

APPRENTICESHIP & CERTIFICATION

Study Guide Sheet Metal Worker




Newfoundland
Labrador

Apprenticeship and Certification

Study Guide

Sheet Metal Worker

(Based on Red Seal Occupational Standard – RSOS 2017)

Government of Newfoundland and Labrador
Department of Advanced Education, Skills and Labour

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Introduction

This Study Guide has been developed by the Newfoundland and Labrador Department of Advanced Education, Skills and Labour, Apprenticeship and Trades Certification Division, to assist apprentices and trade qualifiers as they prepare to write the Interprovincial (IP) Red Seal Exam. IP Exams are available for all Red Seal trades. For a list of Interprovincial trades please refer to the Department of Advanced Education, Skills and Labour website:

<https://www.aesl.gov.nl.ca/app/trades.html>

Some of the specific goals of this guide are:

- ⇒ to help you understand the skills and knowledge that might be covered on the exam
- ⇒ to help you identify your strengths and weaknesses
- ⇒ to provide organization and structure for a course of study
- ⇒ to provide a list of resources to help you with your study plan
- ⇒ to support and supplement the teaching and learning process

This study guide outlines the theoretical portion of the program. The intent is not to replace technical training provided under the guidance of instructors. Rather, it is a tool to be used in conjunction with formal training.



Exam Process

Before the Exam

You must contact the nearest Apprenticeship and Trades Certification Divisional office to make request to write the IP Red Seal exam (*See Appendix A for a list of regional offices*). Upon approval, the Apprenticeship Program Officer (APO) will notify you of your eligibility to write the exam, and provide you with scheduling information. If you require special accommodations due to a disability or language barrier, please contact your regional office for information on applying for this service.

During the Exam

You must bring:

- personal identification such as a photo or signature ID or valid Newfoundland and Labrador driver's license
- your notification letter

The following will be provided:

- a calculator (*see Appendix B for calculator information*)
- all other items required such as pencils, scrap paper, etc.

Important Note:

Personal cell phones, calculators, or other electronic equipment are NOT allowed into the exam room. If you do bring them, they will be stored away and returned to you when you have completed the exam.

After the Exam

Results will be mailed to you approximately seven to ten days after completion of the exam. All necessary instructions and information will be provided in the results letter.

The percentage mark you obtained will be provided. You will also be given a section by section breakdown, showing how many questions were in each section, as well as the number of questions in each section you completed successfully.

If you are successful in obtaining a 70% or more on your exam, you will be issued a Newfoundland and Labrador Certificate of Qualification with a Red Seal endorsement.

Exam Format

All IP Red Seal exams are written in multiple-choice format. Each exam has between 100 and 150 questions. A multiple choice question consists of a stem (a complete question) followed by four options (A, B, C, D). The stem contains all the information necessary to answer the question. The options consist of the one correct answer and three “distracters.” Distracters are incorrect. (See Appendix C for a sample answer sheet).

IP Red Seal exams contain three types of questions:

Level 1 Knowledge and Recall

Questions at this level test your ability to recall and understand definitions, facts, and principles.

Level 2 Procedural and Application

Questions at this level test your ability to apply your knowledge of procedures to a new situation.

Level 3 Critical Thinking

Questions at this level test your ability to interpret data, solve problems and arrive at valid conclusions.

On the following pages, examples of each of the three types of questions are provided.

Level 1 Examples:

1. What is the correct included grinding angle for a jobber’s steel drill bit?

- A. 109°.
- B. 112°.
- C. 118°.
- D. 121°.



2. Which color of tungsten electrode is used to weld aluminum?

- A. Red.
- B. Green.
- C. Yellow.
- D. Blue.



3. What is used to prepare a joint on cold rolled iron for brazing?

- A. Acid.
- B. Degreaser.
- C. Grinding disk.
- D. Wire brush.



Level 2 Examples:

1. How should a 15-m wire rope be stored?

- A. Coiled dry and hung on a hook in a dry area.
- B. Wound dry on a reel and stored in a dry area.
- C. Lubricated, coiled and hung on a hook.
- D. Lubricated and wound on a reel.



2. What is the net blank cut size for a 90 14-in. diameter seven-piece elbow, used in a material handling system?

- A. 33.18 in. x 44 in.
- B. 44.24 in. x 44 in.
- C. 55.29 in. x 44 in.
- D. 64.50 in. x 44 in.



3. Which combination of materials will corrode the quickest due to electrolysis (or galvanic reaction)?

- A. Aluminum and copper.
- B. Steel and copper.
- C. Nickel and copper.
- D. Lead and copper.



Level 3 Examples:

1. If 24 gauge metal is 0.686 mm (0.027 in.) thick, how much is to be taken from the circumference of a round pipe to make a small end?

- | METRIC | IMPERIAL |
|----------|-------------|
| A. 2 mm. | A. 3/32 in. |
| B. 3 mm. | B. 1/8 in. |
| C. 5 mm. | C. 3/16 in. |
| D. 6 mm. | D. 7/32 in. |



2. A top takeoff used in a residential heating system has an equivalent length of 40 ft. with a design static pressure loss of 0.08 in./wg. What is the resulting friction loss?

- A. 0.032 in./wg.
- B. 0.32 in./wg.
- C. 3.2 in./wg.
- D. 32 in./wg.



3. What is the maximum allowable leakage for a 12-in. diameter duct, 250 ft. long with a leakage allowance of 6 cfm per 100 sq. ft. in surface area?

- A. 11.78 cfm.
- B. 47.12 cfm.
- C. 49.78 cfm.
- D. 53.12 cfm.



Source of Questions:

<http://www.red-seal.ca/s.1mpl.2.2x.1mQ.5.2st.3.4ns-eng.html?tid=215>

Exam Content

Understanding the *Red Seal Occupational Standard (RSOS)*

The Red Seal model has historically been based on the development of the National Occupational Analysis (NOA) which supports the development of multiple-choice format examinations.

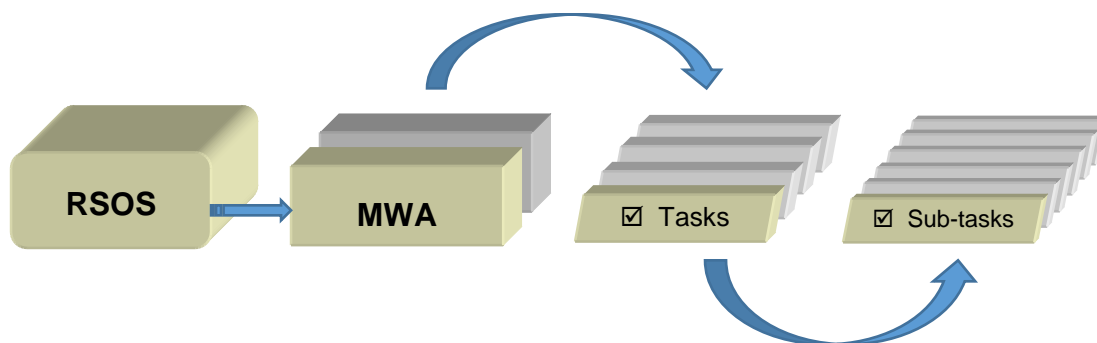
The RSOS was introduced in 2015 and is now taking the place of the NOA. Each RSOS or NOA sets the standard for a Red Seal trade. The Red Seal Inter-provincial Examination is based on the Red Seal Standard.

The new standards provide greater consistency in learning resources and allow for increased industry involvement in the development of these standards. This new model places increases emphasis on apprenticeship training and assessing skills with industry learning objectives, outcomes and performance criteria.

The RSOS for each trade describes the tasks and sub-tasks; skills and knowledge requirements; summary of essential skills; safety information; trends affecting the trade; technical terms; names of tools and equipment; acronyms; learning objectives and outcomes; industry expected performance and essential skills related to each sub-task.

The RSOS is an excellent tool to use as you study for the Red Seal exam. RSOSs can be found at <http://www.red-seal.ca/resources/n.4.1-eng.html>

RSOS material is organized into the following categories: **MWA (Major Working Activity)**. The MWAs are further broken down into **TASKS** (*describes activities within an MWA*) and **SUB-TASKS** (*describe activities within a task – This is what the exam is based on*).

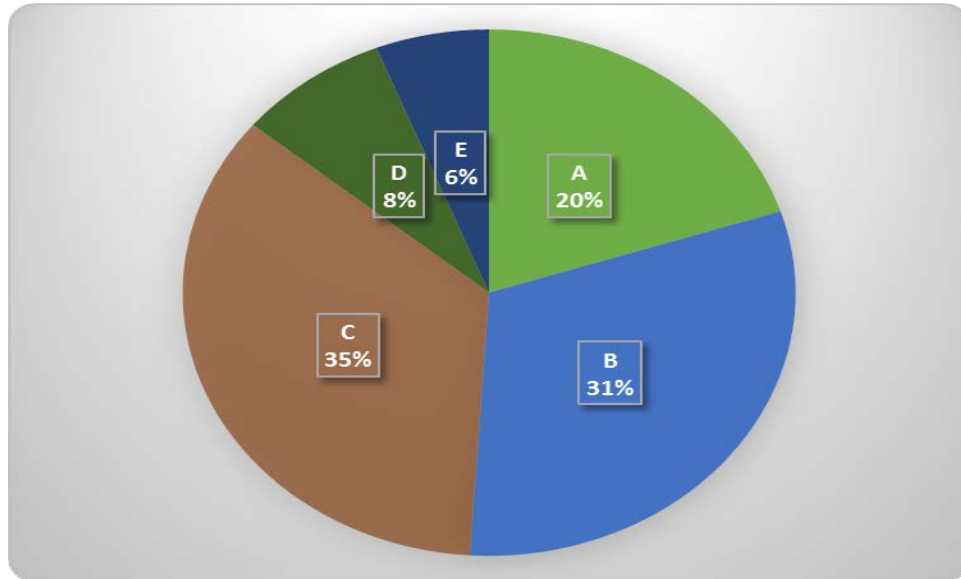


The NOA will continue to be used as the occupational standard for trades that do not yet have an RSOS developed.

RSOS Pie Chart

The RSOS Pie Chart presents the MWA percentages in the form of a pie chart which tells you the approximate number of questions from each MWA. For example, 20% of the questions on the **Sheet Metal Worker** Exam will be based on **MWA A**.

Sheet Metal Worker



MWA TITLES			
MWA A	Common Occupational Skills	MWA D	Roofing and Specialty Product Installation
MWA B	Fabrication	MWA E	Maintenance and Repair
MWA C	Air and Material Handling System Installation		

Exam Breakdown

The **Sheet Metal Worker** IP Red Seal Exam has 120 questions. The following table shows a breakdown of the approximate number of questions that come from each RSOS MWA. It is important to note that the number of questions can change at any time. When you are ready to write your exam you may contact your regional office to verify the number of questions (See Appendix A).

		# of Questions
MWA A	Performs Common Occupational Skills	24
Task 1	Performs safety related functions	
Task 2	Uses and maintains tools and equipment	
Task 3	Organizes work	
Task 4	Uses communication and mentoring techniques	
MWA B	Performs Fabrication	38
Task 5	Performs pattern development	
Task 6	Fabricates sheet metal components for air and material handling systems	
Task 7	Fabricates flashing, roofing, sheeting and cladding	
Task 8	Fabricates specialty products	
MWA C	Installs Air and Material Handling Systems	41
Task 9	Prepares installation site	
Task 10	Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment	
Task 11	Installs air handling system components	
Task 12	Installs material handling system components	
Task 13	Applies thermal insulation, lagging, cladding and flashing	
Task 14	Performs leak testing, air balancing and commissioning	
MWA D	Installs Roofing and Specialty Products	10
Task 15	Installs metal roofing and cladding/siding systems	
Task 16	Installs exterior components	
Task 17	Installs specialty products	
MWA E	Performs Maintenance and Repair	7
Task 18	Performs scheduled maintenance	
Task 19	Repairs faulty systems and components	
	Total	120

RSOS Sub-tasks

The following *RSOS Task Profile Checklist* outlines the MWAs, tasks and sub-tasks for your trade. The IP Red Seal exam is written to test your knowledge and abilities regarding the sub-tasks in the RSOS. This chart can be used to review your current knowledge. You can review by placing a checkmark (✓) next to those you understand fully.

Place your focus on those you do not understand and study them until you are comfortable with the material. Think of possible questions in that particular content area.

The RSOS also contains a list of “supporting knowledge and abilities” for each sub-task. They are the skills and knowledge you must have to perform a sub-task. The supporting knowledge and abilities identified under each sub-task will be very helpful as you review. The list can be found in the RSOS, on the Red Seal website, for your trade.

**Task Profile Checklist
Based on RSOS 2017
Sheet Metal Worker**

MWA A: Performs Common Occupational Skills

Task 1: Performs Safety Related Functions

Sub-Tasks

- Uses personal protective equipment (PPE) and safety equipment
- Maintains safe work environment
- Performs lock-out/tag-out procedures

Task 2: Uses and Maintains Tools and Equipment

Sub-Tasks

- Uses hand and portable power tools
- Uses shop tools and equipment
- Uses gas metal arc welding (GMAW) equipment
- Uses resistance spot welding equipment
- Uses gas tungsten arc welding (GTAW) equipment
- Uses shielded metal arc welding (SMAW) equipment
- Uses oxy-fuel and plasma arc cutting equipment
- Uses soldering and brazing equipment
- Uses measuring and layout equipment
- Uses testing and inspection devices
- Uses stationary and mobile work platforms
- Uses hoisting, rigging and positioning equipment

Task 3: Organizes Work

Sub-Tasks

- Uses trade related documentation
- Interprets drawings
- Organizes materials and equipment for project
- Performs basic design and field modifications

Task 4: Uses Communication and Mentoring Techniques

Sub-Tasks

- Uses communication techniques
- Uses mentoring techniques

MWA B: Performs Fabrication

Task 5: Performs Pattern Development

Sub-Tasks

- Develops patterns using simple and straight line layout
- Develops patterns using parallel line method
- Develops patterns using radial line method
- Develops patterns using triangulation method
- Uses computer technology for pattern development

Task 6: Fabricates Sheet Metal Components for Air and Material Handling Systems

Sub-Tasks

- Cuts ductwork, fittings and components
- Forms ductwork, fittings and components
- Insulates ductwork, fittings and components
- Assembles ductwork, fittings and components
- Fabricates dampers
- Fabricates hanger systems, supports and bases

Task 7: Fabricates Flashing, Roofing, Sheeting, and Cladding

Sub-Tasks

- Cuts metal for flashing, roofing, sheeting and cladding
- Forms flashing, roofing, sheeting and cladding

Task 8: Fabricates Specialty Products

Sub-Tasks

- Cuts material for specialty products
- Forms specialty products
- Assembles specialty products
- Finishes specialty products

MWA C: Installs Air and Material Handling Systems

Task 9: Prepares Installation Site

Sub-Tasks

- Performs onsite measurements
- Performs demolitions for renovations
- Installs penetrations and sleeves
- Installs supports and bases
- Installs hangers, cables, braces and brackets

Task 10: Installs and Connects Chimneys, Breeching and Venting to Exhaust Appliances and Mechanical Equipment

Sub-Tasks

- Installs chimney
- Connects appliances or mechanical equipment to chimney and breeching
- Installs high efficiency appliances and mechanical equipment

Task 11: Installs Air Handling System Components

Sub-Tasks

- Installs air handling equipment
- Installs sheet metal ducts and fittings
- Installs dampers
- Installs fire and fire/smoke dampers
- Installs registers, grilles, diffusers and louvers
- Installs terminal boxes
- Installs coils
- Installs system component accessories
- Installs plenums

MWA C: Installs Air and Material Handling Systems (Cont'd)

Task 12: Installs Material Handling System Components

Sub-Tasks

- Installs pneumatic and gravity material handling system components
- Installs mechanical material handling system components

Task 13: Applies Thermal Insulation, Lagging, Cladding and Flashing

Sub-Tasks

- Applies thermal insulation to components
- Applies lagging and cladding to components
- Applies flashing to components

Task 14: Performs Leak Testing, Air Balancing and Commissioning

Sub-Tasks

- Performs leak tests
- Performs testing, adjusting and balancing (TAB)
- Participates in the commissioning of air and material handling systems

MWA D: Installs Roofing and Specialty Products

Task 15: Installs Metal Roofing and Cladding/Siding Systems

Sub-Tasks

- Lays out roof and walls
- Installs insulation, isolation material and building envelope components
- Installs roofing and cladding/siding system components
- Seals exposed joints
- Installs decking

Task 16: Installs Exterior Components

Sub-Tasks

- Prepares surface
- Fastens exterior components

Task 17: Installs Specialty Products

Sub-Tasks

- Installs stainless steel specialty products
- Installs non-stainless steel products
- Installs marine products (NOT COMMON CORE)

MWA E: Performs Maintenance and Repair

Task 18: Performs Scheduled Maintenance

Sub-Tasks

- Performs maintenance inspections
- Services components

Task 19: Repairs Faulty Systems and Components

Sub-Tasks

- Diagnoses system faults
- Repairs worn or faulty components

Create a Study Plan

As you prepare for your exam, it is important to plan a schedule. The following two tables will help you stay on track.

The first table is a **“Weekly Study Plan.”** In this table list the areas you will focus your study for each day. You should include items you need to review as well as items you need to study. Remember, more time will be needed for study in areas you find difficult, whereas you may only require review in areas you are more familiar with. As you work through the RSOS sub-task list you can start to fill in this table.

The second table is a **“Study Time Table.”** It is important to create a study schedule where you determine the best days of the week and times of day for you to study.

Print several copies of these tables and fill out for each week of study. It is important to stick to your study schedule.

Weekly Study Plan for Week of: _____

	Area of Study 1	Area of Study 2	Area of Study 3	Area of Study 4	Area of Study 5	Area of Study 6
Mon.						
Tues.						
Wed.						
Thu.						
Fri.						
Sat.						
Sun.						

Study Time Table for Week of: _____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
8:00 AM - 9:00 AM							
9:00 AM - 10:00 AM							
10:00 AM - 11:00 AM							
11:00 AM - 12:00 Noon							
12:00 Noon - 1:00 PM							
1:00 PM - 2:00 PM							
2:00 PM - 3:00 PM							
3:00 PM - 4:00 PM							
4:00 PM - 5:00 PM							
5:00 PM - 6:00 PM							
6:00 PM - 7:00 PM							
7:00 PM - 8:00 PM							

Resources - Websites

Study information can be drawn from a variety of sources. A sample list of study materials (websites and books) is provided below. These and other helpful resources may be found in a local college bookstore, on the internet, or at your place of employment. You may also be able to borrow them from an apprentice or journey person in your trade.

Study Strategies and Exam Preparation Guide

The *Study Strategies & Exam Preparation Guide* is meant to be used in conjunction with this study guide. It provides direction and information on such areas as study habits, test preparation and test taking techniques.

Exam Preparation Guide: https://www.aesl.gov.nl.ca/app/publications/exam_prep_guide.pdf

Plan of Training (POT)

A *Provincial Plan of Training* details the full scope of learning for a particular occupation, including both technical training competencies and industry experiences necessary to write an IP Red Seal exam (and complete the requirements for Red Seal Certification), or to write a provincial examination. The Plan of Training is based on the NOA.

POT Website: <https://www.aesl.gov.nl.ca/app/plans.html>

Red Seal Website

Red Seal is a program that sets common standards to evaluate the skills of tradespeople across Canada. It is a partnership between the Federal Government and the provinces/territories.

The Red Seal model has been based on the National Occupational Analyses (NOA) which supports the development of multiple-choice examinations. A new Red Seal Occupational Standard (RSOS) was introduced in 2015 and is taking the place of the NOA.

Red Seal Website: <http://www.red-seal.ca/>

Sheet Metal Worker PRACTICE Exam

This is **NOT** an IP exam. This is a practice exam provided by the Inter-provincial Standards Red Seal program. It was developed using similar question types to that of a Red Seal exam. The exam is intended to be used for self-assessment in preparation for writing an IP Exam.

Sample questions can be found at:

<http://www.red-seal.ca/s.1mpl.2.2x.1mQ.5.2st.3.4ns-eng.html?tid=215>

Glossary of Terms

Refer to the **end of the Study Guide** for a Red Seal copy of the Glossary.

Acronyms

Refer to the **end of the Study Guide** for a Red Seal copy of the Acronyms.

List of Tools and Equipment

Refer to the **end of the Study Guide** for a Red Seal copy of the Tools and Equipment list.

Resources – Book List

The books listed below can help you obtain information on specific topics. It is not necessary to use these books specifically, as you may find others that will be equally beneficial.

If you wish to obtain any of the resources listed above, here is the reference information:

- Mathematics for Sheet Metal Fabrication*, 1st edition, Delmar Cengage Learning, 1970, ISBN 978-0827302952
- Sheet Metal: Introduction to Welding*, ISBN 0131030264
- Layout for Duct Fittings*, Lama Books, Meyer, L.A., ISBN 300880690283
- Sheet Metal*, 2nd edition, American Technical Publishers, 2006, Meyer, L.A., ISBN 0826919103
- Sheet Metal Level One*, Pearson/Prentice Hall, ISBN 0-13-6044832
- Sheet Metal Level Two*, Pearson/Prentice Hall, ISBN 0-13-6044859
- Sheet Metal Level Three*, Pearson/Prentice Hall, ISBN 0-13-102610-0
- Sheet Metal Level Four*, Pearson/Prentice Hall, ISBN 0-13-609965-3
- Sheet Metal Worker Alberta Trades, First, Second, Third, and Fourth Period*, CrownPub@gov.bc.ca
- Practical Sheet Metal Layout*, 4th edition, ISBN 0-912914-68-8
- Practical Sheet Metal Layout*, 6th edition, ISBN 0-912914-67-x
- Practical Sheet Metal Layout*, 4th edition, ISBN 0-912914-69-6
- Architectural Sheet Metal Manual*, 6th edition, Sheet Metal and Air Conditioning Contractors National Association (SMACNA), ASIN B000B5L7TM

Disclaimer

Various external resources (websites, textbooks) have been listed in this study guide to assist a person in preparing to write an IP Red Seal Exam. This does not mean the Department of Advanced Education, Skills and Labour, Newfoundland and Labrador endorses the material or that these are recommended as the best resources. There may be other resources of equal or greater value to an individual preparing for an IP Red Seal exam. The Department of Advanced Education, Skills and Labour has no control over the content of external textbooks and websites listed, and no responsibility is assumed for the accuracy of the material.

Conclusion

We hope this guide has provided you with some useful tools as you prepare for your IP Red Seal exam. If you have any questions regarding your IP Red Seal exam please contact your regional office (*see Appendix A for a list of regional offices*).

We appreciate your comments and feedback regarding the usefulness of this study guide. If you have any comments or suggestions, we welcome your feedback. The feedback form at the end of this guide can be used for this purpose.

Appendix A: Regional Offices

If you have any questions regarding your IP Red Seal exam, please contact one of the following regional offices:

Department of Advanced Education, Skills and Labour
Apprenticeship and Trades Certification Division
Toll Free: 1-877-771-3737
<https://www.aesl.gov.nl.ca/app/>

Corner Brook
1-3 Union Street Aylward Building, 2 nd Floor Corner Brook, NL A2H 5M7
Telephone: (709) 637-2366 Facsimile: (709) 637-2519

Grand Falls-Windsor
42 Hardy Avenue Grand Falls-Windsor, NL A2A 2J9
Telephone: (709) 292-4215 Facsimile: (709) 292-4502

Clarenville
45 Tilley's Road Clarenville, NL A5A 1Z4
Telephone: (709) 466-3982 Facsimile: (709) 466-3987

St. John's
P.O. Box 8700 1170 Topsail Road Mount Pearl, NL A1B 4J6
Telephone: (709) 729-2729 Facsimile: (709) 729-5878

Happy Valley – Goose Bay
163 Hamilton River Road Burse Building Happy Valley – Goose Bay, NL A0P 1E0
Telephone: (709) 896-6348 Facsimile: (709) 896-3733

Appendix B: Calculator Use

The picture below shows a calculator with the same functions as the one you will be provided with during your exam. It is advisable to borrow or purchase one with similar functions so that you can familiarize yourself with it before you write your exam.



Appendix C: Answer Sheet Example

With your exam you will be given an answer sheet like the one below. When answering multiple choice questions be sure to fill the circle completely and fill the circle that corresponds to the question on the exam.

Dual readhead scanner required to score this sheet

KEY ID
 A B C D

SCORING & PRINTING OPTIONS:
 RESCORE MULTIPLE ANSWER SCORING
 This sheet always uses the "Total Only" scoring option.

1 T F A B C D E
 2 A B C D E
 3 A B C D E
 4 A B C D E
 5 A B C D E
 6 A B C D E
 7 A B C D E
 8 A B C D E
 9 A B C D E
 10 A B C D E
 11 A B C D E
 12 A B C D E
 13 A B C D E
 14 A B C D E
 15 A B C D E
 16 A B C D E
 17 A B C D E
 18 A B C D E
 19 A B C D E
 20 A B C D E
 21 A B C D E
 22 A B C D E
 23 A B C D E
 24 A B C D E
 25 A B C D E

26 T F A B C D E
 27 A B C D E
 28 A B C D E
 29 A B C D E
 30 A B C D E
 31 A B C D E
 32 A B C D E
 33 A B C D E
 34 A B C D E
 35 A B C D E
 36 A B C D E
 37 A B C D E
 38 A B C D E
 39 A B C D E
 40 A B C D E
 41 A B C D E
 42 A B C D E
 43 A B C D E
 44 A B C D E
 45 A B C D E
 46 A B C D E
 47 A B C D E
 48 A B C D E
 49 A B C D E
 50 A B C D E

51 T F A B C D E
 52 A B C D E
 53 A B C D E
 54 A B C D E
 55 A B C D E
 56 A B C D E
 57 A B C D E
 58 A B C D E
 59 A B C D E
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 73 A B C D E
 74 A B C D E
 75 A B C D E

76 T F A B C D E
 77 A B C D E
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 83 A B C D E
 84 A B C D E
 85 A B C D E
 86 A B C D E
 87 A B C D E
 88 A B C D E
 89 A B C D E
 90 A B C D E
 91 A B C D E
 92 A B C D E
 93 A B C D E
 94 A B C D E
 95 A B C D E
 96 A B C D E
 97 A B C D E
 98 A B C D E
 99 A B C D E
 100 A B C D E

ANSWER KEY INFO.
 # OF KEYS
 ITEM COUNT

0	0	0	2
1	1	1	3
2	2	2	4
3	3		
4	4		
5	5		
6	6		
7	7		
8	8		
9	9		

PERFORMANCE ASSESSMENT
 % OF TOTAL SCORE
 (00 = 100%)

0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Bar Code

NUMBER CORRECT
 PERCENT CORRECT
 ROSTER NUMBER
 SCORE
 RESCORE

COMBINED POINTS EARNED
 COMBINED PERCENT CORRECT
 LETTER GRADE
 SCORE
 RESCORE

200 ITEM

MARKING INSTRUCTIONS
 Use a No. 2 Pencil
 Fill oval completely
 Erase cleanly

STUDENT ID NUMBER

0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9

NAME _____
 SUBJECT _____
 PERIOD _____ DATE _____

Feedback Form

Study Guide – Sheet Metal Worker

Please answer the following:

- (1) This Study Guide is a useful tool for exam preparation.
 strongly agree agree disagree strongly disagree

- (2) The topics contained in the guide are arranged in a logical order.
 strongly agree agree disagree strongly disagree

- (3) The design and format of the guide caught my attention.
 strongly agree agree disagree strongly disagree

- (4) The instructions throughout the guide are clear and to the point.
 strongly agree agree disagree strongly disagree

- (5) The resources listed in this guide are suitable and valuable.
 strongly agree agree disagree strongly disagree

- (6) The guide should contain more information.
 strongly agree agree disagree strongly disagree

Suggested information/resources to include:

Additional Comments:

Please complete this form and return via fax or mail to the following:

Department of Advanced Education, Skills and Labour
Apprenticeship and Trades Certification Division
Standards and Curriculum Unit
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(ACRONYMS; TOOLS/EQUIPMENT; GLOSSARY)

APPENDIX A

ACRONYMS

AHJ	Authority having jurisdiction
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
BIM	building information modelling
CAD	computer-aided design
CNC	Computer Numerical Control
CSA	Canadian Standards Association
CWB	Canadian Welding Bureau
GMAW	gas metal arc welding
GTAW	gas tungsten arc welding
HRV	heat recovery ventilator
HVAC	heating, ventilation and air conditioning
LEED	Leadership in Energy and Environmental Design
MUA	make-up air unit
NBC	National Building Code
NFPA	National Fire Protection Association
OBD	Opposed Blade Damper
OH&S	Occupational Health and Safety
PPE	personal protective equipment
PSI	pre-safety inspection
PVC	polyvinyl chloride
RFI	request for information
RTU	roof top unit
SDS	Safety Data Sheet
SMACNA	Sheet Metal and Air Conditioning National Association
SMAW	shielded metal arc welding
TAB	testing, adjusting and balancing
TABB	Testing, Adjusting and Balancing Bureau
TDC	transverse duct connectors
TDF	transverse duct flange
TSB	Transportation Safety Board
ULC	Underwriters Laboratories of Canada
WETT	Wood Energy Transfer Technology
WHMIS	Workplace Hazardous Materials Information System

APPENDIX B

TOOLS AND EQUIPMENT / OUTILS ET ÉQUIPEMENT

Hand Tools / Outils à main

adjustable wrench	clés à molette
aviation snips R.H. and L.H. (various)	cisailles aviation pour coupe à droite et à gauche (divers)
ball peen hammer	marteaux à panne ronde
banding tools	outils de cerclage
bulldog snips	cisailles Bulldog
bumping hammers	marteaux à débosser
caulking gun	pistolets à calfeutrer
C-clamp	serre-joints en C
center punch	pointeaux centreurs
chalk line	cordeaux à craie
chipping hammer	marteaux burineurs
chisels	burins
combination snip	cisailles universelles
divider	compas à pointes sèches
drift pin	broches d'assemblage
duct puller/stretcher	tireurs et tendeurs de conduits
files	limes
groove seamer – hand groover	agrafeuses rainées – fraises manuelles à rainer
hacksaw	scies à métaux
hand crimpers	sertisseuses à main
hand dolly	tables à main
hand notcher	encocheuses à main
hand seamer/folding pliers	agrafeuses à main/plieuses manuelles
hex keys	clés hexagonales
hole punch	emporte-pièces
levels	niveaux
locking pliers	pince-étaux
magnets	aimants
mallet	maillets
marking pen	marqueurs
paint brush	pinceaux
pipe wrench	clés à tuyau
pliers	pincés
plumb bob	fil à plomb
riveter	riveteuse
prick punch	pointeaux de traçage
rivet set	bouterolles
riveting hammer	marteaux à riveter
scraper	grattoirs
scratch awl	pointes à tracer
screwdrivers	tournevis
scriber	traçoirs
setting hammer	marteaux à restreindre
side cutters	pincés coupantes de côté

socket set
soldering coppers
straight edge
tap and die
wire and bolt cutters
wire brushes
wrenches

jeux de douilles
fers à souder
règles droites
tarauds et filières
coupe-fils et coupe-boulons
brosses métalliques
clés

Portable Power Tools and Accessories / Outils mécaniques portatifs et accessoires

air compressor
angle drill
angle grinder
chop saw
circular saw
cordless drill
die grinder
double cutter
drill bits
electric drill
generator
hammer drill
hole saw
impact wrench
jigsaw
nibbler
spray gun
pneumatic hammer
pneumatic riveter
polisher and buffer
portable band saw
portable plasma cutter
powder-actuated tool
reciprocating saw
seamer
step bits
unishear

compresseurs d'air
perceuses d'angle
meuleuses d'angle
scies à sectionner
scies circulaires
perceuses sans fil
meuleuses à rectifier les matrices
fraises doubles
forets
perceuses électriques
génératrices
marteaux perforateurs
scies emporte-pièces
clés à chocs
scies sauteuses
grignoteuses
pistolets pulvérisateurs
marteaux pneumatiques
riveteuses pneumatiques
polisseuses
scies à ruban portatives
coupeuses au plasma portatives
fixateurs à cartouches
scies alternatives
agrafeuses
forets étagés
cisailles Unishear

Shop Tools and Equipment / Outils et équipement d'atelier

abrasive cut-off saw
angle iron roller
band iron bender
band saw
bar folder
box and pan brake
button lock machine
cleat folder
cleat machine
clinch lock machine
cold cut saw
cut to length line
dimpler
drill index
drill press

scies à tronçonner abrasives
cintreuses de cornières
plieuses de feuillard de fer
scies à ruban
plieuses de barre
plieuses pour boîte et plateau
machines à bouton de blocage
plieuses de clavettes
machines à clavettes
machines pour le clinchage de joints
scies à froid
lignes de cisailage
emboutisseuses
calibres à forets
perceuses à colonne

foot shear
grinder
hand brake
hydraulic press
lever bench shear
magnetic brake
manual notcher
pattern
pin spotter
pipe-threader, cutter, reamer
Pittsburgh machine
power brake
power notcher
power press
power punch
power roll former
power sander or polisher
power shear
punching shear
rivet press
riveting gun
rotary punch
slitter
snap-lock machine
spiral duct machine
transverse duct connector (TDC)/ transverse duct
flange (TDF) machine

cisailles à pédale
meuleuses
plieuses à main
presses hydrauliques
cisailles d'établi à levier
plieuses magnétiques
encocheuses à main
patrons
localisateurs de goupilles
filières à tuyaux, coupe-tuyaux, alésoirs à tuyaux
machines à joint à agrafe Pittsburgh
presse-plieuses mécaniques
encocheuses mécaniques
presses mécaniques
poinçons mécaniques
machines à profiler mécaniques
ponceuses ou polisseuses mécaniques
cisailles mécaniques
cisailles-poinçonneuses
presses à riveter
pistolets à riveter
poinçons rotatifs
machines à refendre
machines pour plis snap lock
machine à conduits d'airs hélicoïdaux
machines pour raccords de conduits transversaux et
pour bride de conduits transversaux

Rotary Machines / Machines rotatives

combination beading and crimping machine
double seaming equipment
easy edger
ring and circle shears
slip roll former
turning machines and attachments (such as elbow
seaming, burring, beading, wiring, crimping)

machines à border et à sertir
équipement pour agrafage double
machines à border d'utilisation facile
cisailles circulaires à arbres inclinés
cintreuse à glissement
tours et accessoires (comme pour l'agrafage sur
bords relevés, l'ébarbage, le roulage de bord,
l'enroulement de fil métallique, le sertissage)

Metal Forming Bench Stakes / Enclumettes pour la mise en forme de tôles

anvil
beak horn
bench plate
blow horn
candle mould
copper smith
creasing stake
double seaming
double seaming with heads
hatchet
hollow mandrel
solid mandrel
square

enclume
bigorne
table d'établi
tas
pour moule à chandelle
de chaudronnier
bigorne à crêper
pour agrafage double
pour agrafage double avec tête
en forme de hachette
à mandrin creux
à mandrin lisse
à tête carrée

Welding, Brazing, Soldering and Cutting Equipment / Équipement de brasage tendre, de brasage fort et de coupe

AC power unit	blocs d'alimentation c.a.
AC/DC power unit	blocs d'alimentation c.a./c.c.
butane torch	torches au butane
electric soldering iron	fers à souder électriques
gas metal arc welding (GMAW) equipment	équipement de soudage par procédé GMAW
gas tungsten arc welding (GTAW) equipment	équipement de soudage par procédé GTAW
laser cutting equipment	équipement de découpe au laser
oxy-fuel welding (OFW) equipment	équipement de soudage oxyacétylénique
plasma cutting equipment	équipement de découpe au plasma
shielded metal arc welding (SMAW) equipment	équipement de soudage par procédé SMAW
soldering coppers	fers à souder
soldering furnace or pot	fours ou pots à souder
spot welder	appareils de soudage par points
strongback	plaques de renfort
tiger torch	buses de lance-flammes
water jet cutting equipment	équipement de découpe au jet d'eau

Layout and Drafting Equipment / Équipement de traçage et de dessin

beam compass	compas à verge
circumference rule	règles de circonférence
combination square	équerres combinées
compass	compas
divider	compas à pointes sèches
drafting arm	bras orientable de planche à dessin
drafting pencil	crayons à dessin
drafting table	tables à dessin
eraser shield	gabarits à effacer
framing square	équerres de charpentier
parallel bar	barres parallèles
protractor	rapporteurs d'angle
scale ruler	règles graduées
set square	équerres à dessin
stencil	pochoirs
template	gabarits
trammel points	pointes d'un compas à verge
triangle	équerres à dessin
T-square	équerres en T

Measuring Tools / Instruments de mesure

angle finder	détecteurs d'angle
angle rule	rapporteurs d'angle
bench rule	règles d'établi
caliper	compas d'épaisseur
laser level	niveaux à laser
laser measure	mesures au laser
micrometer	micromètres
tape measure	rubans à mesurer
transit level	niveaux théodolites
vernier caliper	pieds à coulisse

Access Equipment / Équipement d'accès

aerial work platforms
ladders
mast climbing lift
scaffolds
swing stage

plateformes de travail élévatrices
échelles
plateformes de travail sur mât
échafaudages
échafaudages suspendus

Hoisting and Rigging Equipment / Équipement de hissage et de gréage

cable
chain blocks
chain hoist
chokers
come-along
fork lift
grip hoist
hydraulic hoist
material lift
overhead crane
pulley (gin wheel)
rope
shackles
slings

câbles
palans à chaîne
palans à chaîne
étrangleurs
palans manuels
chariots élévateurs à fourches
treuils manuels
palans hydrauliques
monte-charges
ponts roulants
poulies
cordes
manilles
élingues

Testing Equipment / Équipement d'essai

ammeter
anemometer
calibrated flow hood
CO₂ tester
digital combustion analyzer
digital manometer
digital multimeter
digital scope
digital thermometer
duct thermometer
grommet or plug
hygrometer
inclined manometer
magnehelic pressure gauge
mechanical tachometer
micro amp meter
multimeter
CO tester
O₂ tester
pitot tube
pressure gauge
pressure tester
psychrometer
smoke tester
stack thermometer
stethoscope
stop watch
strobe tachometer

ampèremètres
anémomètres
hottes à flux jaugées
contrôleurs de CO₂
analyseurs de combustion numériques
manomètres numériques
multimètres numériques
oscilloscopes numériques
thermomètres numériques
thermomètres pour conduits
passe-fils ou bouchons
hygromètres
manomètres à tube incliné
manomètres Magnehelic
tachymètres mécaniques
microampèremètres
multimètres
analyseurs de CO
analyseurs d'O₂
tubes de Pitot
manomètres
vérificateurs de pression
psychromètres
fumimètres
thermomètres de gaz d'échappement
stéthoscopes
chronomètres
tachymètres stroboscopiques

tachometer
U tube manometer
velometer

tachymètres
manomètres à tube en U
véloètres

Computer Assisted Tools and Office Equipment / Outils assistés par ordinateur et matériel de bureau

computer hardware
digital camera
fax machine
hand held personal computer (smart phone, tablet, laptop)
numerical control/computer numerical control equipment (NC/CNC) (plasma, laser, water jet)

printer/scanner
software packages

matériel informatique
caméras numériques
télécopieurs
ordinateurs personnels portatifs (téléphone intelligent, tablette, ordinateur portable)
équipement de commande numérique et de commande numérique par ordinateur (NC/CNC) (à l'arc plasma, au laser, à jet d'eau)
imprimantes/numériseurs
progiciels

Personal Protective Equipment and Safety Equipment / Équipement de sécurité et de protection individuelle

coveralls
eye protection
eye wash station
face shield
fall arrest equipment
fire extinguisher
first aid kit
floatation devices
fume exhaust system
gloves
hard hat
hearing protection
high visibility safety vest
leather apron
reflective vest
respiratory protection
safety boots
sun protection
welding screen
welding helmet
welding jacket

combinaisons de travail
protection oculaire
douches oculaires
écrans faciaux
dispositifs antichute
extincteurs
trousses de premiers soins
dispositifs de flottaison
systèmes d'évacuation de la fumée
gants
casques de sécurité
protection auditive
gilets de haute visibilité
tabliers de cuir
gilets à bandes réfléchissantes
protection des voies respiratoires
bottes de sécurité
protection contre le soleil
écrans de soudeur
casques de soudeur
sarraus de soudeur

APPENDIX C

GLOSSARY / GLOSSAIRE

annealing	process by which metal is heated to relieve stress, changing the metal's strength and hardness	recuit	procédé consistant à chauffer le métal pour éliminer les tensions internes, changeant ainsi la résistance et la dureté du métal
backer rod	small foam rod or cord used to fill gaps between building materials	tige d'appui	petite tige ou cordon en mousse pour combler les écarts entre les matériaux de construction
blank piece	piece of material cut to size prior to notching or marking	flan	pièce de matériau coupée aux dimensions requises pour l'encochage ou le traçage
brake	manual or power equipment used to bend and form metal; may be CNC or manually controlled	presse-plieuse	équipement manuel ou mécanique utilisé pour plier et former le métal. Peut être contrôlé par CNC ou manuellement
breeching	the portion of a combustion venting system between appliance and the chimney or stack used for exhausting fumes and gases	collecteur de fumée	partie d'un réseau d'évacuation à combustion située entre l'appareil et la cheminée utilisée pour évacuer la fumée et les gaz
building envelope	a barrier between the interior and exterior environment of the building that serves as an outer shell to protect the indoor environment from elements such as moisture	enveloppe de bâtiment	barrière entre l'intérieur et l'extérieur du bâtiment qui sert de couche externe pour protéger l'intérieur du bâtiment contre les éléments comme l'humidité
burglar bars	heavy steel bars installed inside ductwork to prevent access	barres antivol	épaisses barres en acier installées dans les réseaux de conduits pour empêcher les entrées
cladding	a material (metal or composite) that covers another material to provide a skin or a layer; it is intended to control infiltration of	placage	matériau (métallique ou en composite) qui en recouvre un autre pour fournir un revêtement ou

	weather elements or for aesthetic purposes		une couche. Il sert à contrôler l'infiltration d'éléments météorologiques ou à embellir
code B-139	provides minimum requirements for the installation of, alteration to, or addition to oil-burning equipment, components and accessories	code B-139	énonce les exigences minimales visant l'installation, la modification ou l'ajout des appareils de combustion, de composants et d'accessoires
code B-149	provides safety requirements for the installation of natural gas and propane appliances, equipment, components, and accessories where gas is to be used for fuel purposes	code B-149	énonce les exigences de sécurité visant l'installation des appareils de gaz naturel et de propane, des appareillages, des composants et des accessoires où le gaz est utilisé comme combustible
coping (architectural)	material used as the capping of a wall	chaperon (architectural)	matériau utilisé comme surfaçage d'un mur
crimper	power or manual tool used to allow round or square sheet metal pipes that are the same size to be corrugated to fit together	sertisseuse	outil électrique ou manuel utilisé pour permettre aux tuyaux en tôle ronds ou carrés de la même taille d'être ondulés pour s'insérer l'un dans l'autre
damper	valve or plate that stops or regulates the flow of air or materials	volet	soupape ou plaque qui bloque ou régularise le débit d'air ou les matériaux
duct traverse	series of evenly spaced pressure readings inside of a duct to measure various pressures at points within the duct	point d'échantillonnage du conduit	série de lectures de pression uniformément espacées à l'intérieur du conduit pour mesurer diverses pressions aux points à l'intérieur du conduit
flashing	thin piece of sheet metal or other impervious material installed to prevent the passage of water into a structure from an angle or joint	solin	mince pièce de tôle ou d'un autre matériau imperméable installée pour empêcher l'infiltration d'eau dans une structure par une cornière ou un joint

interference drawings	drawings that show the coordinated layout of all mechanical, electrical, structural and architectural systems and how the placement of different systems may interfere with one another	figures d'interférence	dessins qui montrent la disposition coordonnée de tous les systèmes mécaniques, électriques, structurels et architecturaux et comment le placement de différents systèmes peut interférer les uns avec les autres
isolation	product used between two dissimilar metals to prevent galvanic corrosion (used in roofing, air handling and material handling applications)	isolation	produit utilisé entre deux métaux de nature différente afin d'empêcher l'électrolyse (utilisée dans les applications de toiture, de traitement de l'air et de manipulation de matériaux)
isolator	components that minimize noise, sound and vibration transfer	isolateur	composant qui minimise le bruit, les sons et les vibrations
lagging	protects insulation from damage and provides a barrier around the insulation; it also creates a true, flat and even surface for aesthetic purposes	revêtement calorifuge	protège l'isolant des dommages et fournit une barrière autour de l'isolant. Crée aussi une surface droite, plate et égale pour des raisons d'esthétique
parallel line development	method of pattern development based upon lines at an equal distance at all points	développement en traits parallèles	méthode de conception de modèle reposant sur le fait qu'une ligne qui est parallèle à une autre se trouve à une distance égale à tous les points
plasma cutting	process used to cut metal using a plasma torch	coupage au jet de plasma	méthode utilisée pour couper à l'aide d'un chalumeau à plasma
radial line development	method of conical pattern development where all points radiate from a common apex	développement de lignes radiales	méthode de conception de modèle conique où tous les points partent d'un sommet commun
seam/lock	any process of connecting two pieces or two ends of metal together	joint/agrafe	toute méthode consistant à joindre deux pièces ou deux bords de métal
shear	equipment or a process of cutting sheet metal	cisailles ou cisaillement	équipement ou méthode de coupage de tôle

stake	equipment used in forming material by hand; usually found in a sheet metal shop	enclume	matériel utilisé pour le formage de matériau à la main ; on la trouve habituellement en tôlerie
stand-offs	material or device used to create a gap between two layers of material	pièce d'espace	matériau ou dispositif utilisé pour créer un espace entre deux couches de matériau
stretch-out	gross stretch-out: overall length of material, including locks and seams; net stretch-out: overall length of material, not including locks and seams	développement	développement brut : longueur hors tout du matériau, comprenant toutes les agrafes et tous les joints; développement net : longueur hors tout du matériau, à l'exclusion des agrafes et des joints
strongback	support to keep a welding joint straight and prevent weld distortion	plaque de renfort	appui permettant de garder le joint de soudure droit et d'empêcher la distorsion due à la soudure
thermal insulation	material installed on the outside of duct used to reduce the rate of heat transfer	isolant thermique	matériau installé à l'extérieur de la conduite utilisé pour réduire le taux de transfert de chaleur
triangulation development	method of pattern development using right angle triangles and two known points to find a third unknown point	triangulation	méthode de conception de modèle à l'aide de triangles à angle droit et de deux points connus pour trouver un troisième point inconnu

