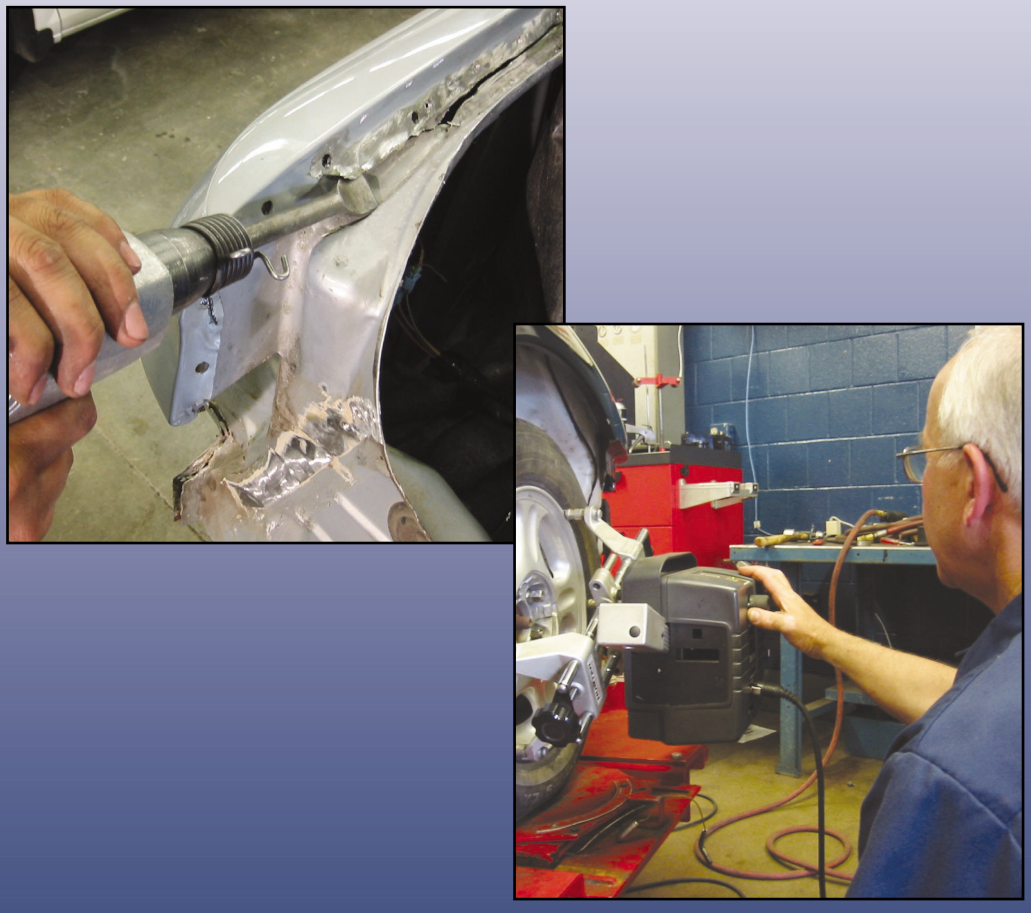
AUTO BODY REPAIR

MISCELLANEOUS REPAIRS



TEACHER'S GUIDE

SHOPWARE®

INTRODUCTION

This Teacher's Guide provides information to help you get the most out of *Miscellaneous Repairs*. The contents in this guide will enable you to prepare your students before using the program and present follow-up activities to reinforce the program's key learning points.

The fine details are the difference between an average and an exceptional auto body repair job. This video demonstrates how to carry out minor repairs to the vehicle body and systems, including lights, wipers, windows, seatbelts and shoulder harnesses, airbags, and interior door and door glass components and hardware. After viewing this video and completing some of the learning activities included in this guide, students will be better prepared to properly complete minor repairs, and incorporate industry terminology in order to communicate effectively with coworkers, parts suppliers, and insurance adjusters. Use the *Miscellaneous Repairs* video and accompanying activities provided in this guide to prepare students for the most effective way to approach auto body repairs, and to familiarize students with terminology used in the auto repair industry.

LEARNING OBJECTIVES

After viewing the program, students will be able to:

- Demonstrate a basic knowledge of operations and safety procedures for miscellaneous repairs.
- Identify the correct tools to use given the vehicle damage.
- Identify direct and indirect damage including movable glass and hardware.
- Assemble and disassemble manual doors.

EDUCATIONAL STANDARDS

The primary certifying body for automotive technician training programs is the National Institute for Automotive Service Excellence (ASE). ASE is a non-profit organization established in 1972 by the automotive industry to improve the quality of vehicle repair and service through the voluntary testing and certification of automotive repair technicians. The National Automotive Technicians Education Foundation (NATEF) is a separate non-profit foundation within ASE. The mission of NATEF is to improve the quality of automotive technician training programs nationwide through voluntary certification. The State Departments of Education in all 50 states support ASE/NATEF certification of automotive programs.

National Standards

This program correlates with the Program Certification Standards for Automobile Technician Training Programs from the National Institute for Automotive Service Excellence (ASE) and the National Automotive Technicians Education Foundation (NATEF). The content has been aligned with the following educational standards, which reflect the tasks in the ASE Program Certification Standards for Automobile General Service Technician Programs.

Preparation

- Review damage report and analyze damage to determine appropriate methods for overall repair; develop repair plan.
- Apply safety procedures associated with vehicle components and systems such as ABS, air bags, refrigerants, batteries, tires, oil, anti-freeze, engine coolants, etc.

Moveable Glass and Hardware

- Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.
- Diagnose and repair water leaks, dust leaks, and wind noises; inspect, repair, and replace weather-stripping.

Electrical

- Check operation of exterior lighting; determine needed repairs.
- Aim headlamp assemblies and fog/driving lamps; determine needed repairs.
- Check operation of retractable headlamp assembly.
- Remove and replace motors, switches, relays, connectors, and wires of retractable headlamp assembly circuits.
- Inspect, test, and repair or replace switches, relays, bulbs, sockets, connectors, and wires of all interior and exterior light circuits.
- Check operation of windshield wiper/washer system.
- Check operation of power side windows and power tailgate window.
- Check operation of electrically heated mirrors, windshields, back lights, panels, etc.; repair as necessary.

Active Restraint Systems

- Inspect, remove, and replace seatbelt and shoulder harness assembly and components in accordance with manufacturer's specifications/procedures.
- Inspect restraint system mounting areas for damage; repair in accordance with manufacturer's specifications/procedures.
- Verify proper operation of seatbelt in accordance with manufacturer's specifications/procedures.

Passive Restraint Systems

- Inspect, remove, and replace seatbelt and shoulder harness assembly and components in accordance with manufacturer's specifications/procedures.
- Inspect restraint system mounting areas for damage in accordance with manufacturer's specifications/procedures.
- Verify proper operation of seatbelt in accordance with manufacturer's specifications/procedures.
- Inspect, remove and replace track and drive assembly, lap retractor, torso retractor, inboard buckle-lap retractor, tensioners and knee bolster (blocker) in accordance with manufacturer's specifications/procedures.

Supplemental Restraint Systems

- Disarm SRS in accordance with manufacturer's specifications/procedures.
- Inspect, remove and replace sensors and wiring in accordance with manufacturer's specifications/procedures; ensure sensor orientation.
- Inspect, remove, replace, and dispose of deployed SRS modules in accordance with manufacturer's specifications/procedures.
- Verify that SRS is operational.
- Inspect, remove, replace, and dispose of non-deployed SRS in accordance with manufacturer's specifications/procedures.
- Diagnose and repair SRS using fault codes and test equipment.

2004 Automobile Program Standards, *by the National Institute for Automotive Service Excellence (ASE), Copyright 2004 Reprinted with permission.*

Language Arts and Communication Standards

According to ASE/NATEF standards, the automobile technician must be proficient in the following Language Arts and Communications related academic skills that are embedded in the occupation. The activities and information presented in this program and accompanying teacher's guide are aligned to the following standards from the National Automotive Technicians Education Foundation from the National Institute for Automotive Service Excellence.

- Request, collect, comprehend, evaluate, and apply oral and written information gathered from customers, associates, and supervisors regarding problem symptoms and potential solutions to problems.
- Identify the purpose for all written and oral communication and then choose the most effective strategies for listening, reading, speaking, and writing to facilitate the communication process.
- Adapt a reading strategy for all written materials, e.g. customer's notes, service manuals, shop manuals, technical bulletins, etc., relevant to problem identification, diagnosis, solution, and repair.
- Use study habits and techniques, i.e. previewing, scanning, skimming, taking notes, etc., when reviewing publications (shop manuals, references, databases, operator's manuals, and text resources) for problem solving, diagnosis, and repair.
- Write clear, concise, complete, and grammatically accurate sentences and paragraphs.
- Write warranty reports and work orders to include information regarding problem resolution and the results of the work performed for the customer or manufacturer.
- Follow all oral/written directions that relate to the task or system under study.
- Comprehend and apply industry definitions and specifications to diagnose and solve problems in all automotive systems and components of the automobile and light truck.
- Comprehend and use problem-solving techniques and decision trees that are contained in service manuals and databases to determine cause-and-effect relationships.
- Use the service manual to identify the manufacturer's specifications for system parameters, operation, and potential malfunctions.
- Supply clarifying information to customers, associates, parts supplier, and supervisors.

Standards for the English Language Arts, *by the International Reading Association and the National Council of Teachers of English, Copyright 1996 by the International Reading Association and the National Council of Teachers of English. Reprinted with permission.*

Technology Standards

The activities in this Teacher's Guide were created in compliance with the following *National Education Technology Standards* from the National Education Technology Standards Project. The content has been aligned with the following educational standards and benchmarks.

- Use a variety of media and formats to communicate information and ideas effectively to multiple audiences.
- Use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.
- Use technology tools to enhance learning, increase productivity, and promote creativity.
- Use technology to locate, evaluate, and collect information from a variety of sources.

The National Education Technology Standards reprinted with permission from the International Society for Technology Education.

PROGRAM OVERVIEW

In auto body repair, it's the little things that count. After the major damage has been repaired, repairs to auto body components such as lights, wipers, windows, seatbelts, airbags, and doors must be attended to. This video shows how to complete an auto body repair job by attending to some of these smaller, yet important details. After viewing this video and completing some of the learning activities included in this guide, students will be better prepared to properly complete minor repairs, and incorporate industry terminology in order to communicate effectively with coworkers, parts suppliers, and insurance adjusters.

MAIN TOPICS

Topic 1: Restraint Systems

This section of the program describes how to check the operation of the seat belt and shoulder harness, as well as the vehicle's air bag system. Specific techniques for testing and replacing these components are discussed.

Topic 2: Headlights, Taillights, and Turn Signals

This section of the program describes how to check the operation of headlight and taillight assemblies before returning a vehicle to its owner. Students will learn the proper procedures for replacing lamps that are not working, as well as techniques to use when replacing headlights.

Topic 3: Windshield Wipers, Washing System, Power Windows, and Doors

This section describes the procedures for checking the operating of the wipers and washing system. Students will also learn how to check the operation of power side and rear windows, as well as door locks. Weatherstripping will be discussed, and final door adjustments demonstrated. Procedures for making common repairs related to the door, such as door handles, window glass, and outside rearview mirrors are discussed in this section.

FAST FACTS

- The seat belt and shoulder harness systems are a safety feature mandated by law for every vehicle.
- Some seat belt assemblies contain a gas cartridge that fires to pull belts tight when air bags are deployed. If air bags have been deployed, and the vehicle has this type of feature, replace the restraint system.
- The seat belt latch is usually bolted to an anchor in the floor beneath the seat. Replace the belt latch mechanism as part of the entire replacement assembly.
- Air bags are designed to be deployed in front-end collisions, but they may not deploy in side or rear impacts.
- When turning on the ignition, a dash light indicates that the air bag system is performing a self-check. It will do this every time the ignition is turned to the "ON" position. In a few moments the air bag dash light should go off. If it doesn't, there's a problem with the system.
- Some air bag systems are equipped with a reserve power supply that will deploy the air bags in the event of a vehicle power failure.
- There's no need to fear working with air bag systems, but treat them with respect. If you don't follow the manufacturer's recommendations, serious injury can result.
- The headlight bulbs are located inside the headlight assembly. Access to the bulbs varies from vehicle to vehicle. In most cases, you can reach inside the back of the assembly and remove the bulb with a twist. If you cannot remove the bulb in this way, you can remove the entire headlight assembly by loosening and removing a few screws. See the vehicle service manual for screw locations and specific instructions on changing headlight lamps and assemblies.
- When replacing the bulb, be careful not to touch it. Headlight bulbs are quartz bulbs that should never be touched with bare fingers. Oil from your skin can shorten their life.
- To allow free movement of the door during alignment testing, you may wish to remove the latch striker plate.
- Never slam the door when you're making adjustments–you could damage trim or panels next to it.
- In electric locks, when you press a door lock button, solenoids convert electrical energy into motion to move the linkage rods.

VOCABULARY TERMS

aiming screws: Screws contained within the headlight assembly that enable the aiming adjustment of headlights.
air bag restraint system: Bags that inflate suddenly in the event of a major impact, cushioning the rider's head and preventing the head from hitting hard surfaces within the car's interior. Designed to be deployed in front-end, and sometimes side impact, collisions. After any collision, whether the air bags deployed or not, check to see that the air bag system is operational.
backup lights: Lights that illuminate when the car is put into reverse.
brake lights: Lights used to indicate that the brakes have been applied and the vehicle is stopping.
flashers: Lights that the driver may turn on in the event of an emergency or other hazardous condition to call attention to the vehicle.

forked trim tool: A forked trim tool is used to remove the plastic clips along the edge of the interior door trim panel.
glass run channels: The grooves within the vehicle's side door through which the windows move up and down.
headlight aiming system: A system used to check and adjust headlight aim. These systems are expensive, and not all body shops have them.
headlights: Lights located at the front of the vehicle that light the area in front of the vehicle while driving. These lights are white.
seat belt: Working in conjunction with the shoulder harness system, the seat belt is a safety feature mandated by law in every vehicle, designed to restrain the rider in the event of an impact. The seat belt is fastened over the hips of a vehicle's rider. The seat belt and shoulder harness system is composed of the belts, upper and lower anchors, a retractor mechanism, and the seat belt latching mechanism.
shoulder harness system: Working in conjunction with the seat belt, the shoulder harness system is a safety feature mandated by law in every vehicle, designed to restrain the rider in the event of an impact. The shoulder harness is fastened over the shoulder of a vehicle's rider. The seat belt and shoulder harness system is composed of the belts, upper and lower anchors, a retractor mechanism, and the seat belt latching mechanism.
spray washer: Working in conjunction with the windshield wiper, the spray washer sprays windshield cleaning fluid on the windshield in order to facilitate the removal of dirt from the windshield.
taillights: Lights located at the back of the vehicle. These lights are red.
turn signals: Lights used by the driver to indicate that the vehicle is about to make a turn. These lights are located at the front and rear of the vehicle.
weather stripping: Material added around the doors and windows of a vehicle in order to prevent water from leaking into a vehicle around the edges of these components.
window regulator: The component within the door that contains the window.
windshield wiper: Device used to wipe away water and dirt from the windshield of a vehicle.

PRE-PROGRAM DISCUSSION QUESTIONS

1. After the main auto body repair work has been done on a vehicle, what do you think are the final details that a technician must attend to prior to returning the vehicle to its owner?
2. What safety precautions should a technician keep in mind when repairing the air bag system?
3. What tools do you think are used by auto body repair technicians to perform repairs on components such as lights, mirrors, wipers, and restraint systems?
4. Can you name all of the exterior lights on a vehicle?
5. What do you think would be some of the biggest challenges you would face when performing repairs to exterior lights? Why?

POST-PROGRAM DISCUSSION QUESTIONS

1. Describe the process for testing the restraint systems on a vehicle. Why are these systems so important?
2. Describe the procedures for disarming the air bag system. Why is it important to refer to the vehicle's service manual when disarming the air bag system?
3. Describe an inexpensive way to test the aim of the headlights without the use of a headlight aiming system.
4. What parts within the door are described in the *Miscellaneous Repairs* video? What tools are needed to repair these components?
5. How should you adjust a door with welded door hinges? What tool is required? How do you use this tool to adjust the door?

GROUP ACTIVITIES

Miscellaneous Repairs Scavenger Hunt

As a group, go on a scavenger hunt around your town. Your mission is to find and photograph cars that need the repairs discussed in the *Miscellaneous Repairs* video: restraint systems, lights, wipers, windows, and doors (get permission from the owners of the vehicles before taking pictures). Take at least five photos of five different vehicles, and then mount these photos on posterboard. Provide a description next to each photo stating the problem the vehicle has, the repairs you would recommend, and how much money, approximately, it would take to repair the vehicle properly. Be prepared to use your poster in an oral presentation to the class.

Miscellaneous Repair Job Aids

Imagine that your group is in charge of an auto body repair school. You want to put together some job aids for the students in your school that they can reference when making miscellaneous repairs. Use the *Miscellaneous Repairs* video as well as the service repair manuals for several different makes of vehicles to put together one-page instructional sheets that technicians can consult on the following topics:

- Testing restraint systems
- Replacing restraint systems
- Safety when testing and replacing air bags
- Replacing headlights
- Replacing mirrors

Bind all of your job aids together and hand them in to your teacher.

Miscellaneous Repairs Trivia Board Game

Prepare a trivia board game for the other members of your class to play. Include ten questions in each of four categories: "Restraint Systems," "Lights,", "Wipers," and "Windows and Doors," and write each question on a color-coded card (one color for each category). Then, prepare your game board: provide spaces for each player's pieces to land on, based on a roll

of a die. There should be 31 total spaces on your game board, in each of four colors (to correspond with your four question categories.) To play, the first player rolls a die and moves that number of spaces. Then, the player must answer a question card from the category matching the color of the space his/her piece landed on. If the player answers correctly, he/she can take another turn. If the player answers incorrectly, the next player takes a turn. Whoever gets all the way around the board first is the winner.

INDIVIDUAL STUDENT PROJECTS

Miscellaneous Repairs Estimate Sheet
Look online and visit a body shop in your area to research how much it costs for the miscellaneous repairs discussed in the video: restraint systems, lights, wipers, windows, and doors. Then, prepare a pricing spreadsheet that shows the average price for each of these repairs.

How-To Plastic Repair Guide
Create a working model of one of the following systems: seat belt restraint system, power window, door handle, headlights. Prepare a presentation for the class that discusses how the system is constructed, how it may be damaged in a collision, the decision about whether to replace or repair it, and repair/replacement procedures. Be sure to include a handout for your classmates that illustrates the repair procedures for the system you chose.

Difficult *Miscellaneous Repairs* Report
Which of the repairs discussed in the *Miscellaneous Repairs* video do you think is the most difficult? Why? Using the Internet, the video, and other sources, prepare a written report on this procedure that explains why you think it is the most difficult, the safety considerations to keep in mind when performing this repair, and the specific techniques to follow in order to perform this repair. Include photos or illustrations of each of the steps to be followed when performing this repair.

INTERNET ACTIVITIES

Air Bag Evolution
Air bags are a safety feature that can sometimes cause injuries as well as protect against them. The auto body repair technician must be extremely careful when working with air bags in order to avoid personal injury. Using the Internet, research the evolution of air bags, the types of air bags, and the pros and cons of using these safety devices. Then, prepare a timeline that shows how air bags were developed and how they have been used over the years, along with an illustrated guide to airbags that shows the types of air bags and how auto body repair technicians can work with them safely. You may wish to start your research at this site:

http://www.nhtsa.dot.gov/airbags

Teach Me! Web Scavenger Hunt
It's your turn to play the role of teacher! Your job is to teach the class all about miscellaneous repairs, using only information you find on the Internet. Prepare a lesson plan that uses a series of Web sites that you could use to teach the topic. Your lesson plan should include at least three unique lessons about miscellaneous repairs. For each lesson, list the Web site, the information it contains, and how you would use that information to teach the class about miscellaneous repairs. When you are finished, present at least one of your lessons to the class.

Power Window Photo Instruction Manual
Prepare a photo instruction manual on how to replace a power window. Use the Internet to find photos of each step. You may wish to begin at:

http://www.diynet.com/diy/ab_windows/article/0,2021,DIY_13702_2272112,00.html

Paste each photo into a word processing document, along with a written description. Print out your instruction manual and hand it in to your teacher.

ASSESSMENT QUESTIONS

Q: Which of the following is NOT a component of the seat belt and shoulder harness system?
(a) Upper and lower anchors
(b) Retractor mechanism
(c) Reserve power supply
(d) Latching mechanism
A: (c)
Feedback: The seat belt and shoulder harness system is composed of the belts, upper and lower anchors, a retractor mechanism, and the seat belt latching mechanism. It's the air bag system that sometimes includes a reserve power supply.

Q: The seat belt latch is usually bolted to _____.
A: an anchor in the floor beneath the seat
Feedback: Replace the belt latch mechanism as part of the entire replacement assembly.

Q. If a seat belt does not release with a normal finger press and retract easily, it should be repaired. *(True or False?)*
A: False
Feedback: If a seat belt does not release with a normal press and retract easily, the belt does not lock as it should when the car is in motion, so it should be repaired. If the anchors are bent or deformed, if the belt webbing is torn or frayed, or if the belt latch mechanism or retractor isn't working properly, the assembly should be replaced, not repaired.

Q: Where can an auto body repair technician find the headlight bulbs when they need to be replaced?
A: Inside the headlight assembly
Feedback: The headlight bulbs are located inside the headlight assembly. Access to the bulbs varies from vehicle to vehicle. In most cases you can reach inside the back of the assembly and remove the bulb with a twist.

Q: Before servicing an air bag system, which of the following must be done by the auto body repair technician?

(a) Disarm the airbag system
(b) Unscrew the air bag from the assembly
(c) Remove the clips that fasten the air bag system
(d) Both (b) and (c)

A: (a)
Feedback: Before servicing an air bag system, the auto body repair technician must disarm it. This means disconnecting any power sources. Always disconnect the negative battery terminal. Some manufacturers recommend removing the fuse to the system as well. But be careful. Even these procedures may not completely disarm the system. Some air bag systems are equipped with a reserve power supply that will deploy the air bags in the event of a vehicle power failure. Always refer to the vehicle service manual for the exact procedures to disarm the system.

Q: Why is it important not to touch a headlight bulb when replacing it?
A: Oil from your skin can shorten the life of quartz headlight bulbs.
Feedback: When replacing the bulb, be careful not to touch it. Headlight bulbs are quartz bulbs that should never be touched with bare fingers. Oil from your skin can shorten their life.

Q: When aligning headlights, what common instrument can be lined up with the hood ornament to get a precise measure?

(a) Tape measure
(b) Hammer
(c) Wrench
(d) Yardstick

A: (d)
Feedback: When aligning headlights, you can use a yardstick lined up with the hood ornament to get a precise measure. “Hang the yardstick” and use it to draw the centerline.

Q: If a vehicle has only single headlights, there is no separate adjustment for the high beam. *(True or False?)*
A: True
Feedback: If the vehicle has only single headlights, check and adjust the aim of the low beams. There is no separate adjustment for the high beam. Typically, it will automatically fall within an acceptable range if the lower beam lights are properly aimed.

Q: When adjusting the alignment of doors on a four-door vehicle, which door should be aligned first?

(a) Front door to the quarter panel
(b) Rear door to the quarter panel
(c) Front door opposite the quarter panel
(d) Rear door opposite the quarter panel

A: (b)
Feedback: When adjusting the alignment of doors on a four-door vehicle, begin by adjusting the rear door to the quarter panel. The quarter panel is welded or bonded in place and can't be moved.

Q: To remove and replace an exterior door handle, what tool should be used?
A: A short screwdriver or a small drive socket
Feedback: To remove and replace an exterior handle, use a short screwdriver or small drive socket to remove the mounting screws.

ADDITIONAL RESOURCES

WEB SITES

Auto Body Curriculum Guide
www.sasked.gov.sk.ca/docs/paa/autobody/index.html

Auto Body Online
www.autobodyonline.com

Auto Body PI
www.autopi.com/frame.htm

Auto Body Pro
www.autobodypro.com

Auto Body Tool Mart Repair and Restoration Tutorials
www.autobodytoolmart.com/restorations.html

Automotive Body Repair News
www.abrn.com/abrn (see: www.abrn.com/abrn/article/articleDetail.jsp?id=39995)

Automotive Learning Online
www.innerauto.com

Auto Glossary
www.autoglossary.com

Automotive Plastics Council
http://www.plastics-car.com/s_plasticscar

Automotive Services Association
www.asashop.org

Automotive Youth Educational Systems (AYES)
www.ayes.org/index.asp

Collision Repair Industry Insight
http://www.collision-insight.com

Do-It Yourself Network—Automotive Repair
www.diynet.com/diy/ab_auto_body_work/0,2020,DIY_13675,00.html

How Stuff Works—Auto Stuff Page
auto.howstuffworks.com

I-car
www.i-car.com

National Automotive Service Task Force
www.nastf.org

National Automotive Technicians Education Foundation—Program Standards
www.natef.org/program_standards/collision/index.cfm

OEM Listing: Auto Body Online
www.autobodyonline.com/industry/OEM/index.cfm

Society of Collision Repair Specialists
www.scrs.com/codeofethics.htm

Tektips—Auto Body Pro Website
www.autobodypro.com/tektips.htm

BOOKS

Chilton Book Company. *Chilton's Auto Repair Manual, 1998-2002.* Chilton Book Co., 2003. ISBN: 0801993628

Duffy, James E. *I-CAR Professional Automotive Collision Repair*. Delmar Thomson Learning, 2001. ISBN: 0766813991

Duffy, James E. *Auto Body Repair Technology, 4th Edition*. Thomson/Delmar Learning, 2003. ISBN: 0766862747

OTHER PRODUCTS

Auto Body Shop Safety, Software, Cambridge Educational
Safety procedures relevant to the auto body shop are outlined, along with lessons on First Aid, Fire Safety and Prevention, Wire Feed MIG Welding, and Proper Use of Auto Body Tools. 3.5" IBM version, Mac version also available. A Shopware Production.
Order #: 20941, www.cambridgeeducational.com, 1-800-468-4227

Multimedia Auto Shop Safety, Software, Cambridge Educational
This multimedia CD-ROM uses video, animation and still photos to examine the topics of general shop safety, fire safety and prevention, first aid, and safe tool use for mechanics. The segment dealing with overall shop safety emphasizes the link between cleanliness and organization, as well as personal safety considerations of glasses, earplugs, shoes, and clothes. The first aid portion suggests that a certified first aid class be taken, but it offers an excellent survey of first aid practices, including what NOT to do. Correct fire extinguisher usage is illustrated by memorable graphics. The auto workshop is portrayed as a work site of numerous potential hazards, while at the same time the viewer is taught how to cope with the challenges of volatile auto products, damaged electrical cords, and welding cylinders and their contents. The mechanic's tools are shown to be a statement of their owner's professionalism. It seeks to foster that professionalism by describing the safe care and use of hand and power tools, wrenches, auto body tools, and measuring devices. Part of the series *Shop Safety.* A Shopware Production.
Order #: 20463, www.cambridgeeducational.com, 1-800-468-4227

Automotive Technicians, VHS/DVD, Cambridge Educational
Sponsored by the National Automotive Technicians Education Foundation (NATEF), this program explores automobile repair and collision repair. NATEF works closely with Automotive Service Excellent (ASE), the nation's only industry-wide certification program for automotive technicians. Technicians with a sound education have a choice of career avenues. Aside from fixing cars and trucks, they can become service managers, service engineers, automotive writers, or even auto technology teachers.
Order #: 24924, www.cambridgeeducational.com, 1-800-468-4227

Understanding Cars, VHS/DVD, Films for the Humanities and Sciences
First they revolutionized travel. Then they reshaped American culture. This program, narrated by Jane Curtin, traces the history of automobile technology and design through the 20th century. Stops along the way include visits to the Sandia National Laboratories, the GM Design Center, the Detroit Car Show, and the Petersen and Blackhawk Automotive Museums. The mechanics of four-stroke and two-stroke internal combustion engines, energy-efficient vehicles that run on electricity and fuel cells, automated highways and smart cars, and a number of automotive curiosities are featured.
Order #: 29881, www.films.com, 1-800-257-5126

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