

COLLISION REPAIR: STRUCTURAL

COURSE DESCRIPTION

Collision Repair: Structural is a course that prepares students to analyze structural collision damage to a vehicle, determine the extent of the damage and the direction of impact, initiate an appropriate repair plan, and correctly use equipment to fit metal to a specified dimension within tolerances. Course content includes repairs to vehicle frames and glass. The course prepares students for entry level employment and advanced training in collision repair technology, and post-secondary education. Students completing the *Collision Repair: Structural* are eligible to take the ASE written examination for Structural Analysis and Damage Repair.

Recommended: Transportation Core
Algebra I; Physical Science or Principles of Technology I,
Principles of Welding (100 hours) (may be concurrent)

Requirement: A minimum of 260 hours must be dedicated to structural analysis and damage repair with MIG welding or a minimum of 185 hours without MIG welding if 75 hours already earned in Non-Structural to meet minimum standards set by NATEF.

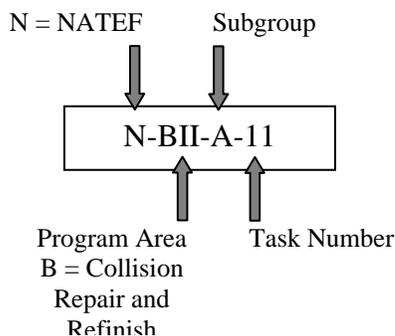
Recommended Credits: Non-NATEF programs – 2 credits
NATEF programs – Option for 3 credits

Recommended Grade Level(s): 11th, or 12th

Number of Competencies: Non-NATEF Certified Programs – 56
(HP-I) High Priority Individual

NATEF Certified Programs - 87
NATEF minimums:
HP-I – 95% (High Priority Individual)
HP-G – 90% (High Priority Group)

Notes: Course is aligned with NATEF tasks list for Collision Repair and Refinish - Structural Analysis and Damage Repair. Items have been organized based on the requirements of the state-required course description format. NATEF tasks are referenced with the corresponding Performance Standards. Codes are as follows:



COLLISION REPAIR: STRUCTURAL STANDARDS

STANDARDS

- 1.0** Students will perform safety examinations and maintain safety records.
- 2.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 3.0** Students will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the work place.
- 4.0** Students will demonstrate proper procedures for frame inspection and repair.
- 5.0** Students will demonstrate proper procedures for unibody and unitized structure inspection, measurement, and repair.
- 6.0** Students will demonstrate proper repair for fixed glass.
- 7.0** Students will demonstrate proper procedures for metal welding and cutting.

COLLISION REPAIR: STRUCTURAL

STANDARD 1.0

Students will perform safety examinations and maintain safety records.

LEARNING EXPECTATIONS

The student will:

- 1.1** Demonstrate a positive attitude regarding safety practices and issues.
- 1.2** Use and inspect personal protective equipment.
- 1.3** Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 1.4** Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
- 1.5** Assume responsibilities under HazCom (Hazard Communication) regulations.
- 1.6** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.
- 1.7** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.
- 1.8** Demonstrate appropriate related safety procedures.
- 1.9** Pass with 100 % accuracy a written examination relating to safety issues
- 1.10** Pass with 100% accuracy a performance examination relating to safety.
- 1.11** Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 1.1A** Is attentive during safety discussions.
- 1.1B** Actively seeks information about safe procedures.
- 1.1C** Responds positively to instruction, advice, and correction regarding safety issues.
- 1.1D** Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 1.1E** Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, etc.
- 1.2** Selects, inspects, and uses the correct personal protective equipment for the assigned task.
- 1.3A** Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 1.3B** Inspects extension cords for the presence of a functional ground connection, prior to use.
- 1.3C** Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 1.4A** Is observant of personnel and activities in the vicinity of the work area.
- 1.4B** Warns nearby personnel, prior to starting potentially hazardous actions.
- 1.5A** When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets), and identifies the health hazards associated with the new material.
- 1.5B** Reports hazards found on the job site to the supervisor.
- 1.6A** Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.

- 1.6B** Provides and activates adequate ventilation equipment as required by the task.
- 1.7A** Reports all injuries to self to the immediate supervisor.
- 1.7B** Reports observed unguarded hazards to their immediate supervisor.
- 1.8A** Complies with personal assignments regarding emergency assignments.
- 1.9A** Passes with 100% accuracy a written examination relating specifically to content area.
- 1.10A** Passes with 100% accuracy a performance examination relating specifically to welding tools, equipment and supplies.
- 1.11A** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Conduct a practice drill simulating a hazardous solvent spill in which an emergency action plan is to be implemented.
- Instruct a visitor to obviously approach the vicinity of a student conducting a hazardous activity and note the level of awareness demonstrated by the student.
- For a project requiring the use of ladders and/or scaffolding, note the proper placement and securing procedures followed by students.

INTEGRATION LINKAGES

Language Arts, Mathematics, Technical Algebra, Technical Geometry, Algebra, Geometry
English IV: Communication for Life, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary's Commission on Achieving Necessary Skills (SCANS), Professional Development Program, SkillsUSA

COLLISION REPAIR: STRUCTURAL

STANDARD 2.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

- 2.1** Cultivate positive leadership skills.
- 2.2** Participate in the student organization directly related to their program of study as an integral part of classroom instruction.
- 2.3** Assess situations, apply problem-solving techniques and decision-making skills within the school, community, and workplace.
- 2.4** Participate as a team member in a learning environment.
- 2.5** Respect the opinions, customs, and individual differences of others.
- 2.6** Build personal career development by identifying career interests, strengths, and opportunities.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1A** Demonstrates character and leadership using creative-and critical-thinking skills.
- 2.1B** Uses creative thought process by “thinking outside the box.”
- 2.2A** Relates the creed, purposes, motto, and emblem of their student organization, directly related to personal and professional development.
- 2.2B** Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.
- 2.3A** Makes decisions and assumes responsibilities.
- 2.3B** Analyzes a situation and uses the Professional Development Program or career technical student organization materials directly related to the student’s program of study to resolve it.
- 2.3C** Understands the importance of learning new information for both current and future problem solving and decision making.
- 2.4A** Organizes committees and participates in functions.
- 2.4B** Cooperates with peers to select and organize a community service project.
- 2.5A** Researches different customs and individual differences of others.
- 2.5B** Interacts respectfully with individuals of different cultures, gender, and backgrounds.
- 2.5C** Resolves conflicts and differences to maintain a smooth workflow and classroom environment.
- 2.6A** Creates personal career development by identifying career interests, strengths, and opportunities.
- 2.6B** Identifies opportunities for career development and certification requirements.
- 2.6C** Plans personal educational paths based on available courses and current career goals.
- 2.6D** Creates a resumé that reflects student’s skills, abilities, and interests.

SAMPLE PERFORMANCE TASKS

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various career technical student organizations' programs and/or competitive events.
- Implement an annual program of work.
- Prepare a meeting agenda for a specific career technical student organization monthly meeting.
- Attend a professional organization meeting.
- Develop a program of study within their career opportunities.
- Participate in the American Spirit Award competition with SkillsUSA.
- Complete *Professional Development Program Level I and Level II*, SkillsUSA.

INTEGRATION LINKAGES

SkillsUSA, *Professional Development Program*; SkillsUSA; Communications and Writing Skills; Teambuilding Skills; Research; Language Arts; Sociology; Psychology; Math; Technical Math; English IV: Communication for Life; Social Studies; Problem Solving; Interpersonal Skills; Employability Skills; Critical-Thinking Skills; Secretary's Commission on Achieving Necessary Skills (SCANS); Chamber of Commerce; Colleges; Universities; Technology Centers; Secretary's Commission on Achieving Necessary Skills (SCANS)

COLLISION REPAIR: STRUCTURAL

STANDARD 3.0

Students will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the work place.

LEARNING EXPECTATIONS

The student will:

- 3.1** Assume responsibility for accomplishing classroom assignments and workplace goals within accepted time frames.
- 3.2** Develop advanced study skills.
- 3.3** Demonstrate and use written and verbal communication skills.
- 3.4** Read and understand technical documents such as regulations, manuals, reports, forms, graphs, charts, and tables.
- 3.5** Apply the foundations of mathematical principles such as algebra, geometry, and advanced math to solve problems.
- 3.6** Apply basic scientific principles and methods to solve problems and complete tasks.
- 3.7** Understand computer operations and related applications to input, store, retrieve, and output information as it relates to the course.
- 3.8** Research, recognize, and understand the interactions of the environment and *green* issues as they relate to the course work and to a global economy.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1A** Uses appropriate time management to achieve goals.
- 3.1B** Arrives at school on time each day.
- 3.1C** Completes assignments and meets deadlines.
- 3.2A** Assesses current personal study skills.
- 3.2B** Demonstrates advanced note-taking ability.
- 3.2C** Formulates appropriate study strategies for given tasks.
- 3.3A** Communicates ideas, information, and messages in a logical manner.
- 3.3B** Fills out forms, reports, logs, and documents to comply with class and project requirements.
- 3.4A** Reads and understands technical documents and uses industry jargon, acronyms, and terminology appropriately.
- 3.4B** Recognizes the meaning of specialized words or phrases unique to the career and industry.
- 3.5A** Utilizes computation in adding, subtracting, multiplying, and dividing of whole numbers, fractions, decimals, and percents.
- 3.5B** Chooses the right mathematical method or formula to solve a problem.
- 3.5C** Performs math operations accurately to complete classroom and lab tasks.
- 3.6A** Understands scientific principles critical to the course.
- 3.6B** Applies scientific principles and technology to solve problems and complete tasks.
- 3.6C** Has knowledge of the scientific method (e.g., identifies the problem, collects information, forms opinions, and draws conclusions).

- 3.7A** Uses basic computer hardware (e.g., PCs, printers) and software to perform tasks as required for the course work.
- 3.7B** Understands capabilities of computers and common computer terminology (e.g., program, operating system).
- 3.7C** Applies the appropriate technical solution to complete tasks.
- 3.7D** Inputs data and information accurately for the course requirements.
- 3.8A** Researches and recognizes *green* trends in career area and industry.
- 3.8B** Examines current environmentally-friendly trends.
- 3.8C** Applies sustainability practices by understanding processes that are non-polluting, conserving of energy and natural resources, and economically efficient.

SAMPLE PERFORMANCE TASKS

- Examine and compile different learning styles for portfolios.
- Create calendars containing all activities and obligations for one month. Discusses how to handle conflicting or competing obligations then complete daily and weekly plans showing tasks, priorities, and scheduling.
- Complete self-assessments of study habits.
- Compute precise and exact measurements.
- Explore study strategies for different subjects and tasks then analyze two homework assignments and select the best strategies for completing them.
- Create “life maps” showing necessary steps or “landmarks” along the path to personal, financial, educational, and career goals.
- Take notes during counselor classroom visits and work in small groups to create flow charts of the path options.
- List attitudes that lead to success then rate individually in these areas. Work together to suggest strategies for overcoming the weaknesses identified own and partners’ self-assessments then share with the class the strategies developed.
- Research the Internet and other technology to collect and analyze data concerning climate change.
- Keep a data file of alternative energy sources and the sources’ impact on the environment.
- Develop a recycling project at home or for the school environment.

INTEGRATION LINKAGES

SkillsUSA, *Professional Development Program*; SkillsUSA; Communications and Writing Skills; Teambuilding Skills; Research; Language Arts; Sociology; Psychology; Math; Technical Math; English IV: Communication for Life; Social Studies; Problem Solving; Interpersonal Skills; Employability Skills; Critical-Thinking Skills; Secretary’s Commission on Achieving Necessary Skills (SCANS); Chamber of Commerce; Colleges; Universities; Technology Centers; Secretary’s Commission on Achieving Necessary Skills (SCANS)

COLLISION REPAIR: STRUCTURAL

STANDARD 4.0

Students will demonstrate proper procedures for frame inspection and repair.

LEARNING EXPECTATIONS

The student will:

- 4.1 Measure and diagnose structural damage using a tram. HP-I
- 4.2 Attach vehicle to anchoring devices. HP-I
- 4.3 Analyze, straighten, and align mash (collapse) damage. HP-G
- 4.4 Analyze, straighten, and align sag damage. HP-G
- 4.5 Analyze, straighten, and align sidesway damage. HP-G
- 4.6 Analyze, straighten, and align twist damage. HP-G
- 4.7 Analyze, straighten, and align diamond frame damage. HP-G
- 4.8 Remove and replace damaged structural components. HP-G
- 4.9 Restore corrosion protection to repaired or replaced frame areas. HP-I
- 4.10 Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems. HP-G
- 4.11 Align or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems. HP-G
- 4.12 Identify heat limitations for structural components. HP-I
- 4.13 Demonstrate an understanding of structural foam applications. HP-G
- 4.14 Measure and diagnose structural damage using a three-dimensional measuring system (mechanical, electronic, laser, etc.). HP-G
- 4.15 Measure and diagnose structural damage to vehicles using a dedicated (fixture) measuring system. HP-G
- 4.16 Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair. HP-I
- 4.17 Analyze and identify crush/collapse zones. HP-I
- 4.18 Restore mounting and anchoring locations. HP-G

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 4.1 Measures and diagnoses structural damage using a tram.
- 4.2 Attaches vehicle to anchoring devices.
- 4.3 Analyzes, straightens, and aligns mash (collapse) damage.
- 4.4 Analyzes, straightens, and aligns sag damage.
- 4.5 Analyzes, straightens, and aligns sidesway damage.
- 4.6 Analyzes, straightens, and aligns twist damage.
- 4.7 Analyzes, straightens, and aligns diamond frame damage.
- 4.8 Removes and replaces damaged structural components.
- 4.9 Restores corrosion protection to repaired or replaced frame areas.
- 4.10 Analyzes and identifies misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.
- 4.11 Aligns or replaces misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.

- 4.12 Identifies heat limitations for structural components.
- 4.13 Demonstrates an understanding of structural foam applications.
- 4.14 Measures and diagnoses structural damage using a three-dimensional measuring system (mechanical, electronic, laser, etc.).
- 4.15 Measures and diagnoses structural damage to vehicles using a dedicated (fixture) measuring system.
- 4.16 Determines the extent of the direct and indirect damage and the direction of impact; documents the methods and sequence of repair.
- 4.17 Analyzes and identifies crush/collapse zones.
- 4.18 Restores mounting and anchoring locations.

SAMPLE PERFORMANCE TASKS

- Diagnose bent frame rail and determine whether to repair or replace.
- Check alignment of steering components on a damaged vehicle and determine whether to align or replace.

INTEGRATION LINKAGES

Math, Science, Chemistry, Physics, Communication Skills, Teamwork Skills, Reading Skills, Leadership Skills, Problem Solving and Critical Thinking Skills, computer Skills, Art and Design, Computer Aided Design, Secretary's Commission on Achieving Necessary Skills (SCANS), National Institute for Automotive Service Excellence, (ASE) National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), SkillsUSA

COLLISION REPAIR: STRUCTURAL

STANDARD 5.0

Students will demonstrate proper procedures for unibody and unitized structure inspection, measurement, and repair.

LEARNING EXPECTATIONS

The student will:

- 5.1** Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems. HP-G
- 5.2** Realign or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems. HP-G
- 5.3** Measure and diagnose unibody damage using tram gauge. HP-I
- 5.4** Determine and inspect the locations of all suspension, steering, and powertrain component attaching points on the vehicle. HP-G
- 5.5** Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system. HP-G
- 5.6** Measure and diagnose unibody vehicles using a three-dimensional measuring system (mechanical, electronic, laser, etc.). HP-G
- 5.7** Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair. HP-I
- 5.8** Attach anchoring devices to vehicle; remove or reposition components as necessary. HP-I
- 5.9** Straighten and align cowl assembly. HP-G
- 5.10** Straighten and align roof rails/headers and roof panels. HP-G
- 5.11** Straighten and align hinge and lock pillars. HP-G
- 5.12** Straighten and align vehicle openings, floor pans, and rocker panels. HP-G
- 5.13** Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points). HP-G
- 5.14** Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points, etc.). HP-G
- 5.15** Identify substrate and repair or replacement recommendations. HP-I
- 5.16** Identify proper cold stress relief methods. HP-I
- 5.17** Repair damage using power tools and hand tools to restore proper contours and dimensions. HP-I
- 5.18** Remove and replace damaged sections of steel body structures. HP-G
- 5.19** Restore corrosion protection to repaired or replaced structural areas. HP-I
- 5.20** Determine the extent of damage to aluminum structural components; repair, weld, or replace. HP-G
- 5.21** Analyze and identify crush/collapse zones. HP-I
- 5.22** Restore mounting and anchoring locations. HP-G

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 5.1 Analyzes and identifies misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems.
- 5.2 Realigns or replaces misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems.
- 5.3 Measures and diagnoses unibody damage using tram gauge.
- 5.4 Determines and inspects the locations of all suspension, steering, and powertrain component attaching points on the vehicle.
- 5.5 Measures and diagnoses unibody vehicles using a dedicated (fixture) measuring system.
- 5.6 Measures and diagnoses unibody vehicles using a three-dimensional measuring system (mechanical, electronic, laser, ect.).
- 5.7 Determines the extent of the direct and indirect damage and the direction of impact; plans and documents the methods and sequence of repair.
- 5.8 Attaches anchoring devices to vehicle; removes or repositions components as necessary.
- 5.9 Straightens and aligns cowl assembly.
- 5.10 Straightens and aligns roof rails/headers and roof panels.
- 5.11 Straightens and aligns hinge and lock pillars.
- 5.12 Straightens and aligns vehicle openings, floor pans, and rocker panels.
- 5.13 Straightens and aligns quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points).
- 5.14 Straightens and aligns front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points, etc.).
- 5.15 Identifies substrate and repair or replacement recommendations.
- 5.16 Identifies proper cold stress relief methods.
- 5.17 Repairs damage using power tools and hand tools to restore proper contours and dimensions.
- 5.18 Removes and replaces damaged sections of steel body structures.
- 5.19 Restores corrosion protection to repaired or replaced structural areas.
- 5.20 Determines the extent of damage to aluminum structural components; repairs, welds, or replaces.
- 5.21 Analyzes and identifies crush/collapse zones.
- 5.22 Restores mounting and anchoring locations.

SAMPLE PERFORMANCE TASKS

- Use power and hand tools to remove dent according to proper contours and dimensions.
- Give an example demonstrating why measuring, dimensioning, and tolerance limits are critical in unibody vehicle repair.

INTEGRATION LINKAGES

Math, Science, Chemistry, Physics, Communication Skills, Teamwork Skills, Reading Skills, Leadership Skills, Problem Solving and Critical Thinking Skills, computer Skills, Art and Design, Computer Aided Design, Secretary's Commission on Achieving Necessary Skills (SCANS), National Institute for Automotive Service Excellence, (ASE) National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), SkillsUSA

COLLISION REPAIR: STRUCTURAL

STANDARD 6.0

Students will demonstrate proper repair for fixed glass.

LEARNING EXPECTATIONS

The student will:

- 6.1** Remove and reinstall or replace fixed glass (heated and non-heated) using recommended materials and techniques. HP-G
- 6.2** Remove and reinstall or replace modular glass using recommended materials. HP-G
- 6.3** Check for water leaks, dust leaks, and wind noise. HP-G

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 6.1** Removes and reinstalls or replaces fixed glass (heated and non-heated) using recommended materials and techniques.
- 6.2** Removes and reinstalls or replaces modular glass using recommended materials.
- 6.3** Checks for water leaks, dust leaks, and wind noise.

SAMPLE PERFORMANCE TASKS

- Replaces a windshield and rear glass in a vehicle.
- Uses correct adhesives in replacing glass.
- Correctly aligns frames and rails for sunroof and moon roof.
- Uses smoke machine to find wind leaks and noises.

INTEGRATION LINKAGES

Math, Science, Chemistry, Physics, Communication Skills, Teamwork Skills, Reading Skills, Leadership Skills, Problem Solving and Critical Thinking Skills, computer Skills, Art and Design, Computer Aided Design, Secretary's Commission on Achieving Necessary Skills (SCANS), National Institute for Automotive Service Excellence, (ASE) National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), SkillsUSA

COLLISION REPAIR: STRUCTURAL

STANDARD 7.0

Students will demonstrate proper procedures for metal welding and cutting.

LEARNING EXPECTATIONS

The student will:

- 7.1 Identify weldable and non-weldable materials used in collision repair. HP-I
- 7.2 Weld and cut high-strength steel and other steels. HP-I
- 7.3 Weld and cut aluminum. HP-G
- 7.4 Determine the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation. HP-I
- 7.5 Set up and adjust the GMAW (MIG) welder to "tune" for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the material being welded. HP-I
- 7.6 Store, handle, and install high-pressure gas cylinders. HP-I
- 7.7 Determine work clamp (ground) location and attach. HP-I
- 7.8 Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions. HP-I
- 7.9 Protect adjacent panels, glass, vehicle interior, etc., from welding and cutting operations. HP-I
- 7.10 Protect computers and other electronic control modules during welding procedures according to manufacturer's specifications. HP-I
- 7.11 Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp as required. HP-I
- 7.12 Determine the joint type (butt weld with backing, lap, etc.) for weld being made. HP-I
- 7.13 Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation. HP-I
- 7.14 Perform the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and lap joints. HP-I
- 7.15 Perform visual and destructive tests on each weld type. HP-I
- 7.16 Identify the causes of various welding defects; make necessary adjustments. HP-I
- 7.17 Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. HP-I
- 7.18 Identify cutting process for different materials and locations in accordance with manufacturer's procedures; perform cutting operation. HP-I
- 7.19 Identify different methods of attaching structural components (squeeze type resistance spot welding, riveting, structural adhesive, silicone bronze, etc.). HP-G

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 7.1 Identifies weldable and non-weldable materials used in collision repair.
- 7.2 Welds and cuts high-strength steel and other steels
- 7.3 Welds and cuts aluminum.
- 7.4 Determines the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.

- 7.5 Sets up and adjusts the GMAW (MIG) welder to "tune" for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the material being welded.
- 7.6 Stores, handles, and installs high-pressure gas cylinders.
- 7.7 Determines work clamp (ground) location and attaches.
- 7.8 Uses the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.
- 7.9 Protects adjacent panels, glass, vehicle interior, etc., from welding and cutting operations.
- 7.10 Protects computers and other electronic control modules during welding procedures according to manufacturer's specifications.
- 7.11 Cleans and prepares the metal to be welded, assuring good metal fit-up, applying weld-through primer if necessary, and clamps as required.
- 7.12 Determines the joint type (butt weld with backing, lap, etc.) for weld being made.
- 7.13 Determines the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation.
- 7.14 Performs the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and lap joints.
- 7.15 Performs visual and destructive tests on each weld type.
- 7.16 Identifies the causes of various welding defects; makes necessary adjustments.
- 7.17 Identifies cause of contact tip burn-back and failure of wire to feed; makes necessary adjustments.
- 7.18 Identifies cutting process for different materials and locations in accordance with manufacturer's procedures; performs cutting operation.
- 7.19 Identifies different methods of attaching structural components (squeeze type resistance spot welding, riveting, structural adhesive, silicone bronze, etc.).

SAMPLE PERFORMANCE TASKS

- Use reference materials to determine procedures for structural analysis and damage repair.
- Work as a team member to develop an analytical strategy.
- Use blueprints and diagrams to execute a task.
- Selects proper settings for welders.
- Selects proper safety goggles and helmets for welding operations.

INTEGRATION LINKAGES

Math, Science, Chemistry, Physics, Communication Skills, Teamwork Skills, Reading Skills, Leadership Skills, Problem Solving and Critical Thinking Skills, computer Skills, Art and Design, Computer Aided Design, Secretary's Commission on Achieving Necessary Skills (SCANS), National Institute for Automotive Service Excellence, (ASE) National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), SkillsUSA

COLLISION REPAIR: STRUCTURAL

SAMPLING OF AVAILABLE RESOURCES

Enhanced Delivery I-Car Curriculum, I-CAR

Auto Collision Curriculum Guide, Instructional Materials Laboratory (IML), University of Missouri

Professional Automotive Collision Repair, 2nd Ed, Duffy, Delmar Publishing

Auto Body Repairing and Refinishing, Goodheart-Willcox, 2000.

Teacher Web resources:

Math/Science Web Site <http://enc.org>

National Science Teachers Association <http://www.nsta.org/store>

Center for Occupational Research and Development (CORD) <http://www.cord.org/>

Delmar International Thomson Learning <http://www.delmar.com/>

University of Missouri Instructional Materials Lab (IML)
<http://www.iml.coe.missouri.edu/>

Oklahoma Curriculum Instructional Materials Center (CIMC)
<http://www.okvotech.org/cimc/home.htm>