



Prince Edward Island Technology Education Curriculum

Education and Early
Childhood Development
English Programs

Career and Technical Education

Carpentry 801A
Floor Systems

CURRICULUM



2010
Prince Edward Island
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Early Childhood Development
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Carpentry Technology

Floor Systems (CAR801A)

Course Description

All construction projects start from the ground up. Floor Systems will help students develop an understanding of the basic design principles of floor frame systems as they estimate, select and install components of a residential floor system. Students will also develop skills and knowledge in the safe use of portable hand and power tools, and will complete WHMIS training to industry standards. They will also continue to develop knowledge and skills related to manufactured building materials, communication through drafting, and trade-related math concepts.

Classroom Component—Suggested time: 36 hours

This component of the curriculum is required to teach the knowledge and skills associated with the learning outcomes of the curriculum.

Skill Development Component—Suggested time: 74 hours

This component of the curriculum is required by the student to apply the knowledge and develop the skills related to the learning outcomes of the curriculum.

SCO - Identifies the Specific Curriculum Outcome (SCO)	
<p>Column 1 SCO - Delineations Describes what the students are expected to know, be able to do, and value in order to achieve the SCO. The teacher is responsible for the planning and facilitation of learning as well as the assessment of each SCO - Delineation.</p>	<p>Column 2 Student Knowledge, Abilities, and Competencies Provides clarity to the SCO by describing the Knowledge, Abilities, and Competencies that the students develop. This column is designed to indicate the depth and breadth of the SCO. It is not necessary to use all of these suggestions or that all of the students be engaged in the same learning activity.</p>
<p>Column 3 Teacher Lessons / Demonstrations Provides suggestions for developing and delivering the content for student learning.</p> <p>Student Activities / Assessments Provides suggestions for creating meaningful activities to allow the student to achieve the SCO.</p>	<p>Column 4 Resources Lists a variety of resources that support the teaching and learning related to the SCO. These resources are suggested to support the teacher in developing an effective instructional package for delivery to the students.</p>

Module 1: WHMIS (~2 hours Classroom Component)

8. Students will be able to describe WHMIS requirements and labelling used by the construction industry.

Students will be expected to

- 8.1 describe the three key elements of WHMIS
8.2 identify WHMIS labels and describe the hazards associated with controlled products

Module 2: Manufactured Construction Products (~4 hours Classroom Component)

9. Students will be able to identify and describe manufactured building products used in the construction industry.

Students will be expected to

- 9.1 identify and describe the application of panel products
9.2 identify and describe the application of engineered wood products
9.3 identify and describe the application of synthetic and metal products

Module 3: Building Loads and Forces (~3 hours Classroom Component)

10. Students will be able to identify and describe the forces that act upon buildings and the design principles used to counteract these forces.

Students will be expected to

- 10.1 describe the forces, live and dead loads, which act upon a building
10.2 describe the compressive, tensile, and lateral forces that act on a building and how these forces are counteracted
10.3 describe construction design and principles used to counteract loads and forces

Module 4: Floor Frame Support Systems (~3 hours Classroom Component)

11. Students will be able to describe floor frame support systems.

Students will be expected to

- 11.1 describe the design and construction of beam supports
11.2 describe the design and construction of commonly used beams
11.3 describe the methods used to anchor the floor frame to the foundation

Module 5: Residential Floor Frame (~14 hours Classroom Component)

12. Students will be able to identify and describe the components and installation of a residential floor frame.

Students will be expected to

- 12.1 *identify and describe the components of a residential floor frame*
- 12.2 *describe the layout and installation procedures for floor frame systems*
- 12.3 *construct a floor assembly using common techniques and materials*
- 12.4 *describe joist restraints and subfloor sheathing installation*
- 12.5 *describe the components and the installation of engineered floor systems*

Module 6: Pictorial Drawing and Sketching (~4 hours Classroom Component)

13. Students will be able to identify and practise the drawing techniques and principles used to produce isometric drawings.

Students will be expected to

- 13.1 *describe pictorial drawing methods*
- 13.2 *describe the isometric principles*
- 13.3 *describe how isometric angles are shown and drawn*
- 13.4 *describe how to develop isometric circles and arcs*

Module 7: Estimating Residential Floor Systems (~6 hours Classroom Component)

14. Students will be able to calculate the quantity of framing materials required for conventionally framed residential floor and floor support systems.

Students will be expected to

- 14.1 *calculate material takeoffs for floor support systems*
- 14.2 *describe the use of on-centre formulas to calculate the number of floor components*
- 14.3 *calculate material takeoffs for floor frames*

WHMIS

(~2 hours Classroom Component)

Introduction

The **Workplace Hazardous Materials Information System**, or **WHMIS**, is designed to protect workers and the public from exposure to harmful substances. This information system requires the employer to ensure that workers are informed, trained in, and understand the WHMIS system. The apprentice and other workers must become very familiar with the WHMIS system and actively demonstrate proper safety precautions.

Specific Curriculum Outcome

8. Students will be able to describe WHMIS requirements and labelling used by the construction industry.

SCO - Delineations

Students will be expected to

8.1 *describe the three key elements of WHMIS*

8.2 *identify WHMIS labels and describe the hazards associated with controlled products*

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 020101d, *Workplace Hazardous Materials Information System (WHMIS)*

WHMIS (~2 hours Classroom Component)

SCO 8. Students will be able to describe WHMIS requirements and labelling used by the construction industry.

SCO - Delineations

Students will be expected to

8.1 describe the three key elements of WHMIS

8.2 identify WHMIS labels and describe the hazards associated with controlled products

Student Knowledge, Abilities, and Competencies

Topic: Three Key WHMIS Elements

- Identify and describe the three key elements of WHMIS.
 - education and training
 - product labelling
 - Material Safety Data Sheets (MSDS)

Topic: WHMIS Education and Training

- Describe the employer’s responsibility to train employees about labels, MSDS, and other identifiers.
- Describe the employer’s responsibility to train employees in work procedures related to WHMIS materials.
- Explain the four general questions that employers are required to ask employees after WHMIS training:
 1. Where do I find information about hazardous products?
 2. What are the hazards of the controlled product?
 3. How can I protect myself from those hazards?
 4. What do I do in the case of an emergency?
- Explain the responsibilities of the worker with regards to WHMIS:
 - to participate in training
 - to use WHMIS information to protect themselves and others
 - to apply workplace labels where and when required

Topic: Product Labeling

- Describe the three types of labels that employers must apply to hazardous materials:
 - suppliers’ labels
 - workplace labels
 - piping systems and vessel labels
- Explain the information that the supplier must attach to any controlled product.
- Identify the purpose of a workplace label.
- Explain when a workplace label must be used.
- Explain the information that must be on the workplace label.
- Demonstrate an understanding that the worker is responsible to ensure that a workplace label is applied to a controlled product.

WHMIS (~2 hours Classroom Component)

SCO 8. Students will be able to describe WHMIS requirements and labelling used by the construction industry.

Teacher Lessons / Demonstrations

Topic: Three Key WHMIS Elements

- Identify the three key elements of WHMIS:
 - education and training
 - product labelling
 - Material Safety Data Sheets (MSDS)

Topic: Education and Training

- Explain the employers responsibility to train employees.
- List and explain the four general questions that employers are required to ask employees after WHMIS training:
 1. Where do I find information about hazardous products?
 2. What are the hazards of the controlled product?
 3. How can I protect myself from those hazards?
 4. What do I do in the case of an emergency?

Topic: Product Labelling

- Describe the three types of labels that employers must apply to hazardous materials:
 - suppliers' labels
 - workplace labels
 - piping systems and vessel labels
- Explain the responsibilities of the supplier, employer, and employee in product labeling.
- Demonstrate the development of a workplace label.

Literacy

- *Freewrite:* Use as a pre-reading strategy. Ask students to write what they know about WHMIS.

Student Activities / Assessments

- Demonstrate an understanding of the three key elements of the WHMIS system.
- Demonstrate an understanding of the employer's responsibilities.
- Demonstrate an understanding of the employee's responsibilities.
- Interpret the information contained on WHMIS labels.
- Create and apply a workplace label.

Enrichment / Research Activities

- Complete the WHMIS test for certification.

Resources**Texts/Teacher Resources**

Alberta Module 020101d
WHMIS
 pp. 1-15

SAS Resources**Visuals/Handouts/Tests**

ILM Self-Test
WHMIS, pp. 13-14

- WHMIS Hazard Symbols
- Material Safety Data Sheet

Manufactured Construction Products

(~4 hours Classroom Component)

Introduction Manufactured construction products make up a large percentage of the materials found on building sites today. The apprentice must be able to identify, select, and apply these products appropriately.

Specific Curriculum Outcome 9. Students will be able to identify and describe manufactured building products used in the construction industry.

SCO - Delineations *Students will be expected to*

- 9.1 *identify and describe the application of panel products*
- 9.2 *identify and describe the application of engineered wood products*
- 9.3 *identify and describe the application of synthetic and metal products*

Assessment Strategies Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources Alberta Module 020102b, *Manufactured Construction Products*

Manufactured Construction Products (~4 hours Classroom Component)

SCO 9. Students will be able to identify and describe manufactured building products used in the construction industry.

SCO - Delineations

Students will be expected to

9.1 identify and describe the application of panel products

Student Knowledge, Abilities, and Competencies

Topic: Plywood

- Describe the design and composition of plywood.
- List four types of plywood cores.
- List and identify five common types of hardwood plywood.
- Explain the differences between interior and exterior grades of plywood, and describe their applications.
- Describe “veneers” and explain the two common methods of manufacturing veneers (rotary and plain slicing).
- List the common sizes of plywood panels.
- Describe the design and placement of tongue and groove plywood.
- Describe the use and application of underlayment plywood.
- Describe the use and application of specialty plywood.
- Identify and interpret Canadian plywood grading systems.
- List six considerations for handling and storing plywood.
- Describe methods and procedures for cutting plywood.
- Demonstrate measuring and cutting plywood with handsaws, portable power saws, and stationary saws.
- Describe methods for drilling plywood.
- Demonstrate measuring and drilling plywood with hand, portable power, and stationary tools.
- Explain the processes and limitations to consider when bending, finishing edges, and sanding plywood.
- Describe common fasteners and adhesives used to assemble or install plywood.

Topic: Composition Panel Products

- Identify the various types of particle board, fibreboard, and oriented strand board composite panels.
- Describe particle board construction, its grades, and common uses.
- Describe the hazards in sawing particle board and demonstrate the use of appropriate personal protective equipment (PPE).
- Describe the construction and uses of fibreboard.
- Describe the construction and common uses of MDF.
- Describe the grades and uses of hardboard/Masonite.
- Describe the construction and applications of OSB.

Manufactured Construction Products (~4 hours Classroom Component)

SCO 9. Students will be able to identify and describe manufactured building products used in the construction industry.

Teacher Lessons / Demonstrations

Topic: Panel Products

- Display a variety of samples of the panel products available (samples could be approx 6" x 6").
- Explain the most common application for each of the samples.
- Demonstrate the proper handling and storage procedures for panel products.
- Demonstrate safe and proper cutting procedures for panel products.
- Demonstrate the proper use of PPE.
- Describe the common fasteners used for applying plywood.
- Develop a written and practical test to cover all outcomes in the ILM.

Literacy

- *Freewrite*: Use as a pre-reading strategy for the section covering panel products.
- *KWL*: Develop a KWL sheet to facilitate learning about panel products.

Numeracy

- *Cost Analysis*: compile a cost comparison of various panel products.

CBL

- Organize a field trip to a local building supply company to see the various panel products and understand how to order, store, and handle materials.

Student Activities / Assessments

- Correctly identify a variety of panel products.
- Practise different cutting techniques on panel products, using the following tools and proper PPE:
 - handsaw
 - circular saw
 - sabre saw
 - jigsaw
 - table saw
- Identify the common fasteners used with panel products.
- Develop a display of the various fasteners.
- Practise drilling panel products.

Enrichment / Research Activities

- Complete and compare cost estimates for the various panel products used to build a floor system.
- Create an application and installation chart for panel products.

Resources

Texts/Teacher Resources

Alberta Module 020102b
Manufactured Construction Products
pp. 1-52

- CMHC, *Canadian Wood-Frame House Construction*

SAS Resource Sharing

Videos

Selected videos on plywood production

Visuals/Handouts/Tests

- Product brochures
- Installation guides
- Manufacturers' brochures
- ILM Self-Test
Manufactured Construction Products, pp. 47-50

Internet

- Manufacturers' sites
- Plywood Council of Canada

Manufactured Construction Products (~4 hours Classroom Component)

SCO 9. Students will be able to identify and describe manufactured building products used in the construction industry.

SCO - Delineations

Students will be expected to

9.2 identify and describe the application of engineered wood products

9.3 identify and describe the application of synthetic and metal products

Student Knowledge, Abilities, and Competencies

Topic: Composite Beams

- Identify and describe the composition of glued laminated timber products.
- Identify and describe the composition of parallel strand lumber (PSL).
- Identify and describe the composition of laminated veneer lumber (LVL).
- Describe the applications of composite lumber products.
- Describe the method of sizing LVL and PSL composite beams.

Topic: Plastic Products

- Identify plastic laminate products.
- Describe the use of plastic laminates.
- Identify solid plastic products.
- Describe the use and application of solid plastic products.
- Identify the various types of foam products and explain their uses and applications.
- Demonstrate the use of spray can foam insulation.
- Describe the purpose and application of polyethylene vapour/air barrier.

Topic: Vinyl Siding

- Identify various types and profiles of vinyl siding.
- Identify the various components and mouldings.
- Demonstrate the application of vinyl siding.
- Demonstrate the selection of appropriate fasteners for exterior applications of vinyl siding.

Manufactured Construction Products (~4 hours Classroom Component)

SCO 9. Students will be able to identify and describe manufactured building products used in the construction industry.

Teacher Lessons / Demonstrations

Topic: Composite Beams

- Describe the use of composite beams in industry.
- Display composite beam samples.

Topic: Plastic Products

- Discuss the use of plastic laminates.
- Identify various plastic laminate products.
- Demonstrate application procedures.
- Demonstrate trimming procedures.
- Discuss various solid plastic products, using examples (plexiglass, lexan, eaves trough, moldings).
- Discuss the use of plastic foam board:
 - extruded polystyrene
 - expanded polystyrene
 - polyurethane, sheets, and spray foam
- Discuss the use of polyethylene sheeting used as a vapour/air barrier.
- Discuss the methods of sealing and the importance of maintaining a continuous vapour barrier.
- Demonstrate the use and application of the above products.

Topic: Vinyl Siding

- Describe the use of plastic as an exterior sheathing, commonly called vinyl siding.
- Identify the various components of vinyl siding.
- Identify the various common profiles.
- Demonstrate the application of vinyl siding.
- Demonstrate the appropriate fasteners and application to prevent buckling.

Literacy

- *Freewrite:* Have students write in response to the question, Where do we use plastics in the building Industry?
- *Brainstorm* to develop a list of plastic products used in the building industry.

Student Activities / Assessments

- Identify the various types of composite beams.
- Compare specifications and costs of composite lumber.
- Demonstrate the application of sheet laminates.
- Select the appropriate foam board for various applications.
- Demonstrate the application and sealing of polyethylene vapour/air barrier.
- Identify the components of vinyl siding.
- Identify the tools used for application of vinyl siding.
- Demonstrate the application of vinyl siding.

Enrichment / Research Activities

Numeracy

- Estimate the materials needed and cost of installing siding on a storage shed.
- Create a display of building products.

Resources

Texts/Teacher Resources

Alberta Module 020102b

Manufactured Construction Products
pp. 1-52

- CMHC, *Canadian Wood-Frame House Construction*

SAS Resource Sharing

Visuals/Handouts/Tests

- Product brochures
 - Installation guides
 - Manufacturers' brochures
 - ILM Self-Test
- Manufactured Construction Products, pp. 47-50*

Internet

- Manufacturers' sites
- Plywood Council of Canada

Manufactured Construction Products (~4 hours Classroom Component)

SCO 9. Students will be able to identify and describe manufactured building products used in the construction industry.

SCO - Delineations

Students will be expected to

9.3 identify and describe the application of synthetic and metal products

Student Knowledge, Abilities, and Competencies

Topic: Metal Products

Concrete Anchors

- Identify foundation anchor bolts.
- Describe the size and placement of anchor bolts (minimum ½" diameter placed no more than 8'- 0" apart).
- Identify various types of concrete anchors and describe their applications.

Metal Flashing

- Identify various metal flashing products available:
 - door/window flashing
 - fascia and soffit
 - chimney
 - plumbing vents
 - eave starter
 - step flashing for roofing
 - termite shields
- Identify the corrosion resistant metals commonly used in flashing.

Reinforcing Steel

- Identify the various reinforcing steel products:
 - deformed reinforcing steel (Rebar)
 - welded wire mesh
 - metal lath

Metal Framing Members

- Identify the various metal framing members:
 - metal studs
 - metal joists
 - open web joists
 - floor/roof decking

Metal Siding and Roofing

- Identify metal siding and roofing products.
- Identify fasteners.
- Describe the application of siding and roofing products.

Specialty Fasteners and Connectors

- Identify specialty fasteners and connectors (joist hangers, framing connectors, cross bridging, gusset plates).

Eavestrough

- Identify the various components of the eavestrough system.

Manufactured Construction Products (~4 hours Classroom Component)

SCO 9. Students will be able to identify and describe manufactured building products used in the construction industry.

Teacher Lessons / Demonstrations

Topic: Metal Products

- Obtain samples of metal construction products for identification and demonstration.
- Obtain samples of the various corrosion resistant metals for identification.
- Set up display boards to exhibit various products.
- Obtain current manufacturers' brochures and data on products.
- Demonstrate the installation of flashing products.
- Demonstrate the installation of metal siding and roofing.
- Demonstrate the use of joist hangers and specialty connectors.
- Demonstrate the construction of a metal stud wall.
- Identify the components and installation of an eavestrough system.

Literacy

- *Freewrite:* Have students write what they know about the use of metal products in residential construction.
KWL: Develop a KWL to facilitate learning about metal products used in residential construction.
- *Anticipation Guide:* Create an anticipation guide to assess students' ability to name metal products. (Use images from the graphics CD, or actual sample products.)

Numeracy

- Estimate the amount and cost of materials.

Student Activities / Assessments

- Identify the various metal components and products.
- Obtain current manufacturers' brochures and data on products.
- Demonstrate the installation of flashing products.
- Demonstrate the installation of metal siding and roofing.
- Demonstrate the use of joist hangers and specialty connectors.
- Demonstrate the construction of a metal stud wall.

Numeracy

- Estimate the amount and cost of the various synthetic and metal products for a particular purpose.

Literacy

- Complete an information sheet on a metal construction product.

Enrichment / Research Activities

- Obtain samples and create a display of metal building products.
- Complete a cost estimate to install metal roofing or siding on a building.
- Complete a material take-off from a set of building plans.

Resources

Texts/Teacher Resources

Alberta Module 020102b

Manufactured Construction Products
pp. 1-52

- CMHC, *Canadian Wood-Frame House Construction*

SAS Resource Sharing

Visuals/Handouts/Tests

- Product brochures
- Installation guides
- Estimate sheets
- Manufacturers' brochures
- ILM Self-Test
Manufactured Construction Products, pp. 47-50

Internet

- Manufacturers' sites
- Plywood Council of Canada

Building Loads and Forces

(~3 hours Classroom Component)

Introduction Looking at a building, most people see the exterior of the structure sitting peacefully at rest. Rarely do they consider the various forces at work—until they see a natural disaster. Architects, engineers, and carpenters must fully understand the various forces that act on structures, and must design and build these structures to withstand the maximum conceivable load that will occur over the entire life span of the structure. The apprentice must develop a thorough understanding of the various forces in action both during the construction phase and throughout the life span of the structure.

Specific Curriculum Outcome 10. Students will be able to identify and describe the forces that act upon buildings and the design principles used to counteract these forces.

SCO - Delineations *Students will be expected to*

- 10.1 *describe the forces, live and dead loads, which act upon a building*
- 10.2 *describe the compressive, tensile, and lateral forces that act on a building, and explain how these forces are counteracted*
- 10.3 *describe construction design and principles used to counteract loads and forces*

Assessment Strategies Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources Alberta Module 020106a, *Building Loads and Forces*

Building Loads and Forces (~3 hours Classroom Component)

SCO 10. Students will be able to identify and describe the forces that act upon buildings and the design principles used to counteract these forces.

SCO - Delineations

Students will be expected to

10.1 describe the forces, live and dead loads, which act upon a building

10.2 describe the compressive, tensile, and lateral forces that act on a building, and explain how these forces are counteracted

Student Knowledge, Abilities, and Competencies

Topic: Building Loads

- Define “static” and “dynamic” loads.
- Define “dead load”, “live load”, and “environmental load”, and explain how they affect the structure.
- Demonstrate an understanding of how each load acts on structures:
 - concentrated loads
 - uniformly distributed loads
 - dead loads
 - live loads
 - environmental loads
 - dynamic loads
 - static loads

Topic: Building Forces

- Define the term “load” as it relates to structural design.
- Develop an understanding of tension and compression forces (i.e., identify the two basic types of stresses that act upon a building):
 - tension (pull, stretch)
 - compression (push, shorten)
- Explain how the two basic forces of tension and compression act on vertical columns and horizontal beams.
- Develop an understanding of shear forces.
- Explain the concept of shear forces in an object (two opposing forces acting in opposite directions within a material), and give examples of
 - horizontal shear
 - vertical shear
 - diagonal shear.

Building Loads and Forces (~3 hours Classroom Component)

SCO 10. Students will be able to identify and describe the forces that act upon buildings and the design principles used to counteract these forces.

Teacher Lessons / Demonstrations

Topic: Building Loads

- Explain the concepts of live load and dead load, giving examples of each.
- Explain the concepts of static load and dynamic load, giving examples of each.
- Explain the concept of environmental load and discuss effects over a long period of time.

Topic: Building Forces

- Explain the concepts of tension and compression in structural components.
- Use a foam noodle to demonstrate compression and tension:
 - Use the noodle as a beam and draw a centreline along the beam.
 - Add vertical lines, evenly spaced.
 - As you bend the foam beam, the tension and compression forces become obvious.
- Explain how these forces act in various materials. (Concrete is a good example to show where reinforcing steel is added to increase tensile strength. (Concrete is only 10% as strong in tension as it is in compression).

Literacy

- *Freewrite:* Ask the students to complete a freewrite activity to describe the forces that act on a residential structure.
- *Anticipation Guide:* Create an anticipation guide to assess the students' understanding of the various forces acting on a building.
- *Anticipation Guide:* Create an anticipation guide to develop the concepts of tension, compression, and shear forces.

Numeracy

- Calculate live loads and dead loads.

Student Activities / Assessments

- Give examples of dead loads.
- Give examples of live loads.
- Give examples of environmental loads.

Numeracy

- Calculate the forces within a beam, and draw a force diagram.

Enrichment / Research Activities

- Research design load specifications for the various types of loads (e.g., earthquake, wind, snow, soil types, frost depths).
- Perform a shear test on various materials (e.g., wood, soil, Jello).
- Build a small tower and do a destructive test (competition).

CBL

- Participate in the P.E.I. Engineering Association bridge-building competition.

Resources

Texts/Teacher Resources

Alberta Module 020106a
Building Loads and Forces
pp. 1-38

- CMHC, *Canadian Wood-Frame House Construction*
- National Building Code

SAS Resource Sharing

Videos

- News coverage of a natural disaster
- Documentaries of disasters
- ILM Self-Test
Building Loads and Forces, pp. 33-38

Visuals/Handouts/Tests

- anticipation guide
- force diagrams

Building Loads and Forces (~3 hours Classroom Component)

SCO 10. Students will be able to identify and describe the forces that act upon buildings and the design principles used to counteract these forces.

SCO - Delineations

Students will be expected to

10.3 describe construction design and principles used to counteract loads and forces

Student Knowledge, Abilities, and Competencies

Topic: Construction Design and Principles

- Identify materials and methods used to counteract loads and forces.

Concrete

- Develop an understanding of the properties of concrete:
 - Concrete is good in compression and poor in tension.
 - Concrete is a composite material combined with steel.
 - Reinforcement increases the tensile and shear strength.
 - Steel is good in both tension and compression, but subject to buckling.
- Explain the location of reinforcing steel in the concrete, (placed in areas of tension).

Wood

- Identify the solid wood materials used for floor joists.
- Explain the forces and load transfer within joists.
- Explain joist size, strength, and maximum deflection (e.g., 1/180).
- Describe joist options (solid wood joists, prefabricated wood joists).
- Interpolate building code tables to determine joist sizing.
- Explain how loads are transferred through walls, to the earth.
- Explain how sheathing and bracing are used to prevent racking.

Masonry

- Explain the placement and purpose of control joints in masonry walls and concrete slabs.

Foundations

- Identify basic soil types and their bearing capacity (e.g., sand, gravel, clay, silt, rock).
- Explain how water can act on foundations and describe methods used to control excessive water (e.g., tar membrane, drainage).
- Explain frost action in soils.
- List factors that affect the depth of a foundation.
- Identify the common materials used in foundation construction.
- Identify four variables affecting foundation stability (e.g., wall height, thickness, and length; material; backfill height; lateral support).
- Describe methods used to provide lateral support at both the bottom and top of a foundation wall.

Building Loads and Forces (~3 hours Classroom Component)

SCO 10. Students will be able to identify and describe the forces that act upon buildings and the design principles used to counteract these forces.

Teacher Lessons / Demonstrations

Topic: Construction Design and Principles

- Discuss the design properties of concrete.
- Identify the limitations of concrete placed in tension (only 10% of the strength of concrete in compression).
- Explain the design and placement of reinforcing steel.
- Discuss the purpose of joists, the various types of joists, and their spacing.
- Demonstrate the use of joist tables to determine joist sizing.
- Demonstrate how walls are braced and how easily they can “rack” if they are unbraced.
- Explain the design and drainage of foundations.

Literacy

- *Think Aloud:* Read through the opening section on materials (p. 21 in the ILM) and use a Think Aloud strategy to help students understand the abstract nature of this section.

CBL

- Invite an engineer to class to discuss structural design.

Student Activities / Assessments

- Complete a diagram to describe load transfer in a structure.
- List examples of structural and non-structural sheathing.
- Complete a diagram of a foundation system, complete with drainage.

Literacy

- Interpret joist tables (CMHC tables).
- Demonstrate how to interpret joist tables.

Numeracy

- Calculate the various loads on a structure.

Enrichment / Research Activities

Numeracy

- Calculate the weight of a particular house by breaking down the various materials to determine the dead loads they create.
- Add the weights together to determine how much an entire outside wall will weigh. Divide this by the length to determine the weight that must be supported by the soil (per foot/metre).
- Calculate the footing size to determine the pressure on the soil (lbs/ft²; kg/m²)
- Calculate the live loads that would be expected in a typical building, with furniture and people. Calculate the snow loads, and wind loads.
- Research a building disaster related to poor design or overloading.

Resources

Texts/Teacher Resources

Alberta Module 020106a
Building Loads and Forces
pp. 21-38

SAS Resource Sharing

Visuals/Handouts/Tests

- loads in a structure
- foundation cross-section
- CMHC, *Canadian Wood-Frame House Construction*
- National Building Code
- ILM Self-Test
Building Loads and Forces,
pp. 33-38

Floor Frame Support Systems

(~3 hours Classroom Component)

Introduction Building and floor loads must be transferred through the structure to bearing soil. The widths of most buildings require that one or more supporting beams or walls must be constructed to support and transfer the loads. The apprentice must be familiar with common support systems and their design and construction.

Specific Curriculum Outcome

11. Students will be able to describe floor frame support systems.

SCO - Delineations *Students will be expected to*

- 11.1 *describe the design and construction of beam supports*
- 11.2 *describe the design and construction of commonly used beams*
- 11.3 *describe the methods used to anchor the floor frame to the foundation*

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 020106b, *Floor Frame Support Systems*

Floor Frame Support Systems (~3 hours Classroom Component)

SCO 11. Students will be able to describe floor frame support systems.

SCO - Delineations

Students will be expected to

11.1 describe the design and construction of beam supports

11.2 describe the design and construction of commonly used beams

Student Knowledge, Abilities, and Competencies

Topic: Beam Supports

- Describe how building loads are transferred to the bearing soil.
- Identify and describe a column support.
- Describe the limits to supports according to the National Building Code.
- Describe the need for lateral support of columns.
- Explain why columns must be installed plumb.
- Identify and describe strip and pedestal footings.
- Describe and identify various types of columns:
 - steel columns
 - > teleposts (adjustable jack posts)
 - > non-adjustable (fixed) pipe
 - wood columns
 - > solid wood columns
 - > built-up columns
 - > engineered wood products
 - > glued-laminated columns
 - > parallel strand lumber (PSL) columns
 - concrete columns
- Describe interior wood frame load-bearing walls.
- Describe beam end wall support:
 - pony wall and wood foundation column supports
 - beam pockets, end bearing support (3 ½" minimum).

Topic: Supporting Beams

- Demonstrate an understanding of steel beam design/construction:
 - Describe methods of wood joist attachment to steel beams.
 - Describe steel beam sections and sizes (identification).
- Define the supported joist length used in the design of floor systems.
- Interpolate design charts to
 - determine the maximum clear allowable span for beams
 - determine column spacing
- Demonstrate an understanding of wood beam design/construction:
 - Describe built-up beams.
 - Determine beam sizing.
 - Explain the cantilever principle (1/4 point neutral zone).
 - Describe engineered wood products for joists (LVL, PSL, glue-lam).
- Demonstrate the construction of built-up wood beams and identify nailing patterns.

Floor Frame Support Systems (~3 hours Classroom Component)

SCO 11. Students will be able to describe floor frame support systems.

Teacher Lessons / Demonstrations

Topic: Column and Beam Construction

- Review building load transfer.
- Define the terms “span,” “beam end support,” and “fire-cut end.”
- Describe the various types of supporting columns.
- Describe the various options for supporting beams.
- Demonstrate how to calculate beam size and column spacing, using CMHC charts.
- Describe steel beams; cross-sections, and joist support methods.
- Explain the limitations of design charts and the need to consult engineers and architects on buildings over three stories.
- Explain how to calculate the size of supporting strips and pad footings.
- Demonstrate built-up beam construction.
- Demonstrate where to place the joints in a continuous built-up beam.
- Explain the cantilever principle and the 1/4 point neutral zone.
- Explain the use of engineered wood products for beams.
- Organize a class field trip to a building site working on a floor frame.
- Develop a slideshow presentation from the graphics CD.

Literacy

- *Anticipation Guide:* Create an anticipation guide to assess students’ knowledge of column and beam construction.

Numeracy

- Interpret design charts to determine size and placement of beams and columns.

Student Activities / Assessments

- Demonstrate the construction of a built-up wood beam.
- Explain the nailing pattern specifications.

Literacy

- Interpolate design charts to
 - calculate column spans
 - determine beam sizes and options
 - determine nailing pattern.

Numeracy

- Calculate the supported joist length from a drawing.
- Calculate the cost of various column and beam options.
- Convert common imperial lumber sizes to metric (e.g., 2" x 8" = 38 mm x 184 mm).

Enrichment / Research Activities

- Working from a set of floor plans, complete a design and cost estimate for the supporting column and beam system.
- Describe steel beams, sections, and joint support methods.

Resources

Texts/Teacher Resources

Alberta Module 020106b
Floor Frame Support Systems
pp. 1-47

- CMHC, *Canadian Wood-Frame House Construction*
- National Building Code

SAS Resource Sharing

Visuals/Handouts/Tests

- Force diagrams
- Alberta ILM Graphics CD
- Imperial–metric lumber conversion chart
- ILM Self-Test
Floor Frame Support Systems,
pp. 41-47

Floor Frame Support Systems (~3 hours Classroom Component)

SCO 11. Students will be able to describe floor frame support systems.

SCO - Delineations

Students will be expected to

11.3 describe the methods used to anchor the floor frame to the foundation

Student Knowledge, Abilities, and Competencies

Topic: Floor Anchor Systems

- Demonstrate an understanding of floor anchor systems.
- Describe three methods of anchoring the floor system to the foundation:
 - ladder systems
 - sill plate systems (include anchor bolts, and sillplate gasket)
 - cast-in-place systems

Floor Frame Support Systems (~3 hours Classroom Component)

SCO 11. Students will be able to describe floor frame support systems.

Teacher Lessons / Demonstrations

Topic: Floor Anchor Systems

- Explain the importance of anchoring the floor system to the foundation to
 - prevent movement
 - counteract external forces.
- Describe the three common types of anchoring systems:
 - ladder systems
 - cast-in-place systems
 - sill plate systems

Student Activities / Assessments

- Lay out an anchor bolt plan on a drawing.
- Construct a ladder system mock-up.

Numeracy

- Estimate the number of anchor bolts required for a residential house plan.

Resources

Texts/Teacher Resources

Alberta Module 020106b
Floor Frame Support Systems
pp. 1-47

- CMHC, *Canadian Wood-Frame House Construction*
- National Building Code

SAS Resource Sharing

Visuals/Handouts/Tests

- Alberta ILM graphics CD
- ILM Self-Test
Floor Frame Support Systems,
pp. 41-47

Residential Floor Frames

(~14 hours Classroom Component)

Introduction

The residential floor frame provides a platform for the living area and a work space to frame the walls. The floor frame transfers the building loads to the foundation. A knowledge of national and regional building regulations is essential for the construction of safe o construct safe and durable residential floor systems. The apprentice must develop the ability to read and interpret building codes and charts, identify the components, and describe the basic construction methods of floor systems.

Specific Curriculum Outcome

12. Students will be able to identify and describe the components and installation of a residential floor frame.

SCO - Delineations

Students will be expected to

- 12.1 *identify and describe the components of a residential floor frame*
- 12.2 *describe the layout and installation procedures for floor frame systems*
- 12.3 *construct a floor assembly using common techniques and materials*
- 12.4 *describe joist restraints and subfloor sheathing installation*
- 12.5 *describe the components and the installation of engineered floor systems*

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 020106c, *Residential Floor Frames*

Residential Floor Frame (~14 hours Classroom Component)

SCO 12. Students will be able to identify and describe the components and installation of a residential floor frame.

SCO - Delineations

Students will be expected to

- 12.1 identify and describe the components of a residential floor frame

Student Knowledge, Abilities, and Competencies

Topic: Types of Residential Floor Systems

- Describe the two main floor framing methods:
 - balloon framing
 - platform framing
- Demonstrate an understanding that platform framing is the most common method used in residential construction.

Topic: Floor Components

- Identify the key components of a floor system:
 - joists (regular, header, rim, trimmer, tail, cantilever)
 - bridging (solid, cross bridging, strapping)
- Explain different methods of supporting floor joists:
 - foundation walls, and beams
 - minimum end-bearing of 1 ½"
 - joist to beam (lapped or butted on top, ledger strip, joist hanger)
 - joist to steel beam
- Describe the three common methods of anchoring the floor system to the foundation walls. (ladder, sill and anchor bolt, cast-in-place).

Topic: Design of Floor System

- Identify the loads on the floor system (live loads, and dead loads).
- Identify the variables that affect the size of the floor joists:
 - species of lumber
 - grade of lumber
 - joist spacing
 - joist restraints
 - clear span
 - deflection (maximum of 1/360)
- Determine minimum floor joist dimensions.
 - Explain floor joist design and selection.
 - Interpolate design data from CMHC building tables.
- Design a basic floor system.

Residential Floor Frame (~14 hours Classroom Component)

SCO 12. Students will be able to identify and describe the components and installation of a residential floor frame.

Teacher Lessons / Demonstrations

Topic: Residential Floor System Components

- Describe the two types of floor frame systems (platform and balloon).
- Identify the various components of the platform frame.
- Explain the methods and requirements of supporting floor joists.
- Identify the variables that affect the size of floor joists.
- Develop a component identification quiz listing the key components of a platform frame.
- Explain the CMHC building charts used to select floor joist size.
- Create a slideshow from the ILM graphics CD.

Numeracy

- Demonstrate the calculations and data interpretation required to select floor joists.

Literacy

- *Anticipation Guide:* Develop an anticipation guide to support the reading of floor system components.
- *KWL:* Create a KWL to facilitate learning about floor system components.

Student Activities / Assessments

- Identify the two types of floor frame systems.
- Identify the floor frame components.
- Identify the design variables for joist selection.
- Compare the design qualities of the various types of floor bridging.
- Interpret CMHC floor joist charts.
- Complete a worksheet based on the content of the slideshow.
- Design and construct a residential floor frame model.
- Reproduce a proper floor frame layout using a measuring tape, a pencil, and a roll of masking or drywall tape.

Numeracy

- Calculate the supported joist length and select the appropriate joist options.

Enrichment / Research Activities

Numeracy

- Complete a cost analysis of various floor joist options.
- From a set of floor plans, design the floor system, and complete a cost estimate.
- Calculate the allowable deflection in a 14'-0" floor joist if the maximum deflection is 1/360.

Resources

Texts/Teacher Resources

Alberta Module 020106c
Residential Floor Frame
pp. 1-48

- CMHC, *Canadian Wood-Frame House Construction*
- National Building Code

SAS Resource Sharing

Visuals/Handouts/Tests

- CMHC floor joist charts
- Floor frame component identification
- ILM Self-Test
Residential Floor Frame, pp. 43-48

Residential Floor Frame (~14 hours Classroom Component)

SCO 12. Students will be able to identify and describe the components and installation of a residential floor frame.

SCO - Delineations

Students will be expected to

12.2 describe the layout and installation procedures for floor frame systems

12.3 construct a floor assembly using common techniques and materials

Student Knowledge, Abilities, and Competencies

Topic: Layout Procedure for a Residential Floor System

- Explain the methods used to check a foundation for squareness.
 - List the most common joist spacings:
 - 12" on centre
 - 16" on centre
 - 19.2" on centre
 - 24" on centre
 - Explain the concept of "on centre."
 - Identify three different layout methods.
 - Demonstrate the layout of regular floor joists.
 - Identify additional joist components related to the following:
 - stairwells and other large openings
 - headers
 - trimmers
 - tail joists
 - Demonstrate an understanding of the support needed for interior walls with regard to
 - walls parallel to the joist
 - non-load-bearing partitions
 - load-bearing walls.
 - Explain special floor framing methods related to
 - plumbing
 - mechanical ducts
 - flues
 - fireplaces.
 - Interpret national and regional building regulations for cantilevered joists.
 - List installation procedures for constructing a floor system.
-
- Demonstrate the ability to lay out a simple floor system.
 - Demonstrate the ability to construct a simple floor frame.

Residential Floor Frame (~14 hours Classroom Component)

SCO 12. Students will be able to identify and describe the components and installation of a residential floor frame.

Teacher Lessons / Demonstrations

Topic: Layout procedure for a residential floor system.

- Explain the layout procedure for a residential floor system.
- Explain the various joist spacing options.
- Demonstrate the three methods used to lay out regular floor joists.
- Describe the layout methods for butting joists and overlapping joists.
- Describe the layout procedures to facilitate floor openings, partition walls, and mechanical features.
- Describe the framing clearances for flues and fireplaces.
- Demonstrate the installation procedure for constructing a floor joist system.

Literacy

- *Document Reading:* Have students interpret joist charts.

Numeracy

- Using a tape measure, mark out the various joist spacings (use paper drywall tape laid out on the floor).
- Convert between metric and imperial measurements.

Student Activities / Assessments

- List the factors that affect joist spacing.
- List the common joist spacings.
- Lay out the framing pattern for a simple floor frame system.
- Mark joists for crown.
- Demonstrate the installation of floor joists.
- Identify floor framing situations requiring special framing considerations (e.g., chimneys, interior walls, plumbing, stairways).
- Draw or sketch the framing plan for floor openings, and identify components.

Numeracy

- Demonstrate on the workshop floor the layout of a foundation.
 - Working from a foundation plan, mark the corners with tape and mark the sides with a caulk line.
 - Measure the diagonals for squareness. Check the mathematical calculation from the drawings and compare.
- Demonstrate the layout of a floor joist system. From the foundation plan (above) fill in the sides with tape and mark off the floor joists.
- Check a floor system for squareness.
- Calculate the material for a floor joist system.

Enrichment / Research Activities

Numeracy

- Study a set of house plans and determine
 - the outside dimensions
 - the diagonal length.
- Scale the diagonal length.

Resources

Texts/Teacher Resources

Alberta Module 020106c
Residential Floor Frame
pp. 1-48

- CMHC, *Canadian Wood-Frame House Construction*
- National Building Code

SAS Resource Sharing

Visuals/Handouts/Tests

- CMHC floor joist charts
- Floor frame component identification
- ILM Self-Test
Residential Floor Frame, pp. 43-48

Residential Floor Frame (~14 hours Classroom Component)

SCO 12. Students will be able to identify and describe the components and installation of a residential floor frame.

SCO - Delineations

Students will be expected to

12.4 describe joist restraints and subfloor sheathing installation

12.5 describe the components and the installation of engineered floor systems

Student Knowledge, Abilities, and Competencies

Topic: Joist Restraints

- Explain the two main functions of joist restraint systems.
- Identify and describe three common methods of joist restraint:
 - cross bridging
 - strapping
 - solid blocking
- Describe how to lay out cross bridging.
- Demonstrate the installation of cross bridging.

Topic: Floor Sheathing

- Explain the function of floor sheathing (or subfloor).
- List the functions of the subfloor.
- List the common materials and thicknesses used for floor sheathing.
- Explain the National Building Code regulations for sheathing.
- Describe the application process for floor sheathing:
 - face grain orientation to joists
 - joint orientation, expansion gap (2 mm)
 - nailing pattern and adhesives
- Explain the National Building Code regulations for notching and drilling solid wood products.

Topic: Engineered Floor Systems

- Explain the concept of “engineered floor systems.”
- List examples of “engineered floor system” products.
- Explain the functions of the following components in engineered floor systems:
 - I-beam joists
 - rim board
 - squash blocks, web stiffeners
 - backer blocks
 - fillers
 - pony wall
 - beam and joist hangers
 - open web trusses
- Explain the notching and drilling requirements of engineered joists.
- Explain the handling and storage requirements of engineered floor system components.

Residential Floor Frame (~14 hours Classroom Component)

SCO 12. Students will be able to identify and describe the components and installation of a residential floor frame.

Teacher Lessons / Demonstrations

Topic: Joist Restraint Systems

- Describe three different joist restraint systems:
 - cross bridging
 - strapping
 - solid blocking
- Identify where joist restraint is required.
- Demonstrate how to lay out cross bridging using the framing square.
- Demonstrate installation of floor sheathing.
- Identify fasteners and adhesives used with floor sheathing.
- Explain the acceptable limits for drilling and notching joists. Use a handout created from the ILM graphics CD.

Topic: Engineered Floor Systems

- Describe various engineered joist systems. Show examples.
- Describe the various components and special considerations.
- Create a handout from the graphic CD or manufacturer's information.

Literacy

- *KWL*: Use a KWL to help students build a good understanding of floor systems.
- Document Reading: Interpret manufacturers' joist information and charts.

Numeracy

- Convert between metric and imperial measurements.

Student Activities / Assessments

- Identify joist restraint systems.
- Demonstrate how to layout and cut cross bridging.
- Demonstrate the installation of cross bridging.
- Identify floor sheathing material.
- Describe floor sheathing fastening procedures and patterns.
- Identify limits on drilling and notching joists.
- Identify components of engineered floor systems.

Enrichment / Research Activities

Numeracy

- Complete a cost analysis of various engineered floor joist options.
- From a set of floor plans, design the engineered floor system and complete a cost estimate.

Resources

Texts/Teacher Resources

Alberta Module 020106c
Residential Floor Frame
pp. 1-48

- CMHC, *Canadian Wood-Frame House Construction*
- National Building Code

SAS Resource Sharing

Visuals/Handouts/Tests

- CMHC floor joist charts
- Joist restraint systems
- Engineered floor systems
- ILM Self-Test
Residential Floor Frame, pp. 43-48

Pictorial Drawing and Sketching

(~4 hours Classroom Component)

Introduction Pictorial drawings and sketches are commonly used by tradespeople in the construction industry to communicate with other members of the building team. These pictorial drawings show objects in a three-dimensional representation that most people can understand, and they are often used to clarify concepts and ideas. The apprentice should develop a comfort with pictorial drawings, including the ability to read, draw, and sketch in an efficient manner.

Specific Curriculum Outcome 13. Students will be able to identify and practise the drawing techniques and principles used to produce isometric drawings.

SCO - Delineations *Students will be expected to*

- 13.1 *describe pictorial drawing methods*
- 13.2 *describe the isometric principles*
- 13.3 *describe how isometric angles are shown and drawn*
- 13.4 *describe how to develop isometric circles and arcs*

Assessment Strategy Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources Alberta Module 020107c, *Pictorial Drawing and Sketching*

Pictorial Drawing and Sketching (~4 hours Classroom Component)

SCO 13. Students will be able to identify and practise the drawing techniques and principles used to produce isometric drawings.

SCO - Delineations

Students will be expected to

13.1 describe pictorial drawing methods

13.2 describe the isometric principles

Student Knowledge, Abilities, and Competencies

Topic: Pictorial Drawing Methods

- Identify the three basic types of pictorial drawings: isometric, oblique, perspective

Isometric Drawings

- Describe use of isometric drawings in industry.
- Explain the concept of a 3-dimensional drawing.

Oblique Drawings

- Describe the composition of oblique drawings (orthographic front view, 45° receding lines to right side).
- Demonstrate an understanding of cavalier and cabinet drawings.

Perspective Drawings

- Describe the use of perspective drawings.
- Explain the concept of the vanishing point in perspective drawings.
- Describe the three common types of perspective drawings:
 - one-point perspective
 - two-point perspective
 - three-point perspective

Topic: Developing Isometric Drawings

- Describe the concept and basic principles of isometric drawing:
 - iso - metric = equal - measure
 - receding lines drawn at 30° on both left and right axis
- Describe the drawing orientation of showing the object both tilted and rotated.
- Demonstrate the orientation of the isometric axis:
 - three axes (x, y, z) placed 120° apart
 - z axis vertical
 - x axis 30° above horizontal to the left
 - y axis 30° above horizontal to the right
- Demonstrate the use of the basic drawing instruments: (e.g., t-square; 30°-60° triangle; 45° triangle).
- Demonstrate drawing an isometric axis.
- Demonstrate drawing an isometric box.
- Demonstrate drawing an object in isometric.

Pictorial Drawing and Sketching (~4 hours Classroom Component)

SCO 13. Students will be able to identify and practise the drawing techniques and principles used to produce isometric drawings.

Teacher Lessons / Demonstrations

Topic: Pictorial Drawings

- Introduce the concept of using various pictorial drawings to depict an object in 3-D (similar to a picture).

Topic: Perspective Drawings

- Describe the composition of perspective drawings.
- Describe the use of perspective drawings in industry.
- Demonstrate the composition of one-, two-, and three-point perspective drawings (use ILM graphics CD drawings).
- Demonstrate a perspective drawing.

Topic: Oblique Drawings

- Describe the composition of oblique drawings.
- Describe the use of oblique drawings in industry.
- Demonstrate the composition of cavalier and cabinet drawings (use ILM graphic CD drawings).
- Demonstrate an oblique drawing.

Topic: Isometric Drawings

- Describe the composition of isometric drawings.
- Describe the use of isometric drawings in industry.
- Demonstrate the composition of isometric drawings (use ILM graphics CD drawings).
- Demonstrate an isometric drawing:
 - layout of the isometric axis
 - construction of the isometric box
 - completion of drawing details
 - application of dimensions
- Demonstrate the reading of orthographic drawings.
- Demonstrate the method to develop an isometric drawing from an orthographic drawing.

Student Activities / Assessments

- Identify pictorial drawings (three types).
- Identify isometric drawings (showing three sides of an object).
- Identify orthographic drawings.
- Sketch the isometric axis (a Y axis 120° separating each axis).
- Sketch an isometric box.
- Sketch an isometric drawing.
- Complete selected activities as described in the ILM.

Enrichment / Research Activities

- Demonstrate the method used to centre an isometric drawing.
- Complete an isometric drawing.
- Complete oblique and perspective drawings.
- Develop ILM exercises in oblique and perspective.

Resources

Texts/Teacher Resources

Alberta Module 020107c
Pictorial Drawing and Sketching
pp. 1-47

Drafting texts and workbooks

SAS Resource Sharing

Visuals/Handouts/Tests

- Isometric axis
- Centring an isometric drawing
- Isometric development
- ILM exercises

Pictorial Drawing and Sketching (~4 hours Classroom Component)

SCO 13. Students will be able to identify and practise the drawing techniques and principles used to produce isometric drawings.

SCO - Delineations

Students will be expected to

13.3 describe how isometric angles are shown and drawn

13.4 describe how to develop isometric circles and arcs

Student Knowledge, Abilities, and Competencies

Topic: Drawing Isometric Angles

- Identify sloped lines and oblique surfaces in isometric drawings:
 - non-isometric lines
 - lines other than horizontal or vertical lines on the object
- Demonstrate how to locate angles and slopes on isometric drawings.
- Demonstrate the sketching and drawing of non-isometric lines and oblique surfaces.

Topic: Drawing Isometric Circles

- Recognize that circles drawn in isometric are shown as ellipses.
- Describe the method to draw a circle in isometric:
 - Find the centre of the circle.
 - Draw an isometric square (lightly) with sides equal to the diameter of the circle.
 - Inscribe an ellipse within the square. (An ellipse is drawn with four arcs with two different radii.)

Pictorial Drawing and Sketching (~4 hours Classroom Component)

SCO 13. Students will be able to identify and practise the drawing techniques and principles used to produce isometric drawings.

Teacher Lessons / Demonstrations

Topic: Drawing Isometric Angles

- Identify sloped lines and oblique surfaces in isometric drawings. (Use ILM graphics CD drawings.)
- Demonstrate how to locate angles and slopes on isometric drawings.
- Demonstrate the sketching and drawing of non-isometric lines and oblique surfaces.

Topic: Drawing Isometric Circles

- Identify that circles drawn in isometric are shown as an ellipse. (Use ILM graphics CD drawings.)
- Demonstrate the method to draw a circle in isometric.
- Develop a handout sheet to describe the process used to develop isometric circles.

Student Activities / Assessments

- Identify isometric angles and sloped surfaces.
- Describe the process used to draw isometric angles.
- Demonstrate drawing isometric angles and sloped surfaces.
- Identify isometric circles.
- Describe the process to draw isometric circles.
- Demonstrate drawing isometric circles.
- Complete exercises in the ILM.

Enrichment / Research Activities

- Demonstrate the method to centre an isometric drawing.
- Complete an isometric drawing.
- Demonstrate the placement and drawing of angles and sloped surfaces in isometric drawings.
- Demonstrate drawing circles in isometric.
- Apply dimensions to isometric drawings.
- Try isometric modelling in Google Sketchup.

Resources

Texts/Teacher Resources

Alberta Module 020107c
Pictorial Drawing and Sketching
pp. 1-47

Drafting texts and workbooks

SAS Resource Sharing

Visuals/Handouts/Tests

- Centring an isometric drawing
- Isometric development
- Isometric circles
- ILM exercises

Estimating Residential Floor Systems

(~6 hours Classroom Component)

Introduction The estimating process requires a combination of several skill sets. The estimator must read and interpret blueprints and specifications; be familiar with local and national building codes; understand the building process; and allow for waste and the need for supplementary materials. On most residential jobs the carpenter is also the estimator, responsible for material takeoffs, ordering, and delivery. The apprentice must develop the literacy and numeracy skills required to estimate and order building materials.

Specific Curriculum Outcome 14. Students will be able to calculate the quantity of framing materials required for conventionally framed residential floor and floor support systems.

SCO - Delineations *Students will be expected to*

- 14.1 *calculate materials takeoffs for floor support systems*
- 14.2 *describe the use of on-centre formulas to calculate the number of floor components*
- 14.3 *calculate materials takeoffs for floor frames*

Assessment Strategies Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources Alberta Module 020108g, *Estimating Residential Floor Systems*

Estimating Residential Floor Systems (~6 hours Classroom Component)

SCO 14. Students will be able to calculate the quantity of framing materials required for conventionally framed residential floor and floor support systems.

SCO - Delineations

Students will be expected to

14.1 calculate material takeoffs for floor support systems

14.2 describe the use of on-centre formulas to calculate the number of floor frame components

14.3 calculate material takeoffs for floor frames

Student Knowledge, Abilities, and Competencies

Topic: Estimate Floor Support Components

- Identify floor support system components.
- Interpret plans.
- Calculate the design span for support columns.
- Calculate sill materials.
- Design a floor support beam.
- Complete material takeoffs for support beams.
- Demonstrate the ability to work with SI and imperial measurements.
- Complete a material takeoffs chart for floor support systems.

Topic: Estimate Floor Frame Components

- Identify floor frame components.
- Identify common floor joist spacings (SI and imperial)
- Develop the on-centre spacing formula for determining the number of floor joists.
- Calculate the number of floor joists required for a simple floor.
- Calculate the number of floor joists required for floors with jogs or offsets.

Topic: Estimate Floor Frame Material Takeoffs

- Identify floor frame components.
- Determine the joist spacing from drawings and codes (NBC, CMHC).
- Determine the size of components from drawings and codes (NBC, CMHC).
- Calculate the number of regular joists.
- Identify where extra joists are required and determine the number required.
- Determine the number and location of header joists.
- Calculate the amount of cross bridging required.
- Calculate the amount of sub floor required.
- Complete a material takeoffs chart for floor frame systems.

Estimating Residential Floor Systems (~6 hours Classroom Component)

SCO 14. Students will be able to calculate the quantity of framing materials required for conventionally framed residential floor and floor support systems.

Teacher Lessons / Demonstrations

Topic: Estimating Floor Support Components

- Describe floor support system components. (Use examples from ILM graphics CD and building plans,)
- Demonstrate interpretation of floor support beam design charts (CMHC).
- Describe the method used to determine sill plate materials.
- Develop a floor support system materials chart.
- Review SI and imperial measurement conversion.

Topic: Estimating Floor Frame Components

- Identify floor frame components and spacings.
- Describe how to determine the size of the components required. (Use examples from ILM graphics CD and building plans.)

Topic: Estimate Floor Frame Material Takeoffs

- Develop formulas to determine the number of regular floor joists required.
- Explain where additional joists and header joists should be placed.
- Demonstrate how to estimate cross bridging.
- Demonstrate how to select and estimate subfloor.
- Develop charts for floor frame estimation.
- Review exercises in the ILM.

Student Activities / Assessments

- Read and interpret building drawings for floor systems.
- Design floor support systems.
- Complete a materials and cost estimate.
- Read and interpret building drawings for floor joist design.
- Design floor joist frame systems.
- Complete a materials and cost estimate.
- Read and interpret building drawings for floor systems.
- Design residential floor systems.
- Develop charts for floor frame estimation.
- Complete a materials and cost estimate.
- Complete exercises in the ILM.

Resources

Texts/Teacher Resources

Alberta Module 020108g
Estimating Residential Floor Systems
pp. 1-58

- CMHC: *Canadian Wood-Frame House Construction*
- National Building Code

SAS Resource Sharing

Visuals/Handouts/Tests

ILM Self-Test
Estimating Residential Floor Systems,
pp. 42-51

