9033
Damage Analysis and Structural Repairs (12A)

40S/40E/40M

A Collision Repair and Refinishing Technology Course

9033: Damage Analysis and Structural Repair (12A) 40S/40E/40M

Course Description

In this course, students will increase their knowledge of and skills in analyzing damage, planning repairs, and measuring and straightening. They will repair and replace damaged panels and structural components, repair and replace glass components, and restore corrosion protection.

Goal 1: Describe and apply appropriate **health and safety** practices.

GLO 1.1: Describe and apply appropriate **health and safety** practices.

SLO 12A.1.1.1: Identify safety and health requirements. (A2.1)

SLO 12A.1.1.2: Describe the importance of using personal protective equipment (PPE), and identify PPE and procedures. (A2.2) (TSA 16)

SLO 12A.1.1.3: Identify electrical safety, and outline the safety principles for working on and around electrical equipment. (A2.3) (TSA 18)

SLO 12A.1.1.4: Identify fire safety, and outline workplace fire safety principles. (A2.4) (TSA 19)

SLO 12A.1.1.5: Recognize and control hazards. (A2.6)

SLO 12A.1.1.6: Demonstrate awareness of the hazards of confined space entry, and identify the hazards in confined spaces and the preparation needed to work in a confined space. (A2.7) (TSA 20)

SLO 12A.1.1.7: Describe basic first aid and cardiopulmonary resuscitation (CPR) requirements and techniques. (A2.8)

SLO 12A.1.1.8: Explain the Workplace Hazardous Material Information System (WHMIS), and identify the WHMIS safety requirements. (A2.9) (TSA 13)

SLO 12A.1.1.9: Identify and control hazards. (A2.10)

SLO 12A.1.1.10: Identify safety precautions related to gas metal arc welding. (C2.2)

SLO 12A.1.1.11: Identify and describe safety considerations and procedures related to fasteners and adhesives. (D2.1)

SLO 12A.1.1.12: Practise safety precautions related to batteries. (B2.8)

SLO 12A.1.1.13: Identify safety considerations when working with body fillers and abrasives. (F2.4)

SLO 12A.1.1.14: Create and maintain a safe and organized working environment.

SLO 12A.1.1.15: Follow guidelines listed in the Safe Work Procedure for specific tasks.

SLO 12A.1.1.16: Demonstrate an awareness of the safety procedures related to removing and installing glass.

SLO 12A.1.1.17: Identify and explain safety considerations when repairing or replacing structural components. (Level 3, F5.2)

GLO 1.2: Demonstrate knowledge of the *Trade Safety Awareness Manual*.

No applicable SLOs.

Goal 2: Select, use, and manage **tools and equipment**.

GLO 2.1: Select and manage **tools and equipment**.

SLO 12A.2.1.1: Select and manage tools and equipment used in damage analysis and structural repair.

SLO 12A.2.1.2: Identify types of testing/diagnostic equipment, and describe their applications. (A4.4)

SLO 12A.2.1.3: Identify types of straightening equipment, and describe their applications. (A4.8)

SLO 12A.2.1.4: Identify and describe gas metal arc welding equipment and accessories. (C2.3)

SLO 12A.2.1.5: Identify tools and equipment used in stationary glass replacement and their procedures for use. (Level 2, D3.6)

SLO 12A.2.1.6: Identify and describe tools and equipment used to repair or replace structural components. (Level 3, F5.4)

GLO 2.2: Use **tools and equipment**.

SLO 12A.2.2.1: Use tools and equipment applicable to damage analysis and structural repair.

SLO 12A.2.2.2: Use tools and equipment applicable to removing and installing glass.

SLO 12A.2.2.3: Demonstrate the use of various testing/diagnostic equipment. (A4.13)

Goal 3: Demonstrate vehicle **damage analysis** and **repair estimation**.

GLO 3.1: Demonstrate vehicle **damage analysis**.

SLO 12A.3.1.1: Determine whether damaged glass should be repaired or replaced.

SLO 12A.3.1.2: Explain the need to inspect structural components for damage or corrosion.

GLO 3.2: Demonstrate vehicle **repair estimation**.

SLO 12A.3.2.1: Estimate time and materials required to complete repairs.

SLO 12A.3.2.2: Create repair estimates.

Goal 4: Demonstrate **welding** procedures.

GLO 4.1: Demonstrate **welding** procedures.

SLO 12A.4.1.1: Prepare surfaces for welding.

SLO 12A.4.1.2: Define and describe GMAW (gas metal arc welding), related terminology, and its applications. (C2.1)

SLO 12A.4.1.3: Identify the types of welds performed using GMAW equipment. (C2.4)

SLO 12A.4.1.4: Describe the procedures used to gas metal arc weld various substrates. (C2.5)

SLO 12A.4.1.5: Identify weld defects, their causes, and the procedures to prevent and correct them. (C2.6)

SLO 12A.4.1.6: Operate, troubleshoot, and maintain GMAW equipment. (C2.7)

SLO 12A.4.1.7: Describe and perform various types of welds (lap, butt, flat, plug, recessed, tack, stitch, and continuous) in various positions (overhead, horizontal, and vertical). (C2.8)

Goal 5: Demonstrate **structural repair**.

GLO 5.1: Demonstrate an understanding of **vehicle construction**.

SLO 12A.5.1.1: Identify types of vehicle construction, and describe their characteristics. (D1.1)

SLO 12A.5.1.2: Identify body sections, and describe their components. (D1.2)

SLO 12A.5.1.3: Identify and describe structural and non-structural components. (D1.3)

SLO 12A.5.1.4: Identify and describe the types of materials used in vehicle construction. (D1.4)

SLO 12A.5.1.5: Demonstrate sheet metal panel adjustments. (D1.5)

SLO 12A.5.1.6: Identify and describe structural components. (Level 3, F5.1)

GLO 5.2: Demonstrate **measuring and gauging**.

SLO 12A.5.2.1: Identify and describe point-to-point measuring tools and accessories. (Level 3, F7.1)

SLO 12A.5.2.2: Identify and describe the procedures for making point-to-point measurements. (Level 3, F7.2)

SLO 12A.5.2.3: Identify and describe the three-section principle. (Level 3, F7.3)

SLO 12A.5.2.4: Identify and describe *datum* and *centreline*. (Level 3, F7.4)

SLO 12A.5.2.5: Identify and describe three-dimensional measuring systems. (Level 3, F7.5)

GLO 5.3: Perform **structural repairs**.

SLO 12A.5.3.1: Explain the importance of vehicle structures being dimensionally correct.

SLO 12A.5.3.2: Participate in aligning a vehicle to manufacturer's specifications.

SLO 12A.5.3.3: Perform fit-up on replacement sheet metal components.

SLO 12A.5.3.4: Describe the procedures and techniques used to repair structural components. (Level 3, F5.5)

SLO 12A.5.3.5: Describe the procedures used to remove and reinstall structural components. (Level 3, F5.6)

SLO 12A.5.3.6: Describe the procedures used to replace structural components. (Level 3, F5.7)

SLO 12A.5.3.7: Describe the procedures used to adjust and align structural components. (Level 3, F5.8)

Goal 6: Demonstrate **sheet metal repair**.

GLO 6.1: Demonstrate an understanding of the **properties** of metal.

SLO 12A.6.1.1: Describe the types of automotive sheet metal. (F1.1)

SLO 12A.6.1.2: Define and explain terms associated with metallurgy. (B2.1)

SLO 12A.6.1.3: Describe the properties of metals. (B1.1, B2.3)

SLO 12A.6.1.4: Describe heat and its effect on metals. (B1.2)

SLO 12A.6.1.5: Describe high strength steel (HSS) and its applications. (B1.3)

SLO 12A.6.1.6: Describe the effects metal working has on metallurgic properties. (B2.5)

GLO 6.2: Repair sheet metal.

SLO 12A.6.2.1: Identify and describe types of damage to sheet metal. (F1.2)

SLO 12A.6.2.2: Identify considerations when performing metal work on sheet metal. (F1.3)

SLO 12A.6.2.3: Identify the types of panels and their associated repair procedures. (F1.4)

SLO 12A.6.2.4: Demonstrate the methods used to detect surface irregularities. (F1.6)

SLO 12A.6.2.5: Demonstrate the procedures used to rough out and align damaged sheet metal. (F1.7)

SLO 12A.6.2.6: Demonstrate the procedures used to prepare sheet metal for application of fillers. (F1.8)

SLO 12A.6.2.7: Demonstrate unlocking and reshaping metal, dent removal, shrinking, and stress relieving. (F1.10)

SLO 12A.6.2.8: Determine primary and secondary damage. (F1.11)

SLO 12A.6.2.9: Demonstrate the procedures to prevent or correct problems that occur when working metals. (B2.6)

Goal 7: Select, use, and manage **seam sealers, fillers,** and **adhesives**.

GLO 7.1: Select, use, and manage **seam sealers** and **adhesives**.

SLO 12A.7.1.1: Demonstrate the identification, selection, application, maintenance, and management of seam sealers used in structural repairs.

SLO 12A.7.1.2: Demonstrate the identification, selection, application, maintenance, and management of adhesives used in structural repairs.

Goal 8: Select, use, and manage **fasteners**.

GLO 8.1: Select, use, and manage **fasteners**.

No applicable SLOs.

Goal 9: Demonstrate **glass repair and replacement**.

GLO 9.1: Demonstrate **glass repair and replacement**.

SLO 12A.9.1.1: Identify the types of stationary glass and describe their characteristics. (Level 2, D3.1)

SLO 12A.9.1.2: Describe stationary glass and its importance to the vehicle structure/integrity. (Level 2, D3.2)

SLO 12A.9.1.3: Describe the procedures used to determine if stationary glass can be repaired or if replacement is necessary. (Level 2, D3.3)

SLO 12A.9.1.4: Identify the installation methods for stationary glass, and describe the associated components. (Level 2, D3.4)

SLO 12A.9.1.5: Identify the types of movable glass and describe their characteristics. (Level 2, D4.1)

SLO 12A.9.1.6: Describe movable glass–related hardware. (Level 2, D4.2)

SLO 12A.9.1.7: Identify the fastening methods for movable glass, and describe the associated components. (Level 2, D4.3)

Goal 10: Demonstrate repair and replacement of **upholstery, trim,** and **hardware**.

GLO 10.1: Repair and replace **upholstery**.

No applicable SLOs.

GLO 10.2: Repair and replace **trim** and **hardware**.

No applicable SLOs.

Goal 11: Demonstrate **surface preparation**.

GLO 11.1: Select, use, and manage **materials other than abrasives** used in surface preparation.

SLO 12A.11.1.1: Demonstrate the safe and appropriate identification, selection, use, and management of weld-through coatings.

GLO 11.2: Select, use, and manage **abrasives** used in surface preparation.

SLO 12A.11.2.1: Select, use, and manage abrasives.

GLO 11.3: Prepare substrates.

SLO 12A.11.3.1: Prepare surfaces for welding and other forms of structural repair.

Goal 12: Demonstrate **refinishing**.

GLO 12.1: Demonstrate **refinishing** processes.

No applicable SLOs.

Goal 13: Demonstrate **cleaning and detailing**.

GLO 13.1: Demonstrate **cleaning and detailing**.

No applicable SLOs.

Goal 14: Describe **vehicle systems**.

GLO 14.1: Describe **vehicle systems**.

SLO 12A.14.1.1: Demonstrate understanding of the functioning and replacement of passenger restraint systems.

Goal 15: Describe and demonstrate transferable **cross-curricular** knowledge and skills.

GLO 15.1: **Read, interpret, and communicate** information.

SLO 12A.15.1.1: Read, interpret, and communicate information from technical service bulletins.

SLO 12A.15.1.2: Read, interpret, and communicate information from supplier labels.

GLO 15.2: Apply knowledge and skills from **mathematics**.

SLO 12A.15.2.1: Demonstrate the mathematical skills required to create vehicle repair estimates.

GLO 15.3: Apply knowledge and skills from **information and communication technology**.

SLO 12A.15.3.1: Retrieve estimating information from online and printed sources (e.g., Mitchell).

GLO 15.4: Apply knowledge and skills from the **sciences**.

SLO 12A.15.4.1: Describe the effects of heat on metal.

SLO 12A.15.4.2: Discuss the effects of overcatalyzing fillers.

SLO 12A.15.4.3: Describe simple machines and pulleys. (B1.4)

SLO 12A.15.4.4: Describe hydraulic concepts. (B1.5)

Goal 16: Understand **career opportunities** and the **working environment**.

GLO 16.1: Describe **education, career opportunities, professional organizations,** and **working environments** related to collision repair and refinishing technology and associated fields.

SLO 12A.16.1.1: Describe apprenticeship, education, and career opportunities, and professional organizations related to estimating.

SLO 12A.16.1.2: Describe working environments related to estimating.

Goal 17: Demonstrate an awareness of **sustainability**.

GLO 17.1: Describe the effects of collision repair and refinishing technology on **human health and well-being**, including on tradespersons working in the field and those who use their services.

SLO 12A.17.1.1: Discuss long-term health concerns related to welding.

SLO 12A.17.1.2: Demonstrate the use of dust collection systems.

GLO 17.2: Describe collision repair and refinishing technology's **sustainability practices** and **impact on the environment**.

SLO 12A.17.2.1: Practise recycling materials.

GLO 17.3: Describe **sustainable business practices** within collision repair and refinishing technology.

SLO 12A.17.3.1: Discuss the importance of staying current with industry trends.

Goal 18: Demonstrate an awareness of **ethical and legal standards** as they pertain to collision repair and refinishing technology.

GLO 18.1: Practise **ethical and legal standards** as they pertain to collision repair and refinishing technology.

SLO 12A.18.1.1: Discuss the characteristics of quality repairs, including following manufacturer's specifications.

SLO 12A.18.1.2: Discuss the liability associated with substandard repairs.

Goal 19: Demonstrate **employability skills**.

GLO 19.1: Demonstrate fundamental **employability skills**.

SLO 12A.19.1.1: Demonstrate regular and punctual attendance.

SLO 12A.19.1.2: Demonstrate the ability to communicate respectfully and effectively with teachers, supervisors, co-workers, and students.

SLO 12A.19.1.3: Demonstrate accountability by taking responsibility for own actions.

SLO 12A.19.1.4: Demonstrate adaptability, initiative, and effort.

SLO 12A.19.1.5: Demonstrate teamwork skills.

SLO 12A.19.1.6: Demonstrate the ability to stay on task and use time effectively in class and work environments.

SLO 12A.19.1.7: Demonstrate the responsible use of wireless communication devices.

GLO 19.2: Demonstrate an awareness of **cultural proficiency** and its importance in the workplace.

SLO 12A.19.2.1: Discuss the need to interact positively with people of different cultures in society and in the workplace.

GLO 19.3: Demonstrate an understanding of the **business operation** of a collision repair and refinishing technology facility.

No applicable SLOs.

GLO 19.4: Demonstrate **critical thinking skills** in planning, procedures, analysis, and diagnosis.

SLO 12A.19.4.1: Demonstrate critical thinking skills.

SLO 12A.19.4.2: Use a variety of strategies in order to diagnose and solve problems.

Goal 20: Demonstrate an understanding of the **evolution** of collision repair and refinishing technology, including its **technological progression and emerging trends**.

GLO 20.1: Describe the **evolution** of collision repair and refinishing technology, including its **technological progression and emerging trends**.

SLO 12A.20.1.1: Discuss the evolution of damage analysis and structural repair, including technological progression and emerging trends.