

Motor Vehicle Body Repairer (Metal and Paint) Level 3

Motor Vehicle Body Repairer (Metal and Paint)

Unit: A6 Manitoba Ozone Protection Industry Association (MOPIA)

Level: Three

Duration: 4 hours

Theory: 4 hours

Practical: 0 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of MOPIA. Topics will include: diagnosing, servicing and repairing problems related to all key aspects of HVAC. **Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.**

Objectives and Content:

**Percent of
Unit Mark (%)**

1. Describe the fundamentals, health/safety issues and procedures/requirements involved in the handling of Chlorofluorocarbons (CFCs), Hydrofluorocarbons (HFCs) and Hydrochlorofluorocarbons (HCFCs).

n/a

- a. CFC, HFC and HCFC fundamentals
 - Environmental damage potential of compounds
 - CFC and the ozone layer
 - The Montreal protocol
 - CFC: refrigeration and manufacturing industries
 - Ozone Depletion Potential (ODP)
 - Chemical makeup and stability
 - ODP factors for various refrigerants
 - Global warming
 - Control strategies for CFCs, HFCs and HCFCs
 - Environment Canada's role
 - Code practice
 - Responsibilities of service personnel
 - Implementation dates of legislation
- b. Health and safety issues: ozone depleting substances
 - Personnel safety equipment used when handling compounds
 - Eye, hand and face protection
 - Handling dangers: CFCs, HFCs and HCFCs
 - Toxicity
 - Flammability
 - Handling precautions
 - Inhalation
 - Skin and eye contact
 - Cylinder temperatures and pressures
- c. Procedures and requirement: the handling and release of ozone depleting substances

- The four “Rs” of emission reduction
 - Recovery
 - Reuse
 - Recycle
 - Reclaim
- Equipment used to cover refrigerants
- Refrigerant storage tank types: implications of use
- Provincial regulations: handling of recovered ozone depleting substances
- CFC code of practice
- Record keeping requirements
 - Recovered refrigerant
 - Vehicle tagging
 - Cylinder inventories
 - Refrigerant transfers
- Maintenance procedures: recovery and recharging equipment
- Safe operating procedures: recovery and recharging equipment
 - Safety wear
 - Overpressure, overfilling
- Identification and use of reclaim cylinders
- Identification bands
- Contents, recycled gas
- Types of quick disconnects and one-way check valves

2. Describe the major components and operating principles used in mobile air conditioning systems.

n/a

- a. Laws of physics applicable to air conditioning system operation
 - Heat absorption
 - Solid, liquid and gas states
 - Gas laws, temperature, pressure and volume
 - Temperature and humidity relationship
 - Thermal expansion and contraction
 - Methods of heat transfer
 - Air Conditioning (A/C) thermodynamics
 - Refrigerant compressors
 - System lubrication
 - Properties of refrigerants
 - Alternative refrigerants
 - Refrigerant waste law requirements
 - Major components of air conditioning systems
 - Condenser
 - Receiver dehydration
 - Accumulator-dryer
 - Evaporators
 - Compressors (axial recirculating; radial; variable displacement)
 - Hoses, lines and fittings
 - Low and high pressure cutout
 - Low charge protection
 - Evaporator temperature control
 - Cycling clutch control
 - Orifice tubes
 - Expansion valves
 - Fan controls
 - Role of lubricant used in A/C operation
 - Refrigeration oils (R12 and R134A systems)
 - Red Tec refrigerant
 - Refrigerant characteristics
 - R134A

- Tetrafluoroethane
- Boiling point, toxicity, flammability, etc.
- Lubricants for refrigerants
- Air conditioning thermodynamics
- Other refrigerants

3. Describe and perform the diagnosis, inspection, testing and repair of air conditioning and climate control systems.

n/a

a. Diagnosis, inspection and testing methods

- Testing methods
 - Dyes
 - Electronic leak detectors
 - Bubble producing solutions
 - Nitrogen testing
- Testing
- Refrigerant identification
- Testing for refrigerant leaks
 - Dyes
 - Electronic leak detectors
 - Bubble producing solutions
 - Nitrogen testing
 - Fittings
 - Lines
 - Deals
 - Compressors
 - Evaporator
 - Condenser
- Testing system operating pressures and control functions
- Observations during performance tests
- Observance of government regulations for testing
- System tests for low and high pressure using a manifold gauge set
- Testing overall system for leaks using recommended equipment and procedures

b. Repair air conditioning systems and components

- Removal and replacement
 - Compressors, evaporators, condensers and control devices
- Compressor drive belt adjustment procedures
- Discharging, evacuating recovery, recycle and recharging
- Line and leakage repairs
- Service procedures
- Refrigeration systems service
- Retrofitting

c. Inspection, testing and diagnostic procedures on climate and control systems

- System and component diagnosis with recommended repair
- Control system circuit operation (using appropriate test equipment)

Motor Vehicle Body Repairer (Metal and Paint)

Unit: B4 Trade Formulations - III

Level: Three

Duration: 14 hours

Theory: 14 hours

Practical: 0 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of trade formulations. Topics will include: payroll calculations and purchasing parts and paint.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the procedures for performing payroll calculations.	10%
2. Describe the procedures for purchasing parts.	50%
3. Describe the procedures for purchasing paint.	40%

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Unit: C5 Resistance Spot Welding (RSW)

Level: Three

Duration: 3 hours

Theory: 1 hour

Practical: 2 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of resistance spot welding (RSW). Topics will include: describing the application of resistance spot welding (RSW) and squeeze type resistance spot welding (STRSW) and safety precautions in RSW and STRSW.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe resistance spot welding (RSW) and squeeze type resistance spot welding (STRSW) and their applications.	49%
2. Identify safety precautions relating to resistance spot welding and squeeze type resistance spot welding. a. Personal b. Equipment c. Vehicle	21%
3. Demonstrates welds using STRSW equipment	30%

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Unit: D5 Restraint Systems

Level: Three

Duration: 12 hours

Theory: 8 hours

Practical: 4 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of restraint systems. Topics will include: describing the types and location of restraint systems and their components, document interpretation for servicing restraint systems, safety considerations, installing, inspecting, and removing seat belt restraint systems, installing and removing air bags and performing operational checks of restraint systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify the types and location of restraint systems and their components and operation.	14%
a. Active	
b. Passive	
2. Identify and interpret documentation relating to servicing restraint systems.	7%
a. Service manuals (airbag replacement manual)	
b. Original equipment manufacturer (OEM) recommendations	
3. Identify safety considerations relating to restraint systems and their components.	7%
a. Handling	
b. Storage	
c. Disposal	
4. Describe the procedures used to install, inspect, and remove seat belt restraint systems and their components.	14%
5. Describe the procedures used to install and remove air bags and their related components.	18%
6. Describe the procedures used to perform operational check of restraint systems.	10%
7. Inspect seat belts.	5%
8. Locate and identify Safety Restraint Systems (SRS).	9%
9. Locate and retrieve restraint related codes.	5%
10. Remove and re-install air bags.	11%

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Unit: E3 Damage Analysis of Conventional Frames and Unitized Bodies

Level: Three

Duration: 16 hours

Theory: 4 hours

Practical: 12 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of damage analysis of conventional frames and unitized bodies. Topics will include: describing energy management zones, tools and equipment, analyzing damage to unitized bodies and conventional frames.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify and locate energy management zones in conventional frames and unitized bodies. a. Crumple/crush zone	14%
2. Identify and describe tools and equipment used to analyze damage to conventional frames and unitized bodies, their applications and procedures for use.	28%
3. Identify and describe the procedures and considerations for analyzing damage to unitized bodies.	14%
4. Identify and describe the procedures and considerations for analyzing damage to <i>conventional</i> frames.	14%
5. Locate energy management zones in unitized bodies and conventional frames.	12%
6. Perform damage analyses on both a unitized body and conventional frame.	18%

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Unit: E4 Damage Analysis and Estimating Costs

Level: Three

Duration: 8 hours

Theory: 2 hours

Practical: 6 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of damage analysis and estimating costs. Topics will include: communicating estimates, sources of information for prepping estimates, procedures in performing damage analysis and preparing estimate documentation.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the importance of effective communication relating to preparing estimates. a. Customers b. Co-workers c. Appraisers d. Insurance adjusters	7%
2. Identify the sources of information used in the preparation of estimates.	7%
3. Describe the procedures used to perform damage analysis.	28%
4. Describe the procedures used to prepare estimate documentation.	28%
5. Locate and list all of the necessary sources of information from the vehicle and applicable data bases.	9%
6. Perform estimate and prepare estimate documentation.	21%

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Unit: F5 Structural Components

Level: Three

Duration: 54 hours

Theory: 4 hours

Practical: 50 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of structural components. Topics will include: describing structural components, safety considerations when repairing or replacing structural components, inspecting structural components, tools and equipment, removing, re-installing, replacing, adjusting and aligning structural components and protecting electrical and electronic components during repair.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify and describe structural components.	7%
2. Identify and explain safety consideration when repairing or replacing structural components.	4%
3. Describe the procedures used to inspect structural components.	7%
a. Corrosion	
b. Collision	
4. Identify and describe tools and equipment used to repair or replace structural components.	4%
5. Describe the procedures and techniques used to repair structural components.	13%
a. Original equipment manufacturer (OEM) recommendations	
b. Industry standards (tested procedures)	
6. Describe the procedures used to remove and re-install structural components.	7%
7. Describe the procedures used to replace structural components.	14%
a. Full replacement	
b. Sectioning	
8. Describe the procedures used to adjust and align structural components.	4%
9. Describe the procedures and techniques used to protect electrical and electronic systems and components during repair.	10%

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| 10. Inspect structural components for corrosion and collision. | 3% |
| 11. Use tools and equipment to repair and replace structural components. | 3% |
| 12. Remove and re-install structural components. | 9% |
| 13. Adjust and align structural components. | 9% |
| 14. Repair structural components. | 6% |

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Unit: F6 Non-structural Components

Level: Three

Duration: 54 hours

Theory: 4 hours

Practical: 50 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of non-structural components. Topics will include: describing non-structural components, safety considerations when repairing or replacing non-structural components, inspecting non-structural components, tools and equipment, removing, re-installing, replacing, adjusting and aligning non-structural components and protecting electrical and electronic components during repair.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify and describe non-structural components.	7%
2. Identify and describe safety consideration when repairing or replacing non-structural components.	4%
3. Describe the procedures used to inspect non-structural components.	7%
a. Corrosion	
b. Collision	
4. Identify and describe tools and equipment used to repair or replace non-structural components.	4%
5. Describe the procedures used to repair non-structural components.	13%
a. Original equipment manufacturer (OEM) recommendations	
b. Industry standards (tested procedures)	
6. Describe the procedures used to remove and re-install non-structural components.	7%
7. Describe the procedures used to replace non-structural components.	14%
a. Full replacement	
b. Sectioning	
8. Describe the procedures used to adjust and align non-structural components.	4%
9. Describe the procedures and techniques used to protect electrical and electronic systems and components during repair.	10%

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| 10. Inspect non-structural components for corrosion and collision. | 3% |
| 11. Use tools and equipment to repair and replace non-structural components. | 3% |
| 12. Remove and re-install non-structural components. | 9% |
| 13. Adjust and align non-structural components. | 9% |
| 14. Repair non-structural components. | 6% |

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Unit: F7 Measuring and Gauging

Level: Three

Duration: 13 hours

Theory: 3 hours

Practical: 10 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of measuring and gauging. Topics will include: point-to-point measuring tools and accessories, making point to point measurements, three section principle, Datum, and Centreline, three dimensional measuring systems, theories of three dimensional measuring systems, dimension sheets, OEM and collision specification manuals, dimensions for computerized measuring, additional measuring resources, repair tolerance, types of damage conditions, procedures for preparing to measure vehicles, procedures and equipment for under and upperbody measurements and confirming measurements and comparing readings with collision damage.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify and describe point-to-point measuring tools and accessories.	3%
a. Tram gauge	
2. Identify and describe the procedures for making point-to-point measurements.	4%
a. Measure from different points and locations	
b. Check dimensional integrity to manufacturer's specifications	
3. Identify and describe three section principle.	3%
a. Front section	
b. Centre section	
c. Rear section	
4. Identify and describe Datum and Centreline	4%
a. Height and width measurements from Datum and Centreline	
5. Identify and describe three-dimensional measuring systems	3%
a. Measuring with self-centering gauges	
b. Reading self-centering gauges	
c. Length measurements from tape measure, tram gauge, three dimensional and self-centering gauges.	
d. Strut tower gauge	
6. Describe the theories of three-dimensional measuring systems.	4%
a. Universal mechanical measuring system theory	

- b. Universal laser measuring system theory
 - c. Computerized measuring system – electromechanical theory
 - d. Computerized measuring system – laser theory
 - e. Computerized measuring system – ultrasonic
 - f. Fixture measuring system theory
- 7. Describe dimension sheets. 3%**
- a. Types of dimension specifications
 - b. Underhood and upperbody dimensional manual measurements
 - c. Reading and understanding dimension sheets
 - d. Symmetrical and asymmetrical
 - e. Icons
 - f. Measuring to compensate for weight
 - g. Measuring movable parts
- 8. Identify OEM and Collision Specification Manuals. 4%**
- 9. Describe dimensions for computerized measuring. 3%**
- 10. Identify and describe additional measuring resources for comparative measurements and measurements from an undamaged vehicle. 4%**
- 11. Describe the procedures for repair tolerance and tolerance with 3D measurements. 3%**
- 12. Identify and describe types of damage conditions. 4%**
- a. Diamond
 - b. Twist
 - c. Sag
 - d. Mash
 - e. Sidesway
- 13. Describe interacting damage conditions. 4%**
- 14. Identify and describe the procedures for preparing to measure a vehicle with points for measuring vehicles, measuring objectives, measuring for damage analysis and measuring for repair. 4%**
- 15. Identify and describe measuring worksheets. 4%**
- 16. Identify and describe the procedures for measuring the centre section through checking the centre section, attaching measuring equipment, anchoring and working with a damaged centre section. 4%**
- 17. Describe the procedures for making underbody and upperbody measurements. 4%**
- 18. Identify and describe the procedures for making upperbody measurements and three-dimensional equipment for upperbody measurements. 4%**
- a. Upperbody – door opening (point-to-point and comparison)
- 19. Identify and describe procedures for confirming measurements and comparing readings with collision damage. 4%**
- 20. Demonstrate ability to perform various measurements. 15%**

- a. Point to point
- b. Comparison
- c. Length
- d. Width
- e. Height
- f. Suspension
- g. Rag rail
- h. Three-dimensional

- 21. Demonstrate ability to reference specification sheet and computerize. 6%**
- 22. Demonstrate set-up procedures for anchoring and applying correct force. 9%**

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Unit: G2 Electrical Program I

Level: Three

Duration: 13 hours

Theory: 8 hours

Practical: 5 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of electrical program I. Topics will include: describing electrical and electronic systems and accessories, tools and equipment, safety considerations, protecting electrical and electronic systems during repairs, electrical and electronic damage, using, repairing, and adjusting electrical and electronic systems and accessories, diagnosing, repairing and replacing electrical and electronic systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify electrical systems, electronic systems and accessories. a. Vehicle management systems b. Electrical generation and distribution systems c. Lighting systems d. Personal comfort systems	13%
2. Identify tools and equipment used in electrical and electronic repairs and describe their applications and procedures for use.	7%
3. Identify and describe safety considerations associated with electrical and electronic systems during repairs. a. Personal b. Vehicle	7%
4. Describe the procedures to protect electrical and electronic systems during repairs.	11%
5. Describe electrical and electronic damage associated with collisions.	7%
6. Describe the procedures used to diagnose electrical or electronic systems and components.	11%
7. Describe the procedures used to repair and replace electrical and electronic systems and components.	14%
8. Test electrical circuits for continuity, resistance, voltage/amperage and grounds.	18%
9. Diagnose and repair a lighting circuit.	12%

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Unit: G3 Mechanical Systems and Components

Level: Three

Duration: 16 hours

Theory: 4 hours

Practical: 12 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of mechanical systems and components. Topics will include: describing mechanical components, safety considerations, describing regulations and documentation relating to servicing, tools and equipment, inspecting, removing, and re-installing mechanical components for collision repair, cleaning, repairing, and replacing mechanical components and performing operational checks.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify mechanical components. a. Drive train b. Exhaust system c. Fuel system d. Heating/cooling system e. accessories	7%
2. Identify and describe safety considerations relating to servicing mechanical systems and components. a. Personal b. Shop/facility c. Environment	4%
3. Identify and describe regulations and documentation relating to servicing mechanical systems. a. Jurisdictional regulations b. Federal regulations	4%
4. Identify tools and equipment used to service mechanical systems and components.	4%
5. Describe the procedures to inspect mechanical systems for collision related damage.	4%
6. Describe the procedures used to remove and re-install mechanical components in order to perform collision repairs.	19%

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| 7. Describe the procedures used to clean, repair and replace mechanical system components. | 14% |
| 8. Describe the procedures used to perform operational check of mechanical system and components. | 14% |
| 9. Perform an inspection of the mechanical systems on a vehicle for collision damage. | 15% |
| 10. Remove, clean, repair, and re-install mechanical components of a vehicle. | 15% |

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Unit: H7 Refinishing III

Level: Three

Duration: 38 hours

Theory: 8 hours

Practical: 30 hours

Overview:

This unit is designed to provide the motor vehicle body repair apprentice with an overview of refinishing. Topics will include: describing colour theory and colour matching, mixing and applying single and multi-stage finishes, refinishing plastic parts, blending top coats and identifying defects and preventing and correcting topcoat defects.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe colour theory.	7%
2. Describe the procedures used for colour matching.	20%
3. Describe the procedures for mixing and applying single stage finishes.	4%
a. Spot	
b. Panel	
c. Complete	
4. Describe the procedures for mixing and applying multi-stage finishes.	7%
a. Spot	
b. Panel	
c. Complete	
5. Describe the procedures used to refinish plastic parts.	4%
a. Interior	
b. Exterior	
6. Describe the procedures used to blend top coats.	21%
a. Single stage	
b. Base coat	
c. Multi-stage	
7. Identify topcoat defects that occur during application and describe the procedures used to prevent and correct them.	7%
8. Demonstrate the procedures for:	30%
a. Colour matching	

- b. Various blending techniques
- c. Mixing and applying single stage finishes
- d. Mixing and applying basecoat, clearcoat, and tri-coats
- e. Refinishing plastic parts
- f. Correcting and preventing topcoat defects
