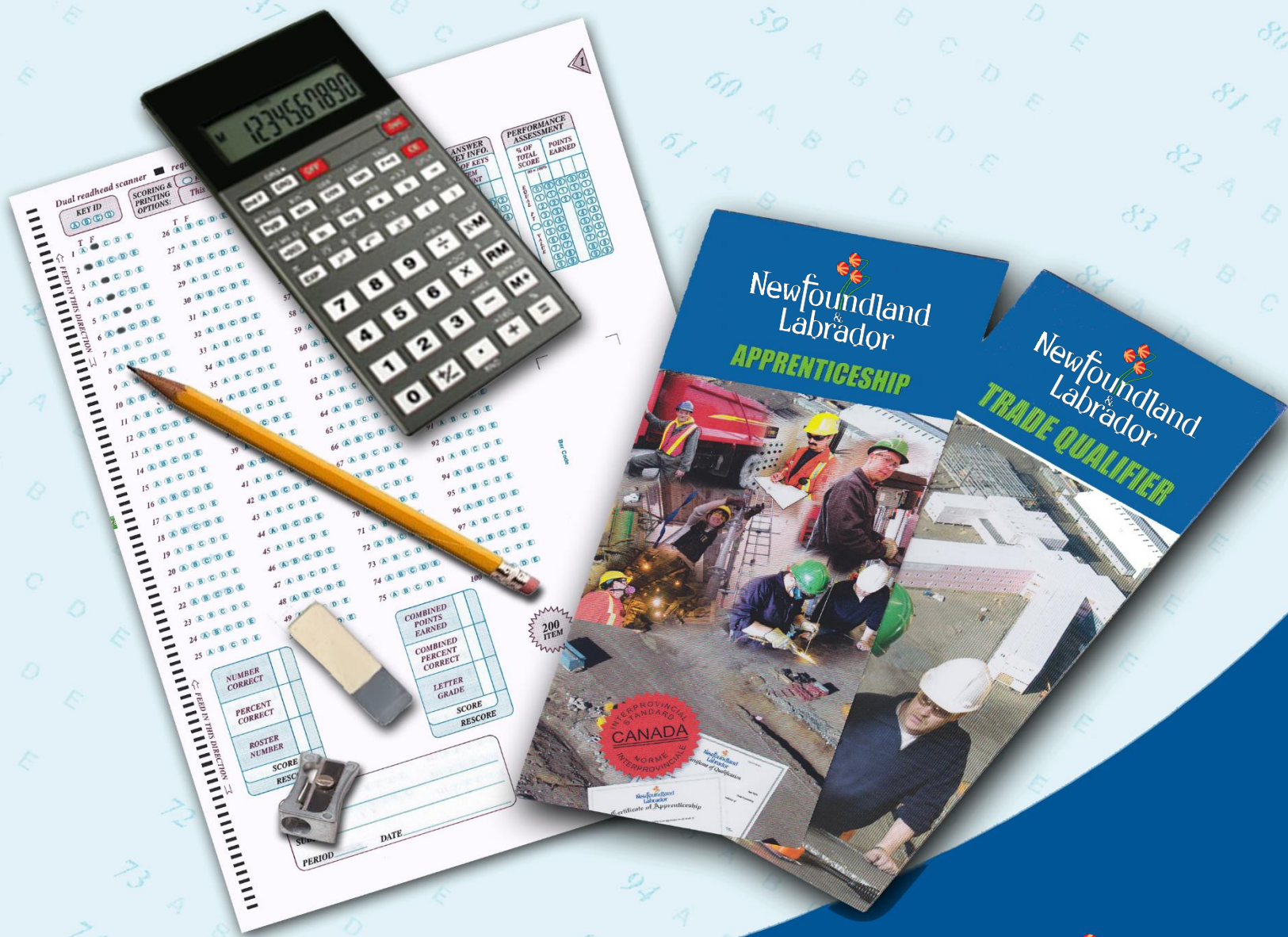


APPRENTICESHIP & CERTIFICATION

Study Guide Sheet Metal Worker



Apprenticeship and Certification

Study Guide

Sheet Metal Worker

(Based on Red Seal Occupational Standard – RSOS 2018)

Government of Newfoundland and Labrador
Department of Immigration, Population Growth and Skills

Version 10

Revised
November 2022

Table of Contents

Introduction	3
Exam Process	4
Before the Exam.....	4
During the Exam.....	4
After the Exam	4
Exam Format	5
Exam Content.....	9
Understanding the Red Seal Occupational Standard (RSOS).....	9
Exam Breakdown	11
RSOS Sub-tasks.....	12
Task Profile Checklist	13
Create a Study Plan	18
Resources - Websites	21
Resources – Book List.....	22
Conclusion.....	23

Appendices:

Appendix A: Regional Offices	24
Appendix B: Calculator Use	25
Appendix C: Answer Sheet Example	26
Appendix D: Acronyms	29
Appendix E: Tools & Equipment.....	30
Appendix F: Glossary	36

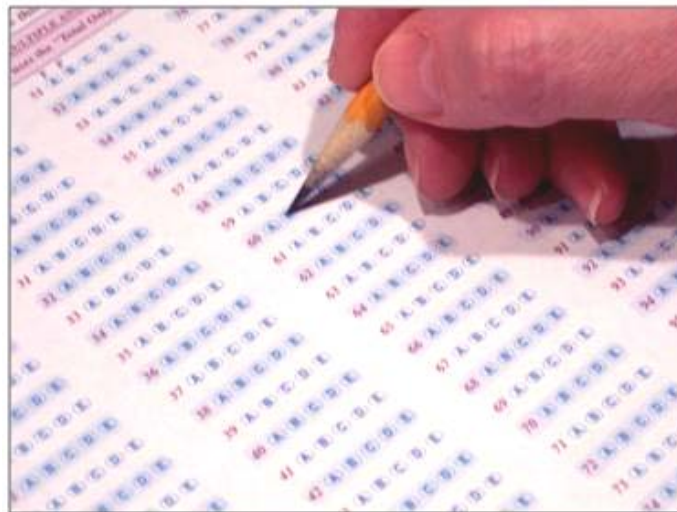
Introduction

This Study Guide has been developed by the Newfoundland and Labrador Department of Immigration, Population Growth and Skills, Apprenticeship and Trades Certification Division, to assist apprentices and trade qualifiers as they prepare to write the Inter-provincial (IP) Red Seal Exam. IP Exams are available for all Red Seal trades. For a list of Inter-provincial trades please refer to the Department of Immigration, Population Growth and Skills website: <https://www.gov.nl.ca/atcd/designated-trades/list-of-designated-trades/>

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.

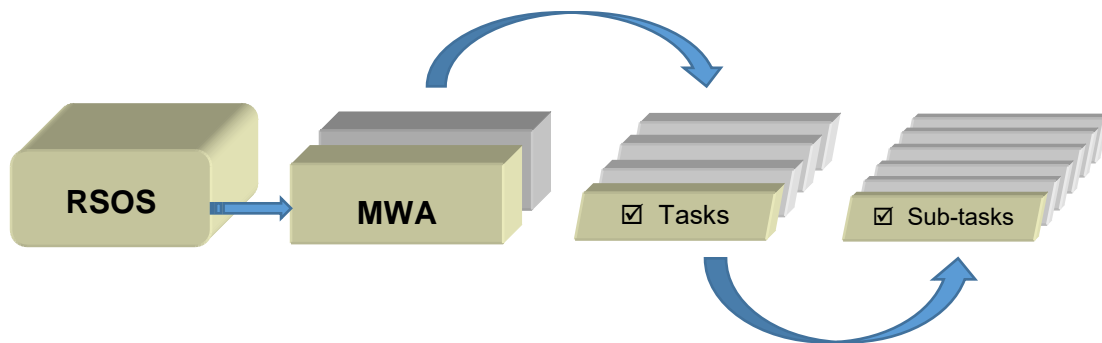
The RSOS was introduced in 2015 and is now taking the place of the NOA. Each RSOS or NOA sets the standard for a Red Seal trade. The Red Seal Inter-provincial Examination is based on the Red Seal Standard.

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*).

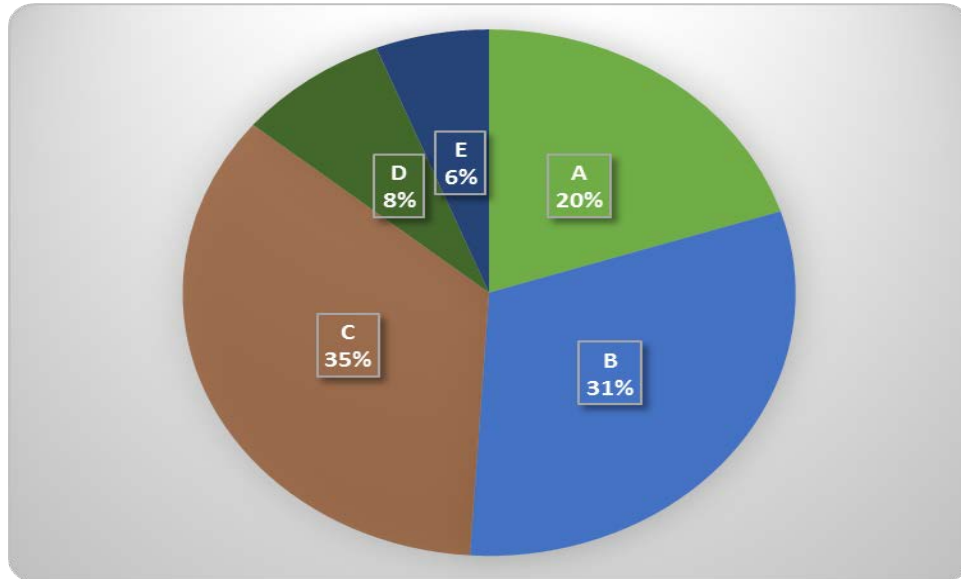


The NOA will continue to be used as the occupational standard for trades that do not yet have an RSOS developed.

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	Performs Common Occupational Skills	MWA D	Installs Roofing and Specialty Products
MWA B	Performs Fabrication	MWA E	Performs Maintenance and Repair
MWA C	Installs Air and Material Handling Systems		

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.

<https://www.gov.nl.ca/atcd/apprentices-youth/self-study/study-guides/>

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.

<https://www.gov.nl.ca/atcd/designated-trades/pots-aacs/>

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.

<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.

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

Red Seal Exam Self-Assessment Guide

Use this self-assessment tool to rate your own understanding and experience with the tasks of the trade that are on the Red Seal examination:

https://www.red-seal.ca/_conf/assets/custom/docms/sheetmetalwork/self-assessment.pdf

Acronyms

Refer to the **Appendix D** for a Red Seal copy of the Acronyms.

List of Tools and Equipment

Refer to the **Appendix E** for a Red Seal copy of the Tools and Equipment list.

Glossary of Terms

Refer to the **Appendix F** for a Red Seal copy of the Glossary.

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 Immigration, Population Growth and Skills, 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 Immigration, Population Growth and Skills 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 Immigration, Population Growth and Skills
Apprenticeship and Trades Certification Division
Toll Free: 1-877-771-3737

<https://www.gov.nl.ca/atcd/contact-us/staff-listing-and-office-locations/>

Corner Brook

1-3 Union Street
Aylward Building, 2nd 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

Clareville

45 Tilley's Road
Clareville, 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

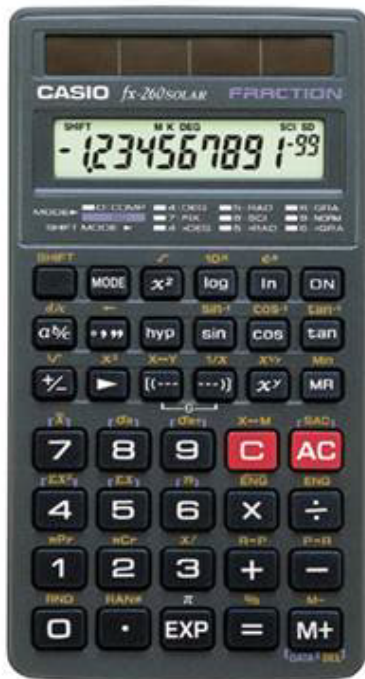
163 Hamilton River Road
Burse Building
Happy Valley – Goose Bay, NL
A0P 1E0

Telephone: (709) 896-6348
Facsimile: (709) 896-3733

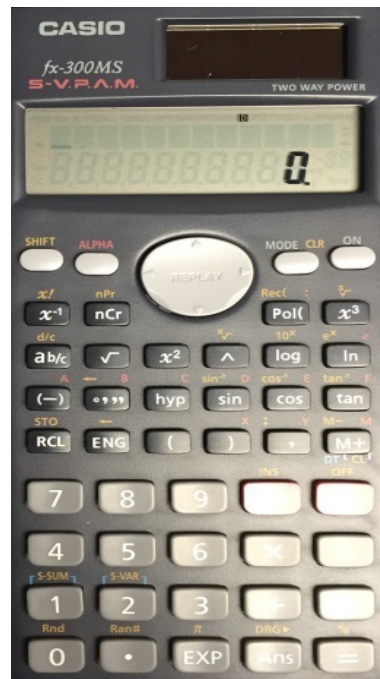
Appendix B: Calculator Use

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.

Casio FX-260



Casio FX-300 MS



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 E

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

1 T F A B C D E 26 T F A B C D E 51 T F A B C D E 76 T F A B C D E
 2 A B C D E 27 A B C D E 52 A B C D E 77 A B C D E
 3 A B C D E 28 A B C D E 53 A B C D E 78 A B C D E
 4 A B C D E 29 A B C D E 54 A B C D E 79 A B C D E
 5 A B C D E 30 A B C D E 55 A B C D E 80 A B C D E
 6 A B C D E 31 A B C D E 56 A B C D E 81 A B C D E
 7 A B C D E 32 A B C D E 57 A B C D E 82 A B C D E
 8 A B C D E 33 A B C D E 58 A B C D E 83 A B C D E
 9 A B C D E 34 A B C D E 59 A B C D E 84 A B C D E
 10 A B C D E 35 A B C D E 60 A B C D E 85 A B C D E
 11 A B C D E 36 A B C D E 61 A B C D E 86 A B C D E
 12 A B C D E 37 A B C D E 62 A B C D E 87 A B C D E
 13 A B C D E 38 A B C D E 63 A B C D E 88 A B C D E
 14 A B C D E 39 A B C D E 64 A B C D E 89 A B C D E
 15 A B C D E 40 A B C D E 65 A B C D E 90 A B C D E
 16 A B C D E 41 A B C D E 66 A B C D E 91 A B C D E
 17 A B C D E 42 A B C D E 67 A B C D E 92 A B C D E
 18 A B C D E 43 A B C D E 68 A B C D E 93 A B C D E
 19 A B C D E 44 A B C D E 69 A B C D E 94 A B C D E
 20 A B C D E 45 A B C D E 70 A B C D E 95 A B C D E
 21 A B C D E 46 A B C D E 71 A B C D E 96 A B C D E
 22 A B C D E 47 A B C D E 72 A B C D E 97 A B C D E
 23 A B C D E 48 A B C D E 73 A B C D E 98 A B C D E
 24 A B C D E 49 A B C D E 74 A B C D E 99 A B C D E
 25 A B C D E 50 A B C D E 75 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	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	

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

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 Immigration, Population Growth and Skills
Apprenticeship and Trades Certification Division
Standards and Curriculum Unit
45 Tilley's Road, Clarenville, NL A5A 1Z4
Fax: (709) 466-3987

RED SEAL DOCUMENT COPIES

(ACRONYMS; TOOLS/EQUIPMENT; GLOSSARY)

APPENDIX D

ACRONYMS

AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
BIM	Building Information Modeling
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 E

TOOLS AND EQUIPMENT

Hand Tools

adjustable wrench
aviation snips R.H. and L.H.
(various)
ball peen hammer
banding tools
bulldog snips
bumping hammers
caulking gun
C-clamp
center punch
chalk line
chipping hammer
chisels
combination snip
divider
drift pin
duct puller/stretcher
files
groove seamer – hand groover
hacksaw
hand crimpers
hand dolly
hand notcher
hand seamer/folding pliers
hex keys
hole punch
levels
locking pliers
magnets
mallet
marking pen
paint brush
pipe wrench
pliers
plumb bob
riveter
prick punch
rivet set
riveting hammer
scraper
scratch awl
screwdrivers
scriber
setting hammer
side cutters
socket set soldering
coppers straight edge
tap and die
wire and bolt cutters
wire brushes
wrenches

Portable Power Tools and Accessories

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
uni-shear

Shop Tools and Equipment

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
flange (TDF)
machine
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

Rotary Machines

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)

Metal Forming Bench Stakes

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

Welding, Brazing, Soldering and Cutting Equipment

AC power unit
AC/DC power unit
butane torch
electric soldering iron
gas metal arc welding (GMAW) equipment
gas tungsten arc welding (GTAW) equipment
laser cutting equipment
oxy-fuel welding (OFW) equipment
plasma cutting equipment
shielded metal arc welding (SMAW) equipment
soldering coppers
soldering furnace or pot
spot welder
strong-back
tiger torch
water jet cutting equipment

Layout and Drafting Equipment

beam compass
circumference
rule
combination
square
compass
divider
drafting arm
drafting pencil
drafting table
eraser shield
framing square
parallel bar
protractor
scale ruler
set square
stencil
template
trammel points
triangle
T-square

Measuring Tools

angle finder
angle rule
bench rule
caliper
laser level
laser
measure
micrometer
tape
measure
transit level
vernier
caliper

Access Equipment

aerial work
platforms ladders
mast climbing lift
scaffolds
swing stage

Testing Equipment

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
tachometer
U tube manometer
velometer

Hoisting and Rigging Equipment

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

Computer Assisted Tools and Office Equipment

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

Personal Protective Equipment and Safety Equipment

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

APPENDIX F

GLOSSARY

annealing	process by which metal is heated to relieve stress, changing the metal's strength and hardness
backer rod	small foam rod or cord used to fill gaps between building materials
blank piece	piece of material cut to size prior to notching or marking
brake	manual or power equipment used to bend and form metal; may be CNC or manually controlled
breeching	the portion of a combustion venting system between appliance and the chimney or stack used for exhausting fumes and gases
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
burglar bars	heavy steel bars installed inside ductwork to prevent access
cladding	a material (metal or composite) that covers another material to provide a skin or a layer; it is intended to control infiltration of weather elements or for aesthetic purposes.

code B-139	provides minimum requirements for the installation of, alteration to, or addition to oil-burning equipment, components and accessories
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
coping (architectural)	material used as the capping of a wall
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
damper	valve or plate that stops or regulates the flow of air or materials
duct traverse	series of evenly spaced pressure readings inside of a duct to measure various pressures at points within the duct
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

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
isolation	product used between two dissimilar metals to prevent galvanic corrosion (used in roofing, air handling and material handling applications)
isolator	components that minimize noise, sound and vibration transfer
lagging	protects insulation from damage and provides a barrier around the insulation; it also creates a true, flat and even surface for aesthetic purposes
parallel line development	method of pattern development based upon lines at an equal distance at all points
plasma cutting	process used to cut metal using a plasma torch
radial line development	method of conical pattern development where all points radiate from a common apex
seam/lock	any process of connecting two pieces or two ends of metal together
shear	equipment or a process of cutting sheet metal

stake	equipment used in forming material by hand; usually found in a sheet metal shop
stand-offs	material or device used to create a gap between two layers of material gross stretch-out: overall length of material, including locks and seams
stretch-out	net stretch-out: overall length of material, not including locks and seams
strongback	support to keep a welding joint straight and prevent weld distortion
thermal insulation	material installed on the outside of duct used to reduce the rate of heat transfer
triangulation development	method of pattern development using right angle triangles and two known points to find a third unknown point

