REQUEST FOR PROPOSALS

(RFP # 1107)

Railway Car Technician

Program Outline and Examination Item Bank Development Project

November 2007

TABLE OF CONTENTS

PURPOSE 1

BACKGROUND 1

PROJECT REQUIREMENTS & SCOPE 2

PREFERRED SUPPLIERS 3

PROPOSAL FORMAT 3

EVALUATION CRITERIA 4

QUESTIONS RELATING TO THE RFP 4

PROCUREMENT SCHEDULE 5

PROPOSAL SUBMISSION 5

LIST OF APPENDICES

1. ONTARIO RAILWAY CAR TECHNICIAN PROGRAM OUTLINE (2007)

2. EXAMPLE OF COMPLETED PROGRAM OUTLINE

3. PROGRAM STANDARDS SPECIFICATION DOCUMENT

4. TABLE OF SPECIFICATIONS TEMPLATE

5. ITA EXAMINATION BANK GUIDELINES

6. INTENT TO SUBMIT FORM

REQUEST FOR PROPOSALS
(RFP # 1107)
PROGRAM OUTLINE AND EXAMINATION ITEM BANK DEVELOPMENT

PURPOSE

The Railway Association of Canada (RAC) seeks proposals from qualified Canadian organizations to convert the existing Ontario outline for the Railway Car Technician Program into the established BC format, meeting the program outline standards of the Industry Training Authority (ITA) in British Columbia. Further, the selected organization will develop a 300 question examination item bank for each of the Levels (1 – 3) of the Railway Car Technician Apprenticeship Program and complete an analysis of available learning resources based on the program outline.

BACKGROUND

The Railway Association of Canada, situated in the nation's capital, represents membership of approximately 60 freight, tourist, commuter, and intercity Canadian railways, playing a major role in promoting the safety, viability, and growth of the railway industry within Canada. More information on the RAC can be found at www.railcan.ca .

The British Columbia Industry Training Authority (ITA) approved a proposal at its January 23rd, 2007 Board meeting to modify the Railway Car Technician Program. The ITA Board has placed a priority on the establishment of rigorous and well-defined industry training program standards in order to ensure the credibility and broad recognition of the qualifications and credentials it provides to trainees. In this respect ITA sees its role as approving and applying standards that have effectively been defined by industry bodies, including national inter-provincial standards mechanisms. More information on the ITA can be found at www.itabc.ca .

To facilitate program and credential alignment and inter-provincial mobility of workers, British Columbia is adopting the Railway Car Technician apprenticeship program that is currently recognized in Ontario, to meet specific provincial requirements. For example, ITA has established specifications for all key elements including program outlines, tables of specifications, and examination item banks. The Ontario Railway Car Technician Program will need to be modified to meet these BC standards.

ITA uses LXR examination management system for item banking, exam generation, scoring and item analysis.

PROJECT REQUIREMENTS & SCOPE

1. Convert the existing Railway Car Technician Program Outline (See Appendix 1) from Ontario, to the British Columbia ITA Format. (See Appendix 2 and Appendix 3)
    - This includes the development of achievement criteria for workplace competencies.
    - The outline must include the following Training Provider Standards:
        - Tools
        - Equipment
        - Facilities
        - Instructor Qualification.

2. Develop a **Table of Specifications (TOS)**, (See Appendix 4) based upon the ITA Railway Car Technician Program Outline that will serve as the basis for the development of examination item banks for Level 1-3 of the provincial apprenticeship program. The TOS will specify, by Level, the number of multiple choice questions for each Line / Block based on the suggested instructional time allocations detailed in the Program Outline; the total number of questions in the bank; and the number of questions in taxonomy 1 – 3.

3. Develop an **Examination Item Bank,** based upon the Table of Specifications, for each of the program's 3 levels that assesses attainment of learning outcomes (objectives and tasks) specified in the Program Outline. The item bank for each level will comprise 300 multiple choice questions developed in accordance with ITA exam bank guidelines. (See Appendix 5) The item banks are intended to enable the generation of three distinct level examinations comprising 100 questions each without duplicating items.

4. Conduct an Examination Item Bank Validation Workshop with industry subject matter experts to ensure the reliability and validity of the item bank multiple choice questions. The selected supplier(s) will need to take measures to ensure the integrity and security of the examination bank during the validation process.

5. Deliver to ITA the completed and validated item banks for each level in Microsoft Word electronic format along with a full assignment of copyright of the item bank(s) to ITA.

6. Complete a gap analysis of available learning resources, against the competencies in the BC Program Outline.

PREFERRED SUPPLIERS

Preferred service suppliers may be public, private, or non-profit Canadian organizations with demonstrated expertise and experience in one or more of the following the following areas:

- Training design and implementation, preferably for trades occupations
- Curriculum design and development
- Examination and assessment development
- Subject matter expertise (Railway Car Technician)

Proposals based upon a partnership arrangement among suppliers are acceptable with the requirement that one partner is designated as the lead organization for contract and accountability purposes. The selected supplier will be required to enter into a standard Contract with the Railway Association of Canada.

PROPOSAL FORMAT

Any portions of the proposal which is to be treated by RAC as proprietary and confidential information must be clearly marked as such. *Clarity and brevity are important*. All proponents must provide, at a minimum, the following information:

A. Table of Contents

A table of contents properly indicating the section of the information included

B. Understanding of the Project

A concise abstract stating the proponant's overview and understanding of the project.

C. Organization Qualifications

A company / organizational profile; a statement of qualifications; vendor relationships; and resumes of project manager(s) and professional staff that are to be directly involved in providing the required services

D. Methodology

A description of how the proponent plans to execute the project including a work plan detailing major tasks and timelines.

E. Price Proposal

A price proposal detailing all costs for labour, materials, travel and any other costs that may be incurred in the provision of the required services.

F. References

A minimum of two references for similar project-related work completed within the past three years and include:

- Project Description
- Project Location
- Contact name and telephone number and e-mail address
- Date of completion

EVALUATION CRITERIA

Each proposal will be reviewed prior to the selection process for completeness and adherence to the format. A proposal will be considered complete if all required sections are present. Proponents may provide any additional information that they consider relevant. All proposals will be evaluated under the following criteria:

1. Proponent's costs, including labour, travel, expenses and materials (30%)
2. Proponent's overall technical capabilities based upon demonstrated experience, past performance, reliability and project team qualifications. (25%)
3. Project methodology (25%)
4. Client references for project of a similar nature (10%)
5. Proposal preparation, thoroughness and responsiveness to the requirements of the RFP. (10%)

The RAC will not be bound to accept the lower cost proposal, nor any proposal at all.

The RAC shall be entitled to cancel this RFP award of the related contract at any time before awarded and no compensation of any nature shall be payable to the consultants because of the exercise of this option

QUESTIONS RELATING TO THE RFP

There will be no pre-proposal bidders' conference for the RFP. Proponents with questions relating to the RFP should contact kflint@railcan.ca via e-mail within the prescribed timeline. All questions and answers will be shared, via e-mail, with those persons / organizations who have submitted an Intent to Submit Form (Appendix 6).

PROCUREMENT SCHEDULE

1.	RFP Released	November 19, 2007
2.	Deadline For Submission of Intent	November 26, 2007
3.	Response to Submitted Questions	November 29, 2007
4.	Deadline For Submission of Proposals	December 7, 2007
5.	Proposal Evaluation	December 10-14, 2007
6.	Contract Award	December 21, 2007
7.	Project Initiation	January 2008

The RAC does not guarantee that these dates will be respected as they are dependent on selection committee availability and other factors not within the RAC's control, such as other business priorities. The RAC endeavours to act diligently in order to meet the dates.

PROPOSAL SUBMISSION

All organizations that intend to submit proposals must first submit the Intent To Submit form (Appendix 6) to Kent Flint @ kentf@railcan.ca not later than 17:00 on November 26, 2007.

Completed proposals shall be submitted electronically to kentf@railcan.ca no later than at 17:00 on December 7, 2007.

APPENDIX 1

ONTARIO RAILWAY CAR TECHNICIAN PROGRAM OUTLINE

Apprenticeship
In-School Curriculum Standards

Railway Car Technician

Level 1

268R

Ministry of Training, Colleges & Universities
Workplace Training Branch

Development date: September 2006
Implementation date:
Printing date:

This new curriculum standard for the Railway Car Technician trade is designed from the learning outcomes, which were developed from the industry-approved training standard.

The curriculum is organized into three levels of training, each including reportable subjects containing learning outcomes to reflect the units of the training standard. The hours charts indicate how the curriculum can be delivered in the current block release format and summarizes the hours of training for each reportable by level. Since the reportable subjects are all divisible by three they can be adapted to accommodate a more flexible training delivery other than block release.

The reportable subjects are cross-referenced to the training standard for ease of comparison.

Each reportable subject and learning outcome identifies a recommended number of training hours. This hour allotment is broken into hours for instruction in theory and practical application. The division of the curriculum into reportable subjects follows a natural progression of learning through the training program. This structure will allow training centres and apprentices flexibility in program delivery while still observing the importance of sequencing learning in a logical progression.

The curriculum is framed by and includes specific references to terminal performance objectives in the Apprenticeship Training Standards Railway Car Technician. However, the curriculum identifies only the learning that takes place off the job, in a training environment. The in-school program focuses primarily on the theoretical knowledge required to master the performance objectives of the Training Standards. Employers are expected to extend the apprentice's knowledge and skills through appropriate practical training on the work site. Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to assure that all apprentices have achieved the learning outcomes identified in the curriculum standard. The balance between theoretical and practical evaluation is identified for each unit of learning outcomes.

Implementation date: to be determined

Table of Contents

Introduction

Summary of Total Program In-School Training Hours 1

Program Summary of Reportable Subjects

1.0 - Protect Self and Others 2
1.1 - Protect Self and Others 3

2.0 – Occupational Practices 6
2.1 - Trade Calculations 7
2.2 - Engineering Drawings and Documentation 9
2.3 - Precision Measuring 11

3.0 - Workshop Techniques 13
3.1 - Hand and Power Tools 14
3.2 - Benchwork 17
3.3 - Materials and Fasteners 20
3.4 - Shop Environment 22

4.0 - Material Handling 24
4.1 - Material Handling Procedures 25

5.0 - Welding and Fabrication 1 29
5.1 - Welding and Fabrication 1 30

6.0 - Regulatory Publications 33
6.1 - Manual of Standards and Recommended Practices (M.S.R.P.) 34
6.2 - Code of Federal Regulations 36
6.3 - Association of American Railroads (AAR) 38

7.0 - Brakes 40
7.1 - Brakes 41

8.0 - Safety Appliances 43
8.1 - Safety Appliances 44

Reference Material 47

Summary of Total Program In-School Training Hours

Reportable Subjects	Total	Theory	Practical
1. Protect Self and Others	6	6	0
2. Occupational Practices	63	63	0
3. Workshop Techniques	63	24	39
4. Material Handling	18	12	6
5. Welding	33	9	24
6. Regulatory Publications	24	24	0
7. Brakes	24	15	9
8. Safety Appliances	9	9	0
Total	240	162	78

Number:	1
Title:	**Protect Self and Others**
Duration:	6 Total Hours Theory: 6 hours Practical: 0 hours
Prerequisites:	N A
Co-requisites:	N A

1.1 – Protect Self and Others

6 Total Hours Theory: 6 hours Practical: 0 hours

1.1 – Protect Self and Others

Cross-Reference to Learning Outcomes:

5570.01, 5570.04, 5570.05, 5570.10, 5570.11, 5570.15

Duration: 6 Total Hours Theory: 6 hours Practical: 0 hours

General Learning Outcome:

Identify and describe procedures and practices to protect self and others in accordance with Safety Legislation and site procedures/standards.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

1.1.1 Identify workplace health and safety hazards, corrective action requirements, and reporting procedures as specified by current government legislation.

1.1.2 Identify and describe safe work habits according to current government regulations.

1.1.3 Identify and describe fire procedures as specified in current government regulations and site procedures/standards.

1.1.4 Identify the procedures for the reporting of information about injuries and safety incidents according to the site guidelines and current government legislation.

1.1.5 Identify and describe the procedures for applying first aid as specified in current government regulations and site requirements.

1.1.6 Identify and describe procedures for handling work site hazards according to government legislation.

Learning Content:

1.1.1 Identify workplace health and safety hazards, corrective action requirements, and reporting procedures as specified by current government legislation.

- describe the current government legislation that relates to workplace hazards
- identify hazardous conditions
- describe the required reporting procedures
- identify the required corrective action to be taken

1.1.2 Identify and describe safe work habits according to current government regulations.

- describe safe work habits in accordance with current government and AAR regulations

1.1.3 Identify and describe fire procedures as specified in current government regulations and site procedures/standards.

- identify plan of action when a fire is detected
- describe the assessment of the severity of the fire
- describe techniques to suppress a minor fire
- describe reporting procedures related to fires

1.1.4 Identify the procedures for the reporting of information about injuries and safety incidents according to the site guidelines and current government legislation.

- describe the injury reporting procedures outlined in the current government regulations
- state the procedures for reporting injuries

1.1.5 Identify and describe the procedures for applying first aid as specified in current government regulations and site requirements.

- assess situations
- list the prescribed procedures for reporting injuries

1.1.6 Identify and describe procedures for handling work site hazards according to government legislation.

- identify workplace hazards including (but not limited to)
  - inadequate ventilation
  - confined spaces
  - noxious fumes
  - high intensity light
  - elevated work sites
  - suspended loads
  - poor lighting
  - extreme temperatures
  - uncontrolled power sources
- describe the procedure for notification of hazards
- identify applicable legislation related to workplace hazards

.

Number:	2
Title:	**Occupational Practices**
Duration:	63 Total Hours Theory: 63 hours Practical: 0 hours
Prerequisites:	N A
Co-requisites:	N A

2.1 – Trade Calculations

15 Total Hours Theory: 15 hours Practical: 0 hours

2.2 – Engineering Drawings and Documentation

33 Total Hours Theory: 33 hours Practical: 0 hours

2.3 – Precision Measuring

15 Total Hours Theory: 15 hours Practical: 0 hours

2.1– Trade Calculations

Cross-Reference to Learning Outcomes:

5571.02

Duration: 15 Total Hours Theory: 15 hours Practical: 0 hours

General Learning Outcome:

Perform metric and imperial calculations.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

2.1.1 Interpret charts, manuals, and job documentation.

2.1.2 Perform trade calculations.

2.1.3 Perform conversions of decimals and fractions.

2.1.4 Perform conversions of metric and imperial units for volumes, weights, tolerances, gauging limits, condemning limits, circumferences, radii, areas, diameters, temperatures, and torque values.

Learning Content:

2.1.1 Interpret charts, manuals, and job documentation.

- interpret and demonstrate use of trade specific conversion tables/charts
- interpret and demonstrate use of trade specific material and product-related specification and value tables and charts

2.1.2 Perform trade calculations.

- solve trade-specific problems using ratios and proportions
- solve trade-specific algebraic equations
- identify and calculate trade-specific perimeters, areas, and volumes

2.1.3 Perform conversions of decimals and fractions.

- round off decimals to the closest one thousandth of an inch
- change common fractions to decimal fractions and decimal fractions to common fractions
- add, subtract, multiply, and divide fractions
- add, subtract, multiply, and divide decimals
- identify and calculate percentages

2.1.4 Perform conversions of metric and imperial units for volumes, weights, tolerances, gauging limits, condemning limits, circumferences, radii, areas, diameters, temperatures, and torque values.

- identify and demonstrate conversions between SI (International Standards) and Imperial systems of measurements including (not limited to):
  - linear units
  - mass units
  - charts
  - tables

2.2 – Engineering Drawings and Documentation

Cross-Reference to Learning Outcomes:

5571.01, 5571.05, 5571.06

Duration: 33 Total Hours Theory: 33 hours Practical: 0 hours

General Learning Outcome:

Plan and prepare for a job according to engineering drawings, specifications, reference materials, and work orders.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

2.2.1 Interpret engineering drawings to plan the maintenance job.

2.2.2 Use reference documentation including (not limited to):manufacturers' manuals, parts bulletins, service or preventative maintenance manuals, technical bulletins, fact sheets, Association of American Railroads (AAR) field manuals, and government regulations to identify job specifications.

2.2.3 Use work orders including (not limited to): billing repair cards, wheel reporting cards, inspection records, and dangerous goods documentation.

Learning Content:

2.2.1 Interpret engineering drawings to plan the maintenance job.

- identify the type of drawing including (not limited to): schematics, blueprints, and assemblies
- determine tolerances, scales, and dimensions
- perform calculations
- identify drawing information including (not limited to): line types, symbols, title block information, references, abbreviations, and bill of materials
- identify common railway nomenclature/terminology
- identify components
- identify types of securement devices
- identify assembly and disassembly sequences

2.2.2 Use reference documentation, including (not limited to): manufacturers' manuals, parts bulletins, service or preventative maintenance manuals, technical bulletins, fact sheets, Association of American Railroads (AAR) field manuals, and government regulations to identify job specifications.

- identify applicable reference documentation
- identify assembly and disassembly sequences
- describe the properties and characteristics of workplace materials
- describe the properties and characteristics of cutting fluids/lubricants
- identify specialty tools
- identify applicable AAR interchange rules
- identify applicable government regulations

2.2.3 Use work orders including (not limited to): billing repair cards, wheel reporting cards, inspection records, and dangerous goods documentation.

- identify types of work orders
- identify applicable safety and dangerous goods legislation
- identify car billing repair codes
- determine work procedures or schedules
- identify applicable AAR interchange rules
- identify applicable government regulations

2.3 – Precision Measuring

Cross-Reference to Learning Outcomes:

5571.03, 5571.04

Duration: 15 Total Hours Theory: 12 hours Practical: 3 hours

General Learning Outcome:

Use and prepare precision measuring and checking devices to verify workpiece.

Learning Outcomes:

2.3.1 Upon successful completion, the apprentice is able to:

2.3.2 Prepare measuring and checking devices in accordance with the manufacturers' specifications.

2.3.3 Verify workpiece material in accordance with engineering drawings and job documentation.

Learning Content:

2.3.1 Prepare measuring and checking devices in accordance with the manufacturers' specifications.

- interpret engineering drawings and job documentation
- identify types of measuring devices including (not limited to): micrometers, callipers, wheel gauge, vernier callipers, magnetic particle tester, dial indicator, truck gauges, air pressure gauges, bubble flowrator, depth or height gauge, restoration gauges, levels, explosive safety meters, air quality meters, thickness meters, straight edge, tapes, steel rules, and plumb bob
- assess device condition
- describe the markings on measuring devices
- demonstrate measuring and checking practices
- describe methods for calibration
- describe maintenance procedures
- document processes

2.3.2 Verify workpiece material in accordance with engineering drawings and job documentation.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- describe the properties of ferrous or non-ferrous materials including (not limited to): steel, alloys, aluminium, and iron
- describe material testing practices
- identify workpiece material
- verify workpiece material for correct size and type

Number:	3
Title:	**Workplace Techniques**
Duration:	63 Total Hours Theory: 27 hours Practical: 36 hours
Prerequisites:	N A
Co-requisites:	N A

3.1– Hand and Power Tools

9 Total Hours Theory: 6 hours Practical: 3 hours

3.2 – Benchwork

36 Total Hours Theory: 9 hours Practical: 27 hours

3.3 – Materials and Fasteners

12 Total Hours Theory: 9 hours Practical: 3 hours

3.4 –Shop Environment

6 Total Hours Theory: 3 hours Practical: 3 hours

3.1– Hand and Power Tools

Cross-Reference to Learning Outcomes:

5571.07, 5571.08, 5571.09, 5571.10

Duration: 9 Total Hours Theory: 6 hours Practical: 3 hours

General Learning Outcome:

Identify and select hand, power, pneumatic, and hydraulic tools.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

3.1.1 Select hand tools.

3.1.2 Select power tools.

3.1.3 Describe the use and application of pneumatic tools.

3.1.4 Describe the use and application of hydraulic tools.

Learning Content:

3.1.1 Select hand tools.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- select required tool including (not limited to): hammers, wrenches, sockets, ratchets, chisels, drifts, punches, pinch bar, screwdrivers, files, saws, pliers, pipe wrench, and steel banding tools
- assess tool condition
- describe maintenance procedures
- describe methods for calibration

3.1.2 Select power tools.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- determine required tool including (not limited to): grinders, drills, die grinders, sanders, and saws
- assess tool condition
- determine calibration requirements
- determine required attachments and tooling

3.1.3 Describe the use and application of pneumatic tools.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- determine required pneumatic tool including (not limited to): jacks, grinders, drills, impact guns, reamers, drifts, punches, and rams
- assess tool condition
- determine calibration requirements
- determine required attachments and tooling
- determine tool limitations including (not limited to): leverage, weight ratios, capacity, tolerances, fluid power, clearances, and stability

3.1.4 Describe the use and application of hydraulic tools.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- determine required hydraulic tool including (not limited to): jacks, rams, Enerpac™, presses, wrecking equipment, and rivet guns
- assess tool condition
- determine calibration requirements
- determine required attachments and tooling
- determine tool limitations, including (not limited to): leverage, weight ratios, capacity, tolerances, fluid power, clearances, and stability

3.2 – Benchwork

Cross-Reference to Learning Outcomes:

5570.03, 5570.07, 5572.01, 5572.02, 5572.03, 5572.04, 5572.05, 5572.06

Duration: 36 Total Hours Theory: 9 hours Practical: 27 hours

General Learning Outcome:

Perform benchworking procedures in accordance with government legislation and job specifications.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

3.2.1 Chisel a workpiece in accordance with job documentation.

3.2.2 Grind a workpiece.

3.2.3 Describe painting procedures.

3.2.4 Drill or ream holes.

3.2.5 Cut internal (ID) and external (OD) threads.

Learning Content:

3.2.1 Chisel a workpiece in accordance with job documentation.

- identify applicable safety standards
- interpret applicable documentation
- select required tools per application
- inspect chisel for defects including (not limited to): burrs or mushroom head
- dress tool
- document work
- maintain a clean worksite

3.2.2 Grind a workpiece.

- identify applicable safety legislation
- interpret job specifications
- select applicable equipment and tooling
- set-up workpiece
- grind the workpiece
- maintain a clean worksite
- document work

3.2.3 Describe painting procedures.

- identify applicable safety standards
- Identify the steps in operating respiratory protectors according to manufacturers' recommendations and the current government regulations
- identify respiratory protectors
- outline the respiratory protectors operating procedures
- describe the of respiratory protectors
- identify applicable environmental procedures
- interpret applicable job documentation
- list types of painting equipment
- describe site preparation
- describe the painting process
- describe the stencilling and decaling and documenting procedures confirming the standards including (not limited to): government legislation and AAR

3.2.4 Drill or ream holes.

- identify applicable standards
- interpret applicable job documentation
- select appropriate tools
- layout workpiece
- perform trade calculations
- drill hole
- ream hole
- use measuring devices
- sharpen drill bit
- verify work
- document work
- maintain a clean worksite

3.2.5 Cut internal (ID) and external (OD) threads.

- identify applicable standards
- interpret applicable job documentation
- select appropriate tools
- layout workpiece
- perform trade calculations
- cut internal threads
- cut external threads
- use measuring devices
- verify work
- document work
- maintain a clean worksite

3.3 – Materials and Fasteners

Cross-Reference to Learning Outcomes:

5071.04, 5571.15, 5572.07

Duration: 12 Total Hours Theory: 9 hours Practical: 3 hours

General Learning Outcome:

Perform benchworking procedures in accordance with government legislation and job specifications.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

3.3.1 Verify workpiece material in accordance with engineering drawings.

3.3.2 Select fasteners per application.

3.3.3 Fasten workpieces in accordance with legislation and regulations.

Learning Content:

3.3.1 Verify workpiece material in accordance with engineering drawings.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- describe the properties of ferrous or non-ferrous materials including (not limited to): steel, alloys, aluminium, and iron
- describe material testing practices
- identify workpiece material
- verify workpiece material for correct size and type

3.3.2 Select fasteners per application.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- identify the types and applications of fasteners including (not limited to): nuts, bolts, rivets, screws, pins, clips, cotter keys, and lock washers
- determine the size, grade, and nomenclature/terminology of fasteners
- identify torque values
- identify tap drill sizes

3.3.3 Fasten workpieces in accordance with legislation and specifications.

- identify applicable safety standards
- interpret applicable job documentation
- select appropriate fasteners
- use hand and power tools including (not limited to): wrench, power tool, torque wrench, and socket
- describe calibration techniques
- select appropriate locking, sealing, and lubricating fluids including lubricant, oils, Locktight™, and Teflon™
- fasten workpiece using threaded fasteners
- describe locking techniques including (not limited to): tacking, chiselling, heating, and peening
- document work
- maintain a clean worksite

3.4– Shop Environment

Cross-Reference to Learning Outcomes:

5570.07, 5570.08, 5570.09, 5570.12

Duration: 6 Total Hours Theory: 3 hours Practical: 3 hours

General Learning Outcome:

Ensure safety of self and others in the shop environment.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

3.4.1 Practise personal hygiene in a shop environment.

3.4.2 Maintain a clean and organized classroom environment.

3.4.3 Inspect all equipment for defects and safe working condition according to manufacturers' specifications and current government legislation.

3.4.4 Identify steps in locking out and tagging mechanical equipment or dangerous goods/commodities utilizing approved and specified equipment according to government legislation.

Learning Content:

3.4.1 Practise personal hygiene in a shop environment.

- identify the applicable safe work practices and current government regulations
- interpret workplace safety policies
- identify and wear required protective clothing and gear
- demonstrate the use of safety eye wash stations and showers
- practise personal hygiene in a shop environment

3.4.2 Maintain a clean and organized classroom environment.

- identify the applicable safe work practices
- maintain a clean work area
- store tools and equipment in appropriate locations

3.4.3 Inspect all equipment for defects and safe working condition according to manufacturers' specifications and current government legislation.

- describe current government legislation relating to operating equipment
- assess guards and condition of safety devices on equipment
- identify the required corrective action to be taken

3.4.4 Identify the steps in locking out and tagging mechanical equipment according to manufacturers' recommendations and current government regulations.

- outline the lock out and tag procedures
- describe the procedure for a lock out and tag for repair on mechanical equipment

Number:	4
Title:	**Material Handling**
Duration:	18 Total Hours Theory: 12 hours Practical: 6 hours
Prerequisites:	N A
Co-requisites:	N A

4.1– Material Handling Procedures

18 Total Hours Theory: 12 hours Practical: 6 hours

4.1– Material Handling Procedures

Cross-Reference to Learning Outcomes:

5570.14, 5573.01, 5573.02, 5573.03, 5573.04, 5573.05, 5573.06, 5573.07, 5573.08, 5573.09, 5573.10

Duration: 18 Total Hours Theory: 12 hours Practical: 6 hours

General Learning Outcome:

Perform material handling procedures in accordance with government legislation and job specifications.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

4.1.1 Calculate forces and loads.

4.1.2 Select and inspect rigging equipment.

4.1.3 Position and attach rigging.

4.1.4 Describe inspection and preparation of hoisting and lifting equipment.

4.1.5 Describe worksite preparation.

4.1.6 Describe hoisting equipment operations.

4.1.7 Describe the use of scaffolds, lift platforms, and ladders.

4.1.8 Describe how to move the load or workpiece.

4.1.9 Describe procedures to set down the load.

4.1.10 Describe shut down and storage of material handling equipment.

Learning Content:

4.1.1 Calculate forces and loads.

- identify applicable safety legislation
- interpret applicable job documentation
- determine load weights
- determine allowable loads
- identify centre of gravity
- calculate vertical and horizontal forces
- determine distribution of loads
- select sling patterns and configurations
- calculate the load and capacity
- plan the move

4.1.2 Select and inspect rigging equipment.

- identify applicable safety legislation
- interpret applicable job documentation
- select rigging equipment including (not limited to): cable clamps, chain block hoists, chains, chokers, come-alongs, connectors, ropes, slings, and tuggers
- perform pre-operational checks including (not limited to): damaged links, cracks, frayed cables, kinking, cuts in slings, threads on shackles, and any other physical damage
- make recommendations for repair and further action

4.1.3 Position and attach rigging.

- identify applicable safety legislation
- interpret applicable job documentation
- demonstrate hand signals
- position the rigging
- attach rigging
- verify lifting capacity
- verify position of rigging and load
- move the workpiece
- document work

4.1.4 Describe inspection and preparation of hoisting and lifting equipment.

- identify applicable safety legislation
- interpret applicable job documentation
- perform calculations
- identify types of lifting equipment including (not limited to): forklift, jib-crane, portable boom, overhead hoist, and other lifting equipment
- describe pre-operational circle check
- describe equipment assessment process
- recommend repair or further action
- describe tagging and isolation procedures
- document work
- identify and describe procedures for operating and storing lift equipment

4.1.5 Describe worksite preparation.

- identify applicable safety legislation
- interpret applicable job documentation
- describe worksite clearing procedures
- describe pathway clearing process
- describe pathway verification process
- document work

4.1.6 Describe hoisting equipment operations.

- identify applicable safety legislation
- interpret applicable job documentation
- identify applicable hoisting equipment including (not limited to): forklift, jib-crane, portable boom, overhead hoist, chains, slings, and hooks
- describe inspection procedures
- describe verification procedures
- describe lifting and moving procedures
- document work

4.1.7 Describe the use of scaffolds, lift platforms, and ladders.

- identify applicable safety legislation
- interpret applicable job documentation
- describe visual inspection techniques
- describe assembly procedures
- describe fall protection systems
- describe disassembly procedures
- document work

4.1.8 Describe how to move the load or workpiece.

- identify applicable safety legislation
- interpret applicable job documentation
- describe load control including (not limited to): installing required tag lines; correctly controlling speed and travel; turning and positioning load; checking that travel path/way is clear of overhanging interference and all obstructions; checking that all personnel are clear of load travel path/way; checking that all operators keep to the back end of the load; and checking that the slinger guide keeps to the front to guide the load
- document work

4.1.9 Describe procedures to set down the load.

- identify applicable safety legislation
- interpret applicable job documentation
- describe set down procedures including (not limited to): checking that work or job site is clear of all equipment and personnel; checking that all supports are correctly placed and aligned; controlling lowering speed; checking for adequate spacing by stopping the set down before placing down the load; and sounding the alarm confirming “all clear for down”; so that materials are correctly placed, balanced, aligned, and secure
- document work

4.1.10 Describe shut down and storage of material handling equipment.

- identify applicable safety legislation
- interpret applicable job documentation
- describe shut down and storage procedures
- document work

Number:	5
Title:	**Welding and Fabrication 1**
Duration:	33 Total Hours Theory: 9 hours Practical: 24 hours
Prerequisites:	N A
Co-requisites:	N A

5.1 Welding and Fabrication 1

33 Total Hours Theory: 9 hours Practical: 24 hours

5.1 – Welding and Fabrication 1

Cross-Reference to Learning Outcomes:

5570.02, 5570.06, 5570.13, 5571.11, 5571.13, 5571.14

Duration: 33 Total Hours Theory: 9 hours Practical: 24 hours

General Learning Outcome:

Demonstrate the use of oxy-fuel and plasma-arc cutting equipment, and Shielded Metal Arc Welding (SMAW) equipment.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

5.1.1 Demonstrate the use of oxy-fuel and plasma-arc cutting equipment.

5.1.1 Demonstrate the use of Shielded Metal Arc Welding (SMAW) equipment.

5.1.2 Describe gas-fuelled equipment.

5.1.3 Identify steps in operating emergency safety equipment according to manufacturers' recommendations and current government regulations.

5.1.4 Handle, store, and control hazardous materials or dangerous goods/commodities utilizing approved and specified equipment according to government legislation.

Learning Content:

5.1.1 Demonstrate the use of oxy-fuel and plasma-arc cutting equipment.

- interpret applicable safety legislation
- wear, adjust, and maintain personal protective equipment as required by the current government legislation and recommended by the manufacturer
- interpret engineering drawings and job documentation
- determine required pressures and equipment including fuel gases, tips, gas distributors, cable assemblies, plasma gun liners
- assess equipment condition
- determine calibration requirements
- determine required attachments and tooling
- demonstrate the set-up and tear down of oxy-fuel and plasma-arc cutting equipment

5.1.2 Demonstrate the use of Shielded Metal Arc Welding equipment.

- interpret applicable safety legislation
- wear, adjust, and maintain personal protective equipment as required by the current government legislation and recommended by the manufacturer
- interpret engineering drawings and job documentation
- identify power source, welding cable assemblies, electrode holder, electrode type and size
- determine required equipment
- assess equipment condition
- determine required attachments and tooling
- demonstrate assembly, setting up, and testing of welding equipment
- describe calibration requirements

5.1.3 Describe gas-fuelled equipment.

- interpret applicable safety legislation
- wear, adjust, and maintain personal protective equipment as required by the current government legislation and recommended by the manufacturer
- interpret engineering drawings and job documentation
- describe required equipment including (not limited to): jacks, compressors, and generators
- describe equipment condition assessment procedures
- describe calibration requirements
- describe required attachments and tooling
- describe required fuel levels
- describe the set-up and tear down of gas-fuelled equipment
- describe equipment limitations, including (not limited to): leverage, weight ratios, capacity, tolerances, fluid power, clearances, and stability

5.1.4 Identify the steps in operating emergency safety equipment according to manufacturers' recommendations and the current government regulations.

- identify emergency safety equipment
- outline the equipment operating procedures of fire extinguishers
- describe the use of extinguishers, respirators, and first aid equipment
- describe the operation of emergency safety equipment

5.1.5 Handle, store and control hazardous materials or dangerous goods/commodities utilizing approved and specified equipment according to government legislation.

- identify the requirements of the current government regulations for hazardous materials or dangerous goods/commodities
- identify the safe handling and storage procedures for hazardous materials or dangerous goods/commodities
- demonstrate the recommended practices to handle and store hazardous materials or dangerous goods/commodities
- use specified procedures for handling and storage of equipment and/or materials or dangerous goods/commodities

Number: 6

Title: **Regulatory Publications**

Duration: 24 Total Hours Theory: 24 hours Practical: 0 hours

Prerequisites: N A

Co-requisites: N A

6.1 Manual of Standards and Recommended Practices (M.S.R.P.)

9 Total Hours Theory: 9 hours Practical: 0 hours

6.2 Code of Federal Regulations

6 Total Hours Theory: 6 hours Practical: 0 hours

6.3 Association of American Railroads (AAR) Field Manual

9 Total Hours Theory: 9 hours Practical: 0 hours

6.1 – Manual of Standards and Recommended Practices (M.S.R.P.)

Cross-Reference to Learning Outcomes:

5070.16

Duration: 9 Total Hours Theory: 9 hours Practical: 0 hours

General Learning Outcome:

Interpret regularly adopted specifications, standards, and recommended practices of the Association of American Railroads Mechanical Section.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

6.1.1 Identify key M.S.R.P. sections.

6.1.2 Distinguish between specifications, standards, and recommended practice.

6.1.3 Describe the maintenance and update procedure for the publication.

6.1.4 Identity and describe procedures for applying blue flag procedures according to government legislation.

6.1.5 Interpret Section A Part I

Learning Content:

6.1.1 Identify key M.S.R.P. sections.

- describe the scope and purpose of M.S.R.P.
- describe the application of the M.S.R.P. specifications and practices
- identify the different sections and relevant parts

6.1.2 Distinguish between specifications, standards, and recommended practice.

- define the terms specification, standard, and recommended practice
- describe the identification code for specifications
- describe the identification code for standards
- define the code for recommended practice
- define the terms past practices, alternate acceptable standards, effective dates, and conditional approvals

6.1.3 Describe the maintenance and update procedure for the publication.

- describe publication maintenance procedures
- outline update procedures

6.1.4 Identity and describe procedures for applying blue flag procedures according to government legislation.

6.1.5 Interpret Section A Part I

6.2 – Code of Federal Regulations

Cross-Reference to Learning Outcomes:

Duration: 6 Total Hours Theory: 6 hours Practical: 0 hours

General Learning Outcome:

Identify the general and permanent rules established by the Federal Register in the Code of Federal Regulations.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

6.2.1 Define the term Hazardous Materials Regulations.

6.2.2 Define the purpose and scope of the regulations.

6.2.3 Identify key parts of the regulations.

Learning Content:

6.2.1 Define the term Hazardous Materials Regulations.

- describe the link between hazardous materials and the code

6.2.2 Define the purpose and scope of the regulations.

- identify the purpose of the regulations
- describe the scope of the regulations
- identify the update process

6.2.3 Identify key parts of the regulations.

- describe key components of the regulations
- navigate specified sections

6.3 – Association of American Railroads (AAR) Field Manual

Cross-Reference to Learning Outcomes:

Duration: 9 Total Hours Theory: 9 hours Practical: 0 hours

General Learning Outcome:

Navigate the AAR Field Manual and interpret specified regulations.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

6.3.1 Define the purpose and scope of the AAR Field Manual.

6.3.2 Identify the main categories of the Field Manual.

6.3.3 Interpret the General Rules of the Field Manual.

6.3.4 Describe the update and maintenance procedure.

6.3.5 Navigate specified areas of the Field Manual.

Learning Content:

6.3.1 Define purpose and scope of the AAR Field Manual.

- identify the purpose of the AAR Field Manual
- describe the scope of the Field Manual

6.3.2 Identify main categories of the Field Manual.

- identify the main sections of the manual

6.3.3 Interpret the General Rules of the Field Manual.

- identify the General Rules
- describe compliance and reinforcement polices and procedures

6.3.4 Describe the update and maintenance procedure.

- explain the procedures for updating the AAR Field Manual

6.3.5 Navigate specified areas of the Field Manual.

- identify areas of the Field Manual related to wear limits, gauging procedures, and limits.
- identify welding specifications in the Field Manual

Number:	7
Title:	**Brakes**
Duration:	24 Total Hours Theory: 15 hours Practical: 9 hours
Prerequisites:	N A
Co-requisites:	N A

7.1 Brakes

24 Total Hours Theory: 15 hours Practical: 9 hours

7.1 – Brakes

Cross-Reference to Learning Outcomes:

5576.01

Duration: 24 Total Hours Theory: 15 hours Practical: 9 hours

General Learning Outcome:

Identify and describe procedures for servicing brakes.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

7.1.1 Describe single-car brake test procedures.

Learning Content:

7.1.1 Describe single-car brake test procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe pre-test inspection procedures on components including (not limited to): brake rigging, shoes, hand brake, bleed rods, valves, piping, hoses, slack adjusters, reservoirs, and cylinders
- describe troubleshooting procedures
- identify SCTD (single car test device) daily test
- identify air-brake test procedures
- describe documentation

Number:	8
Title:	**Safety Appliances**
Duration:	9 Total Hours Theory: 9 hours Practical: 0 hours
Prerequisites:	N A
Co-requisites:	N A

8.1 Safety Appliances

9 Total Hours Theory: 9 hours Practical: 0 hours

8.1 – Safety Appliances

Cross-Reference to Learning Outcomes:

5577.01, 5577.02, 5577.03, 5577.04

Duration: 9 Total Hours Theory: 9 hours Practical: 0 hours

General Learning Outcome:

Identify and describe procedures for servicing car safety appliances

Learning Outcomes:

Upon successful completion, the apprentice is able to:

8.1.1 Describe maintenance procedures for hand rails and grabs.

8.1.2 Describe maintenance of ladders.

8.1.3 Describe platform maintenance procedures.

8.1.4 Describe sill step maintenance procedures.

Learning Content:

8.1.1 Describe maintenance procedures for hand rails and grabs.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): gauges, measuring devices, torches, hammers, rivet guns, fasteners, and chisels
- describe maintenance procedures including (not limited to): riveting, heating, straightening, fastening, and peening
- describe verification procedures
- describe documentation

8.1.2 Describe maintenance of ladders.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures including (not limited to): inspections of rungs, brackets, and stiles
- describe defects
- select tools and equipment including (not limited to): measuring devices, torches, hammers, rivet guns, fasteners, sockets, ratchets, and pinch bars
- describe maintenance procedures including (not limited to): heating, splicing, straightening, riveting, fastening, and peening
- describe verification process
- describe documentation

8.1.3 Describe platform maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe components including (not limited to): decks, frames, and brackets
- describe defects
- select tools and equipment including (not limited to): measuring devices, torches, hammers, rivet guns, fasteners, sockets, and ratchets
- describe maintenance procedures including (not limited to): heating, straightening, fastening, riveting, welding, and peening
- describe verification process
- describe documentation

8.1.4 Describe sill step maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe components including (not limited to): support brackets, steps, and treads
- describe defects
- select tools and equipment including (not limited to): measuring devices, torches, hammers, rivet guns, fasteners, and paint equipment
- describe maintenance procedures including (not limited to): heating, straightening, fastening, riveting, and peening
- describe verification process
- describe documentation

Reference Material

AAR Publications
By Transportation Technology Center, Inc.
Published by Association of American Railroads

Interpreting Engineering Drawings
By Cecil H. Jensen; Dr. Jay D. Helsel
Published by Delmar Publishers Inc.
ISBN# 1-4180-5573-5

Modern Welding Technology
By Howard B. Cary
Published by Prentice-Hall
ISBN# 0-1359-9290-7

Railway Locomotive Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/rules/tc_o_0_55.htm#contents

Railway Passenger Car Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/Rules/TC_0-26.htm

Railway Freight Car Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/Rules/TC_0-06-1.htm

Apprenticeship
In-School Curriculum Standards

Railway Car Technician

Level 2

268R

Ministry of Training, Colleges & Universities
Workplace Training Branch

Development date: September 2006
Implementation date:
Printing date:

This new curriculum standard for the Railway Car Technician trade is designed from the learning outcomes, which were developed from the industry-approved training standard.

The curriculum is organized into three levels of training, each including reportable subjects containing learning outcomes to reflect the units of the training standard. The hours charts indicate how the curriculum can be delivered in the current block release format and summarizes the hours of training for each reportable by level. Since the reportable subjects are all divisible by three they can be adapted to accommodate a more flexible training delivery other than block release.

The reportable subjects are cross-referenced to the training standard for ease of comparison.

Each reportable subject and learning outcome identifies a recommended number of training hours. This hour allotment is broken into hours for instruction in theory and practical application. The division of the curriculum into reportable subjects follows a natural progression of learning through the training program. This structure will allow training centres and apprentices flexibility in program delivery while still observing the importance of sequencing learning in a logical progression.

The curriculum is framed by and includes specific references to terminal performance objectives in the Apprenticeship Training Standards Railway Car Technician. However, the curriculum identifies only the learning that takes place off the job, in a training environment. The in-school program focuses primarily on the theoretical knowledge required to master the performance objectives of the Training Standards. Employers are expected to extend the apprentice's knowledge and skills through appropriate practical training on the work site. Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to assure that all apprentices have achieved the learning outcomes identified in the curriculum standard. The balance between theoretical and practical evaluation is identified for each unit of learning outcomes.

Implementation date: to be determined

Table of Contents

Introduction

Summary of Total Program In-School Training Hours 1

Program Summary of Reportable Subjects

1.0 - Safety and Maintenance Inspections 1 2
1.1 - Safety and Maintenance Inspections 1 3

2.0 - Trucks 1 6
2.1 - Trucks 1 7

3.0 - Underframes 1 10
3.1 - Underframes 1 11

4.0 - Car Bodies 1 14
4.1 - Car Bodies 1 15

5.0 - Welding and Fabrication 2 18
5.1 - Welding and Fabrication 19

6.0 - Regulatory Publications 2 21
6.1 - Manual of Standards and Recommended Practices (M.S.R.P.) 22
6.2 - Association of American Railroads (AAR) Field Manual 24

7.0 - Brakes 2 26
7.1 - Brakes 2 27

8.0 - Coaches 1 30
8.1 - Coaches 1 31

References 37

Summary of Total Program In-School Training Hours

Reportable Subjects	Total	Theory	Practical
1. Safety and Maintenance Inspections 1	15	9	6
2. Trucks 1	33	18	15
3. Underframes 1	33	24	9
4. Car Bodies 1	45	30	15
5. Welding and Fabrication 2	33	9	24
6. Regulatory Publications 2	9	9	0
7. Brakes 2	49	24	15
8. Coaches 1	33	24	9
Total	240	147	93

Number:	1
Title:	**Safety and Maintenance Inspections 1**
Duration:	15 Total Hours Theory: 9 hours Practical: 6 hours
Prerequisites:	Completion of Level 1
Co-requisites:	N A

1.1 – Safety and Maintenance Inspections 1

15 Total Hours Theory: 9 hours Practical: 6 hours

1.2 – Safety and Maintenance Inspections 1

Cross-Reference to Learning Outcomes:

5578.01, 5578.02, 5578.03, 5578.05

Duration: 15 Total Hours Theory: 9 hours Practical: 6 hours

General Learning Outcome:

Identify and describe procedures for performing safety and maintenance inspections.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

1.1.1 Describe in-bound or out-bound rolling pull-by inspection procedures.

1.1.2 Describe standing car/train inspection procedures.

1.1.3 Describe dangerous commodity inspection procedures.

1.1.4 Describe open-top load inspection procedures.

Learning Content:

1.1.1 Describe in-bound or out-bound rolling pull-by inspection procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe defects
- describe recommendations for further inspection, repair, or replacement
- describe documentation

1.1.2 Describe standing car/train inspection procedures.

- identify applicable safety legislation
- describe blue flag procedures
- interpret applicable job documentation
- describe inspection procedures
- describe defects including (not limited to): shifted or improper loads, strong chemical smells, overheating wheels or bearings, and leaks
- select tools, equipment, and gauges
- describe recommendations for further inspection, repair, or replacement
- describe documentation

1.1.3 Describe dangerous commodity inspection procedures.

- identify applicable safety legislation
- describe blue flag procedures
- interpret applicable job documentation
- describe use of placards
- describe inspection procedures
- describe defects
- select tools, equipment, and gauges
- describe recommendations for further inspection or action
- describe reporting requirements
- describe documentation

1.1.4 Describe open-top load inspection procedures.

- identify applicable safety legislation
- describe blue flag procedures
- interpret applicable job documentation
- describe inspection procedures for securements, blocking, banding, cables, location of load on car, load distribution, and load dimensions
- describe defects
- select tools and equipment
- describe recommendations for further inspection, repair, or replacement
- describe reporting requirements
- describe documentation

Number:	2
Title:	**Trucks 1**
Duration:	33 Total Hours Theory: 18 hours Practical: 15 hours
Prerequisites:	Completion of Level 1
Co-requisites:	N A

2.1 – Trucks

33 Total Hours Theory: 18 hours Practical: 15 hours

2.1 - Trucks 1

Cross-Reference to Learning Outcomes:

5574.01, 5574.02, 5574.03, 5574.04, 5574.05

Duration: 33 Total Hours Theory: 18 hours Practical: 15 hours

General Learning Outcome:

Identify and describe rail truck servicing procedures in accordance with government legislation.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

2.1.1 Describe wheel inspection procedures.

2.1.5 Describe inspection procedures for roller bearings.

2.1.6 Describe bolster inspection and repair procedures.

2.1.7 Describe maintenance procedures for truck suspensions.

2.1.8 Describe side frame maintenance procedures.

Learning Content:

2.1.1 Describe wheel inspection procedures.

- identify applicable safety legislation
- interpret applicable job documentation and codes
- describe inspection procedures for wheels, axles, and roller bearings
- select applicable gauges
- describe types of wheel defects
- describe condemnable defects
- recommend repair or further action
- document work

2.1.2 Describe inspection procedures for roller bearings.

- identify applicable safety legislation
- interpret applicable job documentation
- identify different types of bearings
- describe field and shop inspection procedures of bearings, end caps, backing rings, cups, and seals
- describe type of bearing defects
- describe recommendations for repair or replacement
- document work

2.1.3 Describe bolster inspection and repair procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- select measuring devices, including (not limited to): gauges, callipers, and steel rules
- describe inspection procedures for bolster components including (not limited to): gibs, wear plates, bolster pockets, centre plate rings, centre pins, side bearings, and cages
- describe defects
- describe recommendations for repair or replacement
- describe verification procedures
- describe documentation

2.1.4 Describe maintenance procedures for truck suspensions.

- identify applicable safety legislation
- interpret applicable job documentation
- describe the function of suspension dampening systems
- describe suspension components including (not limited to): coil springs, friction blocks, truck side bearings, elliptical springs, shock absorbers, air spring bellows, load levelers, load snubbers, spring planks, equalizers, hangers, torsion bars, and safeties
- describe inspection procedures
- describe defects
- identify applicable gauges
- describe recommendations for repair or replacement
- describe verification procedures
- describe documentation

2.1.5 Describe side frame maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- select measuring devices, including (not limited to): gauges, callipers, and steel rules
- describe side frame components including (not limited to): side frames, column wear plates, column widths, thrust lug spacing, centring, width, pedestal roofs, and paring buttons
- describe inspection procedures
- describe defects
- describe recommendations for repair or replacement
- describe verification procedures
- describe documentation

Number:	3
Title:	**Underframes 1**
Duration:	33 Total Hours Theory: 24 hours Practical: 9 hours
Prerequisites:	Completion of Level 1
Co-requisites:	N A

3.1– Underframes 1

33 Total Hours Theory: 24 hours Practical: 9 hours

3.1– Underframes 1

Cross-Reference to Learning Outcomes:

5575.01, 5575.02, 5575.03

Duration: 33 Total Hours Theory: 24 hours Practical: 9 hours

General Learning Outcome:

Identify and describe procedures for servicing underframes.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

3.1.1 Describe maintenance procedures for coupling devices.

3.1.2 Describe maintenance procedures for articulated connectors.

3.1.3 Describe maintenance procedures for end of car and centre of car draft systems.

Learning Content:

3.1.1 Describe maintenance procedures for coupling devices.

- identify applicable safety legislation
- interpret applicable job documentation
- describe components of coupling devices including (not limited to): throwers, locking blocks, lifters, coupler bodies, knuckles, knuckle pins, top or bottom uncoupling levers, cross-key retainer, coupler carrier wear plates, and shank wear plates
- describe inspection procedures
- describe defects
- describe maintenance procedures including (not limited to): welding, grinding, heating, and straightening
- select tools, equipment, and gauges
- describe the verification process
- describe documentation

3.1.2 Describe maintenance procedures for articulated connectors.

- identify applicable safety legislation
- interpret applicable job documentation
- describe connector components including (not limited to): connecting pins, locking wedges, spherical balls, spherical ball liners, shackle connectors, male and female inter-connecting castings, retaining bolts and pins, and carrier wear plates
- describe inspection procedures
- describe defects
- select tools, equipment, and gauges
- describe maintenance procedures including (not limited to): welding, grinding, heating, and pressing with hydraulic devices
- describe the verification process
- describe documentation

3.1.3 Describe maintenance procedures for end of car and centre of car draft systems.

- identify applicable safety legislation
- interpret applicable job documentation
- describe car draft components including (not limited to): centre of car cushioning devices, sliding centre sills, yokes, draft gears, followers, follower blocks, carriers, gas units, and draft stops
- describe inspection procedures
- describe defects
- select tools, equipment, and gauges including (not limited to): welding machine, cutting torch, table lift, hydraulic ram, and plasma arc
- describe maintenance procedures including (not limited to): welding, grinding, heating, and straightening; recharging or replacing gas units
- describe the verification process
- describe documentation

Number:	4
Title:	**Car Bodies 1**
Duration:	45 Total Hours Theory: 30 hours Practical: 15 hours
Prerequisites:	Completion of Level 1
Co-requisites:	N A

4.1– Car Bodies 1

45 Total Hours Theory: 30 hours Practical: 15 hours

4.1– Car Bodies 1

Cross-Reference to Learning Outcomes:

5579.01, 5579.02, 5579.03

Duration: 45 Total Hours Theory: 30 hours Practical: 15 hours

General Learning Outcome:

Identify and describe procedures for servicing car bodies.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

4.1.11 Describe box car maintenance procedures.

4.1.12 Describe flat car maintenance procedures.

4.1.13 Describe gondola car maintenance procedures.

Learning Content:

4.1.1 Describe box car maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe defects including (not limited to): holes, cracks, rust, leaks, body damage, bent and/or twisted doors, and lack of lubrication
- select tools and equipment including (not limited to): power tools, hand tools, welding equipment, and hoisting or rigging equipment
- describe maintenance procedures including (not limited to): welding, heating, straightening, grinding, and adjusting
- describe verification procedures
- describe documentation

4.1.2 Describe flat car maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe defects including (not limited to): holes, cracks, rust, leaks, and body damage
- select tools and equipment including (not limited to): power tools, hand tools, welding equipment, and hoisting or rigging equipment
- describe maintenance procedures including (not limited to): welding, cutting, straightening, riveting, grinding, and fastening
- describe verification procedures
- describe documentation

4.1.3 Describe gondola car maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe defects including (not limited to): holes, cracks, rust, leaks, roof covers, and body damage
- select tools and equipment including (not limited to): power tools, hand tools, welding equipment, and hoisting or rigging equipment
- describe maintenance procedures including (not limited to): welding, cutting, straightening, riveting, grinding, and fastening
- describe verification procedures
- describe documentation

Number:	5
Title:	**Welding and Fabrication 2**
Duration:	33 Total Hours Theory: 9 hours Practical: 24 hours
Prerequisites:	Completion of Level 1
Co-requisites:	N A

5.1 Welding and Fabrication 2

33 Total Hours Theory: 9 hours Practical: 24 hours

5.1 – Welding and Fabrication 2

Cross-Reference to Learning Outcomes:

5571.12

Duration: 33 Total Hours Theory: 9 hours Practical: 24 hours

General Learning Outcome:

Prepare Shielded Metal Arc Welding (SMAW) equipment.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

5.1.1 Demonstrate the use of Shielded Metal Arc Welding (SMAW) equipment.

Learning Content:

5.1.1 Demonstrate the use of Shielded Metal Arc Welding equipment.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- identify power source, welding cable assemblies, electrode holder, and electrode type and size
- determine required equipment
- assess equipment condition
- determine required attachments and tooling
- demonstrate assembly, setting up, and testing of welding equipment
- describe calibration requirements

Number:	6
Title:	**Regulatory Publications 2**
Duration:	9 Total Hours Theory: 9 hours Practical: 0 hours
Prerequisites:	Completion of Level 1
Co-requisites:	N A

6.1 Manual of Standards and Recommended Practices (M.S.R.P.)

4 Total Hours Theory: 4 hours Practical: 0 hours

6.2 Association of American Railroads (AAR) Field Manual

5 Total Hours Theory: 5 hours Practical: 0 hours

6.1 – Manual of Standards and Recommended Practices (M.S.R.P.)

Cross-Reference to Learning Outcomes:

Duration: 4 Total Hours Theory: 4 hours Practical: 0 hours

General Learning Outcome:

Interpret regularly adopted specifications, standards, and recommended practices of the Association of American Railroads Mechanical Section.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

6.1.6 Interpret Section D.

6.1.7 Interpret Sections G and H.

6.1.8 Interpret Section C.

6.1.9 Interpret Section E.

6.1.10 Interpret Section B.

Learning Content:

6.1.4 Interpret specific regulations from section D II.

- identify regulations relating to Trucks and Truck Details
- identify regulations relating to Codes for Designating Design Features for Sideframes and Truck Bolsters

6.1.5 Interpret specific regulations from sections G I & II and H I &II.

- identify regulations relating to Wheels and Axles
- identify regulations relating to Roller Bearings

6.1.6 Interpret specific regulations from section C I, II & III.

- identify regulations relating to Car Construction

6.1.7 Interpret section E.

- identify regulations relating to Brakes

6.1.5 Interpret section B.

- identify regulations relating to Couplers

6.2 – Association of American Railroads (AAR) Field Manual

Cross-Reference to Learning Outcomes:

Duration: 5 Total Hours Theory: 5 hours Practical: 0 hours

General Learning Outcome:

Navigate the AAR Field Manual and interpret specified regulations.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

6.2.1 Interpret selected regulations related to Air Brake Equipment.

6.2.2 Interpret selected regulations related to Roller Bearings.

6.2.3 Interpret selected regulations related to Wheels and Axles.

6.2.4 Interpret selected regulations related to Trucks.

Learning Content:

6.2.1 Interpret selected regulations related to Air Brake Equipment.

6.2.2 Interpret selected regulations related to Roller Bearings.

6.2.3 Interpret selected regulations related to Wheels and Axles.

6.2.4 Interpret selected regulations related to Trucks.

Number:	7
Title:	**Brakes 2**
Duration:	39 Total Hours Theory: 24 hours Practical: 15 hours
Prerequisites:	Completion of Level 1
Co-requisites:	N A

7.1 Brakes 2

39 Total Hours Theory: 24 hours Practical: 15 hours

7.1 – Brakes 2

Cross-Reference to Learning Outcomes:

5576.02, 5576.03, 5576.04

Duration: 39 Total Hours Theory: 24 hours Practical: 15 hours

General Learning Outcome:

Identify and describe procedures for servicing brakes.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

7.1.1 Describe brake valve replacement procedures.

7.1.2 Describe maintenance procedures for flexible hoses, train line hoses, and piping.

7.1.3 Describe maintenance procedures for brake cylinder units.

Learning Content:

7.1.1 Describe brake valve replacement procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- identify types of brake valves
- describe single-car test procedures
- select tools and equipment including (not limited to): single-car test device, sockets, ratchets, hammers, torches, pliers, and wrenches
- describe basic valve construction
- describe brake valve removal and installation procedures
- describe troubleshooting verification procedures
- describe documentation

7.1.2 Describe maintenance procedures for flexible hoses, train line hoses, and piping.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe single-car test procedures
- describe defects
- select required tools and equipment including (not limited to): single-car test device, torches, wrenches, grinders, welding equipment, bar hammer, and fasteners
- describe repair or replacement procedures including (not limited to): welding, straightening, fastening, and tightening
- describe verification procedures
- describe documentation

7.1.3 Describe maintenance procedures for brake cylinder units.

- identify applicable safety legislation
- interpret applicable job documentation
- describe types of brake cylinder units
- describe single-car test procedures
- describe defects
- describe brake cylinder unit repair and replacement procedures
- select tools and equipment including (not limited to): single-car test device, wrenches, fasteners, and clamps
- describe brake cylinder units overhaul procedures
- describe testing and replacement of cylinder hoses
- describe verification procedures
- describe documentation

Number:	8
Title:	**Coaches 1**
Duration:	33 Total Hours Theory: 24 hours Practical: 9 hours
Prerequisites:	All Level 1 courses
Co-requisites:	N A

8.1 Coaches 1 (Track 2 only)

33 Total Hours Theory: 24 hours Practical: 9 hours

8.1 – Coaches 1

Cross-Reference to Learning Outcomes:

5580.01, 5580.02, 5580.03, 5580.04, 5580.05, 5580.06, 5580.07, 5580.08, 5580.10

Duration: 33 Total Hours Theory: 24 hours Practical: 9 hours

General Learning Outcome:

Identify and describe procedures for servicing coaches.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

8.1.5 Describe coach exterior end maintenance procedures.

8.1.6 Describe coach vestibules maintenance procedures.

8.1.7 Describe coach roof maintenance procedures.

8.1.8 Describe the maintenance of coach exterior sides.

8.1.9 Describe coach underframe maintenance procedures.

8.1.10 Describe coach interior sides and ends maintenance procedures.

8.1.11 Describe coach ceiling and floor maintenance procedures.

8.1.12 Describe coach window, blinds, and curtains maintenance procedures.

8.1.13 Describe interior furnishing maintenance procedures.

Learning Content:

8.1.1 Describe coach exterior end maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe coach end components including (not limited to): end sills and posts, corner posts, end sheets, tops sills, bellows and diaphragms, headers, stay rods and brackets, side rods, guides, springs, bellows springs, curtains and gates, and threshold plates
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment
- describe maintenance procedures including (not limited to): welding and splicing of handrails
- describe verification process
- describe documentation

8.1.2 Describe coach vestibules maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe coach vestibule components including (not limited to): steps, doors and hardware, window frames and seals, trap door hardware and seals, platforms, ceilings, filter frames, and fixed end doors
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): welding equipment, painting equipment, cutting torch, pneumatic or electric tools, ladders, and rigging equipment
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.3 Describe coach roof maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe coach roof components including (not limited to): roof sheeting, caps, hatches, hatch frames, rain gutters, shrouds, and cover
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.4 Describe the maintenance of coach exterior sides.

- identify applicable safety legislation
- interpret applicable job documents
- describe coach sides components including (not limited to): side posts, sheeting, sills, top sills, window frames, skirts, name plates, and vent covers
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.5 Describe coach underframe maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe coach underframe components including (not limited to): draft systems, trucks, wheels, securements, air conditioning units, raceways, waste tanks, battery boxes, water tanks, battery chargers, floor deafening, and insulation
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.6 Describe coach interior sides and ends maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe coach interior components including (not limited to): deafening, insulation, side sheeting, sidewall coverings, inside window frames, luggage racks, fixture supports, end sheeting, end wall coverings, end doors, door tracks and seals, partitions, windows and seals, service lockers, doors and hardware, and grills
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.7 Describe coach ceiling and floor maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe coach ceiling components including (not limited to): floor coverings, fixture supports, carpet, feature strip, baseboards, access hatches, covers, inserts, deafening, insulation, coverings, frames, filter frames, bulkheads, grills, ductwork, and hvac
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): hand, pneumatic, or electric power tools, and upholstery equipment
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.8 Describe coach window, blinds, and curtains maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe windows, blinds, and curtain components including (not limited to): fabric, rollers, guides, tension devices, valances, rods, brackets, tie backs, and hardware
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): electric power tools and hand tools
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.9 Describe interior furnishing maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe interior furnishing components including (not limited to): tables, seats, benches, cupboards, counters, beds, platforms, drawers, hardware, brackets, and shelving
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): electric power tools and hand tools
- describe maintenance procedures
- describe verification process
- describe documentation

Reference Material

AAR Publications
By Transportation Technology Center, Inc.
Published by Association of American Railroads

Modern Welding Technology
By Howard B. Cary
Published by Prentice-Hall
ISBN# 0-1359-9290-7

Railway Locomotive Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/rules/tc_o_0_55.htm#contents

Railway Passenger Car Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/Rules/TC_0-26.htm

Railway Freight Car Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/Rules/TC_0-06-1.htm

Apprenticeship
In-School Curriculum Standards

Railway Car Technician

Level 3

268R

Ministry of Training, Colleges & Universities
Workplace Training Branch

Development date: September 2006
Implementation date:
Printing date:

This new curriculum standard for the Railway Car Technician trade is designed from the learning outcomes, which were developed from the industry-approved training standard.

The curriculum is organized into three levels of training, each including reportable subjects containing learning outcomes to reflect the units of the training standard. The hours charts indicate how the curriculum can be delivered in the current block release format and summarizes the hours of training for each reportable by level. Since the reportable subjects are all divisible by three they can be adapted to accommodate a more flexible training delivery other than block release.

The reportable subjects are cross-referenced to the training standard for ease of comparison.

Each reportable subject and learning outcome identifies a recommended number of training hours. This hour allotment is broken into hours for instruction in theory and practical application. The division of the curriculum into reportable subjects follows a natural progression of learning through the training program. This structure will allow training centres and apprentices flexibility in program delivery while still observing the importance of sequencing learning in a logical progression.

The curriculum is framed by and includes specific references to terminal performance objectives in the Apprenticeship Training Standards Railway Car Technician. However, the curriculum identifies only the learning that takes place off the job, in a training environment. The in-school program focuses primarily on the theoretical knowledge required to master the performance objectives of the Training Standards. Employers are expected to extend the apprentice's knowledge and skills through appropriate practical training on the work site. Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to assure that all apprentices have achieved the learning outcomes identified in the curriculum standard. The balance between theoretical and practical evaluation is identified for each unit of learning outcomes.

Implementation date: to be determined

Table of Contents

Introduction

Summary of Total Program In-School Training Hours 1

Program Summary of Reportable Subjects

1.0 - Safety and Maintenance Inspections 2 2
1.1 - Safety and Maintenance Inspections 2 3

2.0 - Trucks 2 6
2.1 - Trucks 2 7

3.0 - Underframes 2 10
3.1 - Underframes 2 11

4.0 - Car Bodies 2 14
4.1 - Car Bodies 2 15

5.0 - Welding and Fabrication 3 17
5.1 - Welding and Fabrication 3 18

6.0 - Regulatory Publications 3 20
6.1 - Manufacturing Standards and Recommended Practices (M.S.R.P.) 21
6.2 - Association of American Railroads (AAR) Field Manual 23

7.0 - Brakes 3 25
7.1 - Brakes 3 26

8.0 - Coaches 2 29
8.1 - Coaches 2 30

Reference Material 34

Summary of Total Program In-School Training Hours

Reportable Subjects	Total	Theory	Practical
1. Safety and Maintenance Inspections 2	24	9	15
2. Trucks 2	39	39	0
3. Underframes 2	24	15	9
4. Car Bodies 2	39	24	15
5. Welding and Fabrication 3	33	9	24
6. Regulatory Publications 3	9	9	0
7. Brakes 3	39	15	24
8. Coaches 2	33	24	9
Total	240	144	96

Number:	1
Title:	**Safety and Maintenance Inspections 2**
Duration:	24 Total Hours Theory: 9 hours Practical: 15 hours
Prerequisites:	Completion of Level 2
Co-requisites:	N A

1.1 - Safety and Maintenance Inspections 2

24 Total Hours Theory: 9 hours Practical: 15 hours

1.3 – Safety and Maintenance Inspections 2

Cross-Reference to Learning Outcomes:

5578.04, 5578.06, 5578.07

Duration: 24 Total Hours Theory: 9 hours Practical: 15 hours

General Learning Outcome:

Identify and describe procedures for performing safety and maintenance inspections.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

1.1.1 Describe outbound #1 air brake test procedures.

1.1.2 Describe pre-trip inspection procedures for auto racks.

1.1.3 Describe rail car wreck damage inspection procedures.

Learning Content:

1.3.1 Describe outbound #1 air brake test procedures.

- identify applicable safety legislation
- describe blue flag procedures
- interpret applicable job documentation
- describe the brake systems and piston travel on freight cars
- describe air brake inspection procedures
- describe the SBU testing procedures
- describe defects
- select tools, equipment, and gauges
- describe procedures for repairs and adjustments
- describe recommendations for further inspection, repair, or replacement
- describe reporting requirements
- describe documentation

1.3.2 Describe pre-trip inspection procedures for auto racks.

- identify applicable safety legislation
- describe blue flag procedures
- interpret applicable job documentation
- describe inspection procedures on interiors, securement devices, stencils, and lubrication
- describe defects
- select tools and equipment
- describe recommendations for further inspection, repair, or replacement
- describe documentation

1.3.3 Describe rail car wreck damage inspection procedures.

- identify applicable safety legislation
- describe blue flag procedures
- interpret applicable job documentation
- describe inspection procedures
- describe defects including (not limited to): checking for bent, broken, and missing components
- describe use of defect cards
- describe recommendations for further inspection, repair, or replacement
- describe reporting requirements
- describe documentation

Number:	2
Title:	**Trucks 2**
Duration:	39 Total Hours Theory: 39 hours Practical: 0 hours
Prerequisites:	Completion of Level 2
Co-requisites:	N A

2.1 - Trucks 2

39 Total Hours Theory: 39 hours Practical: 0 hours

2.1 - Trucks 2

Cross-Reference to Learning Outcomes:

5574.06, 5574.07, 5574.08, 5574.09, 5574.10

Duration: 39 Total Hours Theory: 39 hours Practical: 0 hours

General Learning Outcome:

Identify and describe rail truck servicing procedures in accordance with government legislation.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

2.1.1 Describe brake beam inspection and overhaul procedures.

2.1.9 Describe servicing procedures for brake shoes.

2.1.10 Describe lever overhaul procedures.

2.1.11 Describe brake rod overhaul procedures.

2.1.12 Describe friction bearings maintenance procedures.

Learning Content:

2.1.1 Describe brake beam inspection and overhaul procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- select required gauges, tools, and equipment
- identify brake beam components including (not limited to): heads, guides, tension members, hangers, wear plates, and safeties
- describe inspection procedures
- describe defects
- describe recommendations for repair or replacement
- describe verification procedures
- describe documentation

2.1.2 Describe servicing procedures for brake shoes.

- identify applicable safety legislation
- interpret applicable job documentation
- describe types of brake shoes
- describe inspection procedures
- describe defects of brake shoes and associated parts
- select tools, equipment, and gauges
- describe removal and installation procedures
- describe recommendation for replacement
- describe documentation

2.1.3 Describe lever overhaul procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe components including (not limited to): pins, bushings, and levers
- select tools, equipment, and gauges
- describe defects including (not limited to): lever angularity, broken, worn, cracked, and bent components
- describe removal and installation procedures
- describe recommendations for repair or replacement
- describe verification procedures
- describe documentation

2.1.4 Describe brake rod overhaul procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe components
- select tools, equipment, and gauges
- describe inspection procedures
- describe defects including (not limited to): broken, bent, cracked, or worn rods
- describe removal and installation procedures
- describe recommendations for repair or replacement
- describe verification procedures
- describe documentation

2.1.5 Describe friction bearings maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe components including (not limited to): brass, wedges, lubricators, and journal stops
- describe lubrication requirements
- select tools, equipment, and gauges
- describe defects
- describe removal and installation procedures
- describe recommendations for repair or replacement
- describe verification procedures
- describe documentation

Number:	3
Title:	**Underframes 2**
Duration:	24 Total Hours Theory: 15 hours Practical: 9 hours
Prerequisites:	Completion of Level 2
Co-requisites:	N A

3.1 - Underframes 2

24 Total Hours Theory: 15 hours Practical: 9 hours

3.1– Underframes 2

Cross-Reference to Learning Outcomes:

5575.04, 5575.05, 5575.06, 5575.07

Duration: 24 Total Hours Theory: 15 hours Practical: 9 hours

General Learning Outcome:

Identify and describe procedures for servicing underframes.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

3.1.1 Describe the procedures to refurbish floors or decking.

3.1.2 Describe maintenance procedures for superstructures.

3.1.3 Describe reconditioning procedures for body bolsters.

3.1.4 Describe reconditioning procedures for fixed and sliding centre sills.

Learning Content:

3.1.1 Describe the procedures to refurbish floors or decking.

- identify applicable safety legislation
- interpret applicable job documentation
- describe types of flooring
- describe types of securement devices
- describe inspection procedures
- describe defects
- describe maintenance procedures including (not limited to): patching, welding, grinding, fastening, sanding, replacing, and painting
- describe verification process
- describe documentation

3.1.2 Describe maintenance procedures for superstructures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe superstructure components including (not limited to): main beams, intermediate beams, floor stringers, and end or side sills
- describe inspection procedures
- describe replacement procedures
- select tools and equipment including (not limited to): torches, welding equipment, plasma arc equipment, sledge hammers, grinders, clamps, drills, and measuring or checking equipment
- describe reconditioning procedures including (not limited to): welding, cutting, grinding, fitting, splicing, and straightening
- describe the verification process
- describe documentation

3.1.3 Describe reconditioning procedures for body bolsters.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe replacement procedures
- select tools and equipment including (not limited to): torches, welding equipment, grinders, painting equipment, riveting machine, and measuring or checking equipment
- describe reconditioning procedures including (not limited to): grinding, welding, splicing, straightening, riveting, heating, and painting
- describe magnetic particle testing procedures
- describe the verification process
- describe documentation

3.1.4 Describe reconditioning procedures for fixed and sliding centre sills.

- identify applicable safety legislation
- interpret applicable job documentation
- describe fixed and sliding centre sill components including (not limited to): centre of car cushioning devices, sill carriers, main members, stiffeners, coupler carriers, casting body springs, casting carrier springs, draft lugs, and striker castings
- describe inspection procedures
- describe defects
- select tools and equipments including (not limited to): torches, welding equipment, grinders, painting equipment, riveting machine, hydraulic equipment, and measuring or checking equipment
- describe maintenance procedures including (not limited to): welding, splicing, grinding, riveting, straightening, fitting, and painting
- describe verification procedures
- describe documentation

Number:	4
Title:	**Car Bodies 2**
Duration:	39 Total Hours Theory: 24 hours Practical: 15 hours
Prerequisites:	Completion of Level 2
Co-requisites:	N A

4.1 - Car Bodies 2

39 Total Hours Theory: 24 hours Practical: 15 hours

4.1– Car Bodies 2

Cross-Reference to Learning Outcomes:

5579.04, 5579.05

Duration: 39 Total Hours Theory: 24 hours Practical: 15 hours

General Learning Outcome:

Identify and describe procedures for servicing car bodies.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

4.1.14 Describe hopper car maintenance procedures.

4.1.15 Describe tank car maintenance procedures.

Learning Content:

4.1.1 Describe hopper car maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe defects including (not limited to): holes, cracks, rust, leaks, and body damage
- describe hopper car components including (not limited to): top hatch covers, gaskets, locks, partitions, hinges, interior dividers, walkways, chutes, bottom gates, gates, locks, top and side chord, sills, pressure hoses, gauges, and end caps
- select tools and equipment including (not limited to): power tools, hand tools, welding equipment, and hoisting or rigging equipment
- describe maintenance procedures including (not limited to): welding, cutting, straightening, riveting, grinding, and fastening
- describe verification procedures
- describe documentation

4.1.2 Describe tank car maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe inspection procedures
- describe defects including (not limited to): holes, cracks, rust, leaks, and body damage
- describe tank car components including (not limited to): car ends, sides, car valve housing, safety railings, car valves, stub sills, and bottom outlet caps
- select tools and equipment including (not limited to): power tools, hand tools, welding equipment, and hoisting or rigging equipment
- describe maintenance procedures including (not limited to): welding, heating, straightening, grinding, and adjusting
- describe verification procedures
- describe documentation

Number: 5

Title: **Welding and Fabrication 3**

Duration: 33 Total Hours Theory: 9 hours Practical: 24 hours

Prerequisites: Completion of Level 2

Co-requisites: N A

5.1 - Welding and Fabrication 2

33 Total Hours Theory: 9 hours Practical: 24 hours

5.1 – Welding and Fabrication 3

Cross-Reference to Learning Outcomes:

5571.12

Duration: 33 Total Hours Theory: 9 hours Practical: 24 hours

General Learning Outcome:

Use Gas Metal Arc Welding (GMAW) equipment.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

5.1.2 Demonstrate the use of Gas Metal Arc Welding (GMAW) equipment.

Learning Content:

5.1.1 Demonstrate the use of Gas Metal Arc Welding (GMAW) equipment.

- interpret applicable safety legislation
- interpret engineering drawings and job documentation
- identify power source, feeders, welding cable assemblies, welding gun, gun liners, gas distributor, gas cup and seals, contact tubes, flow meter, and purging equipment
- determine required equipment
- assess equipment condition
- determine required attachments and tooling
- demonstrate assembly, setting up, and testing of welding equipment
- describe calibration requirements

Number:	6
Title:	**Regulatory Publications 3**
Duration:	9 Total Hours Theory: 9 hours Practical: 0 hours
Prerequisites:	Completion of Level 2
Co-requisites:	N A

6.1 - Manual of Standards and Recommended Practices (M.S.R.P.)

4 Total Hours Theory: 4 hours Practical: 0 hours

6.2 - Association of American Railroads (AAR) Field Manual

5 Total Hours Theory: 5 hours Practical: 0 hours

6.1 – Manual of Standards and Recommended Practices (M.S.R.P.)

Cross-Reference to Learning Outcomes:

Duration: 4 Total Hours Theory: 4 hours Practical: 0 hours

General Learning Outcome:

Interpret regularly adopted specifications, standards, and recommended practices of the Association of American Railroads Mechanical Section.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

6.1.11 Interpret Section D.

6.1.12 Interpret Sections G and H.

6.1.13 Interpret Section C.

6.1.14 Interpret Section E.

6.1.15 Interpret Section B.

Learning Content:

6.2.5 Interpret section D.

- identify regulations relating to Trucks and Truck Details
- identify regulations relating to Codes for Designating Design Features for Sideframes and Truck Bolsters

6.2.6 Interpret sections G and H.

- identify regulations relating to Wheels and Axles
- identify regulations relating to Roller Bearings

6.2.7 Interpret sections C.

- identify regulations relating to Car Construction

6.2.8 Interpret section E.

- identify regulations relating to Brakes.

6.1.5 Interpret section B.

- identify regulations relating to Couplers

6.2 – Association of American Railroads (AAR) Field Manual

Cross-Reference to Learning Outcomes:

Duration: 5 Total Hours Theory: 5 hours Practical: 0 hours

General Learning Outcome:

Navigate the AAR Field Manual and interpret specified regulations.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

6.2.1 Interpret selected regulations related to Care and Repair of Freight Cars.

6.2.2 Interpret selected regulations related to Interchange of Freight Cars.

6.2.3 Interpret selected regulations related to Brakes.

6.2.4 Interpret selected regulations related to Welding of Tank Car Tanks.

Learning Content:

6.2.1 Interpret selected regulations related to Care and Repair of Freight Cars.

6.2.2 Interpret selected regulations related to Interchange of Freight Cars.

6.2.3 Interpret selected regulations related to Brakes.

6.2.4 Interpret selected regulations related to Welding of Tank Car Tanks.

Number:	7
Title:	**Brakes 3**
Duration:	39 Total Hours Theory: 15 hours Practical: 24 hours
Prerequisites:	Completion of Level 2
Co-requisites:	N A

7.1 - Brakes 3

39 Total Hours Theory: 15 hours Practical: 24 hours

7.1 – Brakes 3

Cross-Reference to Learning Outcomes:

5576.05, 5576.06, 5576.07

Duration: 39 Total Hours Theory: 15 hours Practical: 24 hours

General Learning Outcome:

Identify and describe procedures for servicing brakes.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

7.1.1 Describe slack adjuster maintenance procedures.

7.1.2 Describe reservoir tank maintenance procedures.

7.1.3 Describe hand brake maintenance procedures.

Learning Content:

7.1.1 Describe slack adjuster maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe single-car test procedures
- describe defective or out-of-adjustment slack adjusters
- select tools and equipment including (not limited to): single-car test device, wrenches, sockets, hammer, pliers, and screwdrivers
- describe adjustment, repair, and replacement procedures
- describe verification procedures
- describe documentation

7.1.2 Describe reservoir tank maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe types of reservoir tanks
- describe single-car test procedures
- describe defects
- select tools and equipment including (not limited to): single-car test device, ratchet, drift, impact devices, pneumatic tools, air guns, and fasteners
- describe component replacement techniques
- describe verification process
- describe documentation

7.1.3 Describe hand brake maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documentation
- describe types of hand brakes
- describe components of hand brakes
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): torches, wrenches, pliers, and sockets
- describe repair or replacement procedures
- describe verification procedures
- describe documentation

Number:	8
Title:	**Coaches 2**
Duration:	33 Total Hours Theory: 24 hours Practical: 9 hours
Prerequisites:	Completion of Level 2
Co-requisites:	N A

8.1 - Coaches 2

33 Total Hours Theory: 24 hours Practical: 9 hours

8.1 – Coaches 2

Cross-Reference to Learning Outcomes:

5580.09, 5580.11, 5580.12, 5580.13, 5580.14, 5580.15

Duration: 33 Total Hours Theory: 24 hours Practical: 9 hours

General Learning Outcome:

Identify and describe procedures for servicing coaches.

Learning Outcomes:

Upon successful completion, the apprentice is able to:

8.1.1 Describe maintenance of kitchen and bathroom equipment and accessories.

8.1.2 Describe emergency equipment maintenance procedures.

8.1.3 Describe electrical component securement procedures.

8.1.4 Describe plumbing fixtures and appliances inspection procedures.

8.1.5 Describe coach brake system maintenance procedures.

8.1.6 Describe roller bearing maintenance procedures.

Learning Content:

8.1.1 Describe maintenance of kitchen and bathroom equipment and accessories.

- identify applicable safety legislation
- interpret applicable job documents
- describe kitchen and bathroom components including (not limited to): securements, griddles, range hoods, fire suppression systems, fridges, freezers, small appliances, microwave ovens, dish racks, cash registers, dispensers, rails, waste receptacles, and mirrors
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): electric power tools and hand tools
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.2 Describe emergency equipment maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe emergency equipment components including (not limited to): window units, release hardware, axes, saws, sledge hammers, fire extinguishers, pry bars, first aid kits, stretchers, and trauma kits
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): electric power tools and hand tools
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.3 Describe electrical component securement procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe electrical components including (not limited to): heaters, lighting, fans, evaporators, blowers, speakers, amplifiers, players, tuners, disc players, television, and audio equipment
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): electric power tools and hand tools
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.4 Describe plumbing fixtures and appliances inspection procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe components including (not limited to): hot water and water storage tanks, exchangers, waste piping, piping, taps, faucets, plugs, bowls, stands, shower stalls, brackets, curtains and rods, toilet seats, lids, drip pans, flush mechanism, shrouds, diaphragms, and holding tanks
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): required hand or power tools
- select fasteners
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.5 Describe coach brake system maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe coach brake system components including (not limited to): service and emergency portions, pressure relief valves, reservoir relief valves, pipe brackets and manifolds, strainers, housings, piston return assemblies, seals, gaskets, lubricants, brake cylinders, and pneumatic slack adjusters
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): required hand or power tools, and air brake testing equipment
- describe maintenance procedures
- describe verification process
- describe documentation

8.1.6 Describe roller bearing maintenance procedures.

- identify applicable safety legislation
- interpret applicable job documents
- describe roller bearing components including (not limited to): caps, cups, cone assemblies, spacers, seal wear rings, seals, backing rings, adaptors, and lubricators
- describe inspection procedures
- describe defects
- select tools and equipment including (not limited to): hand or power tools, hydraulic press, dial indicators, grease slingers, gauges, and torque wrench
- describe maintenance procedures
- describe verification process
- describe documentation

Reference Material

AAR Publications
By Transportation Technology Center, Inc.
Published by Association of American Railroads

Modern Welding Technology
By Howard B. Cary
Published by Prentice-Hall
ISBN# 0-1359-9290-7

Railway Locomotive Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/rules/tc_o_0_55.htm#contents

Railway Passenger Car Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/Rules/TC_0-26.htm

Railway Freight Car Inspection and Safety Rules
Transport Canada
http://www.tc.gc.ca/railway/Rules/TC_0-06-1.htm

Ontario

Apprenticeship Training Standard

Schedule of Training

RAILWAY CAR TECHNICIAN

Trade Code: 268R

This document is the property of the apprentice named inside and represents the official record of his/her training.

Schedule of Training

RAILWAY CAR TECHNICIAN

Trade Code: 268R

Development Date: December 2005
Revision Date: N/A

CONTENTS **PAGE**

Preface 2

Definitions 3

Important Directions to the Apprentice 5

Important Directions for the Sponsor/Employer & Supervisor/Trainer 5

Notice/Declaration for Collection of Personal Information 6

Roles and Responsibilities of Apprentice, Sponsor/Employer and Supervisor/Trainer 7

Skill Set Completion Form 9

Learning Outcome Completion Form 9

Apprentice Completion Form 10

TRAINING CONTENT

A. Description/Duties 11

B. On-the-Job Training Performance Objectives
- 5570.0 Protect self and others 12
- 5571.0 Prepare for job 17
- 5572.0 Perform benchwork 22
- 5573.0 Perform material handling procedures 25
- 5574.0 Service rail trucks 30
- 5575.0 Service underframes 35
- 5576.0 Service brakes 39
- 5577.0 Service car safety appliances 43
- 5578.0 Perform safety and maintenance inspections 45
- 5579.0 Service car bodies 49
- 5580.0 Service coaches (This is an optional skill track) 52

C. Learning Outcomes 57

Apprentice Record 61

PREFACE

This Schedule of Training was developed by the Workplace Training Branch of the Ministry of Training, Colleges, and Universities (MTCU), in partnership with the Industry Advisory Committee and in consultation with representatives from the industry. This document is intended to be used by apprentice, supervisor/trainer and sponsor/employer as a "blueprint" for training and as a prerequisite for completion and certification.

This training document becomes the apprentice's only record of workplace training performance.

Supervisor/trainer and apprentice are required to sign off and date the skills following each successful acquisition, unless a skill is marked shaded (optional).

The care and maintenance of this training document are the joint responsibility of the apprentice and the sponsor/employer. By signing off the skill, the supervisor/trainer and the apprentice are indicating that the apprentice has demonstrated competence of the skill. This training standard has been developed specifically for documenting the apprentices acquisition of skills of the trade.

DEFINITIONS

ACA
Apprenticeship and Certification Act, 1998

Certificate of Apprenticeship (CofA)
Certification issued to individuals who have demonstrated that they have completed an apprenticeship in Ontario.

Certificate of Qualification (CofQ)
Certification issued to C of Q applicants who have achieved a passing grade on the certification exam for their trade.

Competence
The ability of an individual to perform a skill repeatedly and without assistance in the workplace to the standard set out in the Training Standard or Schedule of Training.

Competency Analysis Profile
A document that identifies the training needs of an individual trade and details the skills/skill sets that must be demonstrated.

Industry Committee (IC) - under the ACA and Provincial Advisory Committee (PAC) under the TQAA
Under the ACA and TQAA, the Minister may appoint a provincial committee in any trade or group of trades to advise the Minister in matters relating to the establishment and operation of apprenticeship training programs and trades qualifications.

Journeyperson or Equivalent
A person who has acquired the knowledge and skills in a trade, occupation or craft as attested to by a provincial or territorial authority.

Mandatory
Status assigned to unshaded individual skills, skill sets or general performance objective which must be signed off for the apprentice to complete their program.

Optional
Status assigned to shaded individual skills, skills sets or general performance objective for which sign-off is not required for the apprentice to complete the program.

Schedule of Training
An apprenticeship training standard which includes the on-the-job performance objectives and off-the-job learning outcomes

Sign-off
Signature of the sponsor/employer of record or an individual, to whom that sponsor or employer has delegated signing authority, indicating an apprentice's achievement of competence.

Skill
Individual skill described in the Training Standard (note: does not mean the larger skill groups referred to in the Training Standard as Skill Sets, Training Units, or General Performance Objective, but the individual skills that make up those groups).

Skill Sets
Group of individual skills found in the Training Standard (may also be called Training Unit or General Performance Objective)

Skill Set Completion Form (and Learning Outcome Completion Form)
Lists all skill sets and includes space for sign-off by sponsor/employer of record.

Sponsor/Employer
Means a person that has entered into a registered training agreement under which the person is required to ensure that an individual is provided with workplace-based training in a trade, other occupation or skill set as part of an apprenticeship program approved by the Director.

Sponsor/Employer of Record
Refers to the sponsor or employer documented as the signatory to the current training agreement or contract. In order for an sponsor/employer to be considered for the training of apprentices, they must identify that the workplace has qualified journeypersons or equivalent on site and can identify that the workplace has the tools, equipment, materials, and processes which have been identified by Provincial Advisory Committees (PACs) or Industry Committees (ICs) to be required for the trade.

Supervisor
An individual who oversees the execution of a task, oversees the actions or work of others.

Trainer
A qualified trainer in a compulsory trade is a journeyperson with a Certificate of Qualification or in a voluntary trade is an individual who is considered equivalent to a journeyperson with a Certificate of Qualification.

TQAA
Trades Qualification and Apprenticeship Act.

Training Standard
A document that has been written in concise statements, which describe how well an apprentice must perform each skill in order to become competent. In using the document,

trainers will be able to ensure that the apprentice is developing skills detailed for the occupation.

IMPORTANT DIRECTIONS

Apprentice

1. All complete skills or skill sets must be signed and dated by both the apprentice and sponsor/employer when either all terms of the contract have been completed or the apprentice leaves the employ of the employer.

It is the responsibility of the apprentice to inform the local Apprenticeship Client Services Office regarding the following changes:

- $ change of sponsor/employer address;
- $ change of apprentice name or address;
- $ transfer to a new sponsor/employer.

The Skill Set Completion Form and Learning Outcome Completion Form must be completed and signed by the current sponsor/employer and presented to the local Apprenticeship Client Services Office at the fulfillment of all terms of a Training Agreement.

The apprentice completion form with the Completed and Authorized Schedule of Training must be presented to the local Apprenticeship Client Services Unit.

Sponsors/Employers and Supervisors/Trainers

The Schedule of Training identifies skills and supporting learning outcomes required for this trade/occupation and its related training program.

This Schedule of Training has been written in concise statements which describe how an apprentice must perform each skill/outcome in order to become competent. Competence means being able to perform the task to the required standard.

In using this training standard, supervisors/trainers will be able to ensure that the apprentice is developing the skills detailed for the trade/occupation.

Supervisors/Trainers and apprentices are required to sign off and date the skills following each successful acquisition.

Sponsors/Employers participating in this training program will be designated as the Signing Authority and are required to attest to successful achievement by signing the appropriate box included at the end of each skill set.

NOTICE/DECLARATION FOR COLLECTION OF PERSONAL INFORMATION

1. This information is collected under the authority of the *Apprenticeship and Certification Act, 1998.*

2. The information is collected for the purpose of administering this apprenticeship training program within the Province of Ontario.

3. Questions regarding collection and use of this information may be directed to:

Director
Ministry of Training, Colleges and Universities
Workplace Training Branch
Program Development and Standards Unit
17th Floor, Mowat Block
900 Bay Street
Toronto, ON M7A 1L2
(416) 326-5605

ROLES & RESPONSIBILITIES OF APPRENTICE, SPONSOR/EMPLOYER AND SUPERVISOR/TRAINER

Apprentice "Apprenticeship is Learning On-the-job"

- $ Practice safe work habits.
- $ Use your apprenticeship training standard as a journal to keep track of which skills you have achieved.
- $ Talk over your training plan with your Training Consultant, Employer, Union, or Sponsor.
- $ Know what tools are required for your trade and how to use them.
- $ Ask questions and keep asking.
- $ Talk to your employer about your training needs.
- $ Demonstrate enthusiasm and good work habits.
- $ Ensure that you and your supervisor/trainer sign off skill/skill sets upon demonstration of competency.

Sponsor/Employer "Training is an Investment"

- $ Demonstrate safe work habits.
- $ Attest to successful achievement by signing the skill/skills sets.
- $ Provide opportunities and time for the apprentice to learn the trade.
- $ Offer practical trade training experiences that cover all of the skill sets.
- $ Foster work ethics that support training while minimizing productivity losses.
- $ Set out clear expectations, then recognize or reward performance excellence.
- $ Involve both the apprentice and supervisor/trainer in developing the training plan.
- $ Use the Training Standard as a monitoring tool and part of regular performance evaluations.
- $ Select supervisors/trainers with good communication skills and who work well with others.
- $ Encourage supervisors/trainers to take upgrading courses - (e.g. Train the Trainer, Mentor Coach, etc).
- $ Complete the Skill Set Completion Form once the apprentice has demonstrated competency in the training.
- $ Ensure that the apprentice always works under the direction of or has access to a qualified supervisor/trainer.
- $ Vary the apprentice's exposure to all the skills set out in the training standard.

Supervisor/Trainer

- $ Demonstrate safe work habits.
- $ Treat apprentices fairly and with respect.
- $ Use the Training Standard as a guide to evaluating competence in each skill area. In using the Training Standard, supervisors/trainers will be able to ensure that the apprentice is developing skills detailed for the trade/occupation.
- $ Review the Training Standard with the apprentice and develop a training plan.
- $ Respond fully to all questions.
- $ Be patient. Explain what is to be done then, show how it is done, and then let the apprentice demonstrate the task.
- $ Provide continuous feedback.
- $ Sign off individual skills/skill sets once the apprentice demonstrates competence in the skill.

Suggestions for Assessing the Progress of the Apprentice in the Workplace

- $ Use informal daily observation.
- $ Provide constructive feedback to build confidence.
- $ Allow the supervisor/trainer time to teach and demonstrate the skills.
- $ Take prompt action wherever problems occur.
- $ Conduct regular performance reviews involving the apprentice, supervisor/trainer and sponsor/employer.
- $ Use the Training Standard as the reference for establishing the competency of the apprentice.

SKILL SET COMPLETION FORM

SKILLS SETS	TITLE	SIGNING AUTHORITY
5570.0	Protect self and others	
5571.0	Prepare for job	
5572.0	Perform benchwork	
5573.0	Perform material handling procedures	
5574.0	Service rail trucks	
5575.0	Service underframes	
5576.0	Service brakes	
5577.0	Service car safety appliances	
5578.0	Perform safety and maintenance inspections	
5579.0	Service car bodies	
5580.0	Service coaches (This is an optional skill track)	

NOTE ON SHADED PERFORMANCE OBJECTIVES AND SKILLS:

- $ Shaded performance objectives and skill sets are optional. The shaded skills do not have to be demonstrated or signed-off for completion of the on-the-job component of the apprenticeship
- $ The learning outcomes will cover all of the skill sets, both shaded and unshaded.

LEARNING OUTCOMES COMPLETION FORM

Date of Completion	Organization Name(s)	SIGNING AUTHORITY

APPRENTICE COMPLETION FORM

APPRENTICE NAME	
Print	
Signature	
Social Insurance Number	

Skill Sets and Learning Outcomes when completed should be signed by the Supervisor/Trainer and presented with this completion form to your local Apprenticeship Client Services Office. Any supporting documentation should also be attached.

In-school Completed

Yes ( )

No ( )

Not applicable ( )

(Proof to be Provided)

Hours completed as Per Contract:

Yes ( )

No ( )

Not applicable

( )

SPONSOR/EMPLOYER INFORMATION

Name	
Address	
Telephone	
E-mail Address	
Signature of Signing Authority	

A. DESCRIPTION/DUTIES

A **Railway Car Technician** inspects, repairs, replaces and reconditions mechanical or structural components and systems of freight cars and passenger coaches.

These individuals must have a mechanical aptitude and hands on skills and be able to use many different types of power, pneumatic, and hydraulic tools or equipment. These individuals work for railway companies or rail car repair facilities.

A **TRADE NAME** demonstrates knowledge of:

- Safety Legislations
- American Association of Railways regulations
- Applicable Acts, Codes, Legislation and Regulation

BENCHMARK/GUIDELINE TOTAL TRAINING TIMEFRAMES: (ON-THE-JOB AND OFF-THE-JOB):

8,000 hours
Includes 720 hours of in-school training.

B. ON-THE-JOB PERFORMANCE OBJECTIVES

5570.0 PROTECT SELF AND OTHERS

5570.01 **Identify health and safety hazards in the workplace**, so that the potential for personal injury, damage to equipment or the environment is prevented, and corrective action is taken as defined in Safety Legislation, American Association of Railways (AAR) regulations, or company standards/procedures, and that all hazards are reported.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5570.02 **Wear, adjust, and maintain personal protective equipment** including eye, ear, hand, and foot protectors, to ensure correct fit and optimum protection for the wearer and the task being performed, in compliance with company standards/procedures, AAR regulations, and Safety Legislation.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5570. 03 **Wear, adjust, and maintain respiratory protectors** to ensure correct fit and optimum protection in compliance with company standards/procedures, AAR regulations, and Safety Legislation.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5570.04 **Practise safe work habits** by staying outside guards and barricades, wearing required clothing (not loose or torn), confining long hair, and removing jewellery in accordance with company standards/procedures, AAR regulations, and Safety Legislation.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5570.0 **PROTECT SELF AND OTHERS**

5570.05 **Follow fire procedures** including (not limited to) locating and assessing the severity of the fire, taking appropriate action, suppressing minor fire, activating alarm, and reporting incidents, in compliance with company standards/ procedures, AAR regulations, and Safety Legislation.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5570.06 **Operate emergency safety equipment** including (not limited to) fire extinguishers, respirators, barrier creams, and fire blankets, ensuring that procedures are carried out in a safe and efficient manner, in accordance with company standards/procedures, AAR regulations, and Safety Legislation.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5570.07 **Practise industrial hygiene** by wearing required clothing and using eye wash or showering to avoid contamination or injury, in compliance with company standards/procedures, AAR regulations, and Safety Legislation.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5570.08 **Practise good housekeeping in the workplace** by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment, so that the potential for accident or injury is prevented and tools or equipment are in place and available, in compliance with company standards/procedures, AAR regulations, and Safety Legislation.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5570.0 **PROTECT SELF AND OTHERS**

5570.09 **Conduct pre-operational check of equipment** by checking that guards and safety devices are in place, secured, and not damaged, in compliance with company standards/procedures, AAR regulations, and Safety Legislation.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5570.10 **Report injuries** to supervisor or first aid personnel promptly and clearly, ensuring that the injured person is attended to, and that information is reported precisely and accurately describing how incident occurred, so that future recurrence of similar accidents is prevented, in compliance with company standards/procedures, AAR regulations, and Safety Legislation.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5570.11 **Follow procedures for applying first aid** to treat conditions including (not limited to), sudden illness, burns, cuts, abrasions, sprains, chemical inhalations, falls, and contaminants in eyes, so that the condition of the victim is stabilized and prepared for further first aid treatment, in compliance with company standards/procedures, AAR regulations and Safety Legislation.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5570.12 **Lock out mechanical equipment** for repair or maintenance by shutting down and tagging machine or equipment, to ensure that no materials can enter the equipment being repaired or maintained, no damage is caused to the machine, and accidents are prevented, in compliance with company standards/procedures, AAR regulations and Safety Legislation.

_____ _____
_____

Date Completed Apprentice

Supervisor/Trainer

5570.0 **PROTECT SELF AND OTHERS**

5570.13 **Handle designated substances or dangerous goods/commodities** using specified handling and storage equipment, so that the operator is protected from injury, the environment from contamination, and safe procedures are followed, in compliance with Safety Legislation, AAR regulations, and company standards/procedures.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5570.14 **Operate lifting equipment** including (not limited to) hoists, overhead cranes, chain falls, lift pins, eye bolts, slings, cables, and chains, to remove, transport, and store materials, parts, or equipment, in compliance with Safety Legislation, AAR regulations, and company standards/procedures.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5570.15 **Handle work site hazards** including (not limited to) inadequate ventilation, confined spaces, noxious fumes, dust, high intensity light, elevated work sites, suspended loads, poor lighting, extreme temperatures, and uncontrolled power sources, by identifying hazards, identifying or activating alarms, notifying others, and determining means of emergency containment or site evacuation, so that the potential for personal injury and damage to equipment or the environment is prevented, in compliance with AAR regulations, Safety Legislation, and company standards/procedures.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5570.0 **PROTECT SELF AND OTHERS**

5570.16 **Observe blue flag procedures** by placing blue flags on each end of a string of `cars or at each end of the track, to indicate that workers are working under or in vicinity of the rail cars, ensuring that only approved personnel can remove the blue flags, and that the switch crews are made aware of the presence of blue flags, in accordance with Safety Legislation, AAR regulations, and company standards/procedures.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

_____ _____

5571.0 **PREPARE FOR JOB**

5571.01 **Read and interpret engineering drawings** including schematics, blueprints, sketches, or assembly drawings to identify: required drawings, overall shape, size, orientation, view, symbols, assembly and disassembly sequences, machining requirements, number of components, workpiece material, measurements, dimensions, and any other information required to plan and prepare for the job.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5571.02 **Perform metric and imperial calculations** to determine tolerances, dimensions, angles, linear measurements, lever ratios, size of pipes and fittings, gauging limits, condemning limits, radius, circumference, volumes, weights, and areas, so that all required measurements and parameters are correctly determined to complete the job, in accordance with job specifications and engineering drawings.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5571.03 **Prepare measuring and checking devices** including (not limited to) micrometers, callipers, wheel gauges, coupler gauges, vernier callipers, magnetic particle tester, dial indicator, truck gauges, air pressure gauges, bubble flowrator, depth or height gauges, restoration gauges, levels, explosive safety meters, air quality meters, thickness meters, straight edge, tapes, steel rules, and plumb bob, by reading and interpreting job specifications, calibrating, cleaning, and setting up devices, ensuring that measuring and checking devices are cleaned, calibrated and ready for use, and that devices selected are capable of measuring to obtain the required tolerances and dimensions, in accordance with the engineering drawings, job specifications, process layouts, and AAR regulations.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5571.0 **PREPARE FOR JOB**

5571.04 **Verify workpiece material** for correct size and type by checking material specifications, colour codes, numerical codes, stamps, lettering, and quality assurance tags, to ensure that workpiece selected conforms to engineering drawings, job specifications, and AAR regulations.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5571.05 **Read and interpret reference documentation** including (not limited to) manufacturers' manuals, parts bulletins, service or preventative maintenance manuals, technical bulletins, fact sheets, and AAR manuals to identify: assembly and disassembly sequences, workpiece material, type of cutting fluids/lubricants, modifications to specifications, specialty tools, maintenance procedures and schedules, replacements parts, and any other information needed to complete the job.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5571.06 **Read and interpret work orders** including (not limited to) billing repair cards, wheel reporting cards, inspection records, and dangerous goods documentation, to verify work requirements and to determine work procedures or schedules, so that job can be completed, in accordance with AAR regulations, company standards/policies and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5571.07 **Identify and select hand tools** including (not limited to) hammers, wrenches, sockets, ratchets, chisels, drifts, punches, pinch bars, screwdrivers, files, saws, pliers, pipe wrenches, and steel banding tools, by using information in engineering drawings and job specifications, to ensure that the hand tools selected are the correct size and type for the

application, ready for use, and available to perform the job, in accordance with Safety Legislation and company standards/policies.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5571.0 **PREPARE FOR JOB**

5571.08 **Identify and select power tools** including (not limited to) grinders, drills, die grinders, sanders, and saws by using information from engineering drawings and work process documentation, to ensure that the power tool selected is the correct one for the application, ready for use, and available to perform the job, in accordance with Safety Legislation and company standards/policies.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5571.09 **Identify and select pneumatic tools** including (not limited to) jacks, grinders, drills, impact guns, reamers, drifts, punches, and rams, by using information from engineering drawings and work process documentation, to ensure that the pneumatic tool selected is the correct one for the application, ready for use, and available to perform the job, in accordance with Safety Legislation and company standards/policies.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5571.10 **Identify and select hydraulic tools** including (not limited to) jacks, rams, stationary or portable tools, presses, wrecking equipment, and riveting guns, by using information from engineering drawings and work process documentation, to ensure that the hydraulic tool selected is the correct one for the application, ready for use, and available to perform the job, in accordance with Safety Legislation and company standards/policies.

_____ _____
_____
Date Completed Apprentice
Supervisor/Trainer

5571.11 **Select and prepare Shielded Metal Arc Welding (SMAW) equipment** by selecting power source, welding cable assemblies, electrode holder, electrode type and size, tools, and personal protective equipment, and by assembling, setting up, and testing welding equipment, ensuring that the SMAW welding process and equipment is the correct one for the application, ready for use, and available to perform the job, in accordance

with Safety Legislation, AAR regulations, engineering drawings, job specifications and company standards/policies.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5571.0 **PREPARE FOR JOB**

5571.12 **Select and prepare Gas Metal Arc Welding (GMAW) equipment** by selecting the power source, wire feeder, welding cable assemblies, welding gun, gun liners, gas distributor, gas cup and seals, contact tubes, flow meter, purging equipment, tools, and personal protective equipment, and by assembling, setting up, and testing welding equipment, ensuring that the GMAW welding process and equipment is the correct one for the application, ready for use, and available to perform the job, in accordance with Safety Legislation, engineering drawings, job specifications, AAR regulations, and company standards/policies.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5571.13 **Select and prepare oxy-fuel and plasma-arc cutting equipment** by selecting the power source, gases, gas distributors, tips, pressures, cable assemblies, plasma gun liners, tools, and personal protective equipment, and by assembling, setting up, and testing equipment, ensuring that the cutting process and equipment is the correct one for the application, ready for use, and available to perform the job, in accordance with Safety Legislation, engineering drawings, job specifications, AAR regulations, and company standards/policies.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5571.14 **Select and prepare gas-fuelled equipment** including (not limited to) portable welding equipment, jacks, compressors, generators, and personal protective equipment, by refuelling, cleaning, calibrating, and setting up, ensuring that the gas-fuelled equipment is the correct one for the application, ready for use, and available to perform the job, in accordance with Safety Legislation, engineering drawings, job specifications, AAR regulations, and company standards/policies.

_____ _____ _____

Date Completed Apprentice
Supervisor/Trainer

5571.0 **PREPARE FOR JOB**

5571.15 **Identify and select fasteners** including (not limited to) nuts, bolts, riveting guns, screws, pins, clips, cotter keys, and lock washers, ensuring that the fasteners are the appropriate size, thread type, and grade, in accordance with Safety Legislation, engineering drawings, job.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

_____ _____

5572.0 **PERFORM BENCHWORK**

5572.01 **Chisel workpiece** by following required procedures including (not limited to): reading and interpreting job specifications; selecting required tools; inspecting tools for defects such as burrs or mushroom head; dressing the chisel; wearing personal protective equipment; and, documenting the job; so that the workpiece is chiselled in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5572.02 **Grind workpiece** by following required procedures including (not limited to): reading and interpreting job specifications; using hand grinders, pedestal grinders, or air grinders; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the workpiece is ground to required shape, dimensions, and finish, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5572.03 **Paint workpiece** by following required procedures including (not limited to): reading and interpreting job specifications; using brushes, spray gun, paint, or rollers; preparing the workpiece by surface blasting, masking, sanding, or washing; wearing required personal protective equipment; disposing and storing paint and equipment; cleaning equipment and work area; and, documenting the job; so that the workpiece is painted in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5572.0 **PERFORM BENCHWORK**

5572.04 **Drill or ream holes** by following required procedures including (not limited to): reading and interpreting job specifications; verifying the workpiece material; using drill presses or hand drills; laying out workpiece using centre punch, scribe, chalk, and measuring tools; finishing workpiece by grinding, chamfering, or chiseling; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the holes are drilled or reamed to required size, tolerance, fit, dimension, and finish in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5572.05 **Cut internal (ID) and external (OD) threads** by following required procedures including (not limited to): reading and interpreting job specifications; verifying the workpiece material; using dies, hand or power threaders, gauges, taps, and drills; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the threads are cut to the required type, depth, and size, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5572.06 **Cut workpiece** by following required procedures including (not limited to): reading and interpreting job specifications; verifying the workpiece material; using pedestal grinders, hand grinders, band saw, hand saw, cut-off saw, reciprocating saw, and cutting torches; wearing personal protective equipment; finishing cut edges by grinding, chamfering, or chiseling; cleaning up the work site; and, documenting the job; so that the workpiece is cut to the required shape, size, angles, and dimensions, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5572.0 **PERFORM BENCHWORK**

5572.07 **Fasten workpiece** by following required procedures including (not limited to): reading and interpreting job specifications; using required tools including (not limited to) renches, power tools, torque wrenches, sockets, lubricants, oils, Locktight™ , Teflon™ , oxy-fuel and welding equipment; wearing personal protective equipment; using the required grade and size of fasteners; torquing; tacking; chiseling; heating; peening; chisel-checking the bolt; painting the workpiece area; cleaning up the work site; and, documenting the job; so that the workpiece is fastened and secure, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

_____ _____

5573.0 **PERFORM MATERIAL HANDLING PROCEDURES**

5573.01 **Calculate forces and loads** by following required procedures including (not limited): reading and interpreting manufacturer's manuals, load charts, engineering drawings, rigging manuals, material handling handbooks, job or work site specifications, and bills of lading; determining load weights, allowable loads, centre of gravity, vertical and horizontal forces, distribution of loads, sling patterns and configurations, gross loads on cranes, gross capacities, and working radius; so that the pre-lift is planned for safe and efficient rigging, lifting, and moving of the workpiece, in accordance with Safety Legislation, company standards/policies, AAR regulations, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5573.02 **Select and inspect rigging equipment** by following required procedures including (not limited to): reading and interpreting pre-lift plan and prepared calculations; selecting required equipment including (not limited to) cable clamps, chain block hoists, chains, chokers, come-alongs, connectors, ropes, slings, winches, and safety lines; performing pre-operational check for defective rigging including (not limited to) damaged links, cracks, frayed cables, kinking, cuts in slings, damaged threads on shackles, and any other physical damage; replacing defective components; making recommendations for further repair and action; and, tagging and isolating defective equipment; so that the rigging selected is the correct one for the weight, balance, and size of the job, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5573.0 PERFORM MATERIAL HANDLING PROCEDURES

5573.03 **Position and attach rigging** by following required procedures including (not limited to): placing or attaching the rigging to the load; dismantling or storing the rigging equipment after use; and, documenting the job; so that the correct rigging for the weight, balance, and size of the job is used to secure, lift, or move the workpiece, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5573.04 **Inspect and prepare hoisting and lifting equipment** by following required procedures including (not limited to): reading and interpreting pre-lift plan and prepared calculations; selecting required equipment including (not limited to) forklift, jib-crane, portable boom crane, overhead hoist, and other lifting equipment; performing pre-operational circle-check for defective cables and chains including damaged links and frayed cables, and any other visual damage; tagging and isolating defective equipment; making recommendations for further repair and action; and, documenting the job; so that the hoisting and lifting equipment selected are the corrects ones for the weight, balance, and size of the job in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5573.05 **Identify and prepare work site** by following required procedures including (not limited to): clearing job-site area; measuring and calculating the parameters of the site area to ensure that adequate load set-down space is available; checking that load travel pathway is clear of overhanging interference and all obstructions; and, that all personnel are clear of the load travel pathway; in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5573.0 **PERFORM MATERIAL HANDLING PROCEDURES**

5573.06 **Operate hoisting equipment** by following required procedures including (not limited): selecting required equipment such as forklift, jib-crane, portable boom crane, and overhead hoist; performing final check of chains, slings, and hooks; setting off warning alarms prior to lifts; checking that rigging and lifting equipment are the correct ones for the application; operating crane controls; correctly positioning and aligning hoist over the load; and, by lifting load gradually so that the load is clear of the ground surface; ensuring that equipment is correctly aligned and load is balanced, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5573.07 **Move the load or workpiece** by following required procedures including (not limited to): installing required tag lines; correctly controlling speed and travel; turning and positioning load; checking that travel pathway is clear of overhanging interference and all obstructions; checking that all personnel are clear of load travel pathway; checking that all operators keep to the back end of the load; and, checking that the ground person keeps to the front to guide the load; in accordance with Safety Legislation, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5573.0 **PERFORM MATERIAL HANDLING PROCEDURES**

5573.08 **Set down load** by following required procedures including (not limited to): checking that work or job site is clear of all equipment and personnel; checking that all supports are correctly placed and aligned; controlling lowering speed; checking for adequate spacing by stopping the descent before setting down the load; and, sounding the alarm confirming "all clear for set down"; so that materials are correctly placed, balanced, aligned, and secure, and that no damage is caused to workpiece or material handling equipment, or injury to personnel; in accordance with Safety Legislation, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

Date Completed Apprentice
Supervisor/Trainer

5573.09 **Shut down and store material handling equipment** by unhooking all rigging equipment and returning all lifting equipment to storage positions, and making recommendations for further repair and action, so that the material handling equipment is ready for the next lifting job, in accordance with Safety Legislation, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

Date Completed Apprentice
Supervisor/Trainer

5573.0 **PERFORM MATERIAL HANDLING PROCEDURES**

5573.10 **Work on scaffolds, lift platforms, and ladders** by following required procedures including (not limited to): performing visual pre-use inspection; erecting equipment on firm footings; selecting and utilizing a fall protection system; wearing appropriate fall protection and personal protection equipment; disassembling scaffolds; and, storing personnel lifting equipment, ensuring that equipment selected is appropriate for the task, in accordance with Safety Legislation, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

_____ _____

5574.0 **SERVICE RAIL TRUCKS**

5574.01 **Inspect wheels** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; identifying defects in wheels, axles and roller bearings; using required equipment including (not limited to) simplified wheel gauges, steel wheel gauges, combination gauges, tread-worn hollow gauges, and back-to-back gauges; wearing personal protective equipment; making recommendations for further repairs or replacements; and, by documenting the job; ensuring that the inspections are carried out, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5574.02 **Inspect roller bearings** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; checking for overheated bearings; checking end caps, backing rings, and cups; checking for loose, cracked, broken, or missing parts; checking for defective seals; checking for derailment damage; using temperature indicating crayons or other temperature measuring devices; wearing personal protective equipment; making recommendations for further repairs or replacements; and, documenting the job; ensuring that the inspections are carried out in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5574.0 SERVICE RAIL TRUCKS

5574.03 **Maintain bolsters** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; performing magnetic particle inspection; checking gibs, wear plates, centre plate rings, sizes, centre pins, side bearings and cages; using gauging devices; wearing personal protective equipment; replacing, repairing, or rebuilding defective components or parts; making required adjustments; verifying the maintenance work; cleaning up the work site; and, documenting the jobs; ensuring that the maintenance is carried out in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5574.04 **Maintain suspensions** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; checking coil springs, friction blocks, truck side bearings, elliptical springs, shock absorbers, air spring bellows, load levelers, load snubbers, spring planks, equalizers, hangers, torsion bars and safeties; using gauges; replacing, repairing, or rebuilding defective components or parts; making required adjustments; verifying the maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; ensuring that the maintenance is carried out, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5574.0 SERVICE RAIL TRUCKS

5574.05 **Maintain side frames** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; checking side frames, column wear plates, column widths, thrust lug spacing and centring, pedestal roofs, and pairing buttons; checking for visible cracking indicators and deformations; replacing, repairing, or rebuilding defective components or parts; using required tools and equipment; verifying the maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; ensuring that the maintenance is carried out, in accordance with Safety Legislation, AAR REGULATIONS, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5574.06 **Overhaul brake beams** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; checking heads, guides, tension members, hangers, wear plates, and safeties; replacing, repairing, or rebuilding defective components or parts; using required gauges, tools, and equipment; verifying the maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; ensuring that the overhaul is carried out, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5574.0 **SERVICE RAIL TRUCKS**

5574.07 **Services brake shoes** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; checking shoes and keys; replacing defective components; verifying the service work; using required tools, equipment, and gauges; wearing personal protective equipment; making recommendations for further repairs or replacements; cleaning up the work site; documenting the job; ensuring that the inspections are carried out in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5574.08 **Overhaul levers** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; checking pins, bushings, lever angularity, and sizes; checking for broken, cracked, or bent components; replacing, repairing, or rebuilding defective components or parts; using required tools, equipment, and gauges; wearing personal protective equipment; verifying the overhaul work; cleaning up the work site; and, documenting the job; ensuring that the overhaul is carried out, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5574.0 **SERVICE RAIL TRUCKS**

5574.09 **Overhaul rods** by following required procedures including (not limited to): reading and interpreting job specifications and badge plates; performing visual and manual inspections; checking dimensions of rods; checking for broken, bent, cracked, or worn rods; replacing, repairing, or rebuilding defective components or parts; wearing personal protective equipment; making recommendations for further repair or replacement; using gauges, tape measure, and speciality tools; verifying the overhaul work; cleaning up the work site; and, documenting the job; ensuring that the overhaul is carried out, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5574.10 **Maintain friction bearings** by following required procedures including (not

Optional limited to): reading and interpreting job specifications and badge plates; performing visual and manual inspections; checking brasses, wedges, lubricators, journal stops, and lubricants; removing or replacing bearings; making recommendations for further repair or replacement; using gauges and required tools; wearing personal protective equipment; verifying the maintenance work; cleaning up the work site; and, documenting the job; ensuring that the maintenance is carried out, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

5575.0 **SERVICE UNDERFRAMES**

5575.01 **Maintain coupling devices** by following required procedures including (not limited to): reading and interpreting job specifications; inspecting throwers, locking blocks and lifters, coupler bodies, knuckles, knuckle pins, top or bottom uncoupling levers, cross-key retainers, coupler wear plates, and shank wear plates; replacing, repairing, or rebuilding defective components or parts by welding, grinding, heating, and straightening; using wrenches, gauges, and required equipment; wearing personal protective equipment; cleaning up the work site; verifying the maintenance work; and, documenting the job; so that the coupling devices are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5575.02 **Maintain articulated connectors** by following required procedures including (not limited to): reading and interpreting job specifications; inspecting connecting pins, locking wedges, spherical balls, spherical ball liners, shackle connectors, male and female inter-connecting castings, retaining bolts and pins, cross-keys, carrier wear plates, and shank wear plates; replacing, repairing, or rebuilding defective components or parts by welding, grinding, heating, and press fitting with hydraulic devices; using wrenches, gauges, and required equipment; wearing personal protective equipment; cleaning up the work site; verifying the maintenance work; and, documenting the job; so that the coupling devices are restored to specifications, in accordance with Safety Legislation, AAR REGULATIONS, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5575.0 **SERVICE UNDERFRAMES**

5575.03 **Maintain end of car draft systems** by following required procedures including (not limited to): reading and interpreting job specifications; inspecting yokes, draft gears, followers, follower blocks, carriers, gas units, and draft stops; replacing, repairing, or rebuilding defective components or parts; by welding, grinding, heating, and straightening; recharging or replacing gas units; using required tools and equipment including (not limited to) welding machine, cutting torch, table lift, hydraulic ram, and plasma arc; wearing personal protective equipment; verifying the maintenance work; cleaning up the work site; and, documenting the job; so that the car draft systems are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5575.04 **Refurbish floors or decking** by following required procedures including (not limited to): reading and interpreting job specifications; inspecting flooring or decking; repairing by patching, welding, grinding, and fastening; replacing defective components; sanding or painting; using required tools and equipment including (not limited to) measuring tapes, power tools, grinders, drills, sanders, welding equipment, and painting equipment; wearing personal protective equipment; verifying the refurbishing work; cleaning up the work site; and, documenting the job; so that the car floor or decking is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5575.0 SERVICE UNDERFRAMES

5575.05 **Maintain superstructure** by following required procedures including (not limited to): reading and interpreting job specifications; inspecting main beams, intermediate beams, floor stringers, and end or side sills; replacing defective components; repairing by welding, cutting, grinding, fitting, splicing, and straightening; using required tools and equipment including (not limited to) torches, welding equipment, plasma arc equipment, sledge hammers, grinders, clamps, drills, and measuring or checking equipment; wearing personal protective equipment; verifying the maintenance work; cleaning up the work site; and, documenting the job; so that the car superstructure is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5575.06 **Recondition body bolsters** by following required procedures including (not limited to): reading and interpreting job specifications; inspecting body bolsters and components; replacing defective components; repairing by grinding, welding, splicing, straightening, riveting, heating, and painting; performing magnetic particle tests; using required tools and equipment including (not limited to) torches, welding equipment, grinders, paint equipment, riveting machine, and measuring or checking equipment; wearing personal protective equipment; verifying the reconditioning work; cleaning up the work site; and, documenting the job; so that the body bolsters are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5575.0 **SERVICE UNDERFRAMES**

5575.07 **Recondition centre sills** by following required procedures including (not limited to): reading and interpreting job specifications; inspecting main members, stiffeners, coupler carriers, return springs, carrier springs, draft lugs, and striker castings; replacing or repairing defective components or parts by welding, splicing, grinding, riveting, straightening, fitting, and painting; using required tools and equipment including (not limited to) torches, welding equipment, grinders, paint equipment, riveting machine, hydraulic equipment, and measuring or checking equipment; wearing personal protective equipment; verifying the reconditioned work; cleaning up the work site; and, documenting the job; so that the centre sills are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

_____ _____

5576.0 **SERVICE BRAKES**

5576.01 **Conduct single-car air brake test** by following required procedures including (not limited to): reading and interpreting job specifications; daily testing the single-car test device; tagging device if defective or outdated; inspecting brake rigging, shoes, hand brake and release rods; replacing defective parts; coupling the air brake machine and the air supply to the freight car; repairing by welding, straightening, grinding, and heating; making adjustments and modifications; testing valves, piping, hoses, slack adjusters, reservoirs, and cylinders; using required tools and equipment including (not limited to) welding equipment, grinders, torches, and measuring or checking equipment; wearing personal protective equipment; verifying the air brake test; cleaning up the work site; and, documenting the job; so that the air brake test is completed, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5576.02 **Replace car brake valves** by following required procedures including (not limited to): reading and interpreting job specifications; performing a single-car test; identifying defective valve(s); tagging defective components; replacing defective valve(s); selecting the correct replacement valve; stenciling the car with valve replacement information; making recommendations for further overhaul; using required tools and equipment including (not limited to) single-car test device, sockets, ratchets, hammers, torches, pliers, and wrenches; verifying the replacement valves; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the car brake valve is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5576.0 **SERVICE BRAKES**

5576.03 **Maintain flexible hoses, train line hoses, and piping** by following required procedures including (not limited to): reading and interpreting job specifications; performing a single-car test to determine leakage; checking train line for deteriorated hoses, outdated hoses, and clearances; replacing the defective components; repairing by welding, straightening, fastening, and tightening; verifying the replacement parts and maintenance work; using required tools and equipment including (not limited to) single-car test device, torches, wrenches, grinders, welding equipment, bar, hammer, and fasteners; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the hoses and piping are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5576.04 **Maintain brake cylinder units** by following required procedures including (not limited to): reading and interpreting job specifications; performing a single-car test to determine defective or out-of-adjustment brake cylinder units; selecting replacement parts; replacing the defective components; tightening the fasteners; tagging cylinders for further repair or overhaul; verifying the replacements; using required tools and equipment including (not limited to) single-car test device, wrenches, fasteners, and clamps; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the brake cylinder units are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5576.0 **SERVICE BRAKES**

5576.05 **Maintain slack adjuster** by following required procedures including (not limited to): reading and interpreting job specifications; performing a single-car test or a slack-adjuster test to determine defective or out-of-adjustment slack adjusters; selecting replacement parts; replacing and adjusting defective components; repairing by straightening, adjusting, and welding; verifying the replacements and adjustments; tagging defective slack adjusters for further repair; using required tools and equipment including (not limited to) single-car test device, wrenches, sockets, hammer, pliers, and screwdrivers; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the slack adjuster is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

Date Completed Apprentice

Supervisor/Trainer

5576.06 **Maintain reservoir tank** by following required procedures including (not limited to): reading and interpreting job specifications; performing a single-car test on the tank; removing and replacing defective components; verifying the quality of the replacements; using required tools and equipment including (not limited to) single-car test device, ratchet, drift, pneumatic tools, air guns, and fasteners; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the reservoir tank is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

Date Completed Apprentice

Supervisor/Trainer

5576.0 **SERVICE BRAKES**

5576.07 **Maintain hand brakes** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections to identify worn or broken parts; replacing the defective hand brake; lubricating the hand brake; tagging defective brakes for further repair or rebuild; using required tools and equipment including (not limited to) torches, wrenches, pliers, and sockets; verifying the maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the hand brakes are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

_____ _____

5577.0 **SERVICE CAR SAFETY APPLIANCES**

5577.01 **Maintain hand rails and grabs** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; selecting replacement parts; replacing defective components; repairing by heating, straightening, riveting, fastening, and peening; using required tools and equipment including (not limited to) gauges, measuring devices, torches, hammers, riveting guns, fasteners, and chisels; verifying the maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the hand rails and grabs are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5577.02 **Maintain ladders** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of rungs, brackets, and stiles; replacing defective parts; repairing by heating, splicing, straightening, riveting, fastening, and peening; using required tools and equipment including (not limited to) measuring devices, torches, hammers, rivetingguns, fasteners, sockets, ratchet, and pinch bars; verifying the maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the ladders are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5577.0 SERVICE CAR SAFETY APPLIANCES

5577.03 **Maintain platforms** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of decks, frames, and brackets; replacing defective parts; repairing by heating, straightening, fastening, riveting, welding, and peening; using required tools and equipment including (not limited to) measuring devices, torches, hammers, riveting guns, fasteners, sockets, welding equipment, and ratchets; verifying the maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the platforms are restored to specifications, in accordance with Safety Legislation, AAR equipment, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5577.04 **Maintain sill steps** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of support brackets, steps, and treads; replacing defective components; repairing by heating, riveting, straightening, fastening, peening, and painting; using required tools and equipment including (not limited to) measuring devices, torches, hammers, riveting guns, fasteners, and paint equipment; verifying the maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the sill steps are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

5578.0 PERFORM SAFETY AND MAINTENANCE INSPECTIONS

5578.01 **Conduct rolling pull-by inspection on in-bound or out-bound cars** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections on rolling cars; checking for abnormal sounds, burning rubber, strong chemical smells, and dragging brakes or equipment; checking that all hand brakes are released; using required checking and inspection devices; making recommendations for further inspection, repair, or replacement; verifying the inspection; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the rolling stock is inspected in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5578.02 **Conduct a standing car/train inspection** by following required procedures including (not limited to): reading and interpreting job specifications; checking that track is secured by blue flag procedures; performing visual and manual inspections on standing cars; checking for shifted or improper loads, strong chemical smells, overheated wheels or bearings, defective components on rail car, and leaks; using required checking and inspection devices; making recommendations for further inspection, repair, or replacement; verifying the inspection; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the standing car is inspected, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5578.0 **PERFORM SAFETY AND MAINTENANCE INSPECTIONS**

5578.03 **Conduct a dangerous commodity inspection** by following required procedures including (not limited to): checking that track is secured by blue flag procedures; reading and interpreting job specifications; performing visual and manual inspections; using required checking and inspection devices; checking and verifying the type, quantity, and the placement of placards; checking safety valve and qualification dates; checking for leaks; making recommendations for further inspection and actions; verifying the inspection; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the dangerous commodity inspection is completed, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5578.04 Optional **Conduct outbound #1 air brake test** by following required procedures including (not limited to): checking that track is secured by blue flag procedures; reading and interpreting job specifications; performing visual and manual inspections; using verified testing devices; checking the air line coupling, train line continuity, brake application and release, leakage, and gaskets; checking piston travel, retainer valve, air-to-set brakes, and that all brake shoes are against the wheel; performing required repairs; making adjustments; making recommendations for further inspection and actions; verifying the air brake test; wearing personal protective equipment; cleaning up the work site; reporting the cut-outs; and, documenting the job; so that the outbound #1 air brake test is completed, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5578.0 PERFORM SAFETY AND MAINTENANCE INSPECTIONS

5578.05 **Conduct open-top load inspections** by following required procedures including (not limited to): checking that track is secured by blue flag procedures; reading and interpreting job specifications; performing visual and manual inspections; checking the securements, blocking, banding, cables, location of load on car, load distribution, and load dimensions; making recommendations for further inspection and actions; wearing personal protective equipment; reporting the load dimensions; and, documenting the job; so that the open top load inspection is completed, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5578.06 **Conduct a pre-trip inspection of auto racks** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; checking the operations and functioning of mechanical parts and safety appliances; checking interiors, securement devices, stencils, and lubrication; making recommendations for further inspection and actions; wearing personal protective equipment; and, documenting the job; so that the pre-trip inspection is completed, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5578.0 **PERFORM SAFETY AND MAINTENANCE INSPECTIONS**

5578.07 **Inspect rail car for wreck damage** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections; checking for bent, broken, or missing components; checking the date and location of the defect cards; making recommendations for further inspection and actions; wearing personal protective equipment; reporting the level and type of the damage; and, documenting the job; so that the inspection is completed and car is safe to move, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

_____ _____

5579.0 **SERVICE CAR BODIES**

5579.01 **Maintain box cars** following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of car ends, sides, roofs, and doors; checking for defects including (not limited to) holes, cracks, rust, leaks, and body damage; checking doors for binding, safety hangers, flush-to-frame, and lubrication; replacing defective components; repairing by welding, heating, straightening, grinding, and adjusting; using required tools and equipment including (not limited to) power tools, hand tools, welding equipment, and hoisting or rigging equipment; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the box car structure is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5579.02 **Maintain flat cars** following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of car ends, sides, decking, roofs, and doors; checking for defects including (not limited to) holes, cracks, rust, leaks, and body damage; repairing or replacing defective components on multi-level flats cars including (not limited to) end doors, wheel chocks, chains, ratchets, rusty areas, side sheeting, and roof; repairing defective components on bulkhead flat cars; repairing defective components on piggy flat-back cars including (not limited to) hitches, rub bars, aprons, and flooring; repairing by welding, cutting, straightening, riveting, grinding, and fastening; using required hand tools, welding equipment, power tools, and hoisting or rigging equipment; verifying the flat car maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the flat car structure is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5579.0 **SERVICE CAR BODIES**

5579.03 **Maintain gondola cars** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of car ends, sides, roofs, and doors; checking for defects including (not limited to) holes, cracks, rust, leaks, and body damage; repairing or replacing defective components on mill-end gondolas cars including (not limited to) end gate, locks, interior flooring, interior sheeting, and vertical stiffeners; repairing defective components on the roof covers; repairing bulkhead and load dividers of covered gondola bulkhead; repairing by welding, cutting, straightening, riveting, grinding, and fastening; using required hand tools, welding equipment, power tools, and hoisting or rigging equipment; verifying the gondola car maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the gondola car structure is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5579.04 **Maintain hopper cars** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of car ends, sides, roofs, and doors; checking for defects including (not limited to) holes, cracks, rust, leaks, and body damage; repairing or replacing defective components on covered and pressurized hoppers including (not limited to) top hatch covers, gaskets, locks, partitions, hinges, interior dividers, walkways, chutes, and bottom gates; repairing or replacing defective components on open-top hopper cars including (not limited to) gates, locks, top and side chords, and sills; repairing or replacing defective components on pressure hopper cars including (not limited to) pressure hoses, gauges, and end caps; repairing by welding, cutting, straightening, riveting, grinding, and fastening; using required hand tools, welding equipment, power tools, and hoisting or rigging equipment; verifying the hopper car maintenance work; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the hopper car structure is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

5579.0 **SERVICE CAR BODIES**

5579.05 **Maintain tank cars** following required procedures including (not limited to): reading and interpreting job specifications; verifying that way bill matches the placards; performing visual and manual inspections of tank body; inspecting top of car valve housing and safety railings; inspecting car valves for leakage; checking for defects including (not limited to) holes, cracks, rust, leaks, and body damage; checking centre sills; replacing defective bottom outlet caps; repairing by welding, heating, straightening, grinding, and adjusting; using required tools and equipment including (not limited to) power tools, hand tools, welding equipment, and hoisting or rigging equipment; verifying the tank car maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the tank car structure is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

_____ _____

5580.0 **SERVICE COACHES (THIS IS AN OPTIONAL SKILL TRACK)**

5580.01 **Maintain coach ends** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of end sills and posts, corner posts, end sheets, tops sills, bellows and diaphragms, headers, stay rods and brackets, side rods, guides, and springs, bellows springs, curtain and gates, and threshold plates; replacing defective components; repairing by welding, riveting, fitting, grinding, cutting, and painting; using required tools and equipment including (not limited to) welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the coach ends are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5580.02 **Maintain coach vestibules** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of steps, doors and hardware, window frames and seals, trap door hardware and seals, platforms, ceilings, filter frames, and fixed end doors; repairing by welding, riveting, fitting, grinding, cutting, and painting; using required tools and equipment including (not limited to) welding equipment, painting equipment, cutting torch, pneumatic or electric tools, ladders and rigging equipment; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the coach vestibule is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5580.0 **SERVICE COACHES (THIS IS AN OPTIONAL SKILL TRA**

5580.03 **Maintain coach roofs** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of roof sheeting, caps, hatches, hatch frames, rain gutters, shrouds, and cover; repairing by welding, riveting, fitting, grinding, cutting, and painting; using required tools and equipment including (not limited to) welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the coach roof is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5580.04 **Maintain coach sides** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of side posts, sheeting, sills, top sills, window frames, skirts, name plates, and vent covers; repairing by welding, riveting, fitting, grinding, cutting, and painting; using required tools and equipment including (not limited to) welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the coach sides are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5580.0 **SERVICE COACHES (THIS IS AN OPTIONAL SKILL TRA**

5580.05 **Maintain coach underframes** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspection of securements, air conditioning units, raceways, waste tanks, battery boxes, water tanks, battery chargers, floor deafening and insulation; repairing by welding, riveting, fitting, grinding, cutting, and painting; using required tools and equipment including (not limited to) welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the coach underframe is restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5580.06 **Maintain coach interior sides and ends** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of deafening, insulation, side sheeting, sidewall coverings, inside window frames, luggage racks, fixture supports, end sheeting, end wall coverings, end doors, door tracks and seals, partitions, windows and seals, service lockers, doors and hardware, and grills; replace defective components; repairing by welding, riveting, fitting, grinding, cutting, and painting; using required tools and equipment including (not limited to) welding equipment, painting equipment, cutting torch, pneumatic or electric tools, and hoisting or rigging equipment; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the coach interior sides and ends are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5580.0 **SERVICE COACHES (THIS IS AN OPTIONAL SKILL TRA**

5580.07 **Maintain coach ceilings and floors** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of floor coverings, fixture supports, carpet, feature strip, baseboards, access hatches and covers, inserts, deafening, insulation, coverings, frames, filter frames, bulkheads, and grills; replacing or repairing defective components; using required tools and equipment including (not limited to) hand, pneumatic or electric power tools, and upholstery maintenance equipment; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the coach ceilings and floors are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5580.08 **Maintain window blinds and curtains** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of fabric, rollers, guides, tension devices, valences, rods, brackets, tie backs, and hardware; replacing or repairing defective components; using required electric power tools and hand tools; verifying the maintenance; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the coach blinds and curtains are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____
_____

Date Completed Apprentice
Supervisor/Trainer

5580.0 **SERVICE COACHES (THIS IS AN OPTIONAL SKILL TRA**

5580.09 **Maintain kitchen and bathroom equipment and accessories** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of range securements, griddles, range hoods, fire suppression system, fridges, dishwashers, small appliances, microwave ovens, dish racks, cash registers, dispensers, rails, waste receptacles, and mirrors; replacing defective accessories and equipment; fastening the securements; using required electric power tools and hand tools; verifying the replacements; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the accessories are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____ _____

Date Completed Apprentice Supervisor/Trainer

5580.10 **Maintain interior furnishings** by following required procedures including (not limited to): reading and interpreting job specifications; performing visual and manual inspections of tables, seats, benches, cupboards, counters, beds, platforms, drawers, hardware, brackets, and shelving; repairing or replacing defective furnishings; fastening the securements; using required electric power tools, pneumatic, and hand tools; verifying the maintenance job; wearing personal protective equipment; cleaning up the work site; and, documenting the job; so that the furnishings are restored to specifications, in accordance with Safety Legislation, AAR regulations, company standards/policies, and applicable Acts, Regulations, Legislations, and Codes.

_____ _____ _____

Date Completed Apprentice Supervisor/Trainer

Sponsor's/Employer's Name **Sponsor's/Employer's Signature**

C. LEARNING OUTCOMES

720 hours

1. Protect Self and Others

The apprenticeship is able:

- identify workplace health and safety hazards
- ability to wear, adjust and maintain personal protective equipment
- identify the steps in operating respiratory protectors
- identify and describe safe work habits
- identify and describe fire procedures
- identity the steps in operating emergency safety equipment
- practise personal hygiene in a shop environment
- maintain good housekeeping in a classroom environment
- ability to inspect equipment for defects and safe working conditions
- identify procedures for the report of information about injuries and safety incidents
- identify and describe procedures for applying first aid
- identify the steps in locking out and tagging mechanical equipment
- ability to handle, store, and control hazardous materials
- identify and describe procedures for operating lifting equipment
- ability to identify, handle, and control hazardous work site conditions
- identify and describe procedures for implementing blue flag procedures

2. Prepare for Job

The apprenticeship is able to:

- interpret engineering drawings to plan the maintenance job
- perform metric and imperial calculations
- prepare measuring and checking devices
- verify workpiece material
- use reference documentation – manufacturers' manuals, technical bulletins, parts bulletins, service or preventative maintenance manuals, fact sheets, American Association of Railways (AAR) field manuals, and government regulations
- use work orders – billing repair cards, wheel reporting cards, inspection records and dangerous goods documentation
- select hand tools, power tools, pneumatic tools, hydraulic tools
- prepare Shielded Metal Arc Welding equipment
- prepare Gas Metal Arc Welding equipment
- oxy-fuel and plasma-arc cutting equipment
- prepare gas-fuelled equipment
- select fasteners

C. Learning Outcomes continued:

3. Perform Benchwork

The apprenticeship is able to:

- chisel a workpiece
- grind a workpiece
- describe painting procedures
- drill or ream holes
- cut internal (ID) and external (OD) threads
- cut a workpiece
- fasten workpieces

4. Perform Material Handling

The apprenticeship is able to:

- calculate forces and loads
- select and inspect rigging
- position and attach rigging
- describe inspection and preparation of hoisting and lifting equipment
- describe work site preparation
- describe hoisting equipment
- describe use of scaffolds, lift platforms, and ladders
- describe how to move the load or workpiece
- describe procedures to set down load
- describe the shut down and storage of material handling equipment

5. Service Rail Trucks

The apprenticeship is able to:

- describe wheel inspection procedures
- describe roller bearing inspection procedures
- describe bolster inspection and repair procedures
- describe maintenance procedures for truck suspension
- describe side frame maintenance procedures
- describe brake beam inspection and overhaul procedures
- describe servicing procedures of brake shoes
- describe lever overhaul procedures
- describe brake rod overhaul procedures
- describe friction bearings maintenance procedures

C. Learning Outcomes continued:

6. Service Underframes

The apprenticeship is able:

- describe maintenance procedures for coupling devices
- describe maintenance procedures for articulating connecters
- describe maintenance procedures for end of car draft systems
- describe procedures to refurbish floors
- describe maintenance procedures for super structures
- describe reconditioning procedures for body bolsters
- describe reconditioning procedures for centre sills

7. Service Brakes

The apprenticeship is able to:

- describe single-car brake test procedures
- describe brake valve replacement procedures
- describe maintenance procedures of flexible hoses, train line hoses, and piping
- describe maintenance procedures for brake cylinders
- describe maintenance procedures for slack adjusters
- describe reservoir tank maintenance procedures
- describe hand brake maintenance procedures

8. Service Car Safety Appliances

The apprenticeship is able to:

- describe maintenance procedures for hand rails and grabs
- describe maintenance of ladders
- describe platform maintenance procedures
- describe sill step maintenance procedures

9. Perform Safety and Maintenance Inspections

The apprenticeship is able to:

- describe in-bound or out-bound rolling pull-by inspection procedures
- describe standing car/train inspection procedures
- describe dangerous commodity inspection procedures
- describe outbound #1 air brake test procedures
- describe open-top load inspection procedures
- describe pre-trip inspection procedures for auto racks
- describe rail car wreck damage inspection procedures

C. Learning Outcomes continued:

10. Service Car Bodies

The apprenticeship is able to:

- describe box car maintenance procedures
- describe flat car maintenance procedures
- describe gondola car maintenance procedures
- describe hopper car maintenance procedures
- describe tank car maintenance procedures

11. Service Coaches

The apprenticeship is able to to identify and describe procedures and methods for servicing coaches:

- describe maintenance procedures for the coach end
- describe coach vestibules maintenance procedures
- describe coach roof maintenance procedures
- describe coach side maintenance procedures
- describe coach underframe maintenance procedures
- describe coach sides and ends maintenance procedures
- describe coach ceiling and floor maintenance procedures
- describe coach window, blinds, and curtain maintenance procedures
- describe coach kitchen and bathroom equipment and accessories maintenance procedures
- describe coach interior furnishing maintenance procedures
- describe coach emergency equipment maintenance procedures
- describe coach electrical maintenance procedures
- describe coach plumbing fixture and appliances inspection procedures
- describe coach brakes maintenance procedures
- describe coach roller bearings maintenance procedures

APPRENTICE RECORD

APPRENTICE NAME (Print):

SPONSOR/EMPLOYER INFORMATION	
Training Agreement #	
Name	
Address	
Telephone	
E-mail Address	

SUMMARY OF TRAINING	
Employment Start Date	
Employment End Date	
Total hours of training & instruction between dates of employment.	

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

APPRENTICE RECORD

APPRENTICE NAME (Print):

SPONSOR/EMPLOYER INFORMATION	
Training Agreement #	
Name	
Address	
Telephone	
E-mail Address	

SUMMARY OF TRAINING	
Employment Start Date	
Employment End Date	
Total hours of training & instruction between dates of employment.	

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

APPRENTICE RECORD

APPRENTICE NAME (Print):

SPONSOR/EMPLOYER INFORMATION	
Training Agreement #	
Name	
Address	
Telephone	
E-mail Address	

SUMMARY OF TRAINING	
Employment Start Date	
Employment End Date	
Total hours of training & instruction between dates of employment.	

_____ _____

_____

Date Completed Apprentice

Supervisor/Trainer

APPENDIX 2

EXAMPLE OF COMPLETED ITA PROGRAM OUTLINE

ita
industry training authority

THE RIGHT SKILLS ▶ A PROVEN ADVANTAGE

Automotive Refinishing Paint Technician Program

To order additional copies please contact:
Government Publications Services
PO Box 9452 Stn Prov Govt
Victoria, BC V8W 9V7
Phone: 250 387-6409 or
Toll Free: 1 800 663-6105
Fax: 250 387-1120
www.publications.gov.bc.ca

Copyright © 2006 Industry Training Authority
This publication may not be reproduced in any form without permission by the Industry Training Authority
Contact Director, Government Publications Services, Queen's Printer at 250 356-6876

Automotive Refinishing
Paint Technician

PROGRAM OUTLINE

October, 2006

Developed By
Industry Training Authority
Province of British Columbia

TABLE OF CONTENTS

Foreword ii

Acknowledgements iii

Section 1 – Occupation Analysis 1

Occupation Analysis Chart 2

Section 2 –Program Outline 5

Automotive Refinishing Paint Technician Apprenticeship Training System 6

Schedule of Time Allotment for Second Year Program 7

Program Outline for Automotive Refinishing Paint Technician Program 10

Recommended Reference Textbooks and Other Resource Material 124

Training Provider Standards – Facilities 125

List of Tools and Equipment 126

Instructor Qualification 128

FOREWORD

This Program Outline is issued by the Industry Training and Apprenticeship Commission for use in apprenticeship training classes sponsored by the Industry Training and Apprenticeship Commission. Indentured apprentices will be directed to the Apprenticeship Training classes in accordance with the General Regulations made pursuant to the *"Industry Training and Apprenticeship Act"* of British Columbia.

It is intended as a guide for instructors of apprenticeship. Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

The Program Outline was prepared with the advice and assistance of Automotive Refinishing Paint Technician Trade Advisory Committee comprised of representatives of management and labour and in cooperation with the Colleges and Institutes and the Industry Training and Apprenticeship Commission.

EVALUATION

At the completion of each year's training course each apprentice will complete an evaluation examination based on that year's work. The apprentice must achieve a 70% pass mark before advancing to the next year of training.

SAFETY ADVISORY
Be advised that references to the WorkSafe BC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

ACKNOWLEDGEMENTS

SECTION 1

OCCUPATION ANALYSIS CHART

AUTOMOTIVE REFINISHING PAINT TECHNICIAN PROGRAM

Occupation Analysis Chart

OCCUPATIONAL SKILLS AND SAFETY **LEVEL TWO** **5 HOURS** **A**	Personal safety hazard A1	Describe the use of painter specific documentation in the automotive refinishing trade A2				
GUNS AND EQUIPMENT **LEVEL TWO** **8 HOURS** **B**	Explain the characteristics and care of various spray guns B1	Describe the operation of spray guns used in refinishing B2	Describe characteristics and spraying techniques of H.V.L.P. and L.V.L.P. spray guns B3	Describe the use and characteristics of the equipment used in the automotive refinishing industry B4		
HANDLING OF VEHICLE COMPONENTS **LEVEL TWO** **5 HOURS** **C**	Describe advanced procedures for using estimate sheets and repair orders C1	Describe the problems of mishandling the vehicle's electrical components C2	Describe the proper procedure for working with propane systems C3	Describe the problems of mishandling and air conditioning systems C4	Describe the follow-up procedure as to the ordering of parts and materials C5	Describe the correct methods for R and I of a vehicle's wheels C6
SURFACE PREPARATION **LEVEL TWO** **13 HOURS** **D**	Describe how to establish the type of tasks needed to complete the refinishing repairs D1	Identify the various types of substrates specific to topcoating D2	Explain how to establish the condition of a finish D3	Open to new technology D4	Review of undercoats D5	Demonstrate and explain steps to properly clean and prepare vehicle prior to sanding D6
	Demonstrate and explain the correct procedures for working with plastic body fillers D7	Describe the various sanding equipment and materials used in the refinishing trade D8	Demonstrate and explain the types of sanding procedures used in the refinishing trade D9	Describe the purposes and mixing ratios of metal conditioners D10	Describe advanced masking techniques D11	
ADVANCED USE OF SOLVENTS **LEVEL TWO** **5 HOURS** **E**	Describe the safety and fire precautions to observe when working with solvents E1	Describe the types of functions of solvents E2	Explain the correct method for using solvents E3	Describe the problems encountered by using the wrong type of solvent E4		

RESTORING CORROSION PROTECTION **LEVEL TWO** **11 HOURS** **F**	Describe and analyze corrosion F1	Explain different types of corrosion and cause of each F2	Explain the repair technique of each F3	Explain corrosion F4
UNDERSTANDING TOPCOAT MATERIALS **LEVEL TWO** **18 HOURS** **G**	Describe the various types of topcoats found on today's vehicles G1	Identifying topcoats G2	Describe the main components of paint and the function of each G3	Describe the various topcoat application methods G4
CHARACTERISTICS OF CHEMICAL ADDITIVES **2 HOURS** **H**	Describe the characteristics and procedures of hardeners H1	Describe the characteristics and purpose of accelerators H2	Describe the characteristics and purpose of flex agents H3	Describe the characteristics and purpose of flattening agents H4
THEORY OF COLOUR **26 HOURS** **I**	Describe how to locate, research and record colour data I1	Describe variables which have an influence on colour I2	Define terminology used to describe colour I3	List the steps for mixing and tinting a colour I4
PAINT PROBLEMS AND REPAIRS **LEVEL TWO** **10 HOURS** **J**	Describe the types of repairs one can encounter in the refinishing trade J1	Describe the methods for determining the extent or severity of the refinishing problem J2	Explain the application of colour to match the colour of the vehicle J3	Describe the causes of paint problems that one can encounter while working with refinishing products J4
TRI-COAT APPLICATIONS **2 HOURS** **K**	Describe the procedures for tri-coat refinishing K1	Describe the procedures and effects of pearls and micas K2		

EXPLAIN PRE-DELIVERY **LEVEL TWO** **5 HOURS** **L**	Describe the types of equipment and products required to perform the necessary topcoat repairs L1	Describe the correct methods for using recommended topcoat repair systems L2	Describe vehicle preparation prior to delivery L3	Describe procedure used to install trim, stripes and decals L4
TREATMENT OF PLASTICS **LEVEL TWO** **5 HOURS** **M**	Describe the type of plastic found on today's vehicles M1	Describe where the various types of plastics are located on today's vehicles M2	Describe the repair and refinishing procedures for the various types of plastics M3	Explain the repair and refinishing procedures for the various types of plastics M4
MANAGEMENT OF V.O.C. REGULATIONS **4 HOURS** **N**	Describe B.C. V.O.C. regulations N1	Management methods N2		
FUTURE TRENDS OF THE TWENTY-FIRST CENTURY **1 HOUR** **O**	Describe the need for and how the journeyperson can keep up-to-date with changes in the industry O1			

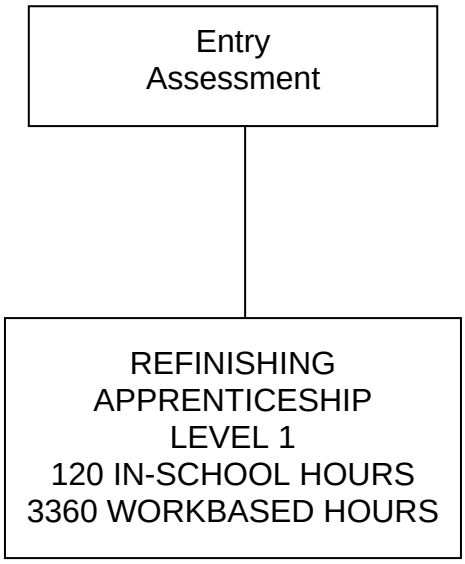
SECTION 2

PROGRAM OUTLINE

AUTOMOTIVE REFINISHING

PAINT TECHNICIAN

APPRENTICESHIP TRAINING SYSTEM



SUGGESTED SCHEDULE OF TIME ALLOTMENT FOR REFINISHING PAINT TECHNICIAN PROGRAM

		Theory	Practical	Page
Line A	**OCCUPATIONAL SKILLS AND SAFETY – Level Two - 5 HOURS 4% OF TIME**	**2%**	**4%**	
A-1	Personal safety hazard			13
A-2	Describe the use of painter specific documentation in the automotive refinishing trade			17
Line B	**GUNS AND EQUIPMENT – Level Two - 8 HOURS 7% OF TIME**	**4%**	**7%**	
B-1	Explain the characteristics and care of various spray guns			18
B-2	Describe the operation of spray guns used in refinishing			21
B-3	Describe characteristics and spraying techniques of H.V.L.P. and L.V.L.P. spray guns			23
B-4	Describe the use and characteristics of the equipment used in the automotive refinishing industry			25
Line C	**HANDLING OF VEHICLE COMPONENTS – Level Two - 5 HOURS 4% OF TIME**	**2%**	**4%**	
C-1	Describe advanced procedures for using estimate sheets and repair orders			31
C-2	Describe the problems of mishandling the vehicle's electrical components			35
C-3	Describe the proper procedure for working with propane systems			36
C-4	Describe the problems of mishandling and air conditioning systems			37
C-5	Describe the follow-up procedure as to the ordering of parts and materials			39
C-6	Describe the correct method for R and I of a vehicle's wheels			40

SUGGESTED SCHEDULE OF TIME ALLOTMENT FOR REFINISHING PAINT TECHNICIAN PROGRAM

		Theory	Practical	Page
Line D	**SURFACE PREPARATION – Level Two - 13 HOURS 11% OF TIME**	**5%**	**11%**	
D-1	Describe how to establish the type of tasks needed to complete the refinishing repairs			41
D-2	Identify the various types of substrates specific to topcoating			43
D-3	Explain how to establish the condition of a finish			45
D-4	Open to new technology			48
D-5	Review of undercoats			49
D-6	Demonstrate and explain steps to properly clean and prepare vehicle prior to sanding			52
D-7	Demonstrate and explain the correct procedures for working with plastic body fillers			54
D-8	Describe the various sanding equipment and materials used in the refinishing trade			56
D-9	Demonstrate and explain the types of sanding procedures used in the refinishing trade			58
D-10	Describe the purposes and mixing ratios of metal conditioners			61
D-11	Describe advanced masking techniques			63
Line E	**ADVANCED USE OF SOLVENTS – Level Two - 5 HOURS 4% OF TIME**	**2%**	**4%**	
E-1	Describe the safety and fire precautions to observe when working with solvents			67
E-2	Describe the types of functions of solvents			69
E-3	Explain the correct method for using solvents			71
E-4	Describe the problems encountered by using the wrong type of solvent			73

SUGGESTED SCHEDULE OF TIME ALLOTMENT FOR REFINISHING PAINT TECHNICIAN PROGRAM

		Theory	Practical	Page
Line F	**RESTORING CORROSION PROTECTION – Level Two - 11 HOURS 9% OF TIME**	**4%**	**9%**	
F-1	Describe and analyze corrosion			74
F-2	Explain different types of corrosion and cause of each			76
F-3	Explain the repair technique of each			77
F-4	Explain corrosion			78
Line G	**ADVANCED UNDERSTANDING OF TOPCOAT MATERIALS – Level Two - 18 HOURS 15% OF TIME**	**7%**	**15%**	
G-1	Describe the various types of topcoats found on today's vehicles			81
G-2	Identifying topcoats			82
G-3	Describe the main components of paint and the function of each			84
G-4	Describe the various topcoat application methods			86
Line H	**CHARACTERISTICS OF CHEMICAL ADDITIVES – 2 HOURS 2% OF TIME**	**1%**	**2%**	
H-1	Describe the characteristics and procedures of hardeners			87
H-2	Describe the characteristics and purpose of accelerators			88
H-3	Describe the characteristics and purpose of flex agents			89
H-4	Describe the characteristics and purpose of flattening agents			90
Line I	**THEORY OF COLOUR – 26 HOURS 22% OF TIME**	**11%**	**22%**	
I-1	Describe how to locate, research and record colour data			91
I-2	Describe variables which have an influence on colour			94
I-3	Define terminology used to describe colour			96
I-4	List the steps for mixing and tinting a colour			97

SUGGESTED SCHEDULE OF TIME ALLOTMENT FOR REFINISHING PAINT TECHNICIAN PROGRAM

		Theory	Practical	Page
Line J	**PAINT PROBLEMS AND REPAIRS – Level Two - 10 HOURS 8% OF TIME**	**4%**	**8%**	
J-1	Describe the types of repairs one can encounter in the refinishing trade			98
J-2	Describe the methods for determining the extent or severity of the refinishing problem			100
J-3	Explain the application of colour to match the colour of the vehicle			102
J-4	Describe the causes of paint problems that one can encounter while working with refinishing products			104
J-5	Describe the various problems that require repair after topcoat application			106
Line K	**TRI-COAT APPLICATIONS – 2 HOURS 2% OF TIME**	**1%**	**2%**	
K-1	Describe the procedures for tri-coat refinishing			107
K-2	Describe the procedures and effects of pearls and micas			109
Line L	**EXPLAIN PRE-DELIVERY – Level Two - 5 HOURS 4% OF TIME**	**2%**	**4%**	
L-1	Describe the types of equipment and products required to perform the necessary topcoat repairs			110
L-2	Describe the correct methods for using recommended topcoat repair systems			113
L-3	Describe vehicle preparation prior to delivery			114
L-4	Describe procedure used to install trim, stripes and decals			116

SUGGESTED SCHEDULE OF TIME ALLOTMENT FOR REFINISHING PAINT TECHNICIAN PROGRAM

		Theory	Practical	Page
Line M	**TREATMENT OF PLASTICS – Level Two - 5 HOURS 4% OF TIME**	**2%**	**4%**	
M-1	Describe the type of plastic found on today's vehicles			117
M-2	Describe where the various types of plastics are located on today's vehicles			118
M-3	Describe the repair and refinishing procedures for the various types of plastics			120
M-4	Explain the repair and refinishing procedures for the various types of plastics			122
Line N	**MANAGEMENT OF V.O.C. REGULATIONS – 4 HOURS 3% OF TIME**	**2%**	**3%**	
N-1	Describe B.C. V.O.C. regulations			123
N-2	Management methods			124
Line O	**FUTURE TRENDS OF THE TWENTY-FIRST CENTURY – 1 HOUR 1% OF TIME**	**1%**	**1%**	
O-1	Describe the need for and how the journeyperson can keep up-to-date with changes in the industry			125

FINAL EXAM WEIGHTING 50% THEORY

PROGRAM OUTLINE
FOR
AUTOMOTIVE REFINISHING
PAINT TECHNICIAN PROGRAM

LINE A: OCCUPATIONAL SKILLS AND SAFETY

Competency: A-1 Personal Safety Hazard

Learning Objectives:

1. The learner will be able to identify and operate personal protective equipment.
2. The learner will be able to describe the areas of the body affected from exposure to chemical additives.
3. The learner will be able to identify dangerous chemical additives used in the refinishing trade.
4. The learner will be able to describe the W.H.M.I.S. system.
5. The learner will be able to list WCB rules and policies.
6. The learner will be able to describe how to maintain a safe work environment.
7. The learner will be able to describe fire types.
8. The learner will be able to describe use and types of fire extinguishers.
9. The learner will be able to describe fire and emergency evacuation methods.

LEARNING TASKS	CONTENT
1. Identify personal protective equipment.	• Respirators • Fresh air supply hoods • Eye protection • Skin protection • Hand • Foot protection • Personal hygiene • Maintenance of PPE • Emergency response • Cleaning of PPE • Storage of personal equipment • Hearing protection • Fitness test • Safety hazards • Workplace hazards
2. Describe the areas of the body affected by chemicals.	• Nervous system • Respiratory system • Skin diseases • Eye sight • Internal organs
3. Describe dangerous chemicals used in the refinishing industry.	• Paint activators • Paint hardeners • Paint products • Solvents • Acids • Paint • Dust • Isocyanates
4. Describe W.H.M.I.S.	• M.S.D.S.

- Location of books
- Reason for books
- Understanding of books
- Product identifier
- PPE
- Hazard symbol
- Risk phrases
- Precautionary measures
- First aid measures
- Paint companies emergency number
- Labeling
- Employer education
- Worker education
- Jurisdictional system

5. List W.C.B. rules governing the auto refinishing industry.

- Respirators
- Hearing protection
- Protective clothing
- Footwear
- Shop safety
- Blowing off clothing
- Blowing off car while spraying
- Material storage
- Cleaning of equipment
- Material disposal
- Using air tools
- Health regulations
- Spills
- Workplace hazards
- Workplace safety

6. Describe the knowledge required to maintain a safe work environment.

- Location of eyewash station
- Location of spill kits
- Location of first aid kit
- Location of fire extinguisher
- Recognize fire and explosive hazards
- Recognize personal injury hazards
- Basic first aid
- Potential hazards
- Emergency response procedure

7. Describe the various types of fires.

- Flammable liquids
- Vapors and gases
- Spontaneous combustion
- Electrical-static
- Dust
- Fire triangle
- Class A
- Class B
- Class C
- Class D
- Workplace hazards

8. Describe the use of the types of fire extinguishers used in the shop area.

- Types of fires
- Location of fire extinguishers
- Use of fire extinguishers
- Maintenance of fire extinguishers
- Recharging of fire extinguisher

9. Describe the purpose of fire drills.

- At training center
- At place of work
- Emergency response
- Location of exits
- Location of alarms
- Communication with others

Achievement Criteria:
On examination, describe the correct use of personal protection equipment and in the event of a worker accidentally ingesting a hazardous material, describe the correct first aid procedure that must be followed. In the event of a chemical explosion fire, describe the order of action taken according to W.C.B. Regulations.

LINE A: **OCCUPATIONAL SKILLS AND SAFETY**

Competency: **A-2** **Describe the Use Of Painter Specific Documentation In The Automotive Refinishing Trade**

Learning Objectives:

1. The learner will be able to identify and interpret vehicle information.
2. The learner will be able to describe the use of technical manual and bulletins.

LEARNING TASKS	CONTENT
1. Identify the knowledge required to interpret vehicle information.	• Industry terminology • Manufacturer's makes and models • VIN and production date • Paint code location • Interpret paint codes
2. Describe the use of technical manual and bulletins.	• Types of manuals and bulletins • Location of manuals and bulletins • Industry terminology • Correct usage of manual and bulletins • Interpret paint codes • Interpret product information sheets

LINE B: **GUNS AND EQUIPMENT**

Competency: **B-1** **Explain the Characteristics and Care of Various Spray Guns**

Learning Objectives:

1. The learner will be able to describe the various types of spray guns.
2. The learner will be able to identify major components of a spray gun.
3. The learner will be able to describe potential spray gun problems.
4. The learner will be able to describe spray gun repair methods.
5. The learner will be able to demonstrate spray gun testing.
6. The learner will be able to describe and demonstrate spray gun cleaning procedures.
7. The learner will be able to describe spray gun maintenance procedures.

LEARNING TASKS	CONTENT
1. Describe the types of spray guns.	• H.V.L.P. • L.V.L.P. • Gravity feed • Pressure feed • Suction feed • Touch up guns • Electrostatic • Air brush • Airless
2. Identify the major parts of the spray gun.	• Gun body • Trigger • Main air valve • Spreader adjustment • Fluid adjustment • Fluid needle and tip • Air cap • Packings Material container • Maintenance • Cleaning procedures and equipment • Lubricating • Storage
3. Describe problems one could encounter with a spray gun.	• Spitting • Air leakage • Split pattern • Jerky spray • Heavy one-sided pattern • Fluid leakage • Heavy-centered spray pattern

4. Describe the methods for correcting the spray gun problems.
   - Inspections
   - Maintenance
   - Storage
   - Lubrication
   - Adjustments
   - Cleaning
   - Parts replacement
   - Limitations
   - Change application technique
   - New spray gun technology
   - Replace worn or damaged parts
   - Service schedule

5. Demonstrate the methods of testing the spray gun.
   - Test pattern
   - Flood tests
   - Chart reading
   - Manufacturer's recommendations
   - Air pressures
   - Air volumes
   - Selecting the correct spray gun

6. Describe and demonstrate the steps for the cleaning of a spray gun.
   - Personal protection
   - Storage of leftover material
   - Disposal of leftover materials
   - Washing (enclosed gun cleaner)
   - Cleaning
   - Brush
   - Flushing
   - Inspection
   - Storage

7. Describe the correct maintenance procedure of a spray gun.
   - Lubrication
   - Cleaning
   - Replacement of parts
   - Inspection
   - Storage
   - Ability to recognize worn or broken parts

Achievement Criteria:
On examination, identify the various spray guns and their major parts and describe and/or demonstrate the steps for cleaning and providing the correct maintenance to a spray gun and describe problems a technician may encounter using a spray gun.

LINE B: GUNS AND EQUIPMENT

Competency: B-2 Describe the Operation of Spray Guns Used In Refinishing

Learning Objectives:

1. The learner will be able to describe variable to consider when adjusting a spray gun.
2. The learner will be able to describe correct spray gun adjustments.
3. The learner will be able to describe spray gun application techniques.
4. The learner will be able to demonstrate the use of the various spray guns.

LEARNING TASKS	CONTENT
1. Describe the variables to consider before adjusting the spray gun.	• Air temperature • Type of spray booth • Amount of air movement • Humidity • Refinisher's ability • Type and speed of solvent • Material viscosity • Type of material
2. Describe the correct spray gun adjustments for applying the wide variety of refinishing materials.	• Air pressure • Fluid nozzle size • Fluid adjustments • Air cap • Pattern adjustments • Test patterns • Flood tests
3. Describe the correct spray gun application techniques for spraying the different refinishing products.	• Distance • Overlapping • Gun angle • Application techniques • Speed • Flash off time • Type of product • Type of spray gun • Type and speed of solvent • Temperature • Type of spray booth • Humidity • Air flow • Ability • Air pressure • Fluid control setting

4. Demonstrate the use of the various spray guns.
    - H.V.L.P.
    - L.V.L.P.
    - Gravity feed
    - Pressure feed
    - Suction feed
    - Touch up
    - Air brush

Achievement Criteria:
On examination, describe the conditions to consider before preparing the spray gun for the application of a refinishing material and describe and/or demonstrate the use and correct application techniques of the various spray guns.

LINE B: **GUNS AND EQUIPMENT**

Competency: **B-3** **Describe Characteristics and Spraying Techniques OF H.V.L.P. AND L.V.L.P. Spray Guns**

Learning Objectives:

1. The learner will be able to describe spray gun characteristics.
2. The learner will be able to describe H.V.L.P. and L.V.L.P. spraying techniques.

LEARNING TASKS	CONTENT
1. Describe the characteristics of H.V.L.P.and L.V.L.P. spray guns.	• Pressurized style • Gravity style • Siphon style • Excellent fluid control • Very easy to clean • Cost efficient • Transfer efficiency • Wide variety of tips and needles • High air pressure transformed to low air pressure at the air cap • Three stages of atomization • Less over-spray • Less V.O.C. emissions • Increases spray booth filter life
2. Describe H.V.L.P. and L.V.L.P. spraying techniques.	• H.V.L.P. gun is held closer to the surface (4 – 6 inches) • L.V.L.P. held 5 – 7 inches from surface • Application speed is increased when using L.V.L.P. • Spray pattern overlap is tighter (up to 70%) • Easier to clean • Spray gun operates at 1-10 PSI at the air cap • Check with spray gun manufacturer for the correct air pressure at the gun

Achievement Criteria:

On examination, describe the spraying techniques used while using an H.V.L.P. spray gun and explain the various characteristics of H.V.L.P. spray guns.

LINE B: **GUNS AND EQUIPMENT**

Competency: **B-4 Describe the Use and Characteristics of the Equipment used by the Automotive Refinishing Industry**

Learning Objectives:

1. The learner will be able to describe spray booth operation.
2. The learner will be able to describe and demonstrate the operation of various spray booths.
3. The learner will be able to explain and demonstrate spray booth cleaning procedures.
4. The learner will be able to explain spray booth paint preparation.
5. The learner will be able to describe types of air compressors.
6. The learner will be able to describe functions of an air compressor.
7. The learner will be able to describe and demonstrate air compressor general maintenance.
8. The learner will be able to describe the functions of an air transformer.
9. The learner will be able to demonstrate air transformer maintenance.
10. The learner will be able to describe functions of an air dryer.
11. The learner will be able to describe and demonstrate functions and types of air hoses.
12. The learner will be able to describe the operation of refinishing specialty tools.
13. The learner will be able to identify the types of refinishing curing equipment.

LEARNING TASKS	CONTENT
1. List the types of spray booths and how they operate.	• Down draft • Semi-down draft • Cross flow • Water filtration • Dry filter filtration • Spray booth set up • Heating system • Booth pressures • Filter types • Manometer • Controls • Interlock switch • Air supply • Air supply adjustment • Health reasons • Air makeup unit • Lighting types • Utilize spray booth space

2. Describe and demonstrate the operation of the different spray booths.	• Air flow direction • Air flow speed controls • Increased air flow, i.e. waterborne products • Air stack adjustments • Temperature controls • Curing/drying times • Filter types and changes • Filter maintenance • Filter replacement • Pressure readings • Manometer reading • Interlock switch • Plenum fan • V.O.C. regulations
3. Explain and demonstrate the cleaning of the booth.	• Washing • Hoses • Filter cleaning • Filter changes • Filter disposal • Vacuuming • Wall coatings • Light fixture cleaning Booth door seals
4. Explain paint preparation of the spray booth prior to use.	• Schedules • Cleaning • Lighting • Spray booth air pressure • Booth coating • Filter inspection • Transformer inspection • Dust free vehicle • Temperature setting • Assistance when entering the spray booth • Ability to troubleshoot problems
5. Describe the types of air compressors.	• Piston type • Single stage • Double stage • Vane type • Rotary screw type • Diaphragm type

6. Describe the functions of an air compressor.	• Air pressure • Volume • Displacement • Pressure losses • Atmospheric versus compressed air
7. Describe and demonstrate the general care and maintenance of the compressor.	• Location • Draining • Oil • Oil changes • Belts • Filters • Safety equipment • Electrical switches • Pressure release valve • Compressor pump • Electric motor • Holding tank • Correct location • Location of air intake • Maintenance schedule
8. Describe the air transformer and its function.	• Regulates air • Pressure gauge • Filters • Water separator • Desiccant type • Activated alumna • Silica gel • Dirt particles • Removes oil • Reduces air line humidity • Maintenance – daily, weekly, monthly • Moisture
9. Demonstrate the care of the air transformer.	• Cleaning • Filter change • Draining • Maintenance schedule
10. Describe air dryers and their function.	• Refrigerated • Desiccant • Removes water vapor Distance from compressor • Maintenance • Fixed location

11. Describe and demonstrate the types of air hoses and their functions.	• Fluid hose • Air hose • Size • Pressure loss • Storage • H.V.L.P. hoses and fittings • Lubricating • Cleaning • Maintenance • Safety precautions
12. Describe the specialty tools and their functions used by the automotive refinishing industry.	• Digital scale • Balance scale • Computer • Computer software • Viscosity cup • Microfiche • Mil gauge • Thermometer • Measure sticks • Mixing containers • Colour card information • Spectrometer • Technical manuals • Manufacturer's bulletins
13. Identify the types of heating/curing equipment used.	• Hot air drying • Infrared • Short wave • Medium/long wave
14. Describe mixing room equipment and maintenance.	• Toner mixing bank • Scales • Shaker • Computerized mixing equipment

Achievement Criteria:
On examination, describe the air supply system equipment and the various types of spray booths used by the automotive refinishing industry and demonstrate and/or describe the various types of curing equipment used by automotive refinishing industry.

LINE C: HANDLING OF VEHICLE COMPONENTS

Competency: C-1 Describe Advanced Procedures For Using Estimate Sheets And Repair Orders

Learning Objectives:

1. The learner will be able to describe the types of estimating systems.
2. The learner will be able to explain the purpose of time sheets.
3. The learner will be able to describe how to read a repair order.
4. The learner will be able to explain the refinishing portion of an estimate.
5. The learner will be able to describe material organization methods.
6. The learner will be able to describe the importance of communication skills.
7. The learner will be able to describe the reasons for masking vehicle components.
8. The learner will be able to describe reason for masking vehicle components.
9. The learner will be able to describe vehicle trim removal and installation procedures.

LEARNING TASKS	CONTENT
1. Describe the types of estimate sheets one might encounter in the refinishing. 2. Explain estimate sheets and their purpose.	• Government insurance • Private insurance • Shop written (private) • Abbreviations • Trade language • Repeat business • Insurance terms • Profit margins • Times (cycle, etc.) • Customer satisfaction • Organization • Supplement sheets
3. Describe how to read a repair order.	• Abbreviations • Insurance terms • Trade language • Extent of refinishing required • Materials required • Paint refinish procedures • Follow work order • Repairs to be performed • Time relationships • Communication with estimator • Communication with production manager

4. Explain the refinishing portion of an estimate.	• Spot repair • Original panel • Secondary panel • Blends • Clear coat • Tri-coat • Luxury • Inners • Gravel guard • Retexture • Two-tones • R and I components • Repairs • Stripes and decals • Hand painted stripes
5. Describe the knowledge required to organize materials.	• Material types • Ordering procedures • Material required • Storage and inventory • Disposal of waste material
6. Describe the importance of communicating with others.	• Oral and written • Conflict resolution techniques • Explain information in layman's terms • Apprentice mentoring • Communication with professionals • Ability to operate cell phones, two way radios and computers
7. Describe reasons for removal of vehicle components.	• Masking problems • Customer request • Faster • Quality • New part • Insurance company demands
8. Describe reasons for masking components.	• Removal problems • Attachment problems • Previously masked components

9. Describe removal and installation of vehicle trim.

- Trim fasteners
- Removal methods
- Attachment methods
- Basic vehicle design
- Composition of trim
- Storage and handling
- Adhesives
- Two sided tape
- Sealers
- Tools
- Manuals
- Corrosion protection
- Protection of finish

Achievement Criteria:
On examination, describe the importance of being able to correctly read a repair order and what may occur if the repair order is not followed closely.

LINE C: HANDLING OF VEHICLE COMPONENTS

Competency: C-2 Describe the Problems of Mishandling the Vehicles Electrical Components

Learning Objectives:

1. The learner will be able to describe automotive electrical components.
2. The learner will be able to describe potential problems encountered with electrical components.

LEARNING TASKS	CONTENT
1. Describe the electrical components found in the vehicle.	• Batteries • Wire harnesses • On board computer • Audio equipment • Accessories • Fuse box
2. Describe the potential problems encountered with the electrical components.	• Fire • Damage • Static electricity • Injury • Lost time • Customer dissatisfaction • Jobless • Dead batteries • Handling and storage

Achievement Criteria:

On examination, describe the safe method of disconnecting a vehicle's battery and describe what may occur to a vehicle's computer system if spray booth temperature is ignored.

LINE C: HANDLING OF VEHICLE COMPONENTS

Competency: C-3 Describe the Proper Procedure for Working with Propane Systems

Learning Objectives:

1. The learner will be able to describe propane and natural gas systems.
2. The learner will be able to describe safe handling of propane and natural gas systems.

LEARNING TASKS	CONTENT
1. Describe the dangers of propane and natural gas systems.	• Explosive • High pressure lines • Hazards • Handling • Environmental issues • High temperatures (baking paints) • Temperature rise versus pressure rise • Workplace hazards
2. Describe the methods for the safe handling of propane.	• Turn off valves • Temperature rise versus pressure rise • No baking at extreme temperatures • Fire department regulations • Contact manufacturer

Achievement Criteria:

On examination, demonstrate the safety procedures that must be followed while preparing a vehicle for the spray booth and describe what may occur if a propane system is exposed to high spray booth temperatures.

LINE C: HANDLING OF VEHICLE COMPONENTS

Competency: C-4 Describe the Problems of Mishandling the Cooling And Air Conditioning System

Learning Objectives:

1. The learner will be able to identify the components of a vehicle cooling system.
2. The learner will be able to describe problems encountered by mishandling components of the cooling system.
3. The learner will be able to describe the components of an air conditioning system.
4. The learner will be able to describe problems encountered by mishandling components of an air condition system.

LEARNING TASKS	CONTENT
1. Identify the basic components that make up the cooling system.	• Radiator • Radiator cap • Fan blade • Belts • Hoses • Clamps • Anti-freeze disposal
2. Describe the problems of mishandling the cooling system.	• Personal safety • Damage to components • Cost • Environmental awareness
3. Describe the basic components that make up the air conditioning system.	• Compressor • Belts • High and low pressure lines • Refrigerant • Evaporator
4. Describe the problems of mishandling the air conditioning system.	• Personal safety • Damage to components • Extreme high pressure • Paint bake temperature versus pressure • Environmental awareness • Cost

Achievement Criteria:

On examination, describe the safe procedure used when handling air conditioning components and describe the environmental concerns these components raise.

LINE C: HANDLING OF VEHICLE COMPONENTS

Competency: C-5 Describe The Follow Up Procedure As To The Ordering Of Parts And Materials

Learning Objectives:

1. The learner will be able to describe the parts ordering procedures.

LEARNING TASKS	CONTENT
1. Describe the follow up procedure as to the ordering of parts and material.	• Repair order • Damage of parts during removal • Insurance • Supplements • Parts availability • Ability to recognize broken parts • Organization of parts • Inventory of parts • Storage of parts • Customer wants • Customer satisfaction

Achievement Criteria:

On examination, describe the procedure to use while following up on a parts and refinishing material purchase order.

LINE C: **HANDLING OF VEHICLE COMPONENTS**

Competency: **C-6** **DESCRIBE THE CORRECT METHOD FOR R AND I OF A VEHICLE'S WHEELS**

Learning Objectives:

1. The learner will be able to describe vehicle wheel removal and installation procedures.
2. The learner will be able to demonstrate the vehicle wheel removal and installation process.

LEARNING TASKS	CONTENT
1. Describe the reasons for knowing the correct procedures for R and I of a vehicles wheels.	• Brake damage • High cost to repair • Customer dissatisfaction • Warranty problems • Safety reasons
2. Demonstrate the correct method for R and I of wheels.	• Jacking • Lifting points • Safety stands • High cost of repair • Care of wheel discs • Proper use of air tools • Tightening sequence specifications • Torque wrench use • Manufacturer's specifications

Achievement Criteria:

On examination, demonstrate the safe method used to remove and install vehicle wheels and describe the correct procedure used to lift and support a vehicle.

LINE D: SURFACE PREPARATION

Competency: D-1 Describe How To Establish The Type Of Tasks Needed To Complete The Refinishing Repairs

Learning Objectives:

1. The learner will be able to describe how to establish the type of repair required to proceed.
2. The learner will be able to describe V.I.P. and colour code locations.
3. The learner will be able to describe customer and shop expectations.
4. The learner will be able to describe vehicle identification plate information.

LEARNING TASKS	CONTENT
1. Describe how to establish the type of task required to complete the repairs.	• Dialogue/foreman • Dialogue/customer • Repair inspection • Identify all paint defects • Type of finish • Type of refinish problem • Read repair order and verify • Read estimate sheet • Spot repair • Panel repair • Blend • Complete refinishing • What, why, to what extent • New or used repair panels • Old damage
2. Describe the location that a V.I.P. plate and colour code may be found on a vehicle.	• Door and hinge pillars • Glove box • Rad support • Firewall • Trunk area • Manufacture manuals • Paint jobbers
2…Continued 3. Determine customer and shop expectations.	• Customer service expectations • Customer satisfaction • Perform quality repair • Present a clean detailed vehicle • Dialogue/customer, manager • Dialogue/insurance estimator

4. Describe the information found on a V.I.P. plate.

- Year and model
- Serial number
- Paint code type
- Upholstery
- Trim colour
- Options
- Two-tone colour

Achievement Criteria:
On examination, describe and/or recognize methods and techniques used to provide initial customer satisfaction and to provide an industry accepted refinishing repair.

LINE D: SURFACE PREPARATION

Competency: D-2 Identify the Various Types Of Substrates Specific to Topcoating

Learning Objectives:

1. The learner will be able to describe types of vehicle substrates.
2. The learner will be able to describe types of topcoat found on automotive vehicles.
3. The learner will be able to demonstrate topcoat identification methods.

LEARNING TASKS	CONTENT
1. Describe the type of substrate one might encounter on today's vehicles.	• Fiberglass • Plastics, rigid, semi-rigid, flexible • O.E.M./aftermarket • S.M.C. • Steel galvanized • Aluminum
2. Describe the types of finishes one might encounter on today's vehicles.	• Waterborne • Single stage urethane • Colour coat/clear coat • Basecoat/clear coat • Tri-coat • Multi-stage • New technology • Lacquer
3. Demonstrate how to determine the type of finish on a vehicle.	• V.I.P. • Sand small area • Rub small area with lacquer thinner • Heat method • Paint manufacturer's manual • Jobber

Achievement Criteria:

On examination, describe the various substrates and topcoats found in the automotive refinishing industry and identify the various substrates and topcoats.

LINE D: SURFACE PREPARATION

Competency: D-3 Explain How To Establish The Condition Of A Finish

Learning Objectives:

1. The learner will be able to describe the component characteristics of a topcoat.
2. The learner will be able to explain environmental effects on a topcoat.
3. The learner will be able to describe identification methods used to determine the type of topcoat.
4. The learner will be able to describe topcoat refinishing conditions.
5. The learner will be able to explain and demonstrate how to determine the condition of a finish.
6. The learner will be able to identify the history of O.E.M. topcoats.

LEARNING TASKS	CONTENT
1. Describe the component characteristics of topcoats.	• Appearance • Corrosion protection • Binders/resins • Pigments • Solvents • Additives • UV screeners • Durability
2. Explain the effects of the environment on topcoats.	• Acid rain • Rail dust/brake dust • UV rays • Relative humidity • Insects • Industrial fall out • Tree sap • Bird droppings • Industrial overspray (wind)
3. Describe the methods for determining the type of topcoat.	• Repair materials • Repair techniques • Computer database • Microfiche • VIP plate • Sanding • Thinner and rag • Jobber • Vehicle manufacturer

4. Describe the conditions one might encounter during a refinishing repair.
   - Delamination
   - Cracking
   - Checking
   - Bleeding
   - Solvent pop
   - Rock chips
   - Scratches
   - Damage
   - Door dings
   - Excess mil thickness
   - Chalking
   - Orange peel
   - Off colour
   - Runs and sags
   - Swelling
   - Pin holes
   - Shrinkage
   - Fish eyes
   - Acid rain
   - Overspray
5. Explain and demonstrate how to determine the condition of a finish.
   - Visual inspection
   - Mil gauge
   - Magnet
   - Magnifying glass
   - Sand a small area
6. Identify the history of OEM topcoats.
   - Acrylic lacquer
   - Alkyd enamel
   - Acrylic enamel
   - Urethane enamel
   - Basecoat/clear coat
   - Waterborne
   - Powder coat clear coats

Achievement Criteria:
On examination, describe the various substrates and topcoats found in the automotive refinishing industry and identify the various substrates and topcoats.

LINE D: SURFACE PREPARATION

Competency: D-4 Open to New Technology

Learning Objectives:

1. The learner will be able to describe new topcoat technology.

LEARNING TASKS	CONTENT
1. Describe new technology.	• Products

LINE D: SURFACE PREPARATION

Competency: D-5 Review of Undercoats

Learning Objectives:

1. The learner will be able to describe the types of undercoat products.
2. The learner will be able to describe the components of an undercoat.
3. The learner will be able to describe functions of the various undercoats.
4. The learner will be able to demonstrate undercoat mixing procedures.

LEARNING TASKS	CONTENT
1. Describe the types of undercoat products.	• Primer • Primer-surfacer • Primer-sealer • Sealer
2. Describe the main base ingredients of the undercoat products.	• Pigment • Binder • Solvent • Additives • Activators • Hardeners
3. Describe the functions of: a. wash primers b. zinc chromate primers c. epoxy primer d. plastic primer e. zinc weld through primer	• High corrosion resistance • Application method • Mixing procedure • Adhesion to aluminum • Adhesion to galvanize • Corrosion resistance • Base for plastic body fillers • Waterproof qualities • Wet on wet application • Weld joint protection • Prevents peeling • Provides adhesion to plastic • Tintable • Aerosol application

4. Describe the functions of a primer surfacer.

- Filler
- Adhesion
- Etch and fill
- Corrosion resistance
- High film build
- Colour hold out
- Aerosol application
- Roll on application
- No shrinkage
- Seals surface
- Tintable
- Direct to metal
- Urethane
- Sprayable polyester
- Single component

5. Describe the functions of a primer-sealer/sealer.

- Adhesion to bare metal
- Corrosion protection
- Prevents solvent penetration
- Uniform hold out
- Controls sandscratch swelling
- Tintable
- Uniform colour hold out
- Topcoat adhesion
- Performance

6. Demonstrate the mixing and application of:
   a. primers
   b. primer-surfacers
   c. primer-sealer
   d. sealer

Achievement Criteria:
On examination, demonstrate the mixing and application method used while applying the various undercoats and describe the functions of the various undercoats.

LINE D: SURFACE PREPARATION

Competency: D-6 Demonstrate and Explain Steps to Properly Clean and Prepare Vehicle Prior To Sanding

Learning Objectives:

1. The learner will be able to describe and demonstrate the cleaning procedure used prior to sanding.
2. The learner will be able to describe functions of refinishing cleaners.
3. The learner will be able to review safety precautions when sanding a vehicle.
4. The learner will be able to describe methods to protect surfaces and trim.

LEARNING TASKS	CONTENT
1. Describe and demonstrate the steps to clean and prepare the vehicle prior to sanding.	• Contaminant knowledge • Cleaning techniques • Disposal of cleaning materials • Soap and water wash • Degreaser • Grease and wax remover (if necessary) • Trim removal • Masking
2. Describe the various types of refinishing cleaners and their functions.	• Alcohol based • Petroleum based • Water based • Application (methods) • Environmental issues • Storage and handling • Disposal • Application sequence
3. Review safety precautions while sanding a vehicle. 3…Continued	• Eye protection • Dust masks • Coveralls • Gloves • Safety shoes • Ear plugs • Adequate ventilation
4. Describe the methods of protecting surfaces and trim.	• Masking/spray on • Covering • Removal • Storage

Achievement Criteria:

On examination, describe the safety precautions and the steps to follow while preparing a vehicle prior to sanding.

LINE D: SURFACE PREPARATION

Competency: D-7 Demonstrate And Explain The Correct Procedures For Working With Plastic Body Fillers

Learning Objectives:

1. The learner will be able to describe types of body filler and putties.
2. The learner will be able to describe characteristics of body fillers and putties.
3. The learner will be able to describe hardener to filler mixing ratios.
4. The learner will be able to explain problems that may occur by incorrectly mixing body filler and putties.
5. The learner will be able to demonstrate body filler and putty application methods.

LEARNING TASKS	CONTENT
1. Describe the different types of body fillers and putties.	• Fiberglass • Aluminum • Light weight • Premium • Polyester • Glazing
2. Describe the characteristics of plastic body fillers and putties.	• Paraffin • Resins • Pigments • Solvents • Identify substrate • Application techniques • Cleaning methods • Cure times • Working times • Environmental forces • Application thickness • Limitations • PPE
3. Describe the mixing ratio of hardeners to fillers.	• 3.5 to 4.5% (putties) • 2 to 2.5% (body fillers) • Mixing method • Estimated quantity • Compatibility • Follow manufacturer's recommendations

4. Explain the problems encountered from incorrectly mixing body fillers and putties.
    - Improper cure
    - Pin holes
    - Poor adhesion
    - Blistering
    - Bleeding of colour coat
    - Sandscratch swelling
    - Bulls eyes
    - Shrinking
    - Surface contamination
    - Moisture
    - Bleaching of topcoat
    - performance
5. Demonstrate the procedures to work with fillers.

Achievement Criteria:
On examination, describe and demonstrate the correct procedure for mixing, applying and finishing plastic body fillers and describe the protective equipment required to apply a two-part putty.

LINE D: SURFACE PREPARATION

Competency: D-8 Describe the Various Sanding Equipment and Materials Used in the Refinishing Trade

Learning Objectives:

1. The learner will be able to describe types of sandpapers.
2. The learner will be able to describe types of sanding equipment.

LEARNING TASKS	CONTENT
1. Describe the various types of sanding materials.	• Grinding discs • Wet/dry papers • Dry papers • Wet versus dry papers • Grit types • Grading of paper • Abrasive pads • Open coat/closed coat • Adhesive type • Costs • Waste control
2. Describe the types of sanding equipment.	• Rotary • Orbital • Random-orbital • Straight-line • Grinders • Sanding blocks • Sanding pads • Squeegee pads • Bucket • Vacuum systems • Operating procedures • Cleaning • Maintenance • Limitations • Storage • Lubrication

Achievement Criteria:

On examination, describe the safe and correct procedure to follow when sanding a vehicle and describe the importance of regular maintenance of sanding equipment used by automotive refinishing technicians.

LINE D: SURFACE PREPARATION

Competency: D-9 Demonstrate and Explain the Types of Sanding Procedures Used in the Refinishing Trade

Learning Objectives:

1. The learner will be able to describe the types of sanding methods.
2. The learner will be able to describe the selection process used when choosing a sanding grit.
3. The learner will be able to identify and explain the purpose of the various types of sandpaper.
4. The learner will be able to describe paint removal methods.
5. The learner will be able to demonstrate hand sanding techniques.
6. The learner will be able to demonstrate power sanding techniques.

LEARNING TASKS	CONTENT
1. Describe the various methods of sanding.	• Hand sanding • Power sanding • Bare metal sanding • Type of old finish • Condition of old finish • Block sanding • Featheredging • Grinding
2. Describe the sanding grit used when preparing a surface for topcoat application.	• Basecoat clear coat • Single stage • Bend panels • Spot repair • Complete repair • Blend tunnel
3. Identify and explain the purpose of various types of sandpaper.	• Grinding discs • Wet sandpaper • Dry sandpaper • Open coat • Closed coat • Scotch brite pads • Scuff paste • Grit sizes • P-grade paper • Handling and storage

4. Describe the various paint removal methods.
   - Chemical
   - Mechanical
   - Media types
   - Sand
   - Glass
   - Walnut
   - Plastic
   - Soda
   - Safety precaution
   - Safety equipment
   - Protect surrounding area
   - Removal techniques
   - Completion cleaning
   - Handle, store and dispose of material
5. Demonstrate the methods of hand sanding.
   - Cutting and folding of sandpaper
   - Soaking the paper
   - Surface cleaning
   - Trim protection
   - Proper motion
   - Proper direction
   - Sanding techniques
   - Sanding block or pad
   - Wet sand grit size
   - Dry sand grit size
   - Sanding lubricants
   - Problems from poor sanding techniques
6. Demonstrate the methods of power sanding.
   - performance

Achievement Criteria:
On examination, demonstrate the various sanding methods and describe the correct sanding procedures to use to prevent refinishing problems.

LINE D: SURFACE PREPARATION

Competency: D-10 Describe the Purposes and Mixing Ratios of Metal Conditioners

Learning Objectives:

1. The learner will be able to describe the components of a metal conditioner and conversion coating.
2. The learner will be able to describe the purpose of metal conditioners and conversion coatings.
3. The learner will be able to demonstrate the mixing process of metal conditioners and conversion coatings.
4. The learner will be able to demonstrate application methods.

LEARNING TASKS	CONTENT
1. Describe the main ingredients of metal conditioners and conversion coating.	• Phosphoric acid • Zinc phosphate/chromate
2. Describe the purposes of metal conditioners and conversion coating.	• Adhesion qualities • Cleaning qualities • Protection • Durability • Corrosion protection
3. Demonstrate the mixing of metal conditioner and conversion coating.	• Safety precautions • Follow directions • Manufacturer's mixing ratios • Pot life
4. Demonstrate the application of metal conditioner and conversion coating.	• Safety precautions • Wet coat • Time allowed before rinsing • Cleanliness • Visual signs • Spray bottle • Sponge application of water (neutralize) • Disposal method • Cleaning after use

Achievement Criteria:

On examination, describe the functions of metal conditioner and conversion coating and demonstrate the safe and correct application methods used to apply these products.

LINE D: SURFACE PREPARATION

Competency: D-11 Describe Advanced Masking Techniques

Learning Objectives:

1. The learner will be able to describe types of masking materials.
2. The learner will be able to describe the use of masking tape.
3. The learner will be able to describe the various masking methods and techniques.
4. The learner will be able to explain methods used to remove masking materials.
5. The learner will be able to explain the process used to prepare a vehicle for a complete paint repair.
6. The learner will be able to mask a vehicle for complete paint.
7. The learner will be able to mask a vehicle for a blend repair.
8. The learner will be able to explain the characteristics of fine line tape.
9. The learner will be able to describe the purpose of fine line tape.
10. The learner will be able to perform a repair using fine line tape.
11. The learner will be able to describe characteristics of spray masking materials.
12. The learner will be able to describe the components of the vehicle that can be spray masked.
13. The learner will be able to identify safety precautions using M.S.D.S.
14. The learner will be able to apply spray mask material.

LEARNING TASKS	CONTENT
1. Describe the characteristics of masking materials and their proper use.	• Waxed on one side • Paper sizes • Solvent resistant • Plastic sheeting • Customer satisfaction • Spray mask • Reduces overspray • Foam • Reduces detailing • Reduces re-dos • Heat resistant • No loose fibers
2. Describe the characteristics of masking tape and its proper use.	• Fine line • Plastic • Foam • Vinyl • Edge type • Widths 1/8” to 2” • Heat resistant • Flexible • Solvent resistant • Prevents overspray • Reduces re-dos • Flush mount parts

3. Describe the various masking techniques.	• Edge • Reverse • Inners • Back mask • Tunnel
4. Explain masking removal methods.	• Types of masking materials • Application techniques • When to remove • Contaminants • Disposal of materials • Back mask
5. Explain the steps for preparing a vehicle for a complete paint job.	• Ability to select quantity of materials • Cleaning • Wax and grease • Blowing off • Masking • Cleaning • Set up spray booth • Tacking
6. Mask a vehicle for complete paint.	• Performance
7. Explain the steps for preparing a vehicle for a blend panel.	• Clean, soap and water • Wax and grease panel • Scuff panel • Clean and blow off panel • Mask perimeter of panel • Clean and tack • Perform any specialty masking (fine line)
8. Mask a vehicle for a blend repair.	• Performance
9. Explain the characteristics of fine line tape.	• Nylon or vinyl • Heat resistant • Solvent resistant • Width 1/16” to 1/4” • Must be removed directly after refinishing • Perform any specialty masking (fine line)
10. Describe the purpose of fine line tape in paint repairs.	• Used on flush mount applications • Prevents overspray • Prevents paint build up (bridging) • Easily managed for fine detail • Flexible
11. Mask a repair using fine line tape.	• Performance

12. Describe the characteristics of various spray masking materials.
    - Prevents overspraying
    - Water soluble
    - Cost effective
    - Contains cleaning agents
    - Environmentally friendly
    - Customer satisfaction
    - Applied with a spray gun
    - Not to be placed in direct sunlight
13. Describe the components to be spray masked.
    - Exterior of the vehicle
    - Wheel and wheel well
    - Engine compartment
    - Vehicle window
    - Vehicle trim
    - Spray booth
14. Identify the correct safety equipment using M.S.D.S.
    - Eye protection
    - Respirator
    - Gloves
    - Ventilation
15. Using safety equipment apply spray mask material.
    - performance

Achievement Criteria:
On examination, demonstrate the correct method to use while masking a vehicle for complete paint and describe the procedure to follow to prevent costly re-dos and overspray.

On examination, demonstrate masking procedures for a blend panel and describe the preparation of a blend prior to masking.

On examination, demonstrate the method used to apply and remove fine line tape and describe the purpose and characteristics of fine line tape.

On examination, demonstrate the safe method used to apply liquid mask products and describe the components of the vehicle where one can use these products.

LINE E: ADVANCED USE OF SOLVENTS

Competency: E-1 Describe the Safety and Fire Precautions to Observe When Working With Solvents

Learning Objectives:

1. The learner will be able to identify components of the human body affected by solvents.
2. The learner will be able to describe potential hazards when using a solvent.
3. The learner will be able to describe potential fire hazards when working with solvents.

LEARNING TASKS	CONTENT
1. Review the areas of the body affected by solvents.	• Eyes • Respiratory system • Nervous system • Skin • Brain cells • Liver deterioration • Burns • Death (explosive or fire) • Reproduction organs
2. Describe when solvents can be a hazard.	• Ability to read MSDS sheets • Location of MSDS sheets • Updating MSDS sheets • Opening of container • Pouring spraying • Storage requirements before and after use • Handling • During evaporation • Spill kit location • Cleaning spills • W.C.B. rules and regulations • Waste disposal • Environmental concerns • Workplace hazards

3. Describe the fire precautions to observe.

- Handling solvents
- Pouring
- Static electricity
- Containers
- Storage and handling
- Cleaning
- Soak rags
- Fire extinguishers
- Fire regulations
- Insurance regulations
- Municipal regulations
- Provincial regulations
- National regulations

Achievement Criteria:
On examination, describe the appropriate safety procedures to prevent workplace injury and fire and demonstrate the safe use of solvents.

LINE E: ADVANCED USE OF SOLVENTS

Competency: E-2 Describe the Types and Function of Solvents

Learning Objectives:

1. The learner will be able to identify various types of solvents.
2. The learner will be able to describe functions of a solvent.
3. The learner will be able to describe the correct selection of a solvent.
4. The learner will be able to explain temperature rated solvents.

LEARNING TASKS	CONTENT
1. Identify the various types of solvents.	• Thinner/gun wash • Reducer/activator • Cleaning agent • Temperature rated
2. Describe the functions of solvent.	• Controls material sprayability (viscosity) • Controls material flow out • Controls flash time • Assist in curing • Cleaning agent • Creates VOC • Promotes adhesion • Evaporates at room temperature
3. Describe how to select the correct solvent.	• Type of refinishing product • Temperature • Humidity • Type of spray booth • Ability of applicator • Shop conditions • Condition of topcoat
4. Explain the temperature variance of solvents.	• Slow • Medium • Fast • Very fast • Activated solvent • Related temperatures • Air flow • Effect of humidity • Flash times • Dry times

Achievement Criteria:

On examination, describe the correct use of solvents and describe and/or identify the different types of solvents and their functions.

LINE E: ADVANCED USE OF SOLVENTS

Competency: E-3 Explain the Correct Method for Using Solvent

Learning Objectives:

1. The learner will be able to explain and demonstrate safe handling of solvents.
2. The learner will be able to explain and demonstrate correct methods for using solvents.
3. The learner will be able to explain and demonstrate the correct method to pour solvent.
4. The learner will be able to explain and demonstrate the use of gun wash cleaner.

LEARNING TASKS	CONTENT
1. Demonstrate and explain the safe handling of solvents.	• Pouring • Containers • Reading and understanding manufacturer's instructions • Disposal/environment • Storage • Personal protection • MSDS information
2. Demonstrate and explain the correct methods for using solvents.	• Spraying environment • Temperature • Flash off times • Humidity • Personal safety equipment
3. Demonstrate and explain the correct method to pour solvent.	• Speed of pour • Ventilation • Mixing ratios • Percentages • Parts • Personal protection • Waste prevention • Storage
4. Demonstrate and explain the correct methods for using gun wash.	• Equipment • Storage • Personal equipment • Disposal

Achievement Criteria:

On examination, demonstrate the safe method used to apply a solvent based product and describe the importance of using the correct solvent.

LINE E: ADVANCED USE OF SOLVENTS

Competency: E-4 Describe the Problems Encountered by Using the Wrong Type of Solvents

Learning Objectives:

1. The learner will be able to describe and identify topcoat problems caused by an incorrect solvent selection.

LEARNING TASKS	CONTENT
1. Describe the problems that may occur while using the wrong type of solvent.	• Paint curdle • Improper application • Improper dry • Colour change • Poor gloss • Orange peel • Solvent popping • Swelling • Seediness • Shrinkage • Sandscratch swelling • Mottling • Sags and runs • Poor adhesion

Achievement Criteria:

On examination, recognize and/or describe refinishing problems that can occur while using a poor quality solvent or the wrong temperature-rated solvent.

LINE F: CORROSION PROTECTION

Competency: F-1 Describe And Analyze Corrosion

Learning Objectives:

1. The learner will be able to describe the definition of corrosion.
2. The learner will be able to describe the reasons why corrosion forms.
3. The learner will be able to describe O.E.M. corrosion protection.
4. The learner will be able to describe P.B.E. when applying corrosion protection materials.

LEARNING TASKS	CONTENT
1. Describe corrosion. a. electrolysis b. types of metals	• Oxidization • Moisture • Ions • Metal oxide • Electrolyte
2. Describe the reasons why corrosion will form.	• Various road conditions • Improper metal preparation • Various weather conditions • Relative humidity • Hot spots • Collision damage • Improper repair • Poor maintenance
3. Describe O.E.M. corrosion protection.	• Metal treatment • Conversion coating • Phosphate coating • Anti-corrosion materials • E-coat
4. Describe the various safety precautions taken when applying corrosion protection materials.	• Respiratory • Eye protection • Skin protection • Adequate ventilation

Achievement Criteria:

On examination, describe the theory of corrosion and describe the safety methods used while applying corrosion protection materials.

LINE F: CORROSION PROTECTION

Competency: F-2 Explain Different Types of Corrosion and the Cause of Each

Learning Objectives:

1. The learner will be able to describe the components of corrosion.
2. The learner will be able to describe the cause of corrosion.
3. The learner will be able to identify the types of corrosion.

LEARNING TASKS	CONTENT
1. Describe the formula for corrosion.	• Oxygen • Moisture • Heat source
2. Describe the cause of corrosion.	• Road salt • Salty air • High relative humidity • Environmental items • High levels of moisture • Improper repair
3. Identify the different types of corrosion.	• Sacrificial corrosion • Galvanic corrosion

Achievement Criteria:

On examination, explain the components needed to start the corrosion process and describe the various types of corrosion.

LINE F: CORROSION PROTECTION

Competency: F-3 Explain the Repair Technique for Each

Learning Objectives:

1. The learner will be able to explain corrosion repair techniques.
2. The learner will be able to demonstrate a corrosion repair.

LEARNING TASKS	CONTENT
1. Explain the repair technique for corrosion.	• Remove as little paint as possible • Removal techniques • Remove all traces of corrosion • Safety precautions • Protect vehicle during repair • Limitations • Use one manufacturer's system • Follow manufacturer's guidelines • Latex ruster converters • Media blasting • Sandblasting
2. Demonstrate corrosion repair.	• Performance

Achievement Criteria:

On examination, demonstrate the method used to repair and remove corrosion and describe the correct repair technique used while repairing or removing corrosion.

LINE F: CORROSION PROTECTION

Competency: F-4 EXPLAIN CORROSION PREVENTION

Learning Objectives:

1. The learner will be able to identify equipment required to apply corrosion protection materials.
2. The learner will be able to describe corrosion protection materials.
3. The learner will be able to describe areas of the vehicle requiring corrosion protection.
4. The learner will be able to identify potential issues caused by improper corrosion protection.
5. The learner will be able to describe chip guards and their functions.
6. The learner will be able to demonstrate the steps to follow to establish corrosion protection.

LEARNING TASKS	CONTENT
1. Identify equipment needed for the application of corrosion protection materials.	• Spray guns • Sealing guns • Undercoat gun • Spray wands • Spray bombs • Brush
2. Describe materials used for corrosion prevention.	• Galvanized metal • Metal conditions • Conversion coating • Epoxy primer • Primer-surfacers • Primer sealer, sealer • Top coat • Anti-corrosion compounds • Seam sealers • Gravel guards • Chip resistant coatings • Application techniques • Cleaning • Storage • Limitations
3. Describe areas requiring protection.	• Joints and seams • Enclosed interior surfaces • Exposed joints • Exposed interior surfaces • Exposed exterior surfaces

4. Identify potential issues caused by improper corrosion protection.	• Poor finish • Life expectancy of vehicle reduced • Warranty issues • Poor customer relations • Liability issues • Corrosion hot spots • Poor adhesion • Blisters • Structural integrity • Hot spots • Vehicle appearance • Customer expectations • Vehicle's life expectancy • Vehicle long term value
5. Describe chip guards and their use. 5…Continued	• Waterborne • Acrylic • Paintable/non-paintable • Dry times • Sanding times • Limitations • Application equipment • Application method • Substrate preparation • Duplicate textures • Protect surrounding areas
6. Demonstrate the correct sequence of steps to follow to provide corrosion protection.	• Cleaning • Drying • Sanding or grinding • Cleaning • Application of product • Equipment • Material knowledge • Drying of products • Topcoating • Safety precautions • Use of a given paint system

Achievement Criteria:
On examination, demonstrate the procedure to follow while applying anti-corrosion materials and describe areas of the vehicle that require corrosion protection.

LINE G: **ADVANCED UNDERSTANDING OF TOPCOAT MATERIALS**

Competency: G-1 Describe the Various Types of Topcoats Found on Today's Vehicle

Learning Objectives:

1. The learner will be able to identify the various types of automotive topcoats.

LEARNING TASKS	CONTENT
1. Identify the various topcoats.	• Basecoat clear coat • Single stage urethane • Colour coat clear coat • Tri-coat • Multi-stage • Enamels • Acrylic enamels • Urethanes • Basecoat • Waterborne • Powder coating • Thermoset • Thermo plastic • Future product changes • Identified by its resin type

Achievement Criteria:

On examination, recognize and describe the various topcoats found on today's vehicles.

LINE G: ADVANCED UNDERSTANDING OF TOPCOAT MATERIALS

Competency: G-2 Identifying Topcoats

Learning Objectives:

1. The learner will be able to describe topcoat functions.
2. The learner will be able to explain and demonstrate how to establish the type and condition of a finish.
3. The learner will be able to describe O.E.M. topcoat application methods.

LEARNING TASKS	CONTENT
1. Describe the functions of the topcoat.	• Environmental protection • Corrosion protection • Appearance • Resale value
2. Demonstrate and explain how to establish the type and condition of a finish on a vehicle.	• Thinner rag • Sanding • V.I.P. • Computer database • Microfiche • Mil gauge • Magnifying glass • Visual inspection • Jobber/supplier • Manufacturer
3. Describe refinishing products and their application methods at the Original Equipment Manufacture (O.E.M.).	• Types of substrates • Factory variables • Standards • Assembly line • Waterborne products • Powdered clearcoats • E-coat • High temperature bake • Non-catalyzed • Robotic spray equipment • Corrosion protection system • Various abilities and product • Variables in types of equipment • Activated products • Baking systems • Powder coatings • Quality checks

Achievement Criteria:

On examination, demonstrate and/or describe the method used to determine the condition of a topcoat and describe the application method and equipment used to apply topcoats at the Original Equipment Manufacture (O.E.M.).

LINE G: ADVANCED UNDERSTANDING OF TOPCOAT MATERIALS

Competency: G-3 Describe the Main Components Of Paint And The Function Of Each

Learning Objectives:

1. The learner will be able to identify the component of paint.
2. The learner will be able to describe the functions of the components of paint.
3. The learner will be able to demonstrate topcoat mixing procedures.

LEARNING TASKS	CONTENT
1. Identify the main components of paint.	• Pigment • Binder/resins • Solvent • Additives • U.V. screeners • Metallics • Pearls/micas
2. Describe the function of the main components of paint.	• Durability • Colour • Adhesion • Gloss • Protection • Dry time • Evaporation rate • Reductions • Water resistance • U.V. protection • Fill • Chemical resistance
3. Demonstrate the mixing procedures for the various topcoats.	• Performance

Achievement Criteria:

On examination, demonstrate the correct and safe method used to mix the various topcoats and describe the functions of each component of paint.

LINE G: ADVANCED UNDERSTANDING OF TOPCOAT MATERIALS

Competency: G-4 Describe The Various Topcoat Application Methods

Learning Objectives:

1. The learner will be able to describe application techniques of the various topcoats.

LEARNING TASKS	CONTENT
1. Describe the application of the various topcoats. a. basecoat clear coat b. single stage urethane c. colour coat clear coat d. tri-coat e. multi-stage f. waterborne	• Safety precautions • Spray gun selection • Paint filters • Air pressure • Spray gun setup • Spray gun techniques • Spray gun cleaning • Spray booth settings • Number of coats • Minimum amount (U.V. protection) • Flash off times • Dry times • Spray out cards • Let down panels

Achievement Criteria:
On examination, describe the various topcoat application methods used by the automotive refinishing industry.

LINE H: CHARACTERISTICS OF CHEMICAL ADDITIVES

Competency: H-1 Describe The Characteristics And Procedures Of Hardeners

Learning Objectives:

1. The learner will be able to describe the use and characteristics of hardeners and activators.

LEARNING TASKS	CONTENT
1. Describe the characteristics and use of hardeners and activators.	• Chemical action • Cross linking • Curing • Thermoset • Deactivates below 58°F • Speed up cure • Improve gloss • Used in all thermoset products • Durability • Handling and storage • Mixing procedures • PPE

Achievement Criteria:
On examination, describe the correct use of the various types of hardeners and describe the characteristics of these hardeners.

LINE H: CHARACTERISTICS OF CHEMICAL ADDITIVES

Competency: H-2 Describe the Characteristics and Purpose of Accelerators

Learning Objectives:

1. The learner will be able to describe the use and characteristics of accelerators.

LEARNING TASKS	CONTENT
1. Describe the characteristics and use of accelerators.	• Speed up dry time • May cause a loss of gloss • Shortened pot life • Should be used in a cooler spraying environment • Used in undercoats and topcoats

Achievement Criteria:
On examination, describe the correct use and characteristics of automotive refinishing accelerators.

LINE H: CHARACTERISTICS OF CHEMICAL ADDITIVES

Competency: H-3 Describe the Characteristics and Purpose of Flex Agents

Learning Objectives:

1. The learner will be able to describe the use and characteristics of flex agents.

LEARNING TASKS	CONTENT
1. Describe the characteristics and use of flex agents.	• Used for flexible parts • Applied to undercoats and topcoats • Mixing ratios may vary with each parts flexibility • Storage after use

Achievement Criteria:
On examination, describe the characteristics and correct use of automotive refinishing flex agents.

LINE H: CHARACTERISTICS OF CHEMICAL ADDITIVES

Competency: H-4 Describe the Characteristics and Purpose of Flattening Agents

Learning Objectives:

1. The learner will be able to describe the use and characteristics of flattening agents.

LEARNING TASKS	CONTENT
1. Describe the characteristics and use of flattening agents.	• Lower gloss • Lower shine • Provide dull finish • Customer satisfaction • Used in topcoats

Achievement Criteria:
On examination, describe the characteristics and correct use of automotive refinishing flattening agents.

LINE I: **THEORY OF COLOUR**

Competency: **I-1** **Describe How to Locate, Research and Record Colour Data**

Learning Objectives:

1. The learner will be able to describe V.I.P. and colour code locations.
2. The learner will be able to describe manufacturer's resource material.
3. The learner will be able to explain the use of automotive refinishing computers.
4. The learner will be able to explain the use of measuring equipment.
5. The learner will be able to explain paint mixing procedures.
6. The learner will be able to describe colour formulation systems.

LEARNING TASKS	CONTENT
1. Describe V.I.P. and colour code location.	• Paint code location • Paint code identification • Location charts
2. Describe manufacturer's resource material.	• Paint chip books • Colour books • Formula books • Microfiche • Variant decks • Chromatic map system • Computer networks • Spectrometer
3. Explain the use of computers in the refinishing trade.	• Computer hardware • Software applications • Spectrophotometer • Paint mixing • Job tracking • Material tracking • Data retrieval • Colour information • Product information • MSDS information • VOC tracking
3…Continued	
4. Explain the use of measuring equipment.	• Scales • Proportional sticks • Containers • Computerized • Digital • Interpret technical manuals • Ability to operate systems • Basic calculations • Set up measuring system • Maintain measuring system

5. Explain procedures to follow when mixing paint.	• Scales and ratios • Viscosity scales • Low and high strength colours • Safety procedures • Mixing equipment • Ability to select correct solvent and activator for the job • Required amount of paint
6. Describe shop colour formulation system.	• Chip books • Product manuals • System updates • Microfiche • Spray out cards • Variant decks • Computer database

Achievement Criteria:
On examination, describe the methods used to obtain and verify a vehicle's paint code and paint formula.

LINE I: THEORY OF COLOUR

Competency: I-2 Describe Variables Which Have an Influence on Colour

Learning Objectives:

1. The learner will be able to describe O.E.M. top coating variations.
2. The learner will be able to describe top coat variables in the automotive refinishing industry.
3. The learner will be able to describe metamorism.

LEARNING TASKS	CONTENT
1. Describe variables at O.E.M. level.	• Allowed margins/tolerances • Multiple plant locations • Differences in equipment • Types of paints applied • Variations in metallic/micas • Paint line stoppage • Multiple paint suppliers • Damages in transit
2. Describe variables in industry.	• Equipment differences • Different paint types • Spray gun techniques and settings • Differences in climate • Improper formulation • Orientation • Weathering of finish • Colour matches • Technician's ability
3. Describe metamorism.	• Natural daylight • Fluorescent/bright or cool white • Incandescent • Finishes viewed under different light sources

Achievement Criteria:

On examination, describe conditions and/or circumstances that influence colour at the O.E.M. level and at the automotive refinishing industry level.

LINE I: **THEORY OF COLOUR**

Competency: **I-3** **Define Terminology used to Describe Colour**

Learning Objectives:

1. The learner will be able to describe terms used to define solid/metallic colours.
2. The learner will be able to describe the three dimensions of colour.

LEARNING TASKS	CONTENT
1. Define terms used to describe solid/metallic colour.	• Pigment • Binder/resin • Tinter • Opaque • Iridescent/metallic • Translucent • Transparent • Micas/pearls • Spectrum of colour • Face, pitch and flash
2. Describe the three dimensions of colour.	• Value • Hue • Chroma • Primary/secondary cast • Saturation/de-saturation • Lightness/darkness

Achievement Criteria:

On examination, describe and identify the correct method used to analyze colour.

LINE I: THEORY OF COLOUR

Competency: I-4 List the Steps for Mixing and Tinting a Colour

Learning Objectives:
1. The learner will be able to describe colour matching procedures.
2. The learner will be able to identify the viewing angles of colour.

LEARNING TASKS	CONTENT
1. Describe colour matching.	• Uniform base colour • Proper mixing of toners • Formula content • Use of scales • Spray out cards • Draw down bar • Comparison colour to vehicle • Colour mapping • Colour adjustment • Toner measurement • Colour change wet/dry • Spray techniques • Air pressure • Solvent selection
2. Identify viewing angles of colour.	• Face • Flash • Pitch • Metallic flop

Achievement Criteria:
On examination, describe the viewing angle a technician uses to determine the flop of a colour and describe the correct procedure used to match a colour.

LINE J: PAINT PROBLEMS AND REPAIRS

Competency: J-1 Describe the Types of Repairs one can Encounter in the Refinishing Trade

Learning Objectives:

1. The learner will be able to describe various topcoat repairs.
2. The learner will be able to describe the types of topcoating colour systems and components.
3. The learner will be able to identify types of topcoat refinishing materials.
4. The learner will be able to identify various vehicle substrates.

LEARNING TASKS	CONTENT
1. Describe the types of surface repair classification.	• Spot repair • Panel repair • Complete repair • Blends (colour and clear)
2. Describe the types of colour systems.	• Solid colour • Metallic colours • Pearlescent • Dyes • Colour coat/clear coat • Basecoat/clear coat
3. Identify the type of topcoat material encountered on the vehicles.	• Basecoat clear coat • Single stage urethane • Colour coat clear coat • Tri-coat • Water base • Lacquer (awareness)
4. Identify the types of substrates one can encounter on a vehicle.	• Fiberglass • Plastic • Steel • Aluminum • S.M.C.

Achievement Criteria:

On examination, describe and/or identify the types of topcoats, colour systems and substrates and describe the correct choice of repair for each.

LINE J: PAINT PROBLEMS AND REPAIRS

Competency: J-2 Describe the Methods for Determining the Extent or Severity of the Refinish Problem

Learning Objectives:

1. The learner will be able to describe the methods of determining the severity of a repair.
2. The learner will be able to explain the importance of performing an inspection prior to starting repairs.
3. The learner will be able to describe surface preparation procedures for a spot, panel and complete repair.
4. The learner will be able to identify problems that result from improper surface preparation.

LEARNING TASKS	CONTENT
1. Describe the methods of determining the severity of the refinishing problem.	• Visual inspection • Film gauge • Magnifying glass • Sanding
2. Explain the importance of performing an inspection prior to starting repairs.	• Confirm repair • Ongoing inspection • Identify all defects • Lost profits
3. Describe the surface preparation procedure for the spot repair of: a. basecoat/clear coat b. single stage (solid and metallic) c. tri-coat d. water base	• Cleaning • Sanding/wet/dry • Compounding • Cleaning • Masking • Cleaning • Adhesion promoter • Metal conditioners • Conversion coating • Primer • Primer surfacer

4. Describe the surface preparation procedure for a panel repair:
   a. basecoat/clear coat
   b. single stage (solid and metallic)
   c. tri-coat
   d. water base

- Cleaning
- Sanding/wet/dry
- Compounding
- Cleaning
- Masking
- Cleaning
- Adhesion promoter
- Metal conditioners
- Conversion coating
- Primer
- Tintable primer surfacer

5. Identify the problems that can result from improper surface prep techniques.

- Adhesion
- Sandscratches
- Bull's eyes
- Sinking
- Swelling
- Colour match
- Customer dissatisfaction
- Lost profits
- Lost personal income

Achievement Criteria:
On examination, describe and/or select the correct surface preparation for the various types of refinishing repairs and describe the equipment used to determine the condition of a topcoat.

LINE J: PAINT PROBLEMS AND REPAIRS

Competency: J-3 Explain The Application Of Colour To Match The Colour Of The Vehicle

Learning Objectives:

1. The learner will be able to describe the use of let down panels.
2. The learner will be able to describe the spray application procedure used to gain a good colour match.

LEARNING TASKS	CONTENT
1. Describe the procedure for using a let down panel.	• Tape application • Base colour • Tinted clear (colour) • Mid coat (pearl) • Dry times • Number of coats • Flash off times • Clear coat • Spray technique
2. Describe the spray application procedure to gain a good colour match.	• Reduction • Air pressure • Spray gun selection • Spray gun set up • Spray adjustment • Application technique • Type of spray booth • Spray booth set up • Spray out cards • Repair zones • Dry times • Let down panels • Colour match • Technician's ability • Correct colour mix

Achievement Criteria:

On examination, describe the correct procedure to use to create a letdown panel and describe the application procedure to achieve a good colour match.

LINE J: PAINT PROBLEMS AND REPAIRS

Competency: J-4 Describe the Causes of Paint Problems That One Can Encounter While Working With Refinishing Products

Learning Objectives:

1. The learner will be able to describe problems that may occur while working with refinishing problems.
2. The learner will be able to describe topcoat problems caused by refinishing material and equipment.
3. The learner will be able to describe corrective measures to prevent topcoat problems.

LEARNING TASKS	CONTENT
1. Describe the problems one can encounter while working with refinishing materials.	• Orange peel • Sags and runs • Dry spray • Off colour • Fish eyes • Dirt nibs • Peeling • Soft paint • Poor gloss • Solvent trapping • Mottling • Wrinkling • Sandscratches • Bulls eyes • Dye back • Topcoat absorption • Overspray • Customer satisfaction
2. Describe topcoat problems caused by refinishing materials and equipment.	• Improper mixing procedures • Intermixing of products • Poor equipment • Dirty equipment • Poor shop conditions • Poor spraying technique • Environmental conditions • Taking shortcuts • Miscommunications

3. Describe the correct actions to prevent topcoat problems.	• Good work habits • Knowledge of products • Proper mixing procedures • Proper preparation • Correct spray equipment • Clean spray equipment • Proper corrosion protection • Application technique • Knowledge of substrate • Know mil thickness

Achievement Criteria:
On examination, recognize and describe the various causes of refinishing problems and describe the correct course of action taken to prevent these problems.

LINE J: PAINT PROBLEMS AND REPAIRS

Competency: J-5 Describe the Various Problems That Require Repair After Topcoat Application

Learning Objectives:

1. The learner will be able to describe how to repair various topcoat problems.

LEARNING TASKS	CONTENT
1. Describe the various types of topcoat problems and how to repair them.	• Orange peel • Sags and runs • Dry spray • Off colour • Fish eyes • Dirt • Peeling • Green finish • Poor gloss • Solvent popping • Mottling • Wrinkling • Sandscratches • Bulls eyes • Dye back • Topcoat absorption • Overspray • Colour holdout

Achievement Criteria:
On examination, describe the various types of repairs a technician may face after the application and/or cure of a topcoat.

LINE K: TRI-COAT APPLICATIONS

Competency: K-1 Describe the Procedures for Tri-Coat Applications

Learning Objectives:
1. The learner will be able to describe the characteristics of a tri-coat finish.
2. The learner will be able to describe tri-coat application procedures.

LEARNING TASKS	CONTENT
1. Describe the characteristics of a tri-coat/quad-coat.	• Two separate base coats with a clear coat • First coat solid colour basecoat • Second coat translucent coat or pearl coat • Final coat clear • Increase depth and high gloss • Highly pigmented base colour • Consumer requirements • Customer satisfaction
2. Describe tri-coat applications.	• Create let-down panel • Proper safety equipment • Use spray booth or prep station • Final clean and blow off • Tacking techniques • Tack refinishing panels • 2 – 4 coats of ground coat to obtain hiding • Follow recommendations for mil thickness • Flash off times (important) • Verify base coat colour match to let down panel • Spray mid coat • Generally 3 – 4 coats of mid coat • Darkens with each mid coat application • Generally overlap each stroke 50 – 80 % • Clear coat panel and compare to vehicle • Generally two coats of clear coat

Achievement Criteria:
On examination, describe the characteristics of a tri-coat and explain the method used to correctly apply a tri-coat.

LINE K: TRI-COAT APPLICATIONS

Competency: K-2 Describe the Procedures and Effects of Pearls and Micas

Learning Objectives:

1. The learner will be able to describe the characteristics of mica and pearl flakes.

LEARNING TASKS	CONTENT
1. Describe the characteristics of pearl and micas.	• Mined inert type pigment • Found in India and U.S.A. • Reflectance value • Light reflects and passes through • Coated with $Ti0^2$ (titanium oxide) fine white pigment • $Ti0^2$ provided foundation for other coloured pigments • When mica is coated with $Ti0^2$ it is then called pearl • Produces brilliant colour flare • Colour flare very translucent • Interference colours

Achievement Criteria:
On examination, describe the effects of pearl and mica flakes provide to a tri-coat finish and describe the characteristics of these pigments.

LINE L: EXPLAIN PRE-DELIVERY

Competency: L-1 Describe the Types of Equipment and Products Required To Perform the Necessary Topcoat Repairs

Learning Objectives:

1. The learner will be able to identify the various topcoats.
2. The learner will be able to describe topcoat surface imperfections.
3. The learner will be able to describe the equipment required to repair topcoat surface imperfection.
4. The learner will be able to describe types of polishing materials.
5. The learner will be able to describe P.P.E. worn when performing topcoat surface repairs.

LEARNING TASKS	CONTENT
1. Identify the types of topcoats.	• Basecoat clear coat • Single stage urethane • Colour coat clear coat
2. Describe the topcoat problems encountered by the detailer after refinishing.	• Orange peel • Peeling • Sags and runs • Poor gloss • Dirt nibs • Solvent popping • Mottling • Sandscratches • Poor adhesion • Dye back • Poor colour match • Swirl marks • Overspray
3. Describe the types of equipment used to repair these problems.	• Polishing technique • Buffing machine • Polishes • Buffing pads • Sanding pads • Sandpaper • Water bucket • File blades • Pneumatic sander • Rags • Razor blades • Refinish if necessary • Plastic razor blades • Sanding block • Clay products

4. Describe the types of products and/or system required.
   - Compounding
   - Polish
   - Wax
   - Sealers
   - Sandpaper
   - Cleaners
   - Water
   - Glazes
5. Describe the safety procedures to follow wile performing topcoat repairs.
   - Equipment
   - Hazards
   - Used product disposal
   - Personal safety equipment
   - Adequate ventilation

Achievement Criteria:
On examination, describe the various topcoats and the types of equipment needed to safely repair the various topcoat problems and describe the types of products and/or systems used to protect the various topcoats.

LINE L: **EXPLAIN PRE-DELIVERY**

Competency: **L-2** **Describe the Correct Methods for Using Recommended Topcoat Repair Systems**

Learning Objectives:

1. The learner will be able to describe topcoat surface repair procedures.

LEARNING TASKS	CONTENT
1. Describe the topcoat surface repair procedure of topcoat systems.	• Surface type • Surface condition • System to use • Sandpaper • Safety precautions • Equipment selection • Buffing pad selection • Product selection (grit-micron size) • Polish/buffer speed • Polish techniques • Motion (direction of travel) • Pressure • Removal of excess material • Glazing application • Environmental issues

Achievement Criteria:
On examination, describe the importance to correctly select the necessary equipment and correct repair techniques while repairing a topcoat finish.

LINE L: EXPLAIN PRE-DELIVERY

Competency: L-3 Describe Vehicle Preparation Prior to Delivery

Learning Objectives:

1. The learner will be able to describe and identify vehicle systems that must be checked prior to customer delivery.

LEARNING TASKS	CONTENT
1. Describe and identify all the items and systems that must be checked prior to customer delivery.	• All work completed as per work order • Restore to pre-existing condition • Industry quality standards • Check cooling system • Check engine • Check wheel lug nuts • Windows, doors, hood, trunk lip operational • Check engine compartment (clean) • Heater system operating (blow out dust) • Air conditioning system • All lights and electrical system operating: radio, door locks, seat controls, windows, antenna, charging system • Computer system functioning • All overspray removed • Vehicle vacuumed and washed • Upholstery clean • All glass clean • Windshield wipers operational • Vehicle road tested • All paperwork completed

Achievement Criteria:

On examination, describe the procedure and system used to prepare a vehicle prior to customer delivery.

LINE L: **EXPLAIN PRE-DELIVERY**

Competency: **L-4** **Describe Procedures Used To Install Trim, Stripes and Decals**

Learning Objectives:

1. The learner will be able to describe trim and accessory installation and removal methods.
2. The learner will be able to describe decal and striping application and removal methods.

LEARNING TASKS	CONTENT
1. Describe trim and accessory installation and removal methods.	• Types of trim and accessories • Types of fasteners • Basic vehicle construction • Installation sequence • Adhesives and two-sided tapes • Surface cleaning • Protect surrounding areas
2. Describe decal and striping application and removal methods.	• Types of decals and stripes • Installation methods • Surface cleaning • Heat guns • Cleaning agents • Air bubble removal • Installation location • Protection of surrounding area

Achievement Criteria:

The learner will conduct a job search to meet with potential Employers and will successfully complete a role play exercise. Learner will be observed and assessed (pass/fail).

LINE M: TREATMENT OF PLASTICS

Competency: M-1 Describe the Type of Plastic Found on Today's Vehicle

Learning Objectives:

1. The learner will be able to describe the two categories of plastics.
2. The learner will be able to describe the differences between thermoplastic and thermoset plastics.

LEARNING TASKS	CONTENT
1. Describe the two categories to which plastics are divided. 2. Describe the difference between thermoset and thermoplastic plastics.	• Thermoset • Thermoplastic • Solvent soluble • Solvent non-soluble • Rigid • Semi-rigid • Flexible • Polypropylene • Chemical sensitivity • Heat sensitivity • Sanding difficulties

Achievement Criteria:

On examination, describe and recognize the two main types of plastics found on today's vehicles.

LINE M: TREATMENT OF PLASTICS

Competency: M-2 Describe Where the Various Types of Plastics are Located on Today's Vehicles

Learning Objectives:

1. The learner will be able to describe the location of rigid flexible and polypropylene plastics found on vehicles.
2. The learner will be able to describe S.M.C. type panel locations.
3. The learner will be able to describe fiberglass panel locations.

LEARNING TASKS	CONTENT
1. Describe where rigid plastics are located on a vehicle.	• Grills • Hoods • Mirrors • Dash extensions
2. Describe where flexible plastics are located on a vehicle.	• Bumpers • Filler panels • Quarter extensions • Spoilers
3. Describe where polypropylene type plastics are located on a vehicle.	• Bumpers • Inner panels • Lower valence parts
4. Describe where S.M.C. type panels are located.	• Quarter panels • Fenders • Doors • Hood and trunk lids
5. Identify where fiberglass type panels are located.	• Exterior body panels

Achievement Criteria:

On examination, describe and recognize the location of the various types of plastics found on today's vehicles and describe the application use of these plastics.

LINE M: TREATMENT OF PLASTICS

Competency: M-3 Describe the Repair and Refinishing Procedures for the Rigid Types of Plastic

Learning Objectives:

1. The learner will be able to describe the refinishing materials required to repair a plastic component.
2. The learner will be able to describe rigid type plastic repair and refinishing procedures.

LEARNING TASKS	CONTENT
1. Describe the various products used in the repair and refinishing of plastic parts.	• Wash with soap/water • Cleaning agents • Sanding material • Welders • Adhesives • Epoxy primers • Adhesion promoters • Primer surfacer • Flex agents • Topcoat • Baking new O.E.M. parts
2. Describe the repair procedure for rigid types of plastics.	• Cleaning • Adhesives • Welding • Sanding • Filling • Cleaning • Priming • Topcoating
3. Describe the refinishing procedure for rigid plastic parts. 3…Continued	• Wash with soap/water • Plastic cleaner • Scuff • Clean with plastic cleaner • Plastic adhesion promoter • Primer surfacer • Clean and tack • Topcoat • Mixing procedures • Application procedure • Equipment • Dry times • Disposal of waste

Achievement Criteria:
On examination, describe and/or recognize the various types of products used to repair and refinish plastics and describe the correct repair procedure used to refinish the various types of plastic.

LINE M: TREATMENT OF PLASTICS

Competency: M-4 Explain the Repair and Refinishing Procedures for Flexible and Semi-Flexible Plastics

Learning Objectives:

1. The learner will be able to describe flexible and semi-rigid repair and refinishing procedures.

LEARNING TASKS	CONTENT
1. Describe the repair procedure for flexible and semi-rigid plastics.	• Adhesives • Welding • Sanding • Filling • Priming
2. Describe the refinishing procedure for flexible and semi-flexible plastics.	• Wash with soap/water • Clean with plastic cleaner • Scuff • Bake if new O.E.M. part • Clean with plastic cleaner • Plastic primer • Flexible primer surfacer • Sand • Clean and tack • Topcoat • Mixing procedures • Application procedures • Equipment • Drying/curing times

Achievement Criteria:
On examination, describe the correct procedure to follow while repairing or refinishing flexible or semi-flexible plastic parts.

LINE N: MANAGEMENT OF V.O.C. REGULATIONS

Competency: N-1 DESCRIBE B.C. V.O.C. REGULATIONS

Learning Objectives:

1. The learner will be able to describe V.O.C. and hazardous waste characteristics.
2. The learner will be able to describe current B.C. V.O.C. emission regulations.

LEARNING TASKS	CONTENT
1. Describe the characteristics of V.O.C.s and hazardous waste.	• V.O.C.s and their purpose • V.O.C. history • Where V.O.C. awareness began • V.O.C. storage • Disposal and handling • Tracking • Reporting • Environmental concerns • Effect on the ozone • Products containing V.O.C.s • How to determine V.O.C. content • Transfer efficiency • V.O.C. regulated equipment • High solids refinishing materials
2. Describe current V.O.C. emission regulations in B.C.	• To follow Canadian V.O.C. regulations • Governed by the G.V.R.D. • Air quality management plan • Shops encouraged to follow the code of good practices

Achievement Criteria:

On examination, describe the environmental concerns generated by V.O.C. emissions and describe the G.V.R.D.'s role in managing B.C.'s V.O.C. regulations.

LINE N: **MANAGEMENT OF V.O.C. REGULATIONS**

Competency: **N-2** **Describe Management Methods**

Learning Objectives:

1. The learner will be able to describe V.O.C. management methods.

LEARNING TASKS	CONTENT
1. Describe V.O.C. management methods.	• Employer • Employee • Canadian government • G.V.R.D. • Air quality management plan

Achievement Criteria:
On examination, describe the B.C. V.O.C. air quality management plan and describe the importance for employers and employees to keep informed with V.O.C. regulations.

LINE O: FUTURE TRENDS OF THE TWENTY-FIRST CENTURY

Competency: O-1 Describe the Need for and How theJourneyperson Can Keep Up-To-Date With Changes In The Industry

Learning Objectives:

1. The learner will be able to describe the need for constant journeyperson upgrading.
2. The learner will be able to identify journeyperson's upgrading programs.

LEARNING TASKS	CONTENT
1. Describe the need for constant upgrading of the journeyperson.	• Trades certificate • Better wages • Employment • Future advancement • Personal pride
2. Identify methods journeypersons can use to keep up-to-date with technological changes.	• Clinics and seminars • Read manufacturer's bulletins • Mailing list for information • Basic computer skills • Keep an open mind • Attitude

Achievement Criteria:

On examination, describe the importance for trades people to keep upgrading their knowledge and describe the need to keep up-to-date with changes within the automotive refinishing industry.

SECTION 3
TRAINING PROVIDER STANDARDS

RECOMMENDED REFERENCE TEXTBOOKS AND OTHER RESOURCE MATERIAL

Auto Body Repair Technology – 4th Edition

TRAINING PROVIDER STANDARDS – FACILITIES

Classroom

The minimum requirements are a well heated and ventilated classroom 900 square feet (e.g. 30’ x 30’) with tables and chairs suitable for adults.
The classroom should be equipped with a large Whiteboard (4’ x 8’) a flip chart, a white matte screen (6 or 7 ft.), an overhead projector, and a TV/VCR.
Note: A multi-media projector with Lap-top computer is advisable but optional.

Shop Area

The working area should be a minimum of:

- 3000 square feet for 12 students (50% outdoors fenced area)
- 4000 square feet for 16 students (50% outdoors fenced area)
- 5000 square feet for 16 students (50% outdoors fenced area)

Shop area should have at least 22 foot ceiling space to allow for scaffold erecting. The working area must be equipped with suitable hand tools and power tools.

Note: Training must simulate job-site conditions as much as possible.

TOOLS AND EQUIPMENT

STANDARD TOOL KIT

adhesive remover (eraser)
air powered tools
air pressure gauge
blow gun
clip removal tool
decal removal tool
drill
dual action sander
file grinder
hand cutting tools
hand tools
heat gun
plastic spreaders
putty board
putty knife
ratchet socket
reveal moulding tool
rubber squeegee
sanding blocks
sanding boards
scratch pad
screwdrivers
socket wrench sockets
sponge blocks
spray bottles stop watch
tape measure
tire chuck
trim removing tools
trouble light
tweezers
upholstery tools

SAFETY AND FIRST AID EQUIPMENT

disposal containers
dust extraction equipment
dust mask
ear protectors
explosion proof room
explosion proof wiring
eye wash station
fire extinguishers
first aid kit
gloves (work & rubber)
goggles
invisible glove
paint suit
protective clothing
respirator (air purifying)
respirator (air supplied)
safety eyewear
safety footwear
spill kits

REFINISHING EQUIPMENT

air brush
anti-static devices
automatic gun washing system
blow gun
colour chips
colour corrective bulbs
computer and software
curing lamps
film thickness gauge (wet and dry)
gravel guard gun
ground cable
gun washer

REFINISHING EQUIPMENT (CONTINUED)

heat lamps
liquid mask
measuring sticks
microfiche reader
mixing cups
mixing machine
mixing scales
mixing sticks
oilless compressor
paint shaker
paint strainers
pressure washers
schutz gun
solvent recycler
spectrophotometer
spray booth
spray gun (electrostatic)
spray gun (gravity feed)
spray gun (HVLP)
spray gun (LVLP)
spray gun (pressure pot system)
spray gun (suction feed)
spray out cards
thermometer
UV lamps
variant cards
viscosity cups

DETAILING AND CLEANING EQUIPMENT

abrasive pad
anti-corrosive applicator
buffer pad
buffer/polisher
cleaning brush
cleaning clothes
cleaning equipment
cleaning solutions
interior cleaner
magnifying glass
moulding cutter
polisher
razor blade
razor blade holder
run-nib file
spray bottle
stripe cutter
tack cloths
vacuum cleaner

SHOP EQUIPMENT

air compressor
air dryer
air hoses
air makeup system
air transformer
axle stand
brooms
caulking gun (manual/air)
decal eraser
files
floor jack
floor squeegees
hangers
hoist
manometer
masking cart
media blasting equipment
moisture trap
moulding remover
parts and bumper stands
plastic rivet gun
pneumatic sanders
pressure washer
regulators
solvent recycler
spreaders
stands
step ladders
telephone
two-way radio
windshield removing tools
wire brush

INSTRUCTOR QUALIFICATION

Qualification

The instructor must have completed an apprenticeship in the occupation and have the Interprovincial Red Seal Certificate.

Experience

APPENDIX 3

PROGRAM STANDARDS SPECIFICATION DOCUMENT

ita
industry training authority

Program Standards Specification

PHASE 1 – PROGRAM PROPOSAL

Section 1: Program Profile

Section 2: Occupation Analysis Chart

PHASE 2 – PROGRAM IMPLEMENTATION

Section 1: Program Outline

Section 2: Assessment Methods

Section 3: Logbooks

December, 2005

PHASE 1 – PROGRAM PROPOSAL

All program proposals submitted to the Industry Training Authority for review shall contain the following additional documentation:

SECTION 1 - PROGRAM PROFILE:

The Program Profile shall contain the following headings and content:

1) Occupational Description
   The occupation shall be summarized in one or two paragraphs.

2) Credential Issued
   The description shall identify the credential issued by the Industry Training Authority after successful completion or challenge of the program requirements.

3) Linkage to other Credentials
   The description shall explain how the proposed program links to other credentials or ladders into other programs.

4) Program Duration:
   Where applicable, the durations for in-school technical training hours and/or work-based training hours shall be clearly identified.

5) Prerequisites:
   Where applicable, prerequisite learning shall be identified and graphically represented in a sequential learning map that clearly identifies the starting and ending points.

6) Assessment Methods:
   Assessment at each level of learning shall be based on theory examination, practical assessment and/or worksite competency assessment.

7) Challenge requirements:
   Challenge requirements shall be based on a minimum of 1.5 times the work based training hours excluding in-school technical training time.

8) Completion requirements:
   The requirements for program completion shall be identified for each level.

9) Review Schedule:
   The Occupational Analysis, Program Profile, Program Outline and Assessment shall be reviewed at regular intervals of no greater than five years.

SECTION 2 - OCCUPATION ANALYSIS CHART:

The Occupation Analysis Chart (DACUM Chart) shall be laid out in a graphical format that identifies all duties and competencies.

Each competency descriptor shall contain an action verb that conveys action/behaviors and reflects the type of performance that is to occur.

PHASE 2 – PROGRAM IMPLEMENTATION

All program proposals approved by the Industry Training Authority shall undergo development and implementation of the following criteria under the direction of the Industry Training Authority.

SECTION 1 - PROGRAM OUTLINE:

Part 1: The Program Outline:
The program outline shall expand and explain each competency identified on the Occupation Analysis Chart. A single page for each description shall contain the following headings and content:

1) Competency Description
   The description shall be the same identified on the occupation analysis chart.

2) Learning Objective
   The learning objective shall describe what the learners will be expected to do when they have completed a specified course of instruction.

3) Learning Tasks and Content
   The learning tasks and content shall be laid out in numbered point/bullet form, and shall describe what the learners will be expected to learn during their course of instruction.

4) Achievement Criteria:
   Where applicable, minimum standards of achievement shall be identified for each competency in measurable units of quality, quantity, and/or time.

Part 2: Training Provider Standards:
For effective program delivery, minimum standards shall be established for:

1) Facilities:
   For each level of technical training, facilities appropriate for delivery of instruction shall be

identified.

2) Tools and Lab/Shop Equipment:
For each level of technical training, all tools, lab and shop equipment shall be identified.

3) Instructor Qualification:
For each level of technical training, instructor qualifications and experience shall be identified.

SECTION 2 - ASSESSMENT METHODS:

1) Knowledge Assessment:
An examination bank of multiple choice criterion referenced questions with answer keys shall exist for all level and challenge examinations.

The examination banks and answer keys shall be provided to the Industry Training Authority in Microsoft Word format for storage on examination management software.

Each bank shall contain a minimum of three times the questions asked on each examination as identified in the Examination Table of Specification.

2) Examination Table of Specification:
A table of specification shall exist for each examination and shall identify:
   a) The weighting for each block of competencies based on relative importance, difficulty and frequency.
   b) The number of questions asked within each block of competencies.
   c) The total number of questions asked on the examination.
   d) The total number of questions required for the examination bank.

3) Practical Assessment:
A bank of practical assessments, job diagrams and material lists shall be provided to the Industry Training Authority in Microsoft Word format for storage on examination management software.

All practical assessments shall contain clearly defined minimum industry standards of performance in measurable units of quality, quantity, and/or time.

SECTION 3 - LOGBOOK:

Where applicable, logbooks shall align with the competencies identified in the occupation analysis chart and program outline.

The Logbook shall provide a record of work based training hours and a signoff of competencies after successful demonstration of ability to minimum industry standards.

APPENDIX 4

TABLE OF SPECIFICATIONS TEMPLATE AND EXAMPLE

PROGRAM NAME

[LXR Naming Convention xxxxxxxx] LEVEL oo

TABLE OF SPECIFICATIONS WEIGHTING TEMPLATE

Date Auto-Assigned_____

Objective	CATEGORY 1				Theory Weig ng
[old]: Orientation to the Residential Construction Industry [new]: orientation	Question Level [new]: L1	Sub-Topic [new]: A1	number of questions 2	Subtopic Description Describe Work Performed by Technicians	5%
		A2	1	Describe the Industry Structure	
		A3	3	Describe Construction Trades	
[old]: Residential Construction Career Access Skills [new]: careeraccess	Question Level [new]: L2	Sub-Topic [new]: B1	number of questions 3	Subtopic Description Perform Basic Calculations	35%
		B2	2	Use Safe Work Practices	
		B3		Identify Materials	
		B4	1	Work Safety Around Material Handling Vehicles	
		B5	1	Explain WCB Regulations	
[old]: Residential Construction Tools and Equipment [new]: tools&equipment	Question Level [new]: L3	Sub-Topic [new]: C1	number of questions 3	Subtopic Description	45%
	CATEGORY 2				
	K	C	A	Total Number of Questions	

Comment [le1]: Competency Objective Area 15 characters maximum

Comment [le2]: Category 2 is Taxonomy

These weightings used for calculating the blending of practical & theo

The template has been developed for u

Practical	***70%***
Theory (Exam)	***30%***

Validated Table of Specifications (TOS) and Taxonomy (Updated July 8, 2007)

Level One	Line/Competency	TOS %	Items per exam	Tax 1	Tax 2	Tax 3	Items in bank	Tax. per comp.	Tax 1	Tax 2	Tax 3	Pract. In-Sch Assess.*
Line A	**Overview of BET's Work, Scope & Responsibility**	**5**	**5**	5	0	0	**15**		15	0	0	**10**
A1	Describe the construction process							1	1	0	0	
A2	Use construction terminology							6	6	0	0	
A3	Describe the main tasks of BETs							8	8	0	0	
	Total							**15**	0	0	0	
Line B	**Use Safe work Practices**	**10**	**10**	7	2	1	**30**		24	5	1	**20****
B1	Use good housekeeping and general safety practices							9	7	2	0	
B2	Obtain WHMIS certification							11	8	3	0	
B3	Use personal injury protection practices							3	3	0	0	
B4	Obtain Level 1 First Aid Certification							2	1	0	1	
B5	Obtain Fall Protection Certification							5	5	0	0	
	Total							**30**				
Line C	**Use and Care of Equipment and Tools**	**10**	**10**	10	0	0	**30**		30	0	0	**20**
C1	Use and care for equipment used by BETs							26	26	0	0	
C2	Use and care for tools used by BETs							4	4	0	0	
	Total							**30**				
Line D	**Understand Building Science**	**20**	**20**	12	6	2	**60**		36	19	5	**40**
D1	Describe "house-as-a-system" concept							8	2	5	1	
D2	Install Foundation Wall							9	6	3	0	
D3	Describe overall moisture control strategy							6	3	3	0	
D4	Describe moisture movement mechanisms							2	2	0	0	
D5	Describe conditions for and forces causing water leakage							6	2	2	2	
D6	Describe capillary action and causal factors							3	3	0	0	
D7	Describe air-borne moisture and causal factors							4	3		1	
D8	Describe vapour diffusion and causal factors							9	7	1	1	
D9	Describe condensation, resulting problems and moisture removal							7	6	1	0	
D10	Describe heat flow and insulation							2	1	1	0	
D11	Describe the role of mechanical systems and control of interior moisture load							4	1	3	0	
	Total							**60**				

* This is the in-school assessment which will be a combination of end of line multiple-choice quizzes and instructor assessment of practical demonstrations and certifications. The value of each end of line quiz is provided in this table. The value of practical demonstrations is weighted and evaluated by the instructor. The value of the certification is "certified" or "not certified".

** Plus obtaining certifications.

Validated Table of Specifications (TOS) and Taxonomy (Updated July 8, 2007)

Level One	Line/Competency	TOS %	Items per exam	Tax 1	Tax 2	Tax 3	Items in bank	Tax. per comp	Tax 1	Tax 2	Tax 3	Pract. In-Sch Assess
Line E	**Understand Applied Building Science**	**17**	**17**	10	4	3	**51**		31	12	8	**20**
E1	Describe moisture load							6	4	1	1	
E2	Describe methods for controlling forces causing water leakage							7	2	2	3	
E3	Describe methods for controlling capillary action							5	2	3	0	
E4	Describe methods for controlling air-borne vapour							18	12	2	4	
E5	Describe methods for controlling vapour							10	8	2	0	
E6	Describe methods for controlling condensation and drying							5	3	2	0	
	Total							**51**				
Line F	**Describe Walls**	**4**	**4**	3	1	0	**12**		10	2	0	**5**
F1	Identify elements and functions of walls							10	8	2	0	
F2	Identify types of walls							2	2	0	0	
	Total							**12**				
Line H	**Read Drawings, Plans and Specifications**	**10**	**10**	8	1	1	**30**		25	1	4	**25**
H1	Read building plans, detail and shop drawings and specifications							30	25	1	4	
	Total							**30**				
Line I	**Apply Sheathing Membrane**	**4**	**4**	2	2	0	**12**		6	6	0	**10**
I1	Identify products and requirements							10	6	4	0	
I2	Apply sheathing membrane on plane of wall							2	0	2	0	
	Total							**12**				
Line J	**Install Windows and Doors**	**4**	**4**	2	1	1	**12**		10	1	1	**10**
J1	Identify types of windows and doors							8	7	0	1	
J2	Prepare wall for window and door installation and install windows and doors in rough openings							4	3	1	0	
	Total							**12**				
Line L	**Apply Self-Adhered Membrane**	**4**	**4**	3	1	0	**12**		10	2	0	**10**
L1	Describe the purpose of self-adhered membranes and materials used							1	1	0	0	
L2	Describe the handling requirements							3	2	1	0	
L3	Apply self-adhered membrane							8	7	1	0	
	Total							**12**				

Validated Table of Specifications (TOS) and Taxonomy (Updated July 8, 2007)

Level One	Line/Competency	TOS %	Items per exam	Tax 1	Tax 2	Tax 3	Items in bank	Tax. per comp	Tax 1	Tax 2	Tax 3	Pract. In-Sch Assess
Line M	**Install Strapping**	**4**	**4**	3	1	0	**12**		8	4	0	**10**
M1	Describe strapping requirements							7	5	2		
Line N	**Apply Sealants**	**4**	**4**	4	0	0	**12**		12	0	0	**10**
N1	Describe sealant materials, and the purpose and proper use of sealants							6	6	0	0	
N2	Apply sealants							6	6	0	0	
	Total							**12**				
Line O	**Apply Cladding**	**4**	**4**	2	1	1	**12**		8	2	2	**10**
O1	Describe stucco-backer board								0	0	0	
O2	Apply stucco backer board							1	1	0	0	
O3	Describe General Attributes of Alternate Claddings							4	1	1	2	
O4	Perform General Cladding Application Techniques							7	6	1	0	
	Total							**12**				
Total		**100%**	**100**	71	20	9	**300**	**300**	225	54	21	**200**
			Theory									**Pract**
			75%									**25%**
	Total Mark equals → → → → → → → →		**Mark X 0.75**				**→ →**	**→ → → → Plus → → → → →**				**Mark X 0.25**

Note – The exam item bank does not include questions for Line G as these are not assessed by the ITA.

Validated Table of Specifications (TOS) and Taxonomy (Updated July 8, 2007)

Level Two	Line/Competency	TOS %	Items per exam	Tax 1	Tax 2	Tax 3	Items per bank	Tax. Per comp	Tax 1	Tax 2	Tax 3	Pract. In-Sch. Assess.
Line C	**Use and Care of Equipment and Tools**	**5**	**5**	3	2	0	**15**		10	5	0	**10**
C2	Use and care for tools used by BET's								10	5	0	
	Total							**15**				
Line E	**Understand Applied Building Science**	**7**	**7**	5	2	0	**21**		17	4	0	**10**
E7	Describe different climates that require different construction details							8	6	2	0	
E8	Describe methods for protecting/preserving selected materials							10	9	1	0	
E9	Describe wood shrinkage and some implications							3	2	1	0	
	Total							**21**				
Line F	**Describe Walls**	**5**	**5**	3	1	1	**15**		11	3	1	**10**
F3	Identify critical parts of walls							15	11	3	1	
	Total							**15**				
Line H	**Read Drawings, Plans and Specifications**	**5**	**5**	1	1	3	**15**		6	1	8	**15**
H1	Read building plans, detail and shop drawings, and specifications							6	0	0	6	
H2	Apply project recording and reporting practices							9	6	1	2	
	Total							**15**				
Line I	**Apply Sheathing Membrane**	**15**	**15**	5	6	4	**45**		15	17	13	**25**
13	Apply sheathing membrane in critical areas							45	15	17	13	
	Total							**45**				
Line J	**Install Windows and Doors**	**12**	**12**	8	2	2	**36**		25	6	5	**25**
J2	Prepare wall for window and door installation and install windows and doors in rough openings							8	6	1	1	
J3	Seal and install flashing papers around window and door frames, and insulate around window and door frames							1	1	0	0	
J4	Prepare drainage plane and air barrier continuity around windows and doors							27	18	5	4	
	Total							**36**				
Line K	**Flash Windows, Doors and Other Locations**	**20**	**20**	13	5	2	**60**		42	14	4	**35**
K1	Identify flashing design factors and types of flashing							12	9	3	0	
K2	Describe measures to protect and extend the performance of materials							6	3	2	1	
K3	Flash windows and doors							4	3	1	0	
K4	Flash other openings in walls							3	3	0	0	
K5	Flash other locations							35	24	8	3	
	Total							**60**				

Validated Table of Specifications (TOS) and Taxonomy (Updated July 8, 2007)

Level Two	Line/Competency	TOS %	Items per exam	Tax 1	Tax 2	Tax 3	Items per bank	Tax. Per comp	Tax 1	Tax 2	Tax 3	Pract. In-Sch. Assess.
Line L	**Apply Self-adhered Membrane and Install External Insulation**	**10**	**10**	6	3	1	**30**		19	9	2	**25**
L3	Apply self-adhered membrane							13	6	7	0	
L4	Describe the performance and types of insulation							9	9	0	0	
L5	Apply external insulation and prepare for cladding installation							8	4	2	2	
	Total							**30**				
Line M	**Install Strapping**	**7**	**7**	4	2	1	**21**		12	8	1	**15**
M2	Install strapping							21	12	8	1	
	Total							**21**				
Line N	**Apply Sealants**	**7**	**7**	4	3	0	**21**		14	7	0	**15**
N1	Describe sealant materials, and the purpose and proper use of sealants							5	3	2	0	
N2	Apply sealants							16	11	5	0	
	Total							**21**				
Line O	**Apply Cladding**	**7**	**7**	**4**	**2**	**1**	**21**		12	8	1	**15**
O3	Describe general attributes of alternate claddings							3	3	0	0	
O4	Perform general cladding application techniques							18	9	8	1	
	Total							**21**				
Total		**100%**	**100 Theory 30%**	56	29	15	**300**	**300**	183	82	35	**200 Pract 70%**
	Total Mark equals → → → → → →	**→ →**	**Mark X 0.30**				**→ →**	**→ → →**	**→ Plus**	**→ → →**	**→ → →**	**Mark X 0.70**

Note – The exam item bank does not include questions for Line G as these are not assessed by the ITA.

Validated Table of Specifications (TOS) and Taxonomy (Updated July 8, 2007)

BET Apprenticeship Program

CERTIFICATE OF QUALIFICATION (FINAL) EXAM WEIGHTING*

Examination Table of Specifications

LEVEL	LEVEL NAME	WEIGHTING
1	Basic BET	40%
2	Advanced BET	60%
Total		**100%**

****If it is determined by the industry and ITA that there will be no Certificate of Qualification Exam and only a Red Seal Exam, then this table does not apply.

APPENDIX 5

ITA EXAMINATION BANK GUIDELINES

ita
industry training authority

THE RIGHT SKILLS ▶ A PROVEN ADVANTAGE

GUIDELINES FOR DEVELOPING MULTIPLE-CHOICE ITEMS

This document, derived from the Inter-Provincial (Red Seal) Units of Instruction contains general guidelines that, when applied, should result in the production of high quality items.

By definition, a multiple-choice item consists of two parts:

(a) The Stem, which gives the details and poses the problem;
(b) The Responses, one of which is the correct answer, plus three plausible distracters.

In ITA examinations, each item has four responses. The incorrect responses are called distracters because their purpose is to attract those candidates who do not know the correct answer, and therefore "distract" them from the correct response. Four responses with well-constructed distracters can reduce the guessing factor to as low as 25%.

When an item is critically evaluated, the total item should be considered, not just the stem. Distracters are as equally important as the item stem. If the distracters are not plausible and the item cannot be reworked to create three plausible distracters, the item should be discarded.

An item is a miniature examination. Its purpose is to separate the candidates who have certain knowledge from those who do not have this knowledge. When properly constructed, the multiple-choice item is efficient in this regard.

Clearly setting up the problem and stating the answer are the first steps in framing a good multiple-choice item. A great deal of skill, common sense, rules, and time are required to construct an item that adequately tests the sub-task and prevents uninformed candidates from obtaining the correct answer.

Guidelines

The following guidelines are a common sense approach to constructing multiple-choice items. While some discretion may be exercised in their use, they should provide a framework for quality construction and should be adhered to wherever and whenever possible. (The correct response to each of these example items are identified by an asterisk.)

1) Items must be a valid measure of the sub-task (not the Knowledge, Skills and Abilities associated with a sub-task).

Take care to ensure uninformed candidates cannot obtain correct answers by guessing. General knowledge, alertness and the ability to learn quickly are not the specifications of test items.

Example 1.1 (Good)	Example 1.2 (Poor)
Specific trade knowledge.	General knowledge.
What type of waste hook-up is used with a commercial potato peeler? A. Intercepting. B. Direct. C. Screened. * D. Indirect.	Which SI (metric) base unit is mass is expressed in? A. Meters. * B. Kilograms. C. Liters. D. Amperes.

2) The level of vocabulary and terminology must be appropriate for the candidates and the trade/occupation.

It should be possible to construct items using vocabulary that is well known to the candidates and terminology that will be easily understood.

Example 2.1 (Good)	Example 2.2 (Poor)
Which material is considered harmful or toxic when burned by the oxy-acetylene process? A. Copper. B. Aluminium. * C. Rusted steel. D. Galvanized iron.	Which one of the following is considered a pernicious, virulent material when burned by the oxy-acetylene process? A. Copper. B. Aluminium. * C. Rusted steel. D. Galvanized iron.

3) Avoid negatives in any of the information found in an item's stem or responses. When negative items are unavoidable, highlight the negative with a bold font.

When candidates encounter negative test items, they are forced to choose the wrong answer instead of the right one. After reading the stem and its alternatives it is easy to forget the item is negative. Even examinees who have achieved the testing objective will often choose the incorrect alternative, creating a "false negative" for that item.

Example 3.1	Example 3.2
Negative in the stem. (Bold the negative)	Negative responses. (No bold)
An air brake equipped truck has a CMVSS-121 system. Which statement is **not** correct? A. It is energized when the engine is started. B. It works to control skid. C. An electronic module (computer) is used. * D. A notch disc is mounted on the main drive shaft.	Why are brass screws used in repairing motor boats? A. They are stronger than steel screws. * B. They are not subject to rust. C. They are specified by the builder. D. They are not liable to expand.

Comment: In 3.1, bolding attracts the candidate's attention but the negative adds a slight amount of confusion. However, it is often possible to remove the negative. In 3.2, response B should be written, are rust resistant and Response D should be, are free from expansion.

4) Use "soft" conversions rather than "hard" conversions when converting between imperial and metric (SI) systems.

When converting from one system of measurement to another, the degree of difficulty must remain the same for both systems. It is best to use "soft" conversions to avoid impractical or unlikely calculations or dimensions. When mathematical calculations are involved, the responses in each system must agree with the calculations and be equal in difficulty.

Proper Conversion

Example 4.1	Example 4.2
	Soft conversion.
How much energy is required to move a 1 lb. block 1 ft.? A. 2 hp B. : hp * C. 1 hp D. 2 hp	How much energy is required to move a 1 kg block 1 m? A. 1 kJ B. 2 kJ * C. 3 kJ D. 4 kJ

Poor Conversion

Example 4.3	Example 4.4
	Hard conversion.
How much energy is required to move a 1 lb. block 1 ft.? A. 2 hp B. : hp * C. 1 hp D. 2 hp	How much energy is required to move a 454 g block .33 m? A. 0.067 kJ B. 0.905 kJ * C. 1.326 kJ D. 2.652 kJ

Comment: In the "metric" version, Example 4.4 is far more complex than Example 4.3.

Notes

Not all measurements should be converted. Some trades only use one measurement and converting would create confusion therefore the host jurisdiction will determine which system is to be used, based on industry standards.

Whenever an item is impacted by an industrial or construction code, the item will use that code's measurement system.

The bulk of the code will give dimensions in SI units, but others will appear in Imperial units, for example plumbing measurements. Do not convert the Imperial units to SI since these measurements reflect current industry standards for the trade/occupation.

Whenever local and national code standards differ, refer to the national code for items developed for Interprovincial "Red Seal" examinations.

Example 4.5 (Good)
What is the minimum size of drain that is required to serve a 26m x 26m (85 ft. x 85 ft.) roof with a 15 minute rainfall intensity of 28mm (1 in.)? A. 4 in. B. 5 in. C. 6 in. D. 8 in.

Comment: Measurements may be in either metric or imperial, but the code states that sizes must be in imperial only.

5) Items must contain one central problem.

When an examination plan is properly used, single problems will appear almost automatically. Avoid items that are no more than a series of true-false questions since these items create a situation where none of the topics are adequately tested.

Example 5.1 (Good)	Example 5.2 (Poor)
Single problem.	Multi-problem.
What is usually used to hold moulding strips in place? A. Solder. B. Welds. C. Screws. D. Clips.	Which of the following statements is correct? A. Flemish bond is used when building diamond patterns. B. Exterior walls should have raked joints. C. Weep holes are located on the top of the footings. D. Terracotta is cleared by sandblasting.

Comment: What is being tested in Example 5.2? It could be assumed that the test subject is wall joints if the candidate chooses response B. This is not necessarily true, however, since this response could have been selected because the candidate was uncertain about any of the responses but less uncertain about Response B. Some examiners believe it is likely the above uncertainty exists or that the candidate is familiar with response B and knows nothing about the other statements. One single area thoroughly examined is far better than several areas partially tested. Note that example 5.2 does not have a single problem in the stem, a requirement for multiple-choice items.

6) Test items must be independent so that one item is not based upon another.

Example 6.1 (Poor)
A warehouse has a 9051.4 m^2 floor area. The service is single phase 120/240 V. and all conductors are RW 90 XLPE copper with wiring in accordance with the provisions of the Code. In addition, there are the following special loads: • one 2 hp 240 V, 4.9 A sump pump motor; • six 3 A 120 V unit heater motors; • three 1 hp 240 V, 8 A dock leveller motors; • one 3 kW water heater.
1. What is the calculated capacity for the service conductor for the warehouse? A. 144.5 A * B. 184.4 A C. 193.4 A D. 228.47 A
2. What is the minimum size of service conduit for the warehouse? A. 1 3" * B. 1 2" C. 2" D. 2 2"
3. What is the maximum trip setting for the main circuit breaker for the warehouse? A. 125 A B. 150 A C. 175 A * D. 200 A

Comment: If #1 is calculated incorrectly then questions #2 and #3 are also wrong. A correct answer from Item #1 is needed to correctly determine the answers for Items #2 and #3.

7) Avoid placing clues in the item.

If the stem contains clues which easily link the stem and the correct response, the item is ineffective as a valid test question.

Example 7.1 is a situation where the stem contains a key word which is repeated in one of the responses. In example 7.2, there is a common sound or rhyme called a clang effect which links the stem to the correct response.

Example 7.1 (Poor)	Example 7.2 (Poor)
Clue by common element.	Clue by clang effect.
What caused a great industrial upsurge in Great Britain? A. The War of the Roses. B. The intervention of the wheel. C. The building of railways. * D. The Industrial Revolution.	What is a good substitute for table cream? A. Starlac. * B. Pream. C. Dari-Rich. D. Mil-Ko.

Comment: Example 7.1 would be a good question if the stem and correct response did not contain the word "industrial".

Example 7.2 would be an excellent item if the correct answer was not the rhyming word.

8) Every item should be written in simple, clear English/French, incorporating the language of the trade.

Reading comprehension, reading ability and vocabulary are not intended to be tested in these examinations.

The problem should be perfectly clear after the first reading. Whenever a second reading or self-query is necessary ("What are they after?") the item is not satisfactory. A lack of clarity is usually caused by an inappropriate choice of language. An item presented as a verbal puzzle does not accurately measure achievement.

Example 8.1 (Good)	Example 8.2 (Poor)
Trade related.	Not trade specific.
In a circuit the resistance is 3 Ω and the current is 2 A. What is the voltage drop across the load? A. 2 V B. 5 V * C. 6 V D. 8 V	If x = ab where a = 2 and b = 3, what is x? A. 2 B. 5 * C. 6 D. 8

9) Items should not give a clue to any other item.

This rule is particularly important to keep in mind during item banking. A perfectly good item may be rendered useless if another item in the examination gives a clue to the correct response.

Example 9.1	Example 9.2
What is the minimum size of a soil stack? A. 2 in. * B. 3 in. C. 4 in D. 5 in.	If a 3 in. soil stack carried 9 fixture units, what would be the minimum size when the pipe becomes horizontal? A. 2 in. * B. 3 in. C. 4 in. D. 5 in.

Comment: The correct answer for example 9.1 is given away in the first part of the stem in example 9.2. The correct answer for 9.1 is exactly the same for example 9.2.

If both of these questions were on the same examination, the candidate would have a good chance of getting them right because of the clues.

10) The stem should be in the form of a question.

Ending a stem with a question mark helps ensure that the stem contains a problem and greatly eases translation.

The following examples illustrate this point:

Example 10.1 (Good)	Example 10.2 (Not acceptable)
Direct question.	Incomplete statement.
What is the size of the hole required for a #8 metal screw? * A. 1/8 in. B. 3/32 in. C. 3/16 in. D. 5/32 in.	The size of the hole required for a #8 metal screw is * A. 1/8 in. B. 3/32 in. C. 3/16 in. D. 5/32 in.

11) State the problem accurately, briefly, completely and clearly.

Remember that the purpose is to determine if a candidate knows a certain fact, principle, criterion or other learning outcome. Therefore, the item should come directly to the point. Any confusion in the wording will tend to obscure the problem.

In the interest of clarity and quick assimilation, several short, sharp sentences are far better than one long, involved sentence.

Example 11.1 (Good)	Example 11.2 (Poor)
Well constructed item.	Poorly constructed item.
A customer is being charged for a clutch replacement and a transmission overhaul. The recommended rates and current prices are given in the attached list. What is the total cost for time plus parts with a 10% discount? A. $1,102.25 * B. $1,157.05 C. $1,189.59 D. $1,225.30	What is the total cost to the customer, if he/she is being charged time plus parts with a 10% discount based on parts cost only for a clutch replacement and transmission overhaul using the recommended rates and current prices listed in the folder attached? A. $1,102.25 * B. $1,157.05 C. $1,189.59 D. $1,225.30

Comment: The stem in item 11.2 contains several separate questions. It could be broken down into parts or it could be reworded into short sentences with several items based on the information. If a list of rates and prices is to be included, several questions based on the list should be grouped together.

12) Items should contain only information essential to the problem.

Any additional facts in the problem or stem portion may lead even the good candidates, possibly momentarily, to believe these facts have a bearing on the problem. They may know the answer sought but may be distracted.

Example 12.1 (Good)	Example 12.2 (Poor)
Which food groups are good sources of complex carbohydrates? A. Fruits and vegetables. B. Meat and meat alternatives. * C. Whole grain breads and cereal. D. Milk and milk products.	Which food groups (from Canada's Food Guide) are good sources of complex carbohydrates? A. Fruits and vegetables. B. Meat and meat alternatives. * C. Whole grain breads and cereal. D. Milk and milk products.

13) The item should be straight forward with no intent to trick the candidates.

Any trickery would result in the candidates losing faith in the fairness of the examination. It also diminishes the validity of the examination.

Example 13.1 (Good)	Example 13.1 (Poor)
How many bolt holes are there on a standard 152 mm (6") flange? A. 4 B. 6 * C. 8 D. 10	How many holes are there on a standard 152 mm (6") flange? A. 4 B. 6 * C. 8 D. 10

Comment: The question should be clear as to the inclusion or exclusion of the hole in the centre.

14) Avoid using absolutes.

For instance the words "always", "never", "all" and "none" can create unwanted responses. Candidates may unconsciously consider the exception to the rule whenever they see an absolute, such as "always" or "all", mistaking these words as a signal to eliminate that response. The word "only" can also be included with these specific determiners, requiring examiners to carefully analyse its meaning.

Example 14.1 (Good)	Example 14.2 (Poor)
In which projection are field erection drawings shown? A. Perspective. * B. Isometric. C. Oblique. D. Orthographic.	In which projection are field erection drawings always shown? A. Perspective. * B. Isometric. C. Oblique. D. Orthographic.

Comment: Safety-related items may be exempted from this rule.

15) The stem must include the problem and all relevant information necessary to determine the correct response.

All information necessary to solve a problem must be included in the stem. The four possible answers comprise the balance of the item. It follows, then, that the candidate should not have to read beyond the stem to determine what information is required.

A good way to test this principle is to place your hand over the responses and determine the answer from the stem.

Example 15.1 (Good)	Example 15.2 (Poor)
A central problem in the stem.	No central problem in the stem.
Which group of court judges is appointed by the Canadian Federal Parliament? A. Family. B. Municipal. C. Provincial. * D. Supreme.	What is a role of the Canadian Federal Parliament? * A. To appoint Supreme Court Judges. B. To provide schools for language. C. Responsible for atomic power. D. To provide apprenticeship training.

16) The four responses should be well balanced for language, with consistent grammatical form and language.

When developing an item, it's important to pay close attention to the choice of language used in both the stem and the alternative responses. Whenever an alternative is grammatically inconsistent or is apparent that it does not relate to the problem, it becomes a cue that this particular response is incorrect. This decreases the reliability and, consequently, the validity of the item by reducing the number of plausible alternatives.

Example 16.1 (Good)	Example 16.2 (Poor)
Balanced responses.	Unbalanced responses.
How can a mixing valve, which is used to supply a cooling coil, be identified? A. Direct flow through a two-way valve. B. Reverse flow through a two-way valve. C. One inlet, two outlets and flow can be directed to either outlet. D. Two inlet, one outlet and flow can be directed to either outlet.	How can a mixing valve, which is used to supply a cooling coil, be identified? A. Direct flow through a two-way valve. B. Reverse flow through a two-way valve. C. One inlet, two outlets and flow can be directed to either outlet. D. Two outlets, one switch and current can be directed to either outlet.

17) Responses should be approximately equal in length.

Candidates who do not know the correct answer are most likely to guess the longest alternative. Therefore, correct answers should be roughly the same length. It is possible to vary the relative length of the correct answer, in a manner that does not create a pattern, for situations where it is difficult to keep the lengths of all alternatives equal.

Whenever possible, the four responses should be almost identical in appearance. They should have equal eye appeal. For example, imagine having to choose the one good pool ball from four identically sized balls, three of which are hollow. If it is difficult to keep the lengths consistent, write two long alternatives and two short ones.

Example 17.1 (Good)	Example 17.2 (Poor)
Balanced responses.	Unbalanced responses.
In machine work, what is tolerance? A. Allowance for oil film on a bearing. * B. Acceptable variation from a stated size. C. Amount of stock to be removed by polishing. D. Thickness left for later grinding.	In machine work, what is tolerance? A. The allowance for oil film on a bearing. * B. The amount of variation either above or below a certain basic measurement that will be acceptable. C. The amount of stock left for polishing. D. The thickness left for later grinding.

18) Each distracter should be a plausible response to the problem.

This tends to mislead the uninformed candidates and test those who are knowledgeable. Common misconceptions often make good distracters; for example, calculation distracters should be based on common errors. One weak distracter increases the probability of guessing while two weak distracters create a true-false item. Therefore, all three should be equally plausible in their ability to mislead those who do not know the subject matter well.

Example 18.1 (Good)	Example 18.2 (Poor)
Who invented the telephone? * A. Bell. B. Edison. C. Marconi. D. Morse.	Who invented the telephone? * A. Bell. B. Marconi. C. Pasteur. D. Salk.

Comment: Distracters are most appealing when they are presented in a homogeneous list of alternatives. Example 18.1 has more plausible distracters than example 18.2 because each alternative in example 18.1 is the name of an inventor from the field of communications.

In example 18.2, two alternatives can be quickly eliminated because they made discoveries in the health field.

19) Responses should be as brief as possible.

The stem should contain as much of the item as possible so information will not have to be repeated in each alternative.

This helps focus the candidate, reduce reading time and conserve space. It may be necessary to repeat important information for clarity or grammatical consistency. However, any information common to all four responses should be placed in the stem to avoid repetition.

Example 19.1 (Good)	Example 19.2 (Poor)
When double cutting a seam in sheet vinyl, what should be the angle between the knife and the work surface? A. 45° B. 60° * C. 90° D. 105°	When double cutting a seam in sheet vinyl, at what angle should the knife be held to achieve a net seam? A. 45° to the work surface. B. 60° to the work surface. * C. 90° to the work surface. D. 105° to the work surface.

20) Arrange responses in logical order.

When candidates see jumbled and illogical word or numerical sequences they suspect a clue or become confused. Present information, such as numbers and dates, in a logical order (ascending or descending order) or alphabetical order for terms, words or phrases.

Example 20.1 (Good)	Example 20.2 (Poor)
Responses in logical order.	Responses in illogical order.
Which number is stamped on an auger bit that bores a 2" hole? A. 2 B. 4 C. 6 * D. 8	Which number is stamped on an auger bit that bores a 2" hole? A. 6 B. 4 * C. 8 D. 2

21) Avoid overlapping responses.

Overlapping responses could result in more than one answer being correct.

Example 21.1 (Good)	Example 21.2 (Poor)
Inclusive answers.	Inclusive answers.
What is the maximum distance the AT3 transmitter can be controlled? A. 5 mi. * B. 10 mi. C. 15 mi. D. 20 mi.	Up to what distance can the AT3 transmitter be controlled? A. 5 mi. * B. 10 mi. C. 15 mi. D. 20 mi.

Comment: In example 21.2, if response B is correct, so is response A. The item can be salvaged by inserting the word maximum before distance.

22) Phrases "all of the above", "none of the above", "any of the above" or "both A and B" must not be used as potential responses.

Examination writers often abuse "all" or "none" in test items because it makes the task easier. Although it allows the writer to avoid creating three plural distracters, it is inappropriate as an option. "All of the above" is seldom justified as a viable option on a multiple-choice test because if the examinee recognizes that just one of the alternatives is incorrect, then it can be eliminated as the correct answer.

If the examinee sees that two of the alternatives are correct, then "all of the above" must be the correct answer without even having to consider the fourth.

Another problem occurs where "All of the above" is the correct answer. If this is the case, then the other alternatives are also correct. In fact, "All of the above" is the best answer rather than the correct answer.

An argument can be made that the response "none of the above" is the appropriate answer when candidates know what not to do. This might be the case where health and safety practices are being tested

It is not the nature of item writers to exclude the correct answer to an item, especially if it has been carefully crafted. In fact, it does not make sense to write an item and then not include the correct answer as an alternative.

Example 22.1 (Poor)	Example 22.2 (Poor)
What should be done while preparing stocks? A. Cover. B. Stir. * C. Skim. D. All of the above.	Although fat is an essential nutrient, what it is recommended individual daily consumption? A. 10-15% of daily calories of fat. * B. 30-35% of daily calories of fat. C. 30-55% of daily calories of fat. D. None of the above.

23) All items must have four responses.

There are many important trade situations where there are only two or three possible answers, for instance on or off, increase, decrease or remain constant. Additional choices, in those situations, would be obviously wrong and therefore worthless as distracters.

Exam writers are advised to use double responses (pairings) in these cases. Pairing, arranges responses into pairs where one set is usually correct. Candidates are usually aware this creates a true-false situation. For situations where pairing cannot be avoided, use a second pair as a distracter. If two distracters are paired, it is recommended that the other two distracters also be paired.

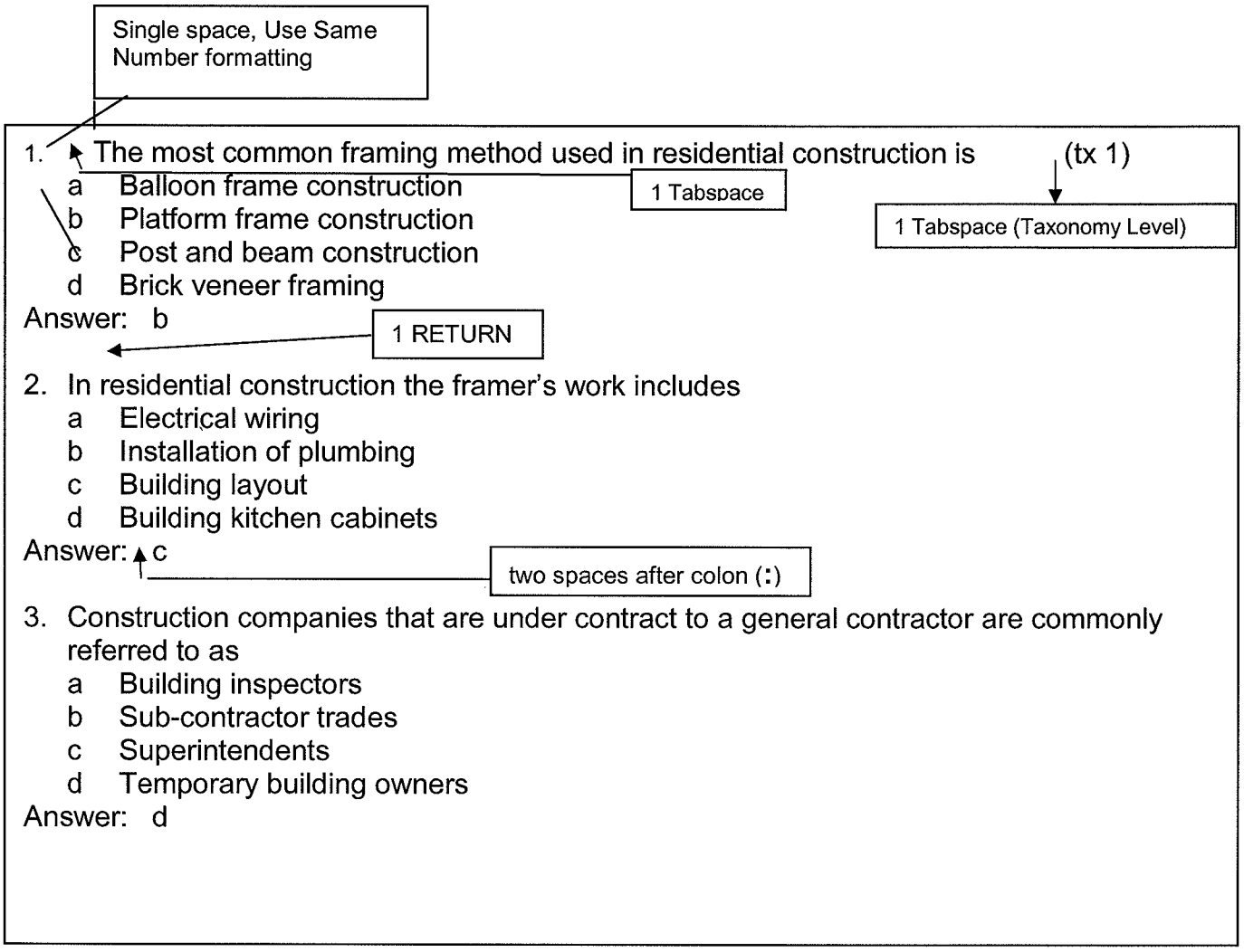
Example 23.1 (Good)
Use double response (pairing) items for those with fewer than four possible responses.
As the speed of a magneto is increased, what is the effect on the output voltage and current? * A. Voltage increases and current increases. B. Voltage increases and current decreases. C. Voltage decreases and current increases. D. Voltage decreases and current decreases.

Example 23.2 (Good)
Four responses contain two pairs.
How is the lagging power factor connected in a system containing several reactive loads and a synchronous motor? A. By underexciting the synchronous motor. * B. By overexciting the synchronous motor. C. By increasing the speed of the synchronous motor. D. By decreasing the speed of the synchronous motor.

Example 23.3 (Poor)
Two responses form a pair.
It is noted in a system containing several reactive loads and a synchronous motor that there is a lagging power factor. How may this be corrected? A. By underexciting the synchronous motor. * B. By overexciting the synchronous motor. C. By reducing the voltage. D. By adding a regulator.

Formatting requirements for Word Exam questions to be used in LXR

Objective (Line) before Question 1.



The First Three Levels of Bloom's Taxonomy of the Cognitive Domain

(*with representative behavioral verbs*)

I. **Knowledge.** Remembering information

Define, identify, label, state, list, match

II. **Comprehension.** Explaining the meaning of information

Describe, generalize, paraphrase, summarize, estimate

III. **Critical Thinking & Application.** Using abstractions in concrete situations

Determine, chart, implement, prepare, solve, use, develop

Multiple-Choice Question Design Checklist

Each multiple-choice test item should meet the criteria listed below:

STEM	ALTERNATIVES	TOTAL ITEM
1. A single problem is presented	Keyed response is correct	Related to a specific curricular objective
2. Clearly worded		Free of any type of bias
3. Worded appropriately for intende reader	Alternatives are grammatically consistent with the stem	Format rules followed
4. Free of unnecessary detail and wording	Length of alternatives roughly equivalent	
5. Grammatically correct	Incorrect alternatives are based on common errors or misconceptions	
6. Negative wording avoided	“All of the above,” “None of the above” have <u>not</u> been used	
7. No grammatical clues to the keyed answers	Format rules followed	
8. Words such as “mostly,” and “frequently,” are avoided		
9. Format rules followed		

APPENDIX 6

INTENT TO SUBMIT FORM

APPENDIX 6

REQUEST FOR PROPOSALS

PROGRAM OUTLINE AND EXAMINATION ITEM BANK DEVELOPMENT PROJECT

INTENT TO SUBMIT FORM

The undersigned, a duly authorized representative of a prospective proponent hereby declares its intent to participate in the above referenced Request For Proposal as follows:

Name of Organization :

Contact Person, including title :

Address of Organization :

Telephone # / e-mail of Contact :

Please submit completed form via e-mail to kentf@railcan.ca