Form

Safety Pledge

I, _____, am enrolled in ST1201. I pledge to follow all safety instructions and rules and regulations for operating tools and equipment. In particular, I will:

1. Follow all safety rules for the lab.
2. Never use or operate a machine without first having:
 - a. permission from the instructor,
 - b. proper instruction and training in the operation of that machinery.
 - c. earned a 100% pass on the machine operation and safety test.
3. Immediately report all injuries or accident to the instructor.
4. Not engage in behaviors that endanger my own, or others, personal safety in the technology lab.

This safety pledge for students is based on:

1. The student having received proper instruction from the instructor.
2. The student assuming responsibility for following prescribed safety rules and procedures.
3. Written permission from the students parents/guardians.

Date: _____ Student's Signature: _____

I hereby give my consent to allow my son/daughter to operate all machinery and equipment necessary to the requirements of the ST1201 course in which he is enrolled.

Date: _____ Parent's Signature: _____

Parents are invited to visit the shop to inspect the machines and to see them in operation.

Tools Listed by Trade

The following should be noted about these tool lists

- These lists include some of the tools employed in the trade. They are not lists of required tools for the course.
- The lists are not intended to be complete or comprehensive, rather as an indication of the range of tools that trades persons use.
- All of these tools require instruction before students use them. Even the simplest tools have best practices which increase effectiveness and decrease risk
- All tools have levels of risk associated with their use. Risk is managed with proper instruction and workshop management.
- Some of these tools require safety tests before students can use them. Where such tests are required a 100% pass is required on verbal and written components and on performance tests.
- Tool safety sheets are provided in Appendix B for many of the tools that require safety testing before use.

Carpentry Tools

Job Site Tools

- Hand saw (crosscut)
- Hand plane (block, smooth)
- Utility knives
- Wood chisels (1/4, 3/8, 1/2, 3/4) and wooden mallet
- 12 ounce and 16 ounce claw hammers
- Nail set
- Try, mitre and framing squares
- Metric and imperial measuring tapes & rules
- 2 foot and 4 foot levels
- Laser level
- Plumb bob
- Chalk line and chalk
- Small pry bar
- Rechargeable electric drills
- 1/2 inch electric drill
- Sets countersinks, twist drills, spade bits and auger bits for power drills
- Set Vixx bits for center boring screw holes in hinges
- Hole saw with assorted sizes (also used for plumbing)
- Countersink
- Pneumatic brad nailer (3/4 to 2 inch)
- Pneumatic framing nailer
- 1-2 hp portable compressor (also needed for sheet metal)
- Power miterbox (laser line would improve safety)
- Rotary orbital action sander with dust collection port

Shop tools

- Stationary drill press
- Band saw
- Table saw
- 6" jointer
- 12 inch or larger planer
- Oscillating spindle sander
- Lathe

Electrical Tools

- Wire T-stripper
- Fibreglass handled hammer
- Heavy duty side-cutting pliers
- Heavy duty needle-nose pliers
- Heavy duty diagonal cutting pliers
- Soldering gun and soldering iron
- 1000V insulated flat, Robertson and Phillips screwdrivers in standard sizes (or a reasonable facsimile)
- Electricians locking knife
- Locking tape measure
- Multi-meter
- Non-contact continuity tester
- Safety glasses
- Wire cutters
- Wire strippers
- Circuit tester
- Drills
- Saws

Plumbing Tools

- Pipe and soil pipe cutters
- Tapes, rules, and squares
- Reaming and deburring tools
- Pipe, chain, and bench vise
- Soapstone
- Cutting tools (hacksaw, hole saw, jab saw, back saw)
- Pliers (groove joint, slip joint, locking)
- Snips (left, right, straight)
- Chisels (cold, punch)
- Propane torch, flame shield, solder, flux (You must be tested and score a 100% pass on the knowledge and practical use of the tool. You may not use the tool until you have been tested)
- Emery cloth
- Safety glasses
- Adjustable wrenches, 6 and 10 inch sizes
- Basin, pipe, strap, monkey, spud, and chain wrenches
- Builder, laser, water, line and torpedo levels

Lather Tools

- Wall board lifter
- Drywall tape reeler
- Hand sander
- Drywall saw
- Stud finder
- Drywall square
- Level
- Drywall corner tool
- Plaster hawk
- Pole sander
- Drywall hammer
- Outside corner tool
- Utility saw
- Utility knife
- Stilts
- Taping knives
- Putty knife
- Finishing knife
- Plastering trowels

Painter Tools

- Paint roller handles for 4 and 10 inch rollers
- Paint trays
- Drop cloths
- Wallpaper tray

Sheet Metal Tools

Hand Tools

- Machinist try square
- 3 head machinist square
- Steel safety straight edge
- Adjustable bevel
- Scribers
- Automatic centre punch
- Compass
- Left, right, and straight aviation snips
- Pop riveter
- Clamps
- Heavy duty locking utility knife
- Hand operated nibbling tool
- Deburrer
- Hand seaming tool
- Electric drill

Pneumatic Tools

- Pneumatic nibbling tool
- Pneumatic shear (straight or pistol grip)
- Pneumatic punch and flanging tool

Machines

- 30 inch 3-in-1 sheet metal machine (shear, brake, roll former)
- Small air compressor (1-2 hp)
- Drill press

Appendix B

Rubrics and Safety Tests

Rubrics	56
Tool Safety Sheets	64

Rubrics

Two general and 4 design rubrics are supplied

- Knowledge
 - Where multiple concepts are assessed, expand the “Understanding of Content” section accordingly
- Skills
 - Where multiple skills are assessed, add each one to the “Ability to Apply Skills” section
- Design Part 1: Opportunity Selection
- Design Part 1: Design Brief
- Design Part 2: Planning
- Design Part 2: Fabrication

References

In addition to references in the guide,

- Holistic rubrics at <http://pals.sri.com/pals/tasks/5-8/ME122/rubric.html>
- Performance assessment at <http://fcit.usf.edu/assessment/performance/assessb.html>
- Rules for writing rubrics at <http://pals.sri.com/guide/scoringdetail.html>

Knowledge Building Rubric

Rating Scale

4. Exceeds Defined Outcomes	3. Meets Defined Outcomes	2. Meets Defined Outcomes	1. Meets Defined Outcomes	0. Has not Completed Defined Outcomes
Exceptional quality and attention to detail. Consistently performs above the standard	Above average quality. Consistently performs to the standard	Average quality. Meets the standard better than 50% of the time	Below average. Meets standards with assistance	Unacceptable. Does not meet the outcome

Scoring Grid

Planning and Management	Score
Identifies what is being asked	
Set goals and plans a sequence of steps to achieve each goal	
Prioritizes tasks and manages time wisely	
Planning and Management Score	

Research	Score
Uses multiple sources	
Uses a variety of information gathering techniques	
Determines relevance of information in an effective and timely manner	
References sources appropriately	
Research Score	

Understanding of Content	Score
Identifies what is being asked	
Can accurately explain the major concepts or ideas	
Can accurately explain the more subtle details of a concept	
Can make appropriate decisions and take appropriate actions based on understanding of the content	
Understanding of Content Score	

Presentation and Reporting	Score
Identifies what is being asked	
Sequences content in a logical manner	
Creates accurate information	
Creates information that is appropriately detailed	
Presents material in a syntactically correct manner	
Presentation and Reporting Score	

Work Practices and Teamwork	Score
Effectively troubleshoots common problems and devises ways to overcome them	
Collaborates effectively in work groups and teams	
Takes on leadership and other team roles	
Correctly and consistently documents work in the work log	
Work Practices and Teamwork Score	

Skill Building Rubric

Rating Scale

4. Exceeds Defined Outcomes	3. Meets Defined Outcomes	2. Meets Defined Outcomes	1. Meets Defined Outcomes	0. Has not Completed Defined Outcomes
Exceptional quality and attention to detail. Consistently performs above the standard	Above average quality. Consistently performs to the standard	Average quality. Meets the standard better than 50% of the time	Below average. Meets standards with assistance	Unacceptable. Does not meet the outcome

Scoring Grid

Planning and Management	Score
Identifies what is being asked	
Set goals and plans a sequence of steps to achieve each goal	
Prioritizes tasks and manages time wisely	
Organizes and works in an orderly manner	
Planning and Management Score	

Tools and Equipment	Score
Gets permission to use equipment	
Selects and uses appropriate tools	
Recognizes and controls health and safety hazards, for example loose clothes, dust control and proper guards	
Uses proper protective equipment	
Use appropriate aids to manage the workpiece, for example a mitre gauge on the table saw or clamping the workpiece for portable tools	
Tools and Equipment Score	

Ability to Apply Skills	Score
With appropriate instruction and practice acquires and uses specific skill 1	
“ skill 2	
Ability to Apply Skills Score	

Materials	Score
Selects materials appropriate to the task	
Uses materials in a manner that minimizes waste	
Uses tools and techniques appropriate to the properties of the material	
Materials Score	

Work Practices and Teamwork	Score
Effectively troubleshoots common problems and devises ways to overcome them	
Collaborates effectively in work groups and teams	
Takes on leadership and other team roles	
Correctly and consistently documents work in the work log	
Communications ideas and information effectively	
Work Practices and Teamwork Score	

Design Part 1: Opportunity Selection Rubric

Rating Scale

4. Exceeds Defined Outcomes	3. Meets Defined Outcomes	2. Meets Defined Outcomes	1. Meets Defined Outcomes	0. Has not Completed Defined Outcomes
Exceptional quality and attention to detail. Consistently performs above the standard	Above average quality. Consistently performs to the standard	Average quality. Meets the standard better than 50% of the time	Below average. Meets standards with assistance	Unacceptable. Does not meet the outcome

Scoring Grid

Planning and Management	Score
Identifies what is being asked	
Set goals and plans a sequence of steps to achieve each goal	
Prioritizes tasks and manages time wisely	
Organizes and works in an orderly manner	
Planning and Management Score	

Project Selection	Score
Assesses opportunities for a design project related to the trades	
Establishes assessment criteria	
Rate the options using their assessment criteria	
Selects an option for a design project related to the trades	
Using the results of their assessment, selects an option	
Gives a rationale for their selection	
Project Selection Score	

Work Practices and Teamwork	Score
Effectively troubleshoots common problems and devises ways to overcome them	
Collaborates effectively in work groups and teams	
Takes on leadership and other team roles	
Communications ideas and information effectively	
Correctly and consistently documents work in the work log	
Work Practices and Teamwork Score	

Design Part 1: Design Brief Rubric

Rating Scale

4. Exceeds Defined Outcomes	3. Meets Defined Outcomes	2. Meets Defined Outcomes	1. Meets Defined Outcomes	0. Has not Completed Defined Outcomes
Exceptional quality and attention to detail. Consistently performs above the standard	Above average quality. Consistently performs to the standard	Average quality. Meets the standard better than 50% of the time	Below average. Meets standards with assistance	Unacceptable. Does not meet the outcome

Scoring Grid

Planning and Management	Score
Identifies what is being asked	
Set goals and plans a sequence of steps to achieve each goal	
Prioritizes tasks and manages time wisely	
Organizes and works in an orderly manner	
Planning and Management Score	

The Design Brief	Score
Project Description	
Task Statement	
Project Includes	
Conditions Affecting the Project	
What the Solution Must Do	
The Design Brief Score	

Work Practices and Teamwork	Score
Effectively troubleshoots common problems and devises ways to overcome them	
Collaborates effectively in work groups and teams	
Takes on leadership and other team roles	
Communications ideas and information effectively	
Correctly and consistently documents work in the work log	
Work Practices and Teamwork Score	

Design Part 2: Planning Rubric

Rating Scale

4. Exceeds Defined Outcomes	3. Meets Defined Outcomes	2. Meets Defined Outcomes	1. Meets Defined Outcomes	0. Has not Completed Defined Outcomes
Exceptional quality and attention to detail. Consistently performs above the standard	Above average quality. Consistently performs to the standard	Average quality. Meets the standard better than 50% of the time	Below average. Meets standards with assistance	Unacceptable. Does not meet the outcome

Scoring Grid

Planning and Management	Score
Identifies the subsystems for the fabrication task	
Uses the trade-specific symbols to make sketches	
Produces properly structured orthographic and/or isometric sketches that convey ideas for additions, modifications or changes to the plan	
Creates a list of required materials sorted by type, dimensions or other appropriate characteristic	
Planning and Management Score	

Tools and Equipment	Score
Identifies a list of tools and equipment required for the process, including for layout, separating, shaping, combining, and finishing	
Identifies tools that they are qualified / not qualified to use and makes arrangements for those they need certification on	
Tools and Equipment Score	

Fabrication Sequence	Score
Identifies the sequence of tasks for this part of the project	
Identifies the tasks from this project in the overall sequence for the total project	
Ability to Apply Skills Score	

Work Practices and Teamwork	Score
Effectively troubleshoots common problems and devises ways to overcome them	
Collaborates effectively in work groups and teams	
Takes on leadership and other team roles	
Communications ideas and information effectively	
Correctly and consistently documents work in the work log	
Work Practices and Teamwork Score	

Design Part 2: Fabrication Rubric

Rating Scale

4. Exceeds Defined Outcomes	3. Meets Defined Outcomes	2. Meets Defined Outcomes	1. Meets Defined Outcomes	0. Has not Completed Defined Outcomes
Exceptional quality and attention to detail. Consistently performs above the standard	Above average quality. Consistently performs to the standard	Average quality. Meets the standard better than 50% of the time	Below average. Meets standards with assistance	Unacceptable. Does not meet the outcome

Scoring Grid

Planning and Management	Score
Organizes fabrications tasks according to the plan	
Implements tasks in the planned order	
Modifies the plan as needed to meet changing work conditions	
Planning and Management Score	

Use of Materials	Score
Makes effective use of the material list	
Selects materials as specified by the codes or regulations for each trade	
Uses tools and techniques appropriate to the properties of the material	
Uses materials in a manner that minimizes waste	
Use of Materials Score	

Tools and Equipment	Score
Gets permission to use equipment	
Selects and uses appropriate tools	
Adjusts tools properly before use	
Uses appropriate techniques to layout, and separate/shape/combine materials	
Recognizes and controls health and safety hazards, for example loose clothes, dust control and proper guards	
Uses proper protective equipment	
Use appropriate aids to manage the workpiece, for example a mitre gauge on the table saw or clamping the workpiece for portable tools	
Tools and Equipment Score	

Fabrication Sequence	Score
Effectively troubleshoots the fabrication process and makes modifications to the work plan as needed	
Using the work plan as reference, correctly lays out the cutting pattern on materials	
Using the work plan as reference, correctly separates materials to complete each of the subsystems, for example cuts joists with a power mitre saw	
Using the work plan as reference, correctly shapes materials to complete each of the subsystems, for example folds sheet metal to make a fascia	
Using the work plan as reference, correctly combines materials to complete each of the subsystems, for example fastens with construction adhesive or nails	
Fabrication Sequence Score	

Work Practices and Teamwork	Score
Takes appropriate measures to minimize risk for themselves and others by	
Engaging in safe practices as designated by standard shop safety rules	
Using tools and materials only when authorized and certified	
Handling materials in a safe and proper fashion	
Adjusting tools and equipment for the material and task being performed	
Keeping the work place clean and tidy	
Effectively troubleshoots common problems and devises ways to overcome them	
Collaborates effectively in work groups and teams	
Takes on leadership and other team roles	
Correctly and consistently documents work in the work log	
Work Practices and Teamwork Score	

Tool Safety Sheets

Tools

Safety sheets are supplied for the following tools

- Table Saw
- Radial Arm Saw
- Drill Press
- Jointer
- Planer
- Band Saw
- Power Mitre Saw
- Scroll Saw
- Electric Drill
- Jig Saw
- Lathe
- Router
- Oscillating Spindle Sander
- Bench Grinder
- Chisel
- Hand Plane

References

Text References

- Wagner & Smith, unit 4, page 75-100
- Koel, chapter 9- 17, page 68-122
- Ummstattd & Davis,
 - chapter 18, page 267-280
 - chapter 21-28, page 305-480
 - chapter 31, page 523-540,

Website references

- Machine Safety at http://ncsudesign.org/PDFs/tool_book.pdf
- Texas Technical University Shop Rules at <http://www.arch.ttu.edu/resources/shop/ShopManual.asp>
- Assessing the Quality of a Product at <http://www.orinda.k12.ca.us/ois/teachers/AllensInformation.htm>
- Lab Safety Manual and Hazardous Materials Guide at <http://www.fbe.unsw.edu.au/staff/mariano.ramirez/IDLabManual2003.pdf>
- University of Louisiana at Lafayette—Lab Safety at <http://arts.louisiana.edu:16080/resources/safety.pdf>
- MTEA Safety Resource—Checklist and Tests at <http://www.mtea.net/PDF%20Files/3-Construction%20Tech.pdf>
- Pennsylvania Safety Manual at <http://www.mtea.net/PDF%20Files/Pennsylvaniasafety.pdf> (Page 131, Machine Tool Tests)

Table Saw

Adjustments

- Blade height
- Blade angle
- Rip fence
- Mitre Gauge

Operations that can only be performed with the guard removed

- Dadoing
- Rabbeting

Standard operations with guards in place

- Ripping
- Crosscutting

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Does not change blades without teacher supervision</p> <p>Sets blade to proper height—3 mm or 1/8" above the work piece</p> <p>Adjusts and properly locks fence or mitre gauge</p> <p>Checks to see that all guards and other safety devices are in place and functioning.</p>	<p>Only uses the saw if all guards are in place</p> <p>Always uses rip fence for ripping and mitre gauge for crosscutting. Never uses both simultaneously</p> <p>Always uses a push stick for ripping to prevent hands from coming within 150 mm or 6" of the blade</p> <p>Stands to one side of the blade when performing any operation</p> <p>Measures off the blade only after it has come to a complete stop</p> <p>Allows the blade to come to a complete stop before waste stock is removed from the table</p> <p>When a helper is assisting with long and/or wide stock, the operator controls the work piece</p> <p>Keeps floor and machine surfaces free from scrap materials.</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Lowers blade and returns the mitre gauge and blade to 90°.</p>

Radial Arm Saw

Adjustments

- Blade height
- Blade angle
- Motor rotation
- Arm angle

Standard operations with guards in place

- Crosscutting
- Mitre cuts

- Compound mitre cuts
- Dadoing
- Ripping (not recommended as it is a dangerous operation)
- Rabbeting (not recommended as it is a dangerous operation)

Operations that can only be performed with the guard removed

- None

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Does not change blades without teacher supervision</p> <p>Sets blade to proper height</p> <p>Adjusts and properly locks</p> <ul style="list-style-type: none"> • main arm • motor carriage slide • motor mount rotation • blade angle <p>Checks to see that all guards and other safety devices are in place and functioning.</p>	<p>Only uses the saw for cross cutting and dadoing operations. Never uses the saw for ripping or rabbeting operations.</p> <p>For cross cutting and dadoing operations, controls the feed speed to prevent climb-cutting</p> <p>Keeps hands at least eight to ten inches from the cut</p> <p>Stands to one side of the blade when performing any operation</p> <p>Measures off the blade only after it has come to a complete stop</p> <p>Allows the blade to come to a complete stop before waste stock is removed from the table</p> <p>Keeps floor and machine surfaces free from scrap materials.</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns saw to standard setup for 90 degree crosscut</p>

Drill Press

Adjustments

- Table height
- Table angle
- Chuck
- Chuck speeds (belt and pulley adjustments)

Required auxiliary supports

- Clamps and/or hold downs for all workpieces
- Guide fences or support blocks for non-rectangular workpieces

Standard operations (No Guards)

- Drilling using a wide variety of cutters
- Sanding
- Morticing

Safety Checklist

Setup	Operation	Shut down
Requests permission to use equipment	Does not hold workpiece by hand for drilling	Makes sure the machine has come to a complete stop prior to cleaning
Removes or secures loose clothes and jewelry and confines long hair	Only drills properly clamped and braced workpieces	Returns tools and accessories to their proper location
Wears the proper personal protective equipment	Turns off power if the drill gets caught in a work piece	Cleans up equipment and work area
Selects and mounts the proper drill bit or accessory	Applies even pressure when drilling	Returns equipment to original state
Removes the key from the chuck	Raises the drill bit occasionally to clear cuttings	
Adjusts the machine to the correct speed	Uses cutting/lubricating fluids if necessary	
Checks the condition and position of pulley guards	Drills a pilot hole for larger holes	
Mounts the work securely in the proper vise or clamp	Removes cuttings with a brush	
Adjusts the depth stop to the correct depth	Keeps floor free from scrap materials.	
Centres punches metal parts prior to drilling		
Checks drill bit for straightness		
Adjusts table height and angle		
Checks drill bit alignment and depth of cut		
Uses a V-block to hold round stock		

Jointer

Adjustments

- Infeed table height (depth of cut)
- Outfeed table height (to align with cutter, only done on installation of cutters)
- Fence
 - width of cut (amount of cutter exposed)
 - angle of cut

Standard operations with guards in place

- Jointing a surface
- Jointing an edge

Operations that can only be performed with the guard removed

- Cutting a rabbet (not recommended for student operation)

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Never adjusts the out-feed table.</p> <p>Checks and makes all adjustments and with power off</p> <p>Checks condition and operation of guards</p> <p>Identifies grain direction in the wood in order to joint in the proper direction</p> <p>Adjusts depth of cut to a maximum of 3 mm or 1/8".</p>	<p>Uses jointer only with the guard in place</p> <p>Joints in direction of grain</p> <p>Makes several multiple thin cuts rather than one heavy cut</p> <p>Only joints material with an absolute minimum length of twice the size of the knives</p> <ul style="list-style-type: none"> • 6" (15 cm) - 12" (30 cm) length • 8" (20 cm) - 16" (40 cm) length <p>Only joints stock greater than 12 mm or 1/2" in thickness</p> <p>Uses push block for flat work</p> <p>Does not pass hand directly over the top of the cutter head</p> <p>Keeps area clean and floor free of scrap materials.</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns adjustments to original state</p>

Planer

Adjustments

- Depth of cut

Standard operations with guards in place

- Surfacing a workpiece

Operations that can only be performed with the guard removed

- None

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Ensures feed area is clear of debris</p> <p>Sees that the work piece is free of loose knots, nails, dirt and finish materials</p> <p>Determines grain and feed direction</p> <p>Adjusts depth of cut, normal 2mm or 1/16"</p>	<p>Planes in the direction of the grain</p> <p>Never looks directly into the front or rear opening of the planer when it is in operation</p> <p>Does not plane stock less than 300 mm or 12" long, or less than 6 mm or 1/4" thick.</p> <p>Uses a follower stick if required for short stock</p> <p>Keeps hands clear of infeed and outfeed rollers in lower table</p> <p>Stands to one side of the stock when planing</p> <p>When a helper is assisting with long stock, the operator controls the work piece</p> <p>Shuts power off before attempting to remove</p> <p>Stock that has become stuck</p> <p>Keeps area around equipment free of scrap.</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns adjustments to original state</p>

Band Saw

Adjustments

- Blade guard
- Upper and lower blade thrust bearings and guide bushings/bearings
- Table tilt
- Mitre gauge
- Rip fence

Standard operations with guards in place

- Ripping and resawing
- Crosscutting (90, and any angle mitre and compound cuts)
- Freehand sawing

Operations that can only be performed with the guard removed

- None

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Checks the condition of the blade and blade guides</p> <p>Adjusts blade guides to the correct height—3 mm or 1/8"—above the workpiece</p>	<p>Guides the work slowly; does not force the work</p> <p>Avoids backing out from cuts other than making relief cuts</p> <p>Does not attempt to cut smaller radius than the Blade will allow</p> <p>Uses V block to cut cylindrical stock</p> <p>Does not place fingers or hands in line with the blade</p> <p>Uses a push stick where necessary</p> <p>Allows the machine to come to a complete stop when removing the work piece, cleaning or making adjustments</p> <p>Maintains a 100 mm margin of safety between fingers and blade.</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns adjustments to original state</p>

Power Mitre Saw

Adjustments

- Storage position lock
- Horizontal angle of cut (mitre)
- Vertical angle of cut (compound mitre)
- Fence adjustment (some models)
- Hold downs (some models)
- Stops for repeat work (some models)
- Horizontal slide (some models)

Standard operations with guards in place

- Standard mitre cuts (90, 45, 22.5 degrees)
- Compound mitre cuts (horizontal and vertical angle adjustment)
- Repeat cuts using a stop to reproduce exact length

Operations that can only be performed with the guard removed

- None

Safety Checklist

Setup	Operation	Shut down
Requests permission to use equipment	Ensures that long workpieces are properly supported before cutting	Makes sure the machine has come to a complete stop prior to cleaning
Removes or secures loose clothes and jewelry and confines long hair	Clamps or holds the work securely against the fence	Returns tools and accessories to their proper location
Wears the proper personal protective equipment	Cuts in a smooth continuous motion	Cleans up equipment and work area
Notifies teacher if blade needs to be changed	Keeps hands 6 inches (15 cm) away from the blade	Returns adjustments to original state
Sets horizontal or vertical angle as needed	Waits until saw comes to a complete stop before removing workpiece	
Gets teacher to check setup before using		

Stationary Scroll Saw

Adjustments

- Blade removal and replacement
- Height of the hold-down / guard
- Table tilt
-

Standard operations with guards in place

- Cutting wood along a line, any direction

Operations that can only be performed with the guard removed

- Not recommended, as the guard also aids cutting by keeping the wood from lifting with the blade (a hold-down)

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Make all adjustments with the power off, then rotate the motor by hand as a final check</p> <p>Make sure all guards are in place and operating correctly</p> <p>Makes sure that hold down is pressing lightly on the work piece</p> <p>Chooses the correct blade and correct speed for the material to be cut, and for the smallest radius required</p> <p>Ensures the blade is held firmly in the chucks, and the chucks are properly mounted in the holders</p> <p>Sets the table angle for the required cut</p>	<p>Uses the saw only with the guard/ hold-down in place</p> <p>Guides the material slowly through the machine with both hands, keeping fingers away from the cut line.</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns adjustments to original state</p>

Electric Drill

Adjustments

- Chuck

Standard operations (No guards)

- Drilling
- Countersinking

Operations that can only be performed with the guard removed

- Not applicable

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Selects correct bit and size for the material being drilled</p> <p>Ensures that bit is properly mounted in the chuck and the chuck is securely tightened</p> <p>Ensures workpiece is properly secured or clamped</p>	<p>Center-punches holes before drilling</p> <p>Holds drill securely, usually using the second hand to steady and guide it</p> <p>Withdraws the bit frequently to clear the hole</p> <p>Uses the proper lubricant when drilling metals</p> <p>Uses a guide such as a square or adjustable bevel for visual alignment to ensure the hole is at the correct angle</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns adjustments to original state</p>

Lathe

Adjustments

- Rotational speed
- Tail stock
- Tool rest
- Centers (drive, center, live)
- Faceplates
- Assorted internal and external clamping chucks

Standard operations with guards in place (guards only on some models)

- Spindle turning
- Faceplate turning

Operations that can only be performed with the guard removed

- Sanding
- French polishing
- Spindle turning
- Faceplate turning

Safety Checklist

Setup	Operation	Shut down
Requests permission to use equipment	Rotates spindle by hand to check clearance before starting	Makes sure the machine has come to a complete stop prior to cleaning
Removes or secures loose clothes and jewelry and confines long hair	Stands to one side when starting the lathe	Returns tools and accessories to their proper location
Wears the proper personal protective equipment	Selects the appropriate cutting tools	Cleans up equipment and work area
Checks stock for balance and soundness	Holds the cutting tools securely and at the proper angles to the work	Returns adjustments to original state
Securely mounts work between centres or to the face plate	Frequently readjusts tool rest to maintain distance to work piece	
Adjusts tool rest to the correct height and distance from the work piece	Adjust tool speed as needed dependant upon the progress in the turning	
Makes sure cutting tools are sharp. If not, notify the teacher to have them sharpened	Allows work piece to fully stop before adjusting the tool rest or measuring the work piece	
Adjusts lathe to operate at the correct speed	Removes tool rest before sanding	
Sets guard to correct distance where one is provided		

Router (Hand held use)

Adjustments

- Fixed base
 - bit changes
 - depth of cut
- Plunge base
 - bit changes
 - depth of plunge cut
- Router fence
 - offset from fence to bit

Standard operations with guards in place

- Pattern routing with upper or lower bearing bit
- Edge routing with router fence
- Through dado or rabbet routing with guides
- Plunge base routing
 - stopped routing with templates

Operations that can only be performed with the guard removed

- None

Safety Checklist

Setup	Operation	Shut down
Requests permission to use equipment	Routes only with the aid of a template, fence or guide.	Makes sure the machine has come to a complete stop prior to cleaning
Removes or secures loose clothes and jewelry and confines long hair	Starts the router with the bit away from the wood	Returns tools and accessories to their proper location
Wears the proper personal protective equipment	Grips the router carefully with both hands to counteract against starting torque	Cleans up equipment and work area
Checks bit for suitability to task	Feeds the router at a constant speed, not slow enough to burn the wood or so fast as to cause bogging down in the cut	Adjusts router so that the bit is inside the base
Gets teacher to install appropriate bit	Cuts in multiple passes, removing about 6 mm of wood at a time	
Adjusts depth of cut or plunge distance, to take 1/4 inch (6mm) deep or less cuts	Cuts in the direction against the bit rotation to prevent climb cutting	
Sets up router fence or clamps guides in place or sets up a template for routing	Allows the router to come to a complete stop before laying it down	
	Places the router on its side or top when done	

Oscillating Spindle Sander

Adjustments

- Changing spindles size
- Changing sanding drums on the spindle
- On some machines, adjusting the angle of the table

Standard operations (No guards)

- Edge sanding different sizes and shapes of wood or plastic

Operations that can only be performed with the guard removed

- Not applicable

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Ensures that spindle is properly mounted and tightened</p>	<p>Ensures that workpiece is not in contact with spindle when starting the machine</p> <p>Feeds material into the spindle against the rotation of the spindle</p> <p>Applies consistent even pressure and rate of feed to prevent gouging of the workpiece or motor stalling</p> <p>Keeps fingers 6 inches (15 cm) away from the spindle</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns adjustments to original state</p>

Bench Grinder

Adjustments

- Guards
- Tool rest

Standard operations with the guard in place

- Grinding
- Sharpening

Operations that can only be performed with the guard removed

- Buffing, with the addition of a buffing wheel and compound

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Notifies the teacher if grinding or buffing wheels need to be changed</p> <p>Ensures that guards are in place and properly adjusted before grinding or sharpening</p> <p>Ensures that tool rests are in place and properly adjusted before grinding or sharpening</p>	<p>Waits until the grinder has reached full rotational speed before placing the workpiece against the wheel</p> <p>Uses correct techniques, depending on the nature of the workpiece</p> <p>Frequently cools the workpiece to prevent changes to the temper of the metal</p>	<p>Makes sure the machine has come to a complete stop prior to cleaning</p> <p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns adjustments to original state</p>

Chisel

Adjustments

- None

Standard operations

- Free hand chiselling
- Chiselling with a striking tool such as a mallet

Safety Checklist

Setup	Operation	Shut down
Requests permission to use equipment Removes or secures loose clothes and jewelry and confines long hair Wears the proper personal protective equipment Clamps the workpiece securely Carries the chisel with the blade down and away from the body Passes a chisel to another person handle first	Operates the chisel so that it cuts away from the body, especially the hands When free hand chiselling, holds the chisel with both hands When using a mallet, Hold the chisel securely against the workpiece before striking it on the handle tip	Returns tools and accessories to their proper location Cleans up equipment and work area Returns adjustments to original state

Hand Plane

Adjustments

- Basic
 - Plane Iron
 - Depth of cut
 - Angle of iron
 - Mouth opening (some models)
- Advanced
 - Frog
 - Plane Iron Cap
 - Lever Cap

Standard operations

- Planing edge or face grain
- Planing end grain

Safety Checklist

Setup	Operation	Shut down
<p>Requests permission to use equipment</p> <p>Removes or secures loose clothes and jewelry and confines long hair</p> <p>Wears the proper personal protective equipment</p> <p>Places plane on its side on the bench when not in use</p> <p>Determines wood grain direction to identify best planing direction</p> <p>Adjusts the depth and angle of cut to suit the workpiece</p> <p>Clamps the workpiece securely before planing</p>	<p>Applies marks to the workpiece to identify areas to be planed and limits of the planing operation</p> <p>Planes in a smooth continuous stroke</p> <p>Applies proper pressure to the correct end of the plane on starting, planning, and ending phases of the stroke</p> <p>Observes results and modifies techniques to prevent tear out and to ensure the workpiece is flattened to a true plane</p>	<p>Returns tools and accessories to their proper location</p> <p>Cleans up equipment and work area</p> <p>Returns adjustments to original state</p>