Apprenticeship Manitoba

Manitoba

Bricklayer
Level 3

Rev. July 2004

Apprenticeship Manitoba

Bricklayer

Unit: A5 Orientation II: The Job of Journeywork

Level: Three

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

Bricklayer Technical training offers an initial orientation to the special challenges of apprenticeship learning. The present unit of instruction introduces senior apprentices to the responsibilities of workplace *teaching* that they will assume as supervising journeypersons. Bricklayers and stonemasons have a particularly rich, time-honoured tradition of ensuring the transmission of skills from generation to generation of trade practice. The purpose of this unit is to provide senior apprentices with some of the tools they will need to contribute to this trade heritage once they are certified. The journeyperson's obligation to assist trade learners to develop skills and knowledge is a complex and challenging one. It involves employer expectations, provincial regulations, as well as the tradition of skills stewardship that links modern practice with the history of workplace teaching and learning that defines the apprenticeable trades. The ability to offer timely, appropriate guidance to apprentices is itself a key aspect of trade learning.

The content of this unit offers background information as well as practical tools intended to refine the ability and inclination to provide this guidance. The unit encourages senior apprentices to reflect upon their personal experience of trade learning with journeypersons as a resource for refining their skills as Practical Trainers-in-training. The unit supplements this with important information about the responsibilities and opportunities which accompany trade certification, particularly concerning roles and methods associated with journey-level supervision assignments in modern trade workplaces.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe the scope, substance and significance of journey-level status. 10%

a. Historical background and trade traditions
- Origin, definition, and examples of journey-level status
- Obligations to employers, trade clients, and apprentices
- Concept of skills stewardship, and its rationale
- Customary responsibilities of journeyperson as workplace trainer/supervisor
- Overview development of formal systems for the regulation and recognition of journey-level competence in apprenticeable (designated) trades
- Contributions of 'unticketed journeymen' and 'Designated Trainers' to workplace trade-learning
- Achievements – and limitations – of informal systems for workplace training
- Canadian and international trends (including succession planning in the trades; recognition of credentials and prior learning; defined standards for on-the-job trades training

b. Current legal and regulatory dimensions re: journey-level status in designated trades
- Journey-level rights and obligations re: Canada's Interprovincial 'Red Seal' Program (Red Seal rationale, scope, and products, including National Occupational Analysis [NOA] Series, and Red Seal trade certification exams
- Manitoba provincial requirements re: supervision and documentation of apprentices' on-the-job Practical Training experience (including *Apprenticeship and Certification Act; General Regulation;* relevant policies of the Apprenticeship and Certification Board of Manitoba)

- Trade-specific requirements re: Practical Training supervision and documentation (e.g., ratios; use of Practical Training Record Book [PTRB]; limitations re: use of Designated Trainers; importance of quality assurance re: practical training

2. Compare/contrast role-options and responsibilities of the supervising journeyperson. 20%

a. Recognizing the scope and kinds of variation re: supervision assignments and venues
b. Source and specification of the supervision assignment
c. Formal vs. informal roles (e.g., assigned/defined by shop manager; mandated by terms of a collective agreement or by employer's succession-planning)
d. Implicit vs. explicit standards and content (e.g., codified Practical Training goals and assessment tools, including quality assurance measures re: supervision itself)
e. Accountability for results - 'self-contained' vs. subject to third-party intervention (e.g., journeyperson must file a written Performance Evaluation that could affect an apprentice's wage-rate or general employability)
f. General vs. task- or job-specific supervision assignments (scope of expectations re: content of supervisory tasks)
g. Long-term vs. short-run supervision assignments (e.g., apprentice can be given considerable latitude to make mistakes and learn from them over a long period)
h. Formally vs. informally structured (e.g., policy/procedure re: coordination with other journeypersons responsible for other phases of supervision)
i. Typology of common role-options and what is implied by each
    - Coach (e.g., often initiated by someone other than apprentice and limited to a particular skill-set or task)
    - Mentor (e.g., often initiated by apprentice and relatively open-ended in content)
    - Peer (e.g., upgrading or 'cross-training' of one journeyperson by another; senior apprentice delegated to provide guidance to a less-experienced trade learner)
    - Manager (e.g., can shade over into hire/fire issues as lead-hand or site-boss)
    - Coordinator (e.g., often a senior-level journeyperson responsible for liaison with apprentices and Practical Trainers to help ensure that learners are systematically exposed to the full scope of a trade's prescribed task-content)
    - Other (e.g., role must be improvised/clarified by journeyperson)
j. Possibilities, perils, and likelihood of role-overlap in 'real-life' trade practice
k. Importance of clarifying all roles, expectations, and implications involved in accepting a particular supervision assignment.
l. Role of the Apprenticeship Training Coordinator, Manitoba Apprenticeship Branch
m. Resources for developing skills and knowledge re: providing journey-level supervision
    - Books and journals (not always trade-specific)
    - Websites
    - Workshops
    - Consultation with peers and others
    - Other (specified by instructor)

3. Describe/demonstrate common requirements and barriers re: journey-level supervision [especially 'Skills Coaching'] tasks. 20%

a. Review Unit A1 content re: opportunities and challenges of Apprenticeship learning/teaching as adapted to journey-level supervision assignments
    - Application of Adult Education concepts to trade teaching/learning (e.g., special responsibilities and expectations of Adult Learner)
    - Practical significance of recognized 'styles' of learning – and teaching – in the workplace
    - Helping apprentices to integrate technical/practical training content
    - Providing help and guidance re: new tasks and skills
    - Providing help and guidance re: fixing mistakes.
    - Learning/teaching 'the ropes' - socialization of learner within a community of trade practice (e.g., how to borrow a tool, interrupt a journeyperson, 'recruit' an advisor, etc.)
    - Coverage/documentation of formally prescribed tasks and subtasks (PTRB), including journeyperson responsibility re: sign-off (when/where/why).
    - Supervising journeyperson's consultation with the Apprenticeship Training Coordinator (ATC), Manitoba Apprenticeship Branch

- Communicating with apprentices and employers about supervision assignments and assignment specifications, including the limits of the trainer's own competence and responsibility (e.g., substance-abuse intervention)
- Benefits of maintaining a personal record of achievements/needs as a workplace trainer -- a further use for the Trade Learning Journal

c. Individual reflection and guided group-discussion re: personal experiences of workplace trade-learning as Registered Apprentices
- Identification of 'best' and 'worst' practices by supervising journeypersons
- Assessment of experiences (if any) to date in supervising others (e.g., a Level One apprentice) – including identification of current strengths and shortcomings
- Identification of factors influencing best/worst practices (e.g., time management)
- Initial development/discussion of personal standards re: the responsibility to share one's knowledge and skill with others in the workplace (e.g., the use/misuse of discretion; rigor; humour; empathy; craft-pride)

d. Comparison/contrast of discussion results with current knowledge and resources re: workplace skills-coaching methodology as applicable to journey-level supervision assignments.
- Qualities of a good workplace coach
- Components of workplace skills-coaching
- Process and recommended practices re: workplace coaching
- Troubleshooting problem assignments re: journey-level supervision
- Other (specified by instructor)

4. Complete Modules 1 to 3, *Workplace Coaching Skills* (Burnaby, BC: 1995), ISBN 1-55139-030-2. (or equivalent). 25%

a. Identifying purpose of the lesson
- explaining the point of the lesson
- role of the coach in specific coaching situation
- Other (specified by instructor)

b. Linking the lesson
- Learner needs
- Lesson sequence
- Focus on learner
- Selection/timing of coaching opportunities

c. Demonstration of skill/task to be learned
- Starting the coaching session
- Demonstration
- Hands-on trial
- Recap for learner

5. Complete Modules 4 to 6, *Workplace Coaching Skills,* (Burnaby, BC: 1995), ISBN 1-55139-030-2. (or equivalent). 25%

a. Practice of skill/task to be learned
- Nature and importance of practice
- Setting up for learner practice
- Types of practice
- Recycling and reinforcing skill/task learning

b. Providing feedback to the learner
- Value of feedback
- Kinds of feedback
- Guidelines and tips

c. Assessment
- Value of assessing learner progress
- Assessing level of skill
- Planning further steps toward skill/task mastery

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Apprenticeship Manitoba

Bricklayer

Unit: A6 Pre-IP Review

Level: Three

Duration: 63 hours

Theory: 63 hours

Practical: 0 hours

Overview:

This unit offers senior apprentices a systematic review of skills and knowledge required to pass the Interprovincial 'Red Seal' Examination. It promotes a purposeful personal synthesis between on-the-job learning and the content of in-school technical training. The unit includes pertinent information about the broad significance of Red Seal Interprovincial certification and the main features of the Interprovincial exam. Trade-specific content is enriched with information about practical strategies/resources for mastering study materials. It is intended that apprentices who seriously tackle the objectives of this unit should be able to approach the IP exam with well-founded confidence. But the unit also promotes a consolidation of study practices, trade knowledge, and self-awareness to help meet the longer-term requirements of further learning throughout one's working life as a certified journeyperson.

Note: No testing is prescribed for this instructional unit per se. Instead, a "Pass/Fail" grade will be awarded upon completion of the unit.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the significance, format, and general content of Interprovincial (Red Seal) Examinations for the trade of Cabinetmaker.	**n/a**

a. Scope and aims of Red Seal system; value of certification
b. Obligations/entitlements of candidates for IP certification
   - Relevance of IP Examination to current, accepted trade practices; industry-based national validation of test items
   - Supplementals Policy (retesting) of the Apprenticeship Manitoba
   - Confidentiality of examination content; the certified journeyperson's own stake in examination security (value of credential)
   - Limitations on use of calculators (e.g., dedicated, pre-programmed builders' calculator not allowed)
c. Multiple-choice (four-option) item format; Red Seal/Apprenticeship Manitoba standards for acceptable test items (e.g., no "trick"-type questions; specifications for use of metric/Imperial units)
d. Important government materials relevant to the IP Examination for apprentice Cabinetmakers
   - National Occupational Analysis (NOA); prescribed scope of the skills and knowledge which comprise the trade
   - NOA "Pie-chart" and its relationship to content-distribution of IP Examination items
   - Manitoba Apprentice Portfolio, especially the NOA-based Practical Record Book and task/subtask checklists as these relate to apprentice's coverage of the skills and knowledge of his/her trade
   - National Building Code's relationship to examination content; availability of NBC excerpts to IP candidates during examination

2 Identify resources, strategies, and other key considerations for maximizing successful completion of written exams used in certifying tradespeople.

a. Personal preparedness
   - Proper rest/nutrition; eye-testing
   - Making room for a personal study regimen: appropriate prior communication with family members, friends, and employers about exam-related commitments/needs; identifying – and concluding – all necessary arrangements for minimizing distractions/disruptions.
   - Focused reflection on prior experience – good and bad -- in test situations (e.g., Unit Tests), especially with respect to what the apprentice already has learned about his/her own personal characteristics, learning styles, exam anxiety, and strategies (e.g., time management) for effective performance in test situations.

b. Self-assessment, consultation, and a Personal Study Plan
   - Preliminary self-assessment of individual strengths/weaknesses in trade-related skills and knowledge; usefulness of old tests; usefulness of Apprenticeship Portfolio checklists and reflection on **both** the in-school and on-the-job components of the Apprenticeship Program in Cabinetmaking, as well as the inter-relationship between these two components; usefulness of consultation with journeypersons, appropriate peers, the Apprenticeship Training Coordinator and/or other trade mentors
   - Use(s) of approved textbooks, chapter tests, study guides, and note-taking in preparing for an examination
   - Study groups: perils and possibilities
   - Formulation, and submission for instructor's comments, of a personal study plan, including an approximate timetable, which describes/schedules a course of action for reviewing all relevant material(s) and for strengthening areas of deficient skills/knowledge in anticipation of the Red Seal Examination

3 Review program content re: trade foundations
a. Structure and scope of the trade
b. Trade safety
c. Trade communications and terminology
d. Quality assurance, including standards, codes, and specifications

4 Review program content re: masonry trade mathematics, documents, and design.
a. Trade mathematics
b. Masonry design and technical drawing
c. Blueprint use
   - Conventions and practices re: construction blueprint preparation/use
   - Residential blueprints re: masonry components
   - Institutional and Commercial/Industrial blueprints re: masonry components

5. Review program content re: masonry tools, equipment, and materials.
a. Tools and equipment
b. Selection, use, and maintenance
c. Materials – brick, block, prefabricated/proprietary panel products, and stone
d. Materials – masonry mortars, grouts, adhesives, and fasteners
e. Concrete and reinforcement

6 Review program content re: masonry wall and column work.
a. Principles of wall/column work and structural integrity
b. Bonds, joints, and corners
c. Building envelope – moisture and air barriers
d. Structural walls and columns
e. Masonry veneers and cladding

7 Review program content re: refractory work.
a. Principles of refractory work and heat dynamics
b. Chimneys
c. Fireplaces
d. Furnaces, kilns, and refractory wall-systems

8 Review program content re: Bricklayer trade specialties.
a. Masonry specialties past and present
b. Stonework and stone ornament

c. Archwork theory and practice
d. Ornamental masonry, including:
   - Paving
   - Glass block and glazed block
e. Restoration masonry – major concepts and techniques

9 Review program content re: jobsite applications

a. Jobsite maintenance and coordination
b. Lifting, rigging, and hoisting
c. Scaffolding and access structures

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Apprenticeship Manitoba

Bricklayer

Unit: B4 Blueprint Use II

Level: Three

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

Bricklayers and stonemasons must be able to use blueprints and entire sets of blueprints with ease and accuracy. Blueprint interpretation involves learning to make sense of special symbols, codes, and conventions used to convey information to those on the bench, shopfloor, and installation jobsite. The set of blueprints required for a typical institutional or commercial project is organized like a large book. It contains hundreds of cross-referenced, dimensioned images, multiple perspectives ('elevations'), cross-sectional views, and varying degrees of detail. Even the blueprints for a simple masonry component an seem complex until blueprint use is mastered. Many of the basic rules for creating and using blueprints were introduced earlier in the program.
This unit of instruction reviews how blueprints are used to obtain and verify important information about masonry project requirements. It builds directly upon earlier Technical training content concerned with relatively simple residential and light-construction projects. However the examples discussed here focus on more complex projects in the industrial and commercial/institutional construction sector.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe the taxonomy of institutional/commercial project blueprints. **10%**

a. Divisions
- Architectural
- Structural
- Mechanical
- Electrical
- Other as specified by instructor

b. Other major categories
- Specifications
- Schedules
- Book (Table of Specifications)
- Addenda

2. Describe the preparation/use of institutional/commercial project blueprints. **10%**

a. Detailed 'mapping' of site/site characteristics.
b. Visual representation of the construction and/or location of a built structure
c. Specification of essential details
- Shape
- Size
- Function
- Materials used
- Access
- Construction details
- Construction sequence and timetable.

d. Aid in estimating and optimizing materials

e. Aid in identifying and coordinating tasks among the trades
f. Roles and responsibilities in preparing blueprints
    - Client
    - Specification writers
    - Designer
    - Architect
    - Mechanical engineers (electrical; HVAC; plumbing)
    - General contractor
    - Subtrades
g. Sequence of blueprint preparation, distribution, and use (e.g., tendering/bidding)
h. Interpreting blueprint codes (including hierarchy of importance)

3. Describe/demonstrate the use of institutional/commercial blueprints to derive specified information. **10%**

a. Use of blueprints to perform specified take-offs
    - Costs
    - Materials
    - Quantity
    - Labour/personnel
    - Shipping
b. Use of blueprints to identify production/coordination requirements

4. Use blueprints to derive/verify information per instructor's specifications. **70%**

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Apprenticeship Manitoba

Bricklayer

Unit: E3 Fireplaces

Level: Three

Duration: 35 hours

Theory: 10 hours

Practical: 25 hours

Overview:

This unit is intended to assist Bricklayer apprentices to extend and integrate their skills as builders with a deepened understanding of heat-resistant masonry structures. Bricklayer trade-learners are urged to review earlier-delivered program content on refractory masonry and chimneys, and relate this to what they will learn about fireplace form and function by completing the present unit of Technical training. Learning about masonry fireplace-building will be further enhanced if apprentices also refresh their familiarity with Technical training content about the significance of aesthetic/architectural design principles, structural integrity, blueprint use, and the trade's quality standards - all of which have direct bearings on eventually mastering the craft and science of this type of refractory work. The unit presents an overview of fireplace variation and function, including the contribution that masonry structures make to ensure the safe and efficient operation of combustion systems. Also, because fireplaces are by definition so closely associated with fire, heat, and hazardous gases, the unit includes content concerning the many important safety-related construction and functional requirements as these are reflected in project blueprints, the *National Building Code*, and hands-on practice. The unit also offers apprentices the chance to apply their practical skills directly to the production of several kinds of fireplace. This material is supplemented by other Technical training units which are included to round out the apprentice's exposure to other varieties of heat-resistant masonry work, including chimneys, heaters, furnaces, and kilns.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe fireplace systems, components, and applicable standards. **20%**

a. Functions
- Review characteristics/requirements of refractory materials re: combustion systems
- Historical, technological, and environmental considerations
- Venting of heat, fumes, and gases generated by combustion
- Fire-protection for adjacent materials *via* voiding and heat-shielding
- Structural support requirements

b. Major varieties, defining features, contrasts, and rationale
- Conventional vs. heat-circulating
- Wood-burning vs. other fuels
- Outdoor (including masonry barbecues; firepits)
- Indoor
- Plain
- Double Opening
- Three-Way Opening
- Raised Hearth
- Scandinavian (Hooded)
- Russian (Finnish)
- Other

c. Fireplace system components, including their relation to combustion systems
- Anchorage and reinforcement

- Ash pit/base
- Corbelling
- Damper
- Face (facing)
- Firebox (fire chamber)
- Flue (including types and sizes)
- Foundation
- Fresh-air inlet (including position, dimensions, and ducting)
- Hearth
- Lintel and other supports
- Inner shell
- Outer shell
- Skirt
- Smoke shelf
- Smoke chamber
- Throat
- Ornament
- Appliances
- Other (specified by instructor)

d. Fireplace materials re: selection/use, variation, and significance
- Brick
- Stone
- Concrete
- Steel and other metals
- Ceramics and clays
- Mortars
- Chemical products
- Bonding methods and patterns
- Hardware, including reinforcement, accessories, etc.
- Properties of expansion/contraction
- Other

e. *National Building Code* provisions and related trade standards re: specified fireplace components
- Fireplace (including general overview; wall thickness; clearances)
- Fire chamber (including firebrick hearth and liner; liner thicknesses; joint dimensions and mortars; skirt re: rough-opening dimension/location)
- Ash Pit (including geometry/shape/inclinations; heights/thicknesses; construction of base/walls; supports; cleanouts, air supply)
- Hearth extension (including dimensions)
- Throat (including effective area)
- Smoke Shelf (including depth; geometry/dimensions; location of lower section)
- Smoke chamber (including inclinations re: sides, etc.; walls re: smoothness, exposure, etc.; clearances (including back and sides re: combustible framing; exterior wall)
- Testing techniques/standards re: combustion efficiency/safety, draught, ventilation, soundness, etc.
- Other (specified by instructor)

f. Examination of typical blueprints for various fireplaces
- Identify/compare significant features (e.g., conventional vs. heat-circulating)
- Derivation of sketches, dimensions, from technical drawings
- Recognition of *NBC*-related provisions and specifications

2. Describe/demonstrate design of single-opening fireplace per instructor specifications. 20%

a. Overview of steps in fireplace design, construction, and installation sequence
b. Considerations and criteria to be determined during design process, including rationale
- Selection and use of all required materials
- Number of flues
- Type of appliances
- Size(s) of flue-liners for non-fireplace facing
- Number of fireplaces required, given specifications
- Design of fireplace facing (including bonding methods and patterns)
- Position, dimensions, and ducting re: combustion air-supply

- Finished height of chimney
- Minimum thicknesses and clearances re: specified components
- Positioning and required thickness of hearth
- Requirements re: structural support, reinforcement, and stabilization
- Requirements re: concrete forming, reinforcement, and placement
- Design of rough-in and ash-pit
- Other (specified by instructor)

c. Calculations and estimates required
- Estimates and take-offs for all materials
- Exact size(s) of finished opening(s)
- Finished height of hearth
- Size of flue-liner(s)
- Estimate re: project time-frame
- Estimate re: project costs

d. Other (specified by instructor)

3. Describe/demonstrate single-opening fireplace construction and installation. 24%

a. Recap re: steps in fireplace construction and installation sequence
b. Derivation of sketch from blueprint
c. Requirements re: tool selection and technique
- Adapting hand-tool techniques for work in constrained spaces
- Maintenance of measure and bond

d. Major considerations and criteria
- Determination/verification of dimensions
- Blueprint interpretation; lay-out
- Construction of interior fireplace foundation and required supports
- Pouring of hearth slab
- Rough brickwork or exterior masonry
- Construction of fire chamber
- Facing of fireplace with bricks
- Laying of masonry hearth
- Installation of fireplace accessories
- General finished appearance
- Organization and time-management
- Reliability of original estimates re: materials, time, etc.

e. Other (specified by instructor)

4. Complete the Multiple-Opening Fireplace Project per instructor specifications. 20%

a. Estimate materials
b. Establish and organize work area
c. Make dry layouts
d. Lay up masonry to opening heights
e. Build firebox
f. Install damper
g. Set steel lintels and arches
h. Install metal accessories
i. Joint exposed masonry
j. Lay masonry hearth

5. Complete the Heat-Circulating Fireplace Project per instructor specifications. 15%

a. Estimate materials
b. Lay back hearth
c. Install heat circulating unit
d. Insulate unit per manufacturer specifications
e. Lay up masonry
f. Install metal accessories
g. Set flue linings
h. Joint exposed masonry
i. Lay masonry hearth
j. Set fireplace tiles
- Selection of tile material and pattern

- Lay tile in mortar bed (wet and dry pack)
- Set tile in tile cement (epoxy)
- Grout tile
- Clean tile

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Apprenticeship Manitoba

Bricklayer

Unit: E4 Furnaces, Kilns and Refractory Linings

Level: Three

Duration: 21 hours

Theory: 10 hours

Practical: 11 hours

Overview:

As outlined earlier in Technical training, refractory masonry work is not limited to the construction and repair of such familiar structures as chimneys and fireplaces. An important subset of refractory work involves highly specialized, carefully-engineered applications of masonry skills on jobsites far removed from the residential market. The present unit of instruction focuses upon this special category of masonry work, which encompasses the industrial use of special-purpose brick, tile, plastic, concrete, and mortar products to build, line, and repair furnaces, kilns, masonry heaters, smokestacks, boilers, and ladles. This instructional unit presents an overview of these applications, integrating new instructional material with relevant skills and knowledge gained from earlier close engagement with the construction of chimneys and fireplaces. For example, like fireplaces, all of the furnaces, kilns, heaters, and special linings explored in this are associated with some kind of combustion chamber. Apprentices who recognize major points of comparison and contrast between the principles of fireplace-building and these other kinds of refractory work will benefit most from this unit. They will also enrich their skills and employability should they decide in future to pursue a specialized career path beyond the construction sector itself. The unit explores the special products, techniques, and other requirements associated with these structures and components.

Objectives and Content: **Percent of Unit Mark (%)**

1. Review the significance, scope, and materials of refractory work. 20%

a. Review significance of refractory work
- Definitions and rationale
- New trends in refractory masonry technology and trade-practice
- Environmental implications and requirements
- Career paths and possibilities

b. Review categories and applications of refractory work in general
- New vs. existing structures
- Structural vs. nonstructural refractory work
- Refractory walls vs. other refractory installations/applications
- Scheduled vs. special-case maintenance/repair
- Plastic vs. castable refractories
- Masonry heaters/stoves
- Smokestacks and smoke-stack linings (including comparison/contrast re: chimneys)
- Furnaces and kilns (including comparison/contrast re: fireplaces)
- Vessels and tanks
- Ladles and miscellaneous applications
- Substrates (including brick, metal, concrete, wood, insulation boards)
- Relevant specifications and standards – source(s); criteria
- Other (specified by instructor)

c. Review classification and significant characteristics of refractory materials.
- Bricks (Fireclay; High Alumina; Silica; Chrome; Magnesite; Forsterite)

- Blocks
- Tile
- Monolithics
- Plastics (ramming mixtures)
- Castables
- Mortars
- Cements, clays, and sprays (including
- Guniting materials
- Chemical products (e.g., epoxies)
- Insulation (major types, uses)
- Hardware (e.g., anchors and brackets)
- Miscellaneous products (e.g., ceramic fibre/rope/paper; wool; blankets modules; cartons, etc.)

d. Review important physical/chemical properties and their relevance
   - Adhesion and cohesion
   - Composition and weight
   - Consistency
   - Ratings re: heat-resistance and combustion point
   - Melting point, fusion, and vitrification
   - Air-setting vs. heat-setting
   - Stability (expansion/contraction)
   - Rigidity vs. malleability
   - Modulus of rupture (transverse resistance to 'cross-breaking')
   - Resistance to abrasion
   - Resistance to oxidation
   - Resistance to acidity
   - Slagging
   - Spalling
   - Setting time
   - 'Shelf-life' (e.g., re: mouldables)

2. Review/demonstrate instructor-specified procedures re: refractory work. 20%

a. Overview of major tasks
   - Dip material (firebrick; acid brick)
   - Lay material
   - Ram plastic
   - Set forms
   - Weld anchors/brackets
   - Pour/vibrate castables
   - Spray with nozzles

b. Precautions re: special hazards, regulations, and other requirements
   - Examples of refractory work-related fatalities
   - Job safety assessment
   - Selection/use of personal protective equipment (including fall-arrest)
   - Cool-down requirements, including control of water/steam
   - Lockout procedures
   - Confined-space entry
   - Ventilation
   - Handling/disposal of hazardous materials/byproducts
   - Other (specified by instructor)

c. Interpret requirements re: engineered scaffolding and other access structures
d. Removal of compromised material (e.g., lining)
e. Cleaning and preparation of substrate
f. Selection and use of required tools, equipment, and accessories, including:
   - Guniting equipment
   - Mechanical mixers/vibrators
   - Pneumatic jackhammer
   - Bolster-surface roughener
   - Pneumatic rammers/tamping tool
   - Wet blankets and/or plastic sheets
   - Scutch hammer
   - Heater

- Skid steer
- Fans
- Other (specified by instructor)

g. Refractory materials handling
h. Cutting refractory materials (e.g., lining)
i. Mixing, pouring/injection, and vibrating of castables
j. Mixing/injection of epoxy
k. Ramming (of plastic)
l. Formwork
m. Dipping and laying of firebrick
n. Placement of refractory products
o. Use of expansion joints
p. Use of control joints
q. Anchorage and stabilization of refractory materials (including welding of anchors/brackets)
r. Curing and thermal drying of refractory systems
s. Inspection and verification of job re: standards
t. Other (specified by instructor)

3. Describe/demonstrate procedure for facing heaters, stoves, and accessories. 30%

a. Types of masonry heater and their function
   - Heaters and stoves, including conventional and pre-cast masonry heaters
   - Past and present variations (e.g., Scandinavia; Russia; North America/UK)

b. Construction/installation standards and requirements
c. Components
d. Installation of masonry units, including bonding methods and patterns
e. Installation of required hardware
f. Assembly of precast masonry/stove units

4. Demonstrate procedure for lining/refining furnaces, kilns, vessels, etc. 30%

a. Preparations for installation/re-installation
   - Interpret drawings and job specifications re: layout, materials, and other requirements
   - Remove existing brickwork or lining
   - Preparation of mortar and accessories

b. Installation of refractory and/or acid-resistant brick
   - Lay out location of walls and expansion joints
   - Install brickwork per specifications (dry/thick/thin joints)
   - Incorporate control joints
   - Incorporate steel lintels or frames
   - Incorporate provisions for mechanical/electrical system components

c. Lining/relining with castable refractories
   - Dampen/lubricate forms and/or substrates
   - Bolt anchors at specified locations

d. Lining/relining using plastic refractories
   - Bolt anchors at specified locations
   - Install temporary supports for arches or ceiling
   - Place plastic slabs on substrate(s)
   - Complete procedure per specifications for setting process

e. Other (specified by instructor)

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Apprenticeship Manitoba

Bricklayer

Unit: F4 Ornamental Masonry: Paving, Glass Block and Other Specialties

Level: Three

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

This instructional unit is intended to broaden still further the Bricklayer apprentice's repertoire of skills and knowledge regarding ornamental masonry specialties. Content includes valuable information about masonry pavings, tilework, and overlays, as well as such specialty units as glass block and sculptured masonry. Many, and perhaps even most apprentice bricklayers might not have opportunity to try their hand at these well-established trade techniques during their on-the-job Practical Training, and thus the unit's shop demonstrations and practical hands-on exercises are intended to be of particular value. Some of the applications involved – such as glass-block panels or brick-pavements – require special care in handling and installation, even as consumer and architectural demand for them will probably continue to vary during the course of a bricklayer trade career.

Completing this unit of instruction, then, will enable apprentices to take advantage of opportunities in ornamental specialty work when they arise, while rounding out the apprentice's ability to satisfy prescribed standards for journey-level certification in the trade.

Objectives and Content: **Percent of Unit Mark (%)**

1. Review the scope/significance of ornamental masonry specialties. 20%

a. Parging and mortarless overlays
b. Masonry pavings and tilework
c. Glass block and glazed block
d. Sculptured masonry units
e. Important considerations re: procedure for ornamental masonry units
   - Factors affecting durability (including frostline, foundation, drainage, batter and backing, expansion joints, flashing, and caping)
   - Preparing site, including foundation building and establishment of finish grade
   - Lay out, including gauging and use of storey poles
   - Laying units to specified bond patterns
   - Bonding pilaster in wall
   - Tying-in and bonding re: intersections
   - Laying out bond and erecting pier
   - Installing accessories
f. Other (specified by instructor)

2. Describe/demonstrate parging and other overlay techniques. 20%

a. Parging
   - Rationale and applications
   - Selection and use of products
   - Mortars and bonding agents
   - Special hazards, precautions, and regulations

b. Parging techniques and procedure
   - Surface preparation
   - Mixing of various mortars
   - Achieving specified thickness
   - Application of parging material
c. Mortarless overlays
   - Overlay products (including adhesives), systems, and their application
   - Fastening systems for mortarless overlay
d. Overlay techniques and procedure
   - Selection/use of mechanical tools (including floor sanders; power trowel)
   - Preparation and use of adhesives
   - Maintenance of bond/pattern
   - Gauging to specified heights
   - Use/installation of overlay fasteners
e. Other (specified by instructor)

3. Describe/demonstrate masonry pavement/tilework techniques. 20%

a. Rationale/applications
   - Interior vs. exterior applications (driveways; floors; patios)
   - Vertical work (piers; pilasters; walls)
b. Varieties of masonry pavement/tilework units and associated materials
   - Nominal vs. modular shapes
   - Mortared/mortarless installation
   - Type M vs. Type S mortar (interior vs. exterior)
c. Types of masonry pavement and their significant characteristics
   - Rigid (mortared)
   - Flexible (mortarless)
   - Semi-rigid (mortarless; flexible joints)
   - Soil-based vs. concrete vs. based
   - Sloped pavement (crowning and angle)
   - Span pavement
   - Bituminous-compound pavement
d. Major components
   - Base/foundation
   - Cushion (levelling)
   - Surface units
   - Drainage provisions (sloped; gravel bed; french/gutter drain)
e. Major bond patterns re: pavements
   - Basketweave
   - Herringbone
   - Running bond
   - Stack bond
   - Circular and running bond
   - Running and stack bond
f. Joints
   - Mortar
   - Dry grout
   - Wet grout
   - Sand-filled
g. Installation procedure/techniques: soil-base masonry paving
   - Lay out; placement of stakes and lines
   - Exposure and compaction of base soil
   - Placement of membrane on base soil
   - Placement of sand/gravel re: drainage cushion
   - Laying of brick edging
   - Laying of surface units
   - Sand-filling of joints/edging
h. Installation procedure/techniques: concrete-base masonry paving
   - Lay out; placement of stakes and lines
   - Removal of soil to desired slope for base
   - Placement of gravel sub-base for drainage between soil and concrete

- Placement of membrane and reinforcement
- Placing of concrete for base
- Laying of surface units and forming of mortar joints

i. Factors/special provisions affecting durability
j. Installation guidelines, standards, and factors/precautions re: durability
   - Re: frostline/level
   - Re: drainage
   - Re: base preparation
   - Re: cushion/bed preparation
   - Re: paving unit installation
   - Re: drainage
   - Re: joints
   - Re: mortars
   - Re: brick edging
   - Re: slopes, screed elevation, and establishment of finished grade

k. Other (specified by instructor)

4. Describe/demonstrate the installation of sculptured masonry units. 20%

a. Classification and variety of units/materials (including common shapes/sizes)
b. Applications and associated special requirements
c. Use of detail drawings and sketches, including re: numbering/coding of units
d. Surface preparation
e. Laying up sculptured units
f. Maintaining pattern and bond
g. Other (specified by instructor)

5. Describe/demonstrate the installation of glass block and glazed block. 20%

a. Applications
   - Window openings
   - Wall panels

b. Product varieties and specifications
   - Square units, including dimensions
   - Rectangular units, including dimensions
   - Patterns
   - Spacers
   - Ties

c. Significant characteristics re: project requirements/application
   - Handling requirements
   - Two panels moulded to form single hollow unit
   - Non-loadbearing
   - Relatively unstable re: expansion/contraction
   - Optimum panel size
   - Cleaning without damaged exposed surface areas

d. Installation procedure and techniques
   - Chased vs. recessed method
   - Panel method
   - Required measurements
   - Composition and consistency of mortar
   - Mortar additives – e.g., integral waterproofing agents only (stearates)
   - Sizing and tooling of joints (full), including allowance for expansion
   - Use of expansion strips, including minimum/maximum dimensions
   - Materials/procedure re: waterproofing
   - Use of spacers

e. Other (specified by instructor)

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Apprenticeship Manitoba

Bricklayer

Unit: F5 Restoration Masonry: Major Concepts and Techniques

Level: Three

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

Restoration masonry represents a particularly complex and exacting trade specialty, for it requires not only a thorough familiarity with contemporary trade practices, but also a well-developed practical sense of how builders have worked in the past. Many restoration projects involve relatively simple, self-evident tasks - such as repointing an old chimney – that are commissioned mainly for economic reasons. Other projects, such as the recent refurbishing of the Manitoba Legislature, involve major financial investment, collaboration with experts in other fields and disciplines, as well as stringent regulations and the community's stake in the conservation of its built heritage.

This unit of instruction explores both the theoretical and practical dimensions of restoration masonry. Content includes valuable tools for understanding, identifying, resolving, and documenting problems in restoration masonry that can be applied to almost any project, whether large or small.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe masonry restoration re: scope/significance and rationale. **15%**

a. Goals, rationale, and major concepts re: conservation/restoration of masonry structures
b. Regulatory and social dimensions
   - Historical, cultural, architectural, and enviromental significance of sites/built structures
   - Designation, documentation, and other regulatory dimensions re: federal, provincial, and municipal jurisdiction
   - Local examples of major recent projects (e.g., Manitoba Legislature)
c. Trade-level practical dimensions of masonry restoration and associated tasks
d. Other (specified by instructor)

2. Describe/demonstrate the deterioration of masonry materials/structures. **15%**

a. Impact 'Zones' and their significance re: restoration masonry
   - Zones of exposure
   - Zones of saturation
   - Zones of evaporation
b. Materials
c. Nature of substrates and soiling
   - Distinction between soiling and patina
   - Soiling due to water, moisture, airborne particulates, soil chemistry, etc.
   - Soiling due to chemical reactivity of masonry units/materials (e.g., binders, paints, coatings, flashings, iron accessories, etc.)
d. Factors and causes re: masonry deterioration/decay
   - External forces and structural movement (e.g., heaving; earth tremors)
   - Initial construction errors, including incorrect bedding; use of soft, low-fired brick; selection/installation of iron anchors and other faulty reinforcement; etc.

- Post-construction history – including structural loading; fire damage, proximity of heavy traffic or adjacent excavation; fire damage; sandblasting; re-pointing with mortar that is too hard, etc.
- Pigeons, plants, and fungi (e.g., ivy or creepers)

e. Major varieties of masonry deterioration/decay, including symptoms and their incidence
- Acid attacks (especially re: marble, limestones, and lime mortars)
- Skin formation (especially re: limestones and sandstones
- Organic growth (especially re: stones and mortars)
- Salt crystallization (especially re: bricks, mortars, renders, and stones)
- Weathering/erosion
- Surface Crust
- Exfoliation (Delamination)
- Spalling
- Cracking
- Efflorescence

f. Other (specified by instructor)

3. Describe/demonstrate restoration procedure re: inspection and analysis. 15%

a. Problem-solving and troubleshooting methods as a trade-related technology
- Parallels with quality assessment/assurance practices
- Roles, responsibilities, and restoration-project relationships (e.g., architect; engineer; home inspectors; subtrades, etc.)
- Components of problem-solving and troubleshooting as systematic process

b. Practical identification and specification of masonry restoration targets
c. Usefulness of Inspection Checklist for masonry restoration projects
d. Inspection Checklist Criteria re: site characteristics
e. Inspection Checklist Criteria re: built structure
- Roof, including chimney and cap; flashing, gutters, corners/copings on parapets, etc.)
- Windows and doors (truth/soundness; slope/drainage of sills; caulking, etc.)
- Basement and foundation
- Interior surfaces
- Walls (including evidence of additions to original structure)

f. Inspection Checklist re: masonry units and components
- Materials
- Bulges/cracks (e.g., in units and/or assemblies)
- Voids (e.g., missing/broken bricks or stone units)
- Moisture (e.g., staining, efflorescence, seepage, stains, etc.)
- Coatings (e.g., paints, parging or deteriorated waterproof coating, etc.)
- Joints (type of mortar; condition; breaks/chipping along joints, etc.)

g. Common sites, problems, and solutions re: masonry restoration/repair
h. Other (specified by instructor)

4. Describe/demonstrate practical techniques re: masonry restoration. 155

a. General scope of masonry remedial work
- Use of technical drawings, specifications, and coded components
- Performing onsite measuring, monitoring and documentation
- Jointing (including use of backing rods)
- Cleaning
- Washing
- Flashings
- Cementitious repairs
- Sealants
- Surface treatments
- Disassembly of units
- Preparation of substrates
- Reinstallation/reassembly of masonry units/components
- Replacement of masonry units/components
- Reproduction/moulding of architectural profiles and masonry design features

b. Cleaning techniques
- Testing re: job requirements

- Comparison/contrast re: preferred use of particular cleaning methods and techniques re: brick; terra cotta; marble, limestone, calcacareous/silicious sandstones; granite; concrete; cast stone; slate; glass block
- Special hazards and precautions (e.g., live steam; pressurized water; chemical agents)
- Required tools and equipment
- Scheduling and organization of work
- Water- and steam-cleaning methods (including soaking)
- Pressurized air
- Surfactant (soap/detergent) cleaning method
- Chemical methods, including acidic/alkaline systems
- Organic solvents, including gels and poultices
- Mechanical cleaning methods, including abrasives, grinding, etc.
- Paint removal
- Use of water pump, electronically controlled timer, and oscillating fan

c. Repointing techniques re: brickwork
- Step-wise procedure, layered build-up of mortar
- Preparation, selection, and aging of mortar(s)
- Removal, raking, replacement, and tooling of old/new mortar
- Joint shape
- Clean-up
- Application of scrub/slurry coating – advantages/disadvantages

d. Stonework repair techniques
- Common problems and specific solution
- Dutchman repair
- Crack repair
- Blind exfoliation repair
- Veneering repair
- Composite patching (plastic repair)
- Consolidation re: crumbling, spalling, and sugaring
- Masonry replacement

e. Techniques re: onsite measurement, mouldings, profiles, etc.
- Use of profile gauges
- Creation/use of templates
- Simple castings
- Onsite measurement re: stitching, pinning, and grouting
- Documentation and record-keeping re: relevant measurements

f. Repair techniques and tips re: common varieties and locations
- Foundations
- Walls (cavity and solid wall types)
- Window and door openings (arches/lintels/sills)
- Chimneys
- Stairs

g. Other (specified by instructor)

5. Complete the Masonry Restoration Project per instructor specifications. 40%

a. Review of all drawings and project specifications with instructor
b. Monitoring project re: required documentation, component coding, record maintenance, etc.
c. Mortar/grouting systems for masonry restoration/repair
- Mixing of mortars/grouts
- Lay up abutment to skewback height
- Application of mortars/grouts

d. Reconstruction
- Disassembly of specified units/components
- Preparation of area for reinstallation/reassembly
- Execution of reinstallation/reassembly per Project specifications

e. Restoration of existing masonry
- Removal of damaged components
- Protection/preservation of adjacent masonry
- Preparation of work surface/substrate

f. Reproduction of a simple masonry profile or moulding
- Measurement and transfer of measurements

- Use of profile gauge and creation of template
- Other (specified by instructor)

g. Cleaning and preservation
   - Use/interpretation of MSDS and observance of safety requirements
   - Handling and application of cleaning agent
   - Application of sealant(s) and protective coating

h. Other (specified by instructor)

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Apprenticeship Manitoba

Bricklayer

Unit: G2 Lifting, Rigging and Hoisting on the Masonry Jobsite

Level: Three

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

The majesty of masonry structures owes much to their design, usefulness, and durability. But it also owes a lot to the often-mysterious trade secrets that have enabled stone-builders to move large, heavy objects into place and ensure that these would stay put – often for centuries at a time. For example, quite apart from their beauty as built structures, the pyramids of pre-Columbian Latin America and ancient Egypt as well as the cathedrals of Europe occasion awe partly because they are a clear testament to masonry workers' unrivalled and magical-seeming skill in moving and handling the materials of their trade. To an outsider, it may even appear that masonry work has much to do with defying the force of gravity. Trade insiders know otherwise. A repertoire of rigorously-applied jobsite techniques for lifting, rigging, and hoisting masonry materials is a vital part of the Manitoba Bricklayer apprentice's heritage as a trade learner.

This unit of instruction introduces the basic concepts, techniques, and jobsite aids that are involved in the handling and placement of masonry materials. Content includes important information about how gravitational and other forces act on material loads of different shapes and size. The unit familiarizes apprentices with the rich fund of practical know-how and technological aids – both simple and complex – that are used to stabilize and position these loads as a routine requirement of modern trade practice. The considerable hazards in handling them on the masonry jobsite are also subject to important regulations and restrictions as outlined in this unit.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe lifting, rigging, and hoisting in the modern Bricklayer trade. 20%

a. Scope and rationale re: lifting, rigging, and hoisting applications
b. Technical terms and major concepts (e.g., gravitational centres; mechanical advantage)
c. Calculation of loads and weights
d. General hazards and precautions re: transportation/handling of masonry materials
   - Size of load
   - Shape/symmetry of load
   - Fragility of load (e.g., concrete panels vs. glass block vs. reinforcing steel)
   - Rigidity/stability of load
   - Identification of balance/stabilization points
   - Identification of required clearances re: start/end points
   - Interplay with access/temporary structures (e.g., lift block while on swingstage)
   - Regulatory considerations
e. Other (specified by instructor)

2. Describe/demonstrate masonry lifting procedure and techniques. 20%

a. General guidelines, precautions, and regulations re: trade-related lifting operations
b. Manual lifting
   - Precautions (e.g., secure footing; bending of knees)
   - Simple aids (e.g., rope and pulley)

- General techniques
- Special considerations re: particular masonry materials/loads

c. Mechanically assisted lifting
   - Precautions (e.g., hands; feet; position of other personnel)
   - Mechanical aids (e.g., hydraulic jack)
   - General techniques
   - Special considerations re: particular masonry materials/loads
d. Basic features and preferred uses of the forkllift
   - Manitoba requirements/restrictions re forklift operation
   - Major components
   - Preferred uses
e. Other (specified by instructor)

3. Describe/demonstrate masonry rigging procedure and techniques. 20%

a. General guidelines, precautions, and regulations re: trade-related rigging operations
b. Knots and splices
   - Bowline
   - Clove-hitch
   - Rescue knot
   - Scaffold-hitch
c. Identification/use of specified rigging aids and equipment
   - Balance bar
   - Chain
   - Choker
   - Clip
   - Come-along
   - Deadman
   - Drum
   - Equalizer beam
   - Fid
   - Hitch
   - Hook
   - Marline spike
   - Pulley
   - Ring
   - Rope – fabric and wire
   - Shackle
   - Sheave
   - Sling
   - Socket
   - Spreader bar
   - Thimble
   - Tirfor
   - Winch
   - Other (specified by instructor)
d. Determination of load limits
e. Determination of placement of load
f. Determination of Safe Working Load (SWL)
g. Placement of chokers and taglines in general
h. Placement/use of chokers and slings for special-requirement loads
   - Smooth, heavy loads
   - Long, flexible loads
   - Imbalanced loads
   - Heavy, fragile loads
i. Other (specified by instructor)

4. Describe masonry hoisting techniques and procedure. 20%

a. General guidelines, precautions, and regulations re: trade-related hoisting operations
b. Major varieties of hoisting equipment/components, including preferred use and specific hazards/precautions
   - Derricks

- Winches
- Boom trucks (including 'zoom boom' cranes)
- Conventional vs. hydraulic cranes
- Tower Cranes

c. Coordination/ communication with hoisting equipment operator and other site personnel
d. Other (specified by instructor)

5. Complete the Masonry Rigging & Hoisting Project per instructor specifications. 20%

a. Identify all requirements, including safety hazards/precautions, re: rigging and lifting instructor-specified load(s) as a function of particular masonry material(s)
b. Select and use required rigging/lifting aids re: instructor-specified load(s)
c. Communicate/coordinate with other jobsite personnel re: lifting of instructor-specified load.
d. Other (specified by instructor)

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Apprenticeship Manitoba

Bricklayer

Unit: G3 Jobsite Coordination and Maintenance

Level: Three

Duration: 7 hours

Theory: 5 hours

Practical: 2 hours

Overview:

The coordination and maintenance of Bricklayer trade jobsites in 'real time' are essential to the safety, efficiency, and successful completion of masonry construction projects. Specific requirements vary widely with the complexity, scale, and seasonality of particular projects. Some of these requirements are common to all masonry jobsites. They include the need to move, handle and store masonry materials and equipment in a secure, orderly manner. They also involve the need to position personnel as well as materials so that the installation of masonry products can proceed according to project plans and industry standards. As well, jobsite coordination requires Bricklayers to dovetail their efforts with those of other jobsite personnel in accordance with the project sequence and timetable. The latter is so important that it is often entrusted to a hierarchy of jobsite coordination specialists that may include lead hands, site bosses, and superintendents, depending on project size and complexity.

This unit of instruction is intended to help apprentice bricklayers assume increasing responsibilities as members of a coordinated jobsite team. Content may be of particular interest to those apprentices who hope eventually to specialize as project supervisors themselves. The immediate focus, however, is on understanding the scope and nature of jobsite coordination/maintenance requirements that apply to apprentices and journeyworkers, including the way these vary with the seasons – for example, with respect to the need for hoardings and other weather-related practices. Other units supplement this introduction to jobsite systems with more detailed content on such topics as lifting, rigging, and hoisting, as well as the safe use of scaffolding and other access structures. This material supplements other program content concerned with safety, communications, and trade standards.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe the coordination and maintenance of project jobsites as a system. **30%**

a. Goals, rationale, and major concepts re: jobsite coordination/maintenance
b. Jobsite planning coordination/maintenance requirements
   - 'Macro'-level
   - 'Micro'-level
c. Variation in jobsite coordination/maintenance requirements and provisions
   - Jobsite safety assessment(s)
   - Roles and responsibilities (including apprentices)
   - Chains of responsibility and accountability
   - Scale and complexity of projects
   - Sequencing and scheduling of project phases
   - Composition of project workforce (including other trades) and its significance
   - Impacts of seasonality and climate
   - Revision of schedules
   - Regulatory and other relevant considerations (including environmental)
d. Career ladders and opportunities within and beyond the trade
e. Symptoms/consequences of faulty coordination/maintenance
f. Other (specified by instructor)

2. Describe/demonstrate coordination and maintenance techniques in general. 30%

a. Planning and organization of masonry project jobsite
   - Schedules (including procurement/delivery of materials)
   - Layout of physical areas re: materials and equipment
   - Temporary utilities, including sources of electrical power, light, water

b. Consultation and communication, including jobsite documentation, inventory-keeping, and signage

c. Handling, storage, and use re: masonry materials and equipment
   - Lifting and shifting
   - Rigging and hoisting
   - Safety and security

d. Access and temporary structures (OHS/environmental considerations)
   - Guardrails
   - Ramps
   - Ladders
   - Shoring
   - Hoardings (environmental; weather-related; engineered hoarding equipment)
   - Stages and swings
   - Scaffolding and scaffold systems

e. Troubleshooting tips and techniques re: masonry jobsite coordination/maintenance

f. Other (specified by instructor)

3. Describe/demonstrate coordination and maintenance techniques re: winter conditions. 40%

a. Scope of trade-related requirements re: winter conditions
   - Implications re: regulatory requirements and employer policy (e.g., shutdowns)
   - Implications re: scheduling, sequencing, and intensity of trade activity
   - Implications re: jobsite personnel (e.g., length of 'stints'; hypothermia/frostbite)
   - Implications re site and access-structure characteristics (e.g., icing and other special hazards on deck of scaffolding)
   - Implications re: specific masonry products and materials (e.g., mortars, concrete, dimensional units, etc.)
   - Implications re: required tools and equipment (e.g., heaters)

b. Use/selection and hazards/precautions re: of materials and equipment for winterizing masonry jobsite
   - Tarpaulins and tarpaulin systems (including insulated and engineered varieties)
   - Tie wire and other fasteners
   - Lumber and other wood products
   - Electrical supply (including extension cords)
   - Ventilation hazards and precautions
   - Generators
   - Propane tanks
   - Heaters (electrical and gas-burning)

c. Practical procedure/techniques re: covering work and supply area(s)
   - Relevant standards and technical requirements
   - Special safety hazards and precautions, including regulatory requirements
   - Installation and securement of tarpaulins
   - Construction/inspection of hoarding(s)

d. Practical procedure/techniques re: heating work and supply area(s)
   - Relevant standards and technical requirements
   - Special safety hazards and precautions, including regulatory requirements
   - Installation, operation, and monitoring of electrical heaters
   - Installation, operation, and monitoring of gas heaters
   - Ventilation and fresh-air supply
   - Heating of water required for preparation of mortar
   - Heating of sand for preparation of mortar

e. Other (specified by instructor)

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