

## 2007 Mississippi Curriculum Framework

### Secondary Automotive Collision Repair Technology

(Program CIP: 47.0603 – Autobody/Collision and Repair Technology/Technician)

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<b>Automotive Service Excellence/ National Automotive Technicians Education Foundation</b>	Reprinted with permission from ASE/NATEF–2006 Collision Repair & Refinish Standards (Painting and Refinishing, Non-Structural and Structural Analysis and Damage Repair, Mechanical & Electrical Components), 101 Blue Seal Drive, Suite 101, Leesburg, VA 20175
<b>Academic Standards</b>	Mississippi Department of Education Subject Area Testing Program
<b>21<sup>st</sup> Century Skills</b>	Reproduced with permission of the Partnership for 21 <sup>st</sup> Century Skills. Further information may be found at <a href="http://www.21stcenturyskills.org">www.21stcenturyskills.org</a>

## Preface

### *Secondary Automotive Collision Repair Research Synopsis*

Articles, books, Web sites, and other materials listed at the end of each unit were considered during the revision process. *ASE Blue Seal Tech*, *Body Shop Business*, *Autobody News*, and *Expert Collision News* were especially useful in providing insight into trends and issues in the field. These references are suggested for use by instructors and students during the study of the topics outlined.

Industry advisory team members from schools throughout the state were asked to give input related to changes to be made to the curriculum framework. Specific comments related to soft skills needed in this program included a positive attitude, being at work every day and on time, and having reading and writing skills to complete work orders and other forms. Occupation-specific skills stated included fundamentals of mechanics, mechanical reasoning, identification of basic parts, operation, and troubleshooting. Safety practices emphasized included practicing all safety rules and wearing the proper safety equipment.

Instructors from schools throughout the state were also asked to give input on changes to be made to the curriculum framework. Changes suggested for the curriculum included aligning the curriculum to current industry standards.

### **Curriculum**

The following state/national standards were referenced in each course of the curriculum:

- *Mississippi Department of Education Subject Area Testing Program Academic Standards*
- *21<sup>st</sup> Century Skills*
- *ASE/NATEF Standards—2006 Collision Repair & Refinish Standards (Painting and Refinishing, Non-Structural and Structural Analysis and Damage Repair, Mechanical & Electrical Components)*

Industry and instructor comments, along with current research, were considered by the curriculum revision team during the revision process; and changes were made as needed and appropriate. Many of the skills and topics noted in the research were already included in the curriculum framework. Specific changes made to the curriculum at the May 10-12, 2006, curriculum revision meeting included:

- The curriculum was aligned with the *2006 ASE/NATEF Collision Repair & Refinish Standards (Painting and Refinishing, Non-Structural and Structural Analysis and Damage Repair, Mechanical & Electrical Components)*
- Competencies and objectives were reviewed to ensure accuracy and appropriateness. Some were rewritten to provide broader competencies and more specific, measurable objectives. Where appropriate, competencies were combined to ensure clarity and minimize repetition.
- Suggested teaching and assessment strategies were added that incorporate preassessment, introductory and closure material, varied projects, mastery learning, and the use of various forms of technology. The integration of workplace and academic skills including math, science, English, and history was also documented.

- The Recommended Tools and Equipment list was updated.

### Assessment

Students will be assessed using the *Secondary Automotive Collision Repair Technology MS-CPAS2 Test*. The test used for 2007 is *Automotive Body Repair*.

### Professional Learning

It is suggested that instructors participate in professional learning related to the following concepts:

- Differentiated instruction - To learn more about differentiated instruction please go to [http://www.paec.org/teacher2teacher/additional\\_subjects.html](http://www.paec.org/teacher2teacher/additional_subjects.html) and click on Differentiated Instruction. Work through this online course and review the additional resources.
- Computer skills for college credit - To learn more about computer skills instruction such as keyboarding, word processing, PowerPoint, etc., please go to <http://msvcc.blackboard.com/webapps/portal/frameset.jsp>.
- Computer skills for CEU credit - To learn more about Computer Skills instruction such as keyboarding, word processing, PowerPoint, etc., please go to <https://cia.rcu.msstate.edu/OnlinePD/>.
- Keyboarding skills - To learn to keyboard, please go to <http://www.learn2type.com/> for a free typing tutor.
- Blackboard training® - To learn more about Blackboard® training, please go to <https://cia.rcu.msstate.edu/OnlinePD/>.
- For the latest in online and yearly Connect training provided by the RCU, please go to <http://info.rcu.msstate.edu/>.

Multiple learning styles inventory training - To learn more about multiple learning styles inventory training, please go to:

- <http://eduscapes.com/tap/topic68.htm> (Technology and Multiple Intelligence)
- [http://72.14.209.104/search?q=cache:GXL5y9zPDdAJ:www.gvsu.edu/forms/infolit/TLA\\_handouts.doc+multiple+learning+styles+online+workshop&hl=en&ct=clnk&cd=3&gl=us](http://72.14.209.104/search?q=cache:GXL5y9zPDdAJ:www.gvsu.edu/forms/infolit/TLA_handouts.doc+multiple+learning+styles+online+workshop&hl=en&ct=clnk&cd=3&gl=us) (Texas Department of Education's Online PD)
- <http://asp.wlv.ac.uk/Level6.asp?UserType=8&Level6=1112> (WLV-Learning Styles)
- [http://www.plsweb.com/graduate\\_courses/full\\_course\\_listing/online/miol/](http://www.plsweb.com/graduate_courses/full_course_listing/online/miol/) (Purposeful Learning Through Multiple Intelligences® Online)

## Foreword

Secondary vocational-technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act III, 1998; and No Child Left Behind Act of 2001).

Each secondary vocational-technical course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Unit Number and Title
- Suggested Time on Task - An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80 percent of the time in the course.
- Competencies and Suggested Objectives
  - A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies.
  - The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.
- Suggested Teaching Strategies - This section of each unit indicates strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies which reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.
- Suggested Assessment Strategies - This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

- Integrated Academic Topics, Workplace Skills, Technology Standards, and Occupational Standards - This section identifies related academic topics as required in the Subject Area Assessment Program (SATP) in Algebra I, Biology I, English II, and U. S. History from 1877, which are integrated into the content of the unit. It also identifies the 21<sup>st</sup> Century Skills, which were developed by the Partnership for 21<sup>st</sup> Century Skills, a group of business and education organizations concerned about the gap between the knowledge and skills learned in school and those needed in communities and the workplace. A portion of the 21<sup>st</sup> Century Skills addresses learning skills needed in the 21<sup>st</sup> century, including information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. The need for these types of skills has been recognized for some time and the 21<sup>st</sup> Century Skills are adapted in part from the 1991 report from the U.S. Secretary of Labor's Commission on Achieving Necessary Skills (SCANS). Another important aspect of learning and working in the 21<sup>st</sup> century involves technology skills, and the International Society for Technology in Education, developers of the National Educational Technology Standards (NETS), were strategic partners in the Partnership for 21<sup>st</sup> Century Skills.
- References - A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

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## Program Description

Automotive Collision Repair Technology I is an instructional program that orients an individual to the field of automotive collision repair. Automotive Collision Repair Technology II is a continuation of Automotive Collision Repair Technology I and allows an individual to prepare for employment or continued education in the occupation of automotive collision repair.

Each course must be taught in a minimum two class period block. The first course in the program includes instruction in the foundation skills related to safety, tools and equipment usage measurement, basic automotive collision repair, non-structural and structural analysis and damage repair, mechanical and electrical, and painting and refinishing. The second course in the program provides students with advanced skills related to non-structural and structural analysis and damage repair, mechanical and electrical, and painting and refinishing.

The program is aligned with the ASE/NATEF—2006 Collision Repair & Refinishing standards, which were retrieved May 1, 2006, from <http://www.natef.org>. Programs seeking certification may receive certification in Painting and Refinishing. Programs can seek certification in other areas if they so desire.

## Course Outline

### Automotive Collision Repair Technology I

Course CIP Code: 47.0603

**Course Description:** Automotive Collision Repair Technology I is an instructional program that orients an individual to the field of automotive collision repair. This course allows an individual to prepare for employment or continued education in the occupation of automotive collision repair. Topics include Introduction and Safety, Basic Tools Usage, Basic Non-Structural and Structural Analysis and Repair, Basic Mechanical and Electrical Components, and Basic Painting and Refinishing.

Unit	Title	Hours
1	Introduction and Orientation	2
2	Safety	8
3	Tools, Technical References, Measurements, and Fasteners	15
4	Basic Non-Structural Analysis and Damage Repair	30
5	Basic Structural Analysis and Damage Repair	20
6	Basic Mechanical and Electrical Components	20
7	Basic Painting and Refinishing	160

### Automotive Collision Repair Technology II

Course CIP Code: 47.9990

**Course Description:** Automotive Collision Repair Technology II is an instructional program that orients an individual to the field of automotive collision repair. This course allows an individual to prepare for employment or continued education in the occupation of automotive collision repair. Topics include Safety, Advanced Non-Structural and Structural Analysis and Repair, Advanced Mechanical and Electrical Components, and Advanced Painting and Refinishing.

Unit	Title	Hours
1	Safety (Review)	5
2	Advanced Non-Structural Analysis and Damage Repair	30
3	Advanced Structural Analysis and Damage Repair	20
4	Advanced Mechanical and Electrical Components	20
5	Advanced Painting and Refinishing	180

**Automotive Collision Repair Technology I**  
**Unit 1: Introduction and Orientation**

**(2 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Introduce concepts and terms associated with the collision repair industry.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Use a multimedia presentation and the Internet to introduce the career field. Discuss job requirements (e.g., certifications, education, etc.), occupation-specific skills, and soft skills needed.</li> <li>• Have students discuss what they already know about the field of collision repair technology, the types of jobs available, and the salaries of those jobs. Have students work as a class to complete a KWL chart (see Appendix D). In the “K” column, have students list information they currently know about the field of collision repair technology, the types of jobs available, and the salaries of those jobs. In the “W” column, have students brainstorm a list of things they want to learn about the field of collision repair technology. Have students work in groups or as individuals to interview industry members to find answers to their “W” list. Have students return to the KWL chart and list everything they learned from the interviews in the “L” column.</li> <li>• Outline the units of the program and how they relate to various jobs in the field. Share with students the Weekly Learning Reflections activity found in Appendix D. Have students complete this activity at the end of each week. Have students discuss with parents their learning, areas of improvements, and goals for the next week.</li> <li>• Use a multiple learning styles inventory to determine students’ learning styles and interests. Share with the students their styles and the impact they have. Throughout the year, provide varied projects to meet the learning styles.</li> <li>• Work with the Special Populations instructor to assess the reading, writing, and math skills of each student and to</li> </ul>

	<p>provide materials that are appropriate for each student. Plan to reassess students at the end of the year.</p> <ul style="list-style-type: none"> <li>• Divide students into groups based on learning styles, and have them use the Internet or textbooks to research the development of the field, origination of terms, and the terms used in different countries throughout the world. Have students present their findings by using technology tools to develop a dictionary, writing and conducting a mock training session for new employees, or making a videotape or tape recording.</li> <li>• Have students research the history of collision repair technology. Have each student create a timeline that indicates growth and changes in the industry.</li> <li>• Have students compare and contrast the American automotive industry to the automotive industries in other countries. Have students present their information in a writing summary. Encourage students to use graphs and timelines as graphical summaries.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Monitor student participation in discussions using the Group Participation Assessment Rubric located in Appendix D.</li> <li>• Evaluate each group's project and presentation for content, clarity, and length.</li> <li>• Use the assessment tools in the Blackboard Learning System® to administer a vocabulary quiz to students.</li> <li>• Evaluate the timeline for content and presentation.</li> </ul>
<p>2. Describe local program and vocational/career technical center policies and procedures.</p> <ol style="list-style-type: none"> <li>a. Describe local program and vocational/career technical center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.</li> <li>b. Compare and contrast local program</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Present local program and vocational/career and technical center policies and procedures.</li> <li>• Have students read the handbook to become aware of what is expected of them in relation to the policies and procedures of the school. This will include dress code, attendance, academic requirements, discipline, and transportation regulations.</li> </ul>

<p>policies, procedures, and expectations to industry policies, procedures, and expectations.</p> <p>c. Preview the school technology acceptable use policy.</p>	<p>Have students work together in pairs. A student with a higher reading ability will team up with a student with a lower reading ability to get a better understanding of the school's program policies and procedures. Have students submit a written report on rules and regulations using technology productivity tools and the Blackboard Learning System<sup>®</sup>.</p> <ul style="list-style-type: none"> <li>• Assign students a mentor from a automotive collision repair services technology industry. Have students use a Venn diagram (see Appendix D) to compare and contrast the class and school policies, procedures, and expectations to a local industry's policies, procedures, and expectations.</li> <li>• Show students video clips about Internet safety for teens from <a href="http://www.netsmartz.org/resources/reallife.htm#realamy">http://www.netsmartz.org/resources/reallife.htm#realamy</a>. Divide students into groups of four. Have each group visit <a href="http://www.getnetwise.org/">http://www.getnetwise.org/</a> to research one of the following topics: <ul style="list-style-type: none"> <li>○ Keeping children safe online</li> <li>○ Stopping unwanted e-mail and spam</li> <li>○ Protecting your computer from hackers and viruses</li> <li>○ Keeping your personal information private</li> </ul> </li> <li>• Ask each group to become experts on their assigned topic. Have each group teach the class about their topic. As a whole group, have students brainstorm guidelines for teen safety on the Internet. Have students compare and contrast their list of guidelines to the school or district's technology acceptable use policy (AUP).</li> <li>• Share with students the Web sites <a href="http://www.missingkids.com">http://www.missingkids.com</a> and <a href="http://www.getnetwise.org/">http://www.getnetwise.org/</a>. Have students complete a teen safety reference sheet that includes information about the following: <ul style="list-style-type: none"> <li>○ Internet safety guidelines for teens</li> <li>○ Strategies to enhance their ability to recognize dangers on the Internet</li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>○ Information about how to report victimizations to a trusted adult</li> <li>• Have students take their teen safety reference sheet and the school's technology AUP home and discuss it with their parents/guardians.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Assess student orientation, policy, and procedure knowledge through instructor observations and written unit test. File completed test to document student mastery of the school and program policies and procedures.</li> <li>• Evaluate the report for clarity and content.</li> </ul>
<p>3. Explore employment opportunities and responsibilities.</p> <ol style="list-style-type: none"> <li>a. Describe employment opportunities including potential earnings, employee benefits, job availability, place of employment, working conditions, and educational requirements.</li> <li>b. Describe basic employee responsibilities.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Use information from the U.S. Department of Labor to describe the major areas of collision repair, related occupations and their expected growth, and salaries of a variety of jobs in the field.</li> <li>• Have each student select a career in a field related to the course and use the Occupational Outlook Handbook (book or Web site), Internet, and other classroom resources to research job titles, educational and skill requirements, expected job growth, and entry-level salaries. Have students compile their research into a spreadsheet and create graphs to describe their data. Have each student report the findings by writing a news report, making a learning center, or creating a job announcement.</li> <li>• Use technology to show students examples of good and bad resumes and cover letters. Have students identify errors and give suggestions for improvement in the bad examples.</li> <li>• Have each student use the Internet or newspapers to choose a job for which he/she is qualified and prepare a resume and cover letter that can be used to apply for the selected job.</li> <li>• Discuss appropriate interview techniques and have the students participate in mock interviews with local personnel working in</li> </ul>

	<p>administrative positions. Have students send thank you notes to mock interviewers.</p> <ul style="list-style-type: none"> <li>To provide closure to each unit throughout the year, have students summarize what they have learned about the topic covered and place the summaries in a notebook or portfolio. Review the notebooks or portfolios at the end of each unit and reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Assess career product for content and appearance.</li> <li>Evaluate the cover letter for clarity and content.</li> <li>Evaluate the resume and interview using the Resume Rubric and Interview Rubric located in Appendix D.</li> <li>Review summary of unit for understanding of material and reteach as needed.</li> <li>Use the assessment tools in the Blackboard Learning System<sup>®</sup> to administer a workplace skills quiz to students.</li> <li>Evaluate student's workplace skills weekly by using the Workplace Skills Weekly Checklist found in Appendix D.</li> </ul>
<p>4. Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA.</p> <ol style="list-style-type: none"> <li>Demonstrate effective teambuilding and leadership skills.</li> <li>Practice appropriate work ethics.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Discuss the role of a team member and leader. Assign the students roles within a team and have them role play a situation in which there is a conflict which must be resolved. Utilize the lessons from SkillsUSA or other resources to provide additional training.</li> <li>Discuss appropriate work ethics standards. Have the students write in a journal what they believe to be the most important issues within the profession.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Assess student participation in role-play using the Role-Play Rubric located in Appendix D.</li> <li>Lessons from other resources should be assessed according to the recommended resource guide.</li> <li>Review the journal entries about work ethics and evaluate using the Student</li> </ul>



	Journal Rubric located in Appendix D.
5. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on- the-job situations.	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Have the students perform an activity involving verbal instructions. Divide the students into groups and have one team be the customer and the other be the service advisor. The customer will describe the concern, and the service advisor will provide an explanation of the processes that will need to be followed for them to properly diagnose the concern. Have the groups switch roles and repeat the process.</li> <li>• The student will be given a work order. The work order will contain written instructions of a specific job. The student will complete the work order.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the presentation using the Presentation Rubric located in Appendix D.</li> <li>• The work order will be evaluated for clarity and content.</li> </ul>
6. Discuss the history of the collision repair industry to include materials, terminology, and techniques.	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Discuss the history of the collision industry. Have the students research the history of the collision industry and develop a presentation for the class.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the presentation using the Presentation Rubric located in Appendix D.</li> </ul>

## STANDARDS

### *2006 ASE/NATEF Collision Repair & Refinish Standards*

CRN1-Non-Structural Analysis and Damage Repair  
 CRS2-Structural Analysis and Damage Repair  
 CRS3-Mechanical and Electrical Components  
 CRP4-Painting and Refinishing

### *Academic Standards*

- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

## Secondary Automotive Collision Repair Technology

- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E10 Use language and critical thinking strategies to serve as tools for learning.
- H2 Describe the impact of science and technology on the historical development of the United States in the global community.
- H3 Describe the relationship of people, places, and environments through time.
- H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

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### *21<sup>st</sup> Century Skills*

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- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

### **SUGGESTED REFERENCES**

#### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J. (2001). *I-CAR professional automotive collision repair.* Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)

Duffy, J., & Scharff, R. (2004). *Auto body repair technology.* Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

Films Media Group. (2005). *Auto body repair basics.* (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction.* (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works.* Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car.* Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence.* Retrieved June 10, 2006, from <http://www.asecert.org/>

**Automotive Collision Repair Technology I**  
**Unit 2: Safety**

(8 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Describe general safety rules for working in a shop/lab and industry.</p> <ol style="list-style-type: none"> <li>Describe how to avoid on-site accidents.</li> <li>Explain the relationship between housekeeping and safety.</li> <li>Explain the importance of following all safety rules and company safety policies.</li> <li>Explain the importance of reporting all on-the-job injuries and accidents.</li> <li>Explain the need for evacuation policies and the importance of following them.</li> <li>Explain the employer's substances abuse policy and how it relates to safety.</li> <li>Explain the safety procedures when working near pressurized or high temperature.</li> </ol>	<p><b>Teaching:</b>  <b>These may be used for the entire unit.</b></p> <ul style="list-style-type: none"> <li>Show students videos demonstrating examples of accidents in the workplace (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>). Pre-assess knowledge of safety by having each student write a summary of the safety violations present in the videos.</li> <li>Divide students into groups based on learning styles, and assign each group a guideline for personal and laboratory safety (i.e., chemicals, fire, equipment, animals, and electrical) or general laboratory conduct. Have each group role-play, create a multimedia presentation or a rap song, or write a story to discuss the proper and improper procedures related to the guideline.</li> <li>Use the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eyes, and ears). Divide the students into pairs and assign each pair one of the guidelines. Each pair will demonstrate the "do's and don'ts" of the guideline.</li> <li>Have an industry speaker present to the class the necessity of safety in the work environment. Have students use the Writing Process (see Appendix D) to develop a summary of the presentation.</li> <li>Invite the local fire department to lead a fire safety lesson. Have students use fire extinguishers properly. Have students locate all fire extinguishers in the school. Have students determine and select the proper fire extinguisher for different types of fires.</li> <li>Divide the students into teams and have them develop scenarios of hazards and accidents using the publications and the Internet. This will include tools, spills, working around welding, ladders or scaffolds, use of MSDS information, fires,</li> </ul>
<p>2. Identify and apply safety around collision operations.</p> <ol style="list-style-type: none"> <li>Use proper safety practices when performing collision operations.</li> <li>Recognize and explain personal protective equipment.</li> <li>Inspect and care for personal protective equipment.</li> </ol>	
<p>3. Explain lifting.</p> <ol style="list-style-type: none"> <li>Identify and explain the procedures for lifting heavy objects.</li> </ol>	
<p>4. Explain the Material Safety Data Sheet (MSDS).</p> <ol style="list-style-type: none"> <li>Explain the function of the MSDS.</li> <li>Interpret the requirements of the MSDS.</li> </ol>	
<p>5. Explain fires.</p> <ol style="list-style-type: none"> <li>Explain the process by which fires start.</li> <li>Explain fire prevention of various flammable liquids.</li> </ol>	

c. Explain the classes of fire and the types of extinguishers.	<p>and electrical situations. In a game-type situation, one team will read a scenario and the other teams will compete to be the first to provide the proper safety measures which should have been used to prevent the hazardous situation. Points will be awarded to the teams with the correct answers.</p> <ul style="list-style-type: none"> <li>NOTE: SAFETY IS TO BE TAUGHT AS AN ONGOING PART OF THE COURSE THROUGHOUT THE YEAR.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Required written tests will follow each section of guidelines for safety rules and procedures. When applicable, use the assessment tools found in the Blackboard Learning System®.</li> <li>Student participation will be monitored by the instructor and the written exam will be graded. The student must achieve 100% accuracy.</li> <li>The “do’s and don’ts” exercise will be critiqued with a peer review.</li> <li>The summary of the speaker’s presentation will be critiqued using the Written Report Assessment Rubric located in Appendix D.</li> <li>The teams will be rewarded according to the points earned from the game. This could be extra points, classroom privileges, etc.</li> <li>Written exams will be graded for accuracy.</li> </ul>
<p>6. Explain safety in and around collision repair and electrical situations.</p> <p>a. Explain injuries when electrical contact occurs.</p> <p>b. Explain safety around collision repair and electrical hazards.</p> <p>c. Explain action to take when an electrical shock occurs.</p>	

## STANDARDS

### *2006 ASE/NATEF Collision Repair & Refinish Standards*

CRN1-Non-Structural Analysis and Damage Repair  
 CRS2-Structural Analysis and Damage Repair  
 CRS3-Mechanical and Electrical Components  
 CRP4-Painting and Refinishing

### *Academic Standards*

E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.

## Secondary Automotive Collision Repair Technology

- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.

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### *21<sup>st</sup> Century Skills*

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- CS1 Global Awareness
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

### **SUGGESTED REFERENCES**

#### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

### Videos

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Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

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*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>

## Automotive Collision Repair Technology I

### Unit 3: Tools, Technical References, Measurement, and Fasteners

(15 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Demonstrate safe and proper use and storage of tools and equipment in an automotive collision repair lab.</p> <ol style="list-style-type: none"> <li>Identify and demonstrate the safe and proper use of common hand tools including wrenches, screwdrivers, pliers, hammers, chisels, body hammers, slide hammers, pull rods, suction cups, and dollies.</li> <li>Identify and demonstrate the safe use of hand-operated power tools including paint sprayer, pneumatic grinders, sanders, drills, dent removal system, and files.</li> <li>Identify hand tools used for body filling and shaping including surform (cheese grater), bondo spreader (squeegee), and sanding blocks.</li> <li>Identify hand tools used for special body work including pop rivet gun, door handle removal tools, windshield knife, and interior and exterior trim removal tools.</li> <li>Identify and describe the safe use of portable and stationary power equipment including hydraulic body jacks, spray booth, frame alignment and straightening equipment, floor jacks, hoists, hydraulic automobile lifts, and drill press.</li> <li>Identify and demonstrate the safe and proper use of lifting equipment.</li> <li>Identify and demonstrate the safe and proper use of cleaning equipment.</li> <li>Organize and maintain a systematic storage system for hand and power tools.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Discuss and demonstrate the safe and proper use and storage of tools and equipment.</li> <li>Review collision repair supply catalogs and self-made pictures of tools and equipment that students will use in the program.</li> <li>Divide the students into groups by learning styles. Have groups demonstrate safety procedures, proper use, and storage of tools and equipment. Assign a specific task to a group of students. Have the group make a list of the proper tools that will be required to complete the task and present their decisions to the class.</li> <li>Explain and demonstrate the use of software for the specific area of instruction. Have students use the software for tool identification.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Have students complete a tool identification test.</li> <li>Evaluate a job sheet for the task.</li> <li>Evaluate the group using the Group Presentation Rubric located in Appendix D.</li> <li>Evaluate the printed results from the software test.</li> </ul>
<p>2. Locate and apply service specifications and information.</p> <ol style="list-style-type: none"> <li>Locate service specifications and information, using both print and computerized service information</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Discuss the importance of being able to locate and apply the proper service specifications.</li> <li>Review the text, Internet, manuals, and</li> </ul>



<p>references.</p> <p>b. Interpret and apply information to a specific job on a specific vehicle.</p> <p>c. Locate and interpret vehicle and major component identification numbers (VIN, certification, and calibration labels).</p>	<p>handouts for locating and applying information. Have students locate specific information using text, Internet, manuals, and handouts for locating and applying for an assigned task.</p> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Record the information on the job sheet.</li> </ul>
<p>3. Demonstrate measurement practices used in the automotive service.</p> <p>a. Measure the length of an object using a rule to the nearest 1/16th of an inch and 1 millimeter.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Ask students the following question: <ul style="list-style-type: none"> <li>○ How good is your eye for measurement?</li> </ul> </li> <li>• Give students the following scenario: <ul style="list-style-type: none"> <li>○ The distance from your nose to the outside of your finger tips is about 1 meter. Estimate the distance between you and three objects in the room. Have each member in the class make a data table and record his/her estimates. Have each student verify his/her estimation and compare it with the real measurement.</li> </ul> </li> <li>• Lead a class discussion using the following prompts: <ul style="list-style-type: none"> <li>○ Were the estimates reasonably close?</li> <li>○ Did one person consistently make accurate estimates?</li> </ul> </li> <li>• Use a KWL chart (see Appendix D) to determine students' previous knowledge of measurement.</li> <li>• Have students define and illustrate measurement terminology.</li> <li>• Explain the importance of proper measurement practices, display tools that are used for measurement, and demonstrate how using the techniques are important to the student's career path.</li> <li>• Give students measurement problems to solve in a group and individual setting.</li> <li>• Demonstrate how to measure a given item using a variety of measuring instruments. Have students work in groups to measure given items and record the answers.</li> <li>• Explain and demonstrate software to review measuring skills. Have students use software to complete measurement problems.</li> </ul>

	<ul style="list-style-type: none"> <li>• Have students practice converting units extensively (i.e., meters/sec to min/hr, cubic inches/day to liters/min).</li> <li>• Have students discuss the importance of measurement with their industry mentor.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate student's measurement problems.</li> <li>• Assess students as they measure given items and record the measurements on a job sheet.</li> <li>• Evaluate measurement conversions for accuracy.</li> </ul>
<p>4. Identify common fasteners and describe their use.</p> <ol style="list-style-type: none"> <li>a. Identify the different types of bolts, nuts, and washers and describe their appropriate uses.</li> <li>b. Identify bolts by grade, diameter, length, and thread pitch.</li> <li>c. Identify different glues and sealants used in automotive service, and describe their appropriate use.</li> <li>d. Restore internal and external threads.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Using a multimedia presentation and classroom materials and supplies, discuss fasteners and their use.</li> <li>• Explain and show how fasteners are used.</li> <li>• Display several models that the students can view and manipulate.</li> <li>• Have students analyze the fasteners and apply the proper fasteners.</li> <li>• Have students use technology productivity tools to develop a fastener sheet. The sheet should contain a picture of common fasteners and a description of their uses.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate using the Activity Performance Rubric located in Appendix D.</li> <li>• Evaluate the fastener sheet for accuracy and layout.</li> </ul>
<p>5. Explain the computerized systems used for estimating collision repairs, measuring damage, and mixing or matching paint.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Using a real vehicle, have student to estimate how much it would cost to fix damage on a vehicle.</li> <li>• Using the estimating guidelines, have students to calculate the expenses and compare the estimates to the actual cost to see how accurate their figures were.</li> <li>• Have the students use the information from the above activities and complete a work order for the customer and/or insurance company.</li> <li>• Divide students into groups and assign them to a project. The project will involve a quote for an estimate from an automobile supply store or salvage yard.</li> </ul>

	<p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the estimate for clarity and content, and accuracy.</li> <li>• Evaluate the work order using industry guidelines and content.</li> </ul>
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## STANDARDS

### *2006 ASE/NATEF Collision Repair & Refinish Standards*

CRN1-Non-Structural Analysis and Damage Repair  
 CRS2-Structural Analysis and Damage Repair  
 CRS3-Mechanical and Electrical Components  
 CRP4-Painting and Refinishing

### *Academic Standards*

- A1 Recognize, classify, and use real numbers and their properties.  
 A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.  
 A5 Utilize various formulas in problem-solving situations.  
 A6 Communicate using the language of algebra.  
 A7 Interpret and apply slope as a rate of change.  
 A8 Analyze data and apply concepts of probability.  
 E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.  
 E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.  
 E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.  
 E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.  
 E5 Complete oral and written presentations which exhibit interaction and consensus within a group.  
 E6 Explore cultural contributions to the history of the English language and its literature.

### *21<sup>st</sup> Century Skills*

- CS2 Financial, Economic, and Business Literacy  
 CS4 Information and Communication Skills  
 CS5 Thinking and Problem-Solving Skills  
 CS6 Interpersonal and Self-Directional Skills

## Secondary Automotive Collision Repair Technology

## SUGGESTED REFERENCES

### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 2: Welding*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J. (2001). *I-CAR professional automotive collision repair*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)

Duffy, J., & Scharff, R. (2004). *Auto body repair technology*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

### Videos

Films Media Group. (2005). *Auto body repair-12 part series*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

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*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>

## Automotive Collision Repair Technology I

### Unit 4: Basic Non-Structural Analysis and Damage Repair

(30 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explore preparation of body components.</p> <ol style="list-style-type: none"> <li>Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan.</li> <li>Inspect, remove, store, and replace exterior trim and moldings.</li> <li>Inspect, remove, store, and replace interior trim and components.</li> <li>Inspect, remove, store, and replace non-structural body panels and components that may interfere with or be damaged during repair.</li> <li>Inspect, remove, store, and replace all vehicle mechanical and electrical components that may interfere with or be damaged during repair.</li> <li>Protect panels, glass, and parts adjacent to the repair area.</li> <li>Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants from those areas to be repaired.</li> <li>Apply safety procedures associated with vehicle components and systems according to manufacturers' specifications/procedures.</li> </ol> <p><b>INSTRUCTOR NOTE:</b> For every task in Non-Structural Analysis and Damage Repair (Body Components), the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.</p>	<p><b>Teaching:</b></p> <p><b>Note: These strategies can be used for the entire unit. Safety will be reviewed and reinforced before and during the unit.</b></p> <p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Review and reinforce safety procedures.</li> <li>• Have students write the answers to the following questions in their notebooks: <ul style="list-style-type: none"> <li>○ What should I know and be able to do at the end of this unit or experience?</li> <li>○ What do I already know that will be useful in learning this new material or working in this way?</li> <li>○ How is this knowledge and how are these skills important in the world outside of school?</li> <li>○ When are the important checkpoints and deadlines?</li> <li>○ How will I be able to tell when I have done a really outstanding job when applying this new knowledge?</li> </ul> </li> <li>• Review student answers and have students discuss their answers when appropriate.</li> <li>• Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task. Have students develop several questions from the video. Lead a group discussion that addresses each question that students listed.</li> <li>• Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class.</li> <li>• Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three</li> </ul>

	<p>minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.</p> <ul style="list-style-type: none"><li>• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into “touring groups” to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have “toured” each chart. When students return to their seats, allow some time for discussion and reactions.</li><li>• Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns.</li><li>• Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task.</li><li>• Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned.</li><li>• Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians use appropriate graphic organizers (Cluster Word Web, Fact or Opinion, Step-by-Step Chart, or the Problem Solution Chart found in Appendix D) to evaluate customer’s concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine</li></ul>
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	<p>the needed action.</p> <ul style="list-style-type: none"> <li>• Have students complete job shadowing experiences. Have students observe and record notes in a journal about the conversations the technician had with customers.</li> <li>• Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit.</li> <li>• After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the questions and answers for content and clarity.</li> <li>• Assess field trip participation using the Field Trip Participation Checklist located in Appendix D.</li> <li>• Evaluate the poster using the Poster Assessment Rubric located in Appendix D.</li> <li>• Assess student participation in role play using the Role-Play Rubric located in Appendix D.</li> <li>• Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D.</li> <li>• Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D.</li> <li>• Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.</li> </ul>
<p>2. Explore outer body panels (repairs, replacement, and adjustments).</p> <ol style="list-style-type: none"> <li>a. Determine the extent of direct and indirect damage and direction of impact; develop and document a repair plan.</li> <li>b. Inspect, remove and replace bolted, bonded, and welded steel panel or panel assemblies.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity</li> </ul>



<ul style="list-style-type: none"> <li>c. Inspect, remove, replace, and align hood, hood hinges, and hood latch.</li> <li>d. Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.</li> <li>e. Inspect, remove, replace, and align doors, tailgates, hatches, lift gates, latches, hinges, and related hardware.</li> <li>f. Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware.</li> <li>g. Inspect, remove, replace, and align front fenders, headers, and other panels.</li> <li>h. Straighten and rough-out contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pull attachments.</li> <li>i. Weld damaged or torn steel body panels; repair broken welds.</li> </ul>	<p>Performance Rubric located in Appendix D.</p>
<p>3. Explore metal finishing and body filling.</p> <ul style="list-style-type: none"> <li>a. Remove paint from the damaged area of a body panel.</li> <li>b. Locate and reduce surface irregularities on a damaged body panel.</li> <li>c. Demonstrate hammer and dolly techniques.</li> <li>d. Heat shrink stretched panel areas to proper contour according to manufacturer's specifications.</li> <li>e. Cold shrink stretched panel areas to proper contour.</li> <li>f. Mix body filler.</li> <li>g. Apply body filler; shape during curing.</li> <li>h. Rough sand cured body filler to contour; finish sand.</li> </ul>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>4. Explore metal welding and cutting procedures for non-structural applications.</p> <ul style="list-style-type: none"> <li>a. Identify weldable and non-weldable materials used in collision repair.</li> <li>b. Weld and cut high-strength steel and other steels using manufacturer's</li> </ul>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul>

<p>specifications/procedures.</p> <ol style="list-style-type: none"> <li>c. Determine the correct welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.</li> <li>d. 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.</li> <li>e. Store, handle, and install high-pressure gas cylinders.</li> <li>f. Determine work clamp (ground) location and attach.</li> <li>g. 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.</li> <li>h. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.</li> <li>i. Protect computers and other electronic control modules during welding procedures according to manufacturer’s specifications.</li> <li>j. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp as required.</li> <li>k. Determine the joint type (butt weld with backing, lap, etc.) for weld being made according to manufacturer’s/industry specifications.</li> <li>l. Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation according to manufacturer’s/industry specifications.</li> </ol>	<p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
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## STANDARDS

### 2006 ASE/NATEF Collision Repair & Refinish Standards

#### CRN1-Non-Structural Analysis and Damage Repair

##### Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E6 Explore cultural contributions to the history of the English language and its literature.

##### 21<sup>st</sup> Century Skills

- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

## SUGGESTED REFERENCES

### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

## Secondary Automotive Collision Repair Technology

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 2: Welding*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 3: Panel repairs*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 4: Painting and refinishing*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 5: Exterior and interior trim*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 6: Mechanical services*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 7: Frame and unibody construction and repair*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 9: Detailing*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J. (2001). *I-CAR professional automotive collision repair*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)

Duffy, J., & Scharff, R. (2004). *Auto body repair technology*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

Bennett Marine Video. (2000). *Caterpillar 3208*. (Available from Bennett Marine Video, 2321 Abbot Kinney Blvd. Top Floor, Venice, CA 90291, 800-733-8862)

Bergwall Productions. (n.d.). *Engines*. (Available in CD-ROM, video, and book from Bergwall Productions, Inc., 1224 Baltimore Pike, Suite 203, Chadds Ford, PA 19317, 1-800-934-8696)

Films Media Group. (2005). *Auto body repair-12 part series*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>

**Automotive Collision Repair Technology I**  
**Unit 5: Basic Structural Analysis and Damage Repair**

**(20 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explore frame inspection and repair.</p> <ol style="list-style-type: none"> <li>Diagnose and measure structural damage using tram and self-centering gauges according to industry specifications.</li> <li>Attach vehicle to anchoring devices.</li> <li>Analyze and identify misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and wheel alignment problems; align or replace in accordance with vehicle manufacturer's specifications/procedures.</li> <li>Diagnose and measure structural damage using a universal measuring system (mechanical, electrical, laser).</li> <li>Diagnose and measure structural vehicles using a dedicated (fixture) measuring system.</li> <li>Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.</li> </ol> <p><b>INSTRUCTOR NOTE:</b> For all the following tasks, recognize that measuring, dimensioning, and tolerance limits in unibody vehicles are critical to repair of these vehicles; recognize that suspension/steering mounting points and engine power train attaching points are critical to vehicle safety, handling, and performance.</p>	<p><b>Teaching:</b>  <b>Note: These strategies can be used for the entire unit. Safety will be reviewed and reinforced before and during the unit.</b></p> <p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Review and reinforce safety procedures.</li> <li>• Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task. The student will develop several questions from the video. Lead a group discussion that addresses each question that students listed.</li> <li>• Have students write the answers to the following questions in their notebooks: <ul style="list-style-type: none"> <li>○ What should I know and be able to do at the end of this unit or experience?</li> <li>○ What do I already know that will be useful in learning this new material or working in this way?</li> <li>○ How is this knowledge and how are these skills important in the world outside of school?</li> <li>○ When are the important checkpoints and deadlines?</li> <li>○ How will I be able to tell when I have done a really outstanding job when applying this new knowledge?</li> </ul> </li> <li>• Review student answers and have students discuss their answers when appropriate.</li> <li>• Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class.</li> <li>• Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three</li> </ul>

	<p>minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.</p> <ul style="list-style-type: none"><li>• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into “touring groups” to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have “toured” each chart. When students return to their seats, allow some time for discussion and reactions.</li><li>• Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources to use technology tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns.</li><li>• Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task.</li><li>• Display pictures from the lab and facilitate discussion about the specific task. Have students develop a descriptive paragraph about each picture. Have students perform each task assigned.</li><li>• Have students work in groups to examine case studies related to task(s) and have students recommend the needed action.</li><li>• Have students complete job shadowing experiences.</li><li>• Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer’s concerns</li></ul>
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	<p>about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action.</p> <ul style="list-style-type: none"> <li>• Have student observe and record notes in a journal about the conversations the technician has with customers.</li> <li>• Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit.</li> <li>• After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the questions and answers for content and clarity.</li> <li>• Assess field trip participation using the Field Trip Participation Checklist located in Appendix D.</li> <li>• Evaluate the poster using the Poster Assessment Rubric located in Appendix D.</li> <li>• Assess student participation in role play using the Role-Play Rubric located in Appendix D.</li> <li>• Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D.</li> <li>• Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D.</li> <li>• Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.</li> </ul>
<p>2. Explore unibody inspection, measurement, and repair.</p> <p>a. Identify misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and chassis alignment problems; realign or replace in accordance with vehicle</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p>



<p>manufacturer's specifications/procedures.</p> <p>b. Diagnose and measure unibody damage using tram and self-centering gauges according to industry specifications.</p> <p>c. Attach anchoring devices to vehicle; remove or reposition components as necessary.</p> <p>d. Identify heat limitations in unibody vehicles in accordance with vehicle manufacturer's specifications/procedures</p> <p>e. Identify proper cold stress relief methods.</p> <p>f. Repair damage using power tools and hand tools to restore proper contours and dimensions.</p>	<ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>3. Explore procedures for fixed glass removal and installation.</p> <p>a. Remove and reinstall or replace fixed glass (heated and non-heated) using manufacturer's specifications/procedures and recommended materials.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>4. Explore metal welding and cutting for non-structural applications.</p> <p>a. Identify weldable and non-weldable materials used in collision repair.</p> <p>b. Weld and cut high-strength steel and other steels using manufacturer's specifications/procedures.</p> <p>c. Determine the correct welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.</p> <p>d. 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.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

<ul style="list-style-type: none"> <li>e. Store, handle, and install high-pressure gas cylinders.</li> <li>f. Determine work clamp (ground) location and attach.</li> <li>g. 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.</li> <li>h. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.</li> <li>i. Protect computers and other electronic control modules during welding procedures according to manufacturer's specifications.</li> <li>j. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp as required.</li> <li>k. Determine the joint type (butt weld with backing, lap, etc.) for weld being made according to manufacturer's/industry specifications.</li> <li>l. Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation according to manufacturer's/industry specifications.</li> </ul>	
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## STANDARDS

### *2006 ASE/NATEF Collision Repair & Refinish Standards*

#### CRS2-Structural Analysis and Damage Repair

##### *Academic Standards*

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.

## Secondary Automotive Collision Repair Technology

- A4 Explore and communicate the characteristics and operations of polynomials.
- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E6 Explore cultural contributions to the history of the English language and its literature.

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### 21<sup>st</sup> Century Skills

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- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

### SUGGESTED REFERENCES

#### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

- Auto collision technology—Module 1: Introduction to auto collision.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 2: Welding.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
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- Auto collision technology—Module 5: Exterior and interior trim.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 6: Mechanical services.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 7: Frame and unibody construction and repair.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Duffy, J. (2001). *I-CAR professional automotive collision repair.* Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)
- Duffy, J., & Scharff, R. (2004). *Auto body repair technology.* Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

- Films Media Group. (2005). *Auto body repair-12 part series.* (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)
- Films Media Group. (2005). *Auto body repair basics.* (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)
- Films Media Group. (2005). *Auto construction.* (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Body alignment*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Dings and scratches*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Replacing and adjusting panels*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Structural analysis and damage repair*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Welding*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>

**Automotive Collision Repair Technology I**  
**Unit 6: Basic Mechanical and Electrical Components**

(20 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explore suspension and steering components and systems.</p> <ol style="list-style-type: none"> <li>a. Identify suspension system fasteners that should not be reused.</li> <li>b. Inspect and adjust (where applicable) steering linkage geometry (attitude/parallelism).</li> <li>c. Inspect and replace pitman arm.</li> <li>d. Inspect and replace relay (center link/intermediate) rod.</li> <li>e. Inspect, remove, and replace idler arm and mountings.</li> <li>f. Inspect, remove, and replace tie rod sleeves, clamps, and tie rod ends.</li> <li>g. Inspect, remove, and replace steering linkage damper.</li> <li>h. Inspect, remove, and replace shock absorbers.</li> <li>i. Measure vehicle ride height; determine needed repairs.</li> <li>j. Diagnose tire wear patterns; determine needed repairs.</li> <li>k. Inspect tires; identify direction of rotation, and location; check and adjust air pressure.</li> <li>l. Diagnose wheel/tire vibration, shimmy, and tramp (wheel hop) problems; determine needed repairs.</li> <li>m. Reinstall wheels and torque lug nuts according to manufacturer's specifications.</li> </ol> <p><b>INSTRUCTOR NOTE:</b> When a technician is replacing components with torque values, it is imperative that fasteners are torqued according to manufacturer's specifications.</p>	<p><b>Teaching:</b>  <b>Note: These strategies can be used for the entire unit. Safety will be reviewed and reinforced before and during the unit.</b></p> <p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Review and reinforce safety procedures.</li> <li>• Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task. The student will develop several questions from the video. Lead a group discussion that addresses each question that students listed.</li> <li>• Have students write the answers to the following questions in their notebooks: <ul style="list-style-type: none"> <li>○ What should I know and be able to do at the end of this unit or experience?</li> <li>○ What do I already know that will be useful in learning this new material or working in this way?</li> <li>○ How is this knowledge and how are these skills important in the world outside of school?</li> <li>○ When are the important checkpoints and deadlines?</li> <li>○ How will I be able to tell when I have done a really outstanding job when applying this new knowledge?</li> </ul> </li> <li>• Review student answers and have students discuss their answers when appropriate.</li> <li>• Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class.</li> <li>• Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three</li> </ul>

	<p>minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.</p> <ul style="list-style-type: none"><li>• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into “touring groups” to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have “toured” each chart. When students return to their seats, allow some time for discussion and reactions.</li><li>• Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources to use technology tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns.</li><li>• Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task.</li><li>• Display pictures from the lab and facilitate discussion about the specific task. Have students develop a descriptive paragraph about each picture. Have students perform each task assigned.</li><li>• Have students work in groups to examine case studies related to task(s) and have students recommend the needed action.</li><li>• Have students complete job shadowing experiences.</li><li>• Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer’s concerns</li></ul>
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	<p>about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action.</p> <ul style="list-style-type: none"> <li>• Have student observe and record notes in a journal about the conversations the technician has with customers.</li> <li>• Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit.</li> <li>• After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the questions and answers for content and clarity.</li> <li>• Assess field trip participation using the Field Trip Participation Checklist located in Appendix D.</li> <li>• Evaluate the poster using the Poster Assessment Rubric located in Appendix D.</li> <li>• Assess student participation in role play using the Role-Play Rubric located in Appendix D.</li> <li>• Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D.</li> <li>• Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D.</li> <li>• Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.</li> </ul>
<p>2. Explore electrical/electronic systems.</p> <ol style="list-style-type: none"> <li>Inspect, test, and replace fusible links, circuit breakers, and fuses.</li> <li>Perform battery state-of-charge test; determine needed service.</li> <li>Inspect, clean, and replace battery.</li> <li>Dispose of batteries and battery acid according to local, state, and federal</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p>



<p>requirements.</p> <p>e. Perform slow/fast battery charge in accordance with manufacturer's recommendations.</p> <p>g. Inspect, clean, and repair or replace battery cables, connectors, and clamps.</p> <p>h. Inspect alignment, adjust, and replace generator (alternator) drive belts, pulleys, and fans.</p> <p>i. Remove and replace generator (alternator).</p> <p>j. Check operation of exterior lighting; determine needed repairs.</p> <p>k. Remove and replace horn(s); check operation.</p> <p>l. Check operation of windshield wiper/washer system.</p> <p>m. Check operation of power side windows and power tailgate window.</p> <p>n. Inspect, remove, and replace power seat, motors, linkages, cables, etc.</p> <p>o. Inspect, remove, and replace components of electric door and hatch/trunk lock.</p> <p>p. Inspect, remove, and replace components of keyless lock/unlock devices and alarm systems.</p> <p>q. Inspect, remove, and replace components of power antenna circuits.</p> <p>r. Demonstrate the proper self-grounding procedures for handling electrical components.</p>	<ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>3. Explore brakes and braking systems.</p> <p>a. Inspect brake lines and fittings for leaks, dents, kinks, rust, cracks, or wear; tighten loose fittings and supports; replace brake lines (double flare and ISO types), hoses, fittings, and supports.</p> <p>b. Inspect flexible brake hoses for leaks, kinks, cracks, bulging or wear; remove and replace hoses; tighten loose fittings and supports.</p> <p>c. Identify, handle, store, and install</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

<p>appropriate brake fluids; dispose of in accordance with federal, state, and local regulations.</p> <ol style="list-style-type: none"> <li>d. Bleed (manual, pressure, vacuum, or surge) hydraulic brake system in accordance with manufacturer's procedures.</li> <li>e. Adjust brake shoes; remove and reinstall brake drums or drum/hub assemblies and wheel bearings.</li> <li>f. Reinstall wheel and torque lug nuts according to manufacturer's specifications.</li> <li>g. Check for bent or damaged brake system components.</li> </ol>	
<ol style="list-style-type: none"> <li>4. Explore heating and air conditioning. <ol style="list-style-type: none"> <li>a. Identify and comply with environmental concerns relating to refrigerants and coolants.</li> <li>b. Locate and identify A/C system service ports.</li> <li>c. Identify, label, and store refrigerant.</li> <li>d. Evacuate A/C system; check for leaks.</li> <li>e. Recharge A/C system with refrigerant; perform leak test.</li> <li>f. Identify oil type and maintain correct amount in A/C system according to manufacturer's specifications.</li> </ol> </li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<ol style="list-style-type: none"> <li>5. Explore cooling systems. <ol style="list-style-type: none"> <li>a. Inspect and replace engine cooling and heater system hoses and belts.</li> <li>b. Inspect, test, remove, and replace radiator, pressure cap, coolant recovery system, and water pump.</li> <li>c. Recover, refill, and bleed system with proper coolant and check level of protection; leak test system and dispose of materials in accordance with EPA specifications.</li> <li>d. Remove and replace fan (both electrical and mechanical), fan pulley, fan clutch, and fan shroud.</li> </ol> </li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

## STANDARDS

### 2006 ASE/NATEF Collision Repair & Refinish Standards

#### CRS3-Mechanical and Electrical Components

#### Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E6 Explore cultural contributions to the history of the English language and its literature.

#### 21<sup>st</sup> Century Skills

- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

## SUGGESTED REFERENCES

### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

## Secondary Automotive Collision Repair Technology

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 3: Panel repairs*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 4: Painting and refinishing*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 6: Mechanical services*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 7: Frame and unibody construction and repair*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 9: Detailing*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J. (2001). *I-CAR professional automotive collision repair*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)

Duffy, J., & Scharff, R. (2004). *Auto body repair technology*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

Films Media Group. (2005). *Auto body repair-12 part series*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Structural analysis and damage repair*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Surface preparation and refinishing*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Welding*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>

**Automotive Collision Repair Technology I**  
**Unit 7: Basic Painting and Refinishing**

(160 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explore and apply safety precautions for painting and refinishing operations.</p> <ol style="list-style-type: none"> <li>Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.</li> <li>Identify safety and personal health hazards according to OSHA guidelines and the “Right to Know Law.”</li> <li>Inspect spray environment to ensure compliance with federal, state, and local regulations and for safety and cleanliness hazards.</li> <li>Select and use the NIOSH approved personal sanding respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulations.</li> <li>Select and use the NIOSH approved (Fresh Air Make-up System) personal painting/refinishing respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.</li> <li>Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).</li> </ol> <p><b>INSTRUCTOR NOTE :</b> Comply with personal and environmental safety practices associated with clothing; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of</p>	<p><b>Teaching:</b>  <b>Note: These strategies can be used for the entire unit. Safety will be reviewed and reinforced before and during the unit.</b>  <b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task.</li> <li>Review and reinforce safety procedures.</li> <li>Have students write the answers to the following questions in their notebooks: <ul style="list-style-type: none"> <li>What should I know and be able to do at the end of this unit or experience?</li> <li>What do I already know that will be useful in learning this new material or working in this way?</li> <li>How is this knowledge and how are these skills important in the world outside of school?</li> <li>When are the important checkpoints and deadlines?</li> <li>How will I be able to tell when I have done a really outstanding job when applying this new knowledge?</li> </ul> </li> <li>Review student answers and have students discuss their answer when appropriate.</li> <li>Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task. Have students develop several questions and answers from the video and the discussion or develop a video anticipation guide for students to complete as they watch the video.</li> <li>Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class.</li> <li>Pose a question that is related to the teaching objective to students. Ask</li> </ul>

chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

When a technician is replacing components with torque values, it is imperative that fasteners are torqued according to manufacturer's specifications.

students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.

- Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into "touring groups" to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have "toured" each chart. When students return to their seats, allow some time for discussion and reactions.
- Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns.
- Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task.
- Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned.
- Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer's concerns about a particular problem that relates to

	<p>the current task being taught about an automobile. Have technicians determine the needed action.</p> <ul style="list-style-type: none"> <li>• Have students complete job shadowing experiences. Have students observe and record notes in a journal about the conversations the technician had with customers.</li> <li>• Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit.</li> <li>• After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the questions and answers for content and clarity.</li> <li>• Assess field trip participation using the Field Trip Participation Checklist located in Appendix D.</li> <li>• Evaluate the poster using the Poster Assessment Rubric located in Appendix D.</li> <li>• Assess student participation in role-play using the Role-Play Rubric located in Appendix D.</li> <li>• Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D.</li> <li>• Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D.</li> <li>• Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.</li> </ul>
<p>2. Explore surface preparation.</p> <ol style="list-style-type: none"> <li>a. Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation.</li> <li>b. Soap and water wash entire vehicle; use appropriate cleaner to remove</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul>



<p>contaminants.</p> <ol style="list-style-type: none"> <li>c. Inspect and identify substrate, type of finish and surface condition; develop and document a plan for refinishing using a total product system.</li> <li>d. Remove paint finish in accordance with manufacturer's recommendations.</li> <li>e. Dry or wet sand areas to be refinished.</li> <li>f. Featheredge damaged areas to be refinished.</li> <li>g. Apply suitable metal treatment or primer in accordance with total product systems.</li> <li>h. Mask and protect other areas that will not be refinished.</li> <li>i. Mix primer, primer-surfacer, or primer-sealer.</li> <li>j. Apply primer onto surface of repaired area.</li> <li>k. Apply two-component finishing filler to minor surface imperfections.</li> <li>l. Dry or wet sand area to which primer-surfacer has been applied.</li> <li>m. Dry sand area to which two-component finishing filler has been applied.</li> <li>n. Remove dust from area to be refinished, including cracks or moldings of adjacent areas.</li> <li>o. Clean area to be refinished using a final cleaning solution.</li> <li>p. Remove, with a tack rag, any dust or lint particles from the area to be refinished.</li> <li>q. Apply suitable sealer to the area being refinished when sealing is needed or desirable.</li> <li>r. Scuff sand to remove nibs or imperfections from a sealer.</li> <li>s. Restore corrosion-resistant coatings, caulking, and seam sealers to repaired areas.</li> <li>t. Prepare adjacent panels for blending.</li> <li>u. Prepare plastic panels for refinishing</li> </ol>	<p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>3. Explore paint spray guns and related</p>	<p><b>Teaching:</b></p>

<p>equipment.</p> <ol style="list-style-type: none"> <li>a. Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).</li> <li>b. Check and adjust spray gun operation for HVLP (high volume, low pressure) or LVLP (low volume, low pressure) guns.</li> <li>c. Set up (fluid needle, nozzle, and cap), adjust, and test spray gun using fluid, air, and pattern control valves.</li> </ol>	<ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<ol style="list-style-type: none"> <li>4. Explore mixing, matching, and applying paint.       <ol style="list-style-type: none"> <li>a. Determine type and color of paint already on vehicle by manufacturer's vehicle information label.</li> <li>b. Shake, stir, reduce, catalyze/activate, and strain paint according to manufacturer's procedures.</li> <li>c. Apply finish using appropriate spray techniques (gun arc, gun angle, gun distance, gun speed, and spray pattern overlap) for the finish being applied.</li> <li>d. Apply selected product on test and let-down panel in accordance with manufacturer's recommendations; check for color match.</li> </ol> </li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<ol style="list-style-type: none"> <li>5. Discuss and perform final detail operations to a vehicle.       <ol style="list-style-type: none"> <li>a. Clean interior, exterior, and glass.</li> <li>b. Clean body openings (door jambs &amp; edges, etc.).</li> <li>c. Remove overspray.</li> </ol> </li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

## STANDARDS

### 2006 ASE/NATEF Collision Repair & Refinish Standards

#### CRP4-Painting and Refinishing

#### Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E6 Explore cultural contributions to the history of the English language and its literature.

#### 21<sup>st</sup> Century Skills

- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

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*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

## Secondary Automotive Collision Repair Technology

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 4: Painting and refinishing*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 9: Detailing*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J. (2001). *I-CAR professional automotive collision repair*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)

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#### Videos

Films Media Group. (2005). *Auto body repair-12 part series*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Dings and scratches*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Replacing and adjusting panels*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Structural analysis and damage repair*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Surface preparation and refinishing*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>

**Automotive Collision Repair Technology II**  
**Unit 1: Safety (Review)**

**(5 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Describe general safety rules for working in a shop/lab and industry.</p> <ol style="list-style-type: none"> <li>Describe how to avoid on-site accidents.</li> <li>Explain the relationship between housekeeping and safety.</li> <li>Explain the importance of following all safety rules and company safety policies.</li> <li>Explain the importance of reporting all on-the-job injuries and accidents.</li> <li>Explain the need for evacuation policies and the importance of following them.</li> <li>Explain the employer's substances abuse policy and how it relates to safety.</li> <li>Explain the safety procedures when working near pressurized or high temperature.</li> </ol>	<p><b>Teaching:</b>  <b>This can be used for the entire unit.</b></p> <ul style="list-style-type: none"> <li>Identify, discuss, and demonstrate terms, rules, and procedures related to shop/lab and industry safety.</li> <li>Required written tests will follow each section of guidelines for safety rules and procedures.</li> <li>Provide the students with a list of terms and have them define the terms. Pair the students to quiz each other on the definitions in preparation for a written exam.</li> <li>Use the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eyes, and ears). Divide the students into pairs and assign each pair one of the guidelines. Each pair will demonstrate the "do's and don'ts" of the guideline.</li> <li>Have an industry speaker present to the class the necessity of safety in the work environment. The students will write a summary of the presentation.</li> <li>Divide the students into teams and have them develop scenarios of hazards and accidents using the publications and the Internet. This will include tools, spills, working around welding, ladders or scaffolds, use of MSDS information, fires, and electrical situations. In a game type situation, one team will read a scenario and the other teams will compete to be the first to provide the proper safety measures which should have been used to prevent the hazardous situation. Points will be awarded to the teams with the correct answers.</li> <li>Required written tests will follow each section of guidelines for safety rules and procedures.</li> <li><b>NOTE: SAFETY IS TO BE TAUGHT AS AN ONGOING PART OF THE COURSE THROUGHOUT THE YEAR.</b></li> </ul>
<p>2. Identify and apply safety around automotive operations.</p> <ol style="list-style-type: none"> <li>Use proper safety practices when performing automotive operations.</li> <li>Recognize and explain personal protective equipment.</li> <li>Inspect and care for personal protective equipment.</li> </ol>	
<p>3. Explain lifting.</p> <ol style="list-style-type: none"> <li>Identify and explain the procedures for lifting heavy objects.</li> </ol>	
<p>4. Explain the Material Safety Data Sheet (MSDS).</p> <ol style="list-style-type: none"> <li>Explain the function of the MSDS.</li> <li>Interpret the requirements of the MSDS.</li> </ol>	
<p>5. Explain fires.</p> <ol style="list-style-type: none"> <li>Explain the process by which fires start.</li> <li>Explain fire prevention of various flammable liquids.</li> <li>Explain the classes of fire and the</li> </ol>	

types of extinguishers.	<b>Assessment:</b>
6. Explain safety in and around automotive collision repair and electrical situations. <ol style="list-style-type: none"> <li>Explain injuries when electrical contact occurs.</li> <li>Explain safety around automotive collision repair and electrical hazards.</li> <li>Explain action to take when an electrical shock occurs.</li> </ol>	
	<ul style="list-style-type: none"> <li>Student participation will be monitored by the instructor and the written exam will be graded. The student must achieve 100% accuracy.</li> <li>The “do’s and don’ts” exercise will be critiqued with a peer review.</li> <li>The summary of the speaker’s presentation will be critiqued using a rubric.</li> <li>The teams will be rewarded according the points earned from the game. This could be extra points, classroom privileges, etc.</li> <li>Written exams will be graded.</li> </ul>

## STANDARDS

### *2006 ASE/NATEF Collision Repair & Refinish Standards*

CRN1-Non-Structural Analysis and Damage Repair  
 CRS2-Structural Analysis and Damage Repair  
 CRS3-Mechanical and Electrical Components  
 CRP4-Painting and Refinishing

### *Academic Standards*

- A1 Recognize, classify, and use real numbers and their properties.  
 A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.  
 E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.  
 E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.  
 E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.  
 E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.  
 E5 Complete oral and written presentations which exhibit interaction and consensus within a group.  
 E6 Explore cultural contributions to the history of the English language and its literature.

### *21<sup>st</sup> Century Skills*

- CS2 Financial, Economic, and Business Literacy  
 CS4 Information and Communication Skills

## Secondary Automotive Collision Repair Technology

- CS5 Thinking and Problem-Solving Skills  
 CS6 Interpersonal and Self-Directional Skills

## SUGGESTED REFERENCES

### Journals

- ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>
- Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>
- BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>
- Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>
- Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

### Texts

- Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 1: Introduction to auto collision*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 2: Welding*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 3: Panel repairs*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 4: Painting and refinishing*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)



*Auto collision technology—Module 5: Exterior and interior trim.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 6: Mechanical services.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 7: Frame and unibody construction and repair.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 8: Steering and suspension systems.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 9: Detailing.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J. (2001). *I-CAR professional automotive collision repair*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)

Duffy, J., & Scharff, R. (2004). *Auto body repair technology*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

Films Media Group. (2005). *Auto body repair-12 part series*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Body alignment*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Dings and scratches*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Replacing and adjusting panels*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Structural analysis and damage repair*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Surface preparation and refinishing*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Welding*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>

## Automotive Collision Repair Technology II

### Unit 2: Advanced Non-Structural Analysis and Damage Repair

(30 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explore metal finishing and body filling.</p> <ol style="list-style-type: none"> <li>Remove paint from the damaged area of a body panel.</li> <li>Locate and reduce surface irregularities on a damaged body panel.</li> <li>Demonstrate hammer and dolly techniques.</li> <li>Heat shrink stretched panel areas to proper contour according to manufacturer's specifications.</li> <li>Cold shrink stretched panel areas to proper contour.</li> <li>Mix body filler.</li> <li>Apply body filler; shape during curing.</li> <li>Rough sand cured body filler to contour; finish sand.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Review and reinforce safety procedures.</li> <li>Have students write the answers to the following questions in their notebooks: <ul style="list-style-type: none"> <li>What should I know and be able to do at the end of this unit or experience?</li> <li>What do I already know that will be useful in learning this new material or working in this way?</li> <li>How is this knowledge and how are these skills important in the world outside of school?</li> <li>When are the important checkpoints and deadlines?</li> <li>How will I be able to tell when I have done a really outstanding job when applying this new knowledge?</li> </ul> </li> <li>Review student answers and have students discuss their answers when appropriate.</li> <li>Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task. Have students develop several questions from the video. Lead a group discussion that addresses each question that students listed.</li> <li>Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class.</li> <li>Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.</li> </ul>

	<ul style="list-style-type: none"><li>• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into “touring groups” to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have “toured” each chart. When students return to their seats, allow some time for discussion and reactions.</li><li>• Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns.</li><li>• Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task.</li><li>• Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned.</li><li>• Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians use appropriate graphic organizers (Cluster Word Web, Fact or Opinion, Step-by-Step Chart, or the Problem Solution Chart found in Appendix D) to evaluate customer’s concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action.</li><li>• Have students complete job shadowing experiences. Have students observe and record notes in a journal about the</li></ul>
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	<p>conversations the technician had with customers.</p> <ul style="list-style-type: none"> <li>• Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit.</li> <li>• After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the questions and answers for content and clarity.</li> <li>• Assess field trip participation using the Field Trip Participation Checklist located in Appendix D.</li> <li>• Evaluate the poster using the Poster Assessment Rubric located in Appendix D.</li> <li>• Assess student participation in role play using the Role-Play Rubric located in Appendix D.</li> <li>• Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D.</li> <li>• Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D.</li> <li>• Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.</li> </ul>
<p>2. Explore moveable glass and hardware.</p> <ol style="list-style-type: none"> <li>a. Inspect, adjust, and repair/replace window regulators; run channels, glass, power mechanisms, and related controls.</li> <li>b. Diagnose and repair water leaks, dust leaks, and wind noises; inspect, repair, and replace weather-stripping.</li> <li>c. Inspect, repair or replace, and adjust removable, manually or power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

4. Inspect, remove, reinstall, and align convertible top and related mechanisms.	
3. Perform the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and lap joints. <ol style="list-style-type: none"> <li>a. Perform visual and destructive tests on each weld type.</li> <li>b. Identify the causes of various welding defects; make necessary adjustments.</li> <li>c. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.</li> <li>d. Identify cutting process for different materials and locations in accordance with manufacturer's procedures; perform cutting operation.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
4. Explore plastics and adhesives. <ol style="list-style-type: none"> <li>a. Identify the types of plastics; determine repairability.</li> <li>b. Identify the types of plastics repair procedures; clean and prepare the surface of plastic parts.</li> <li>c. Replace or repair rigid, semi-rigid, and flexible plastic panels according to manufacturer's/industry specifications.</li> <li>d. Remove or repair damaged areas from rigid exterior sheet-molded compound (SMC) panels.</li> <li>e. Replace bonded sheet-molded compound (SMC) body panels; straighten or align panel supports.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

## STANDARDS

### *2006 ASE/NATEF Collision Repair & Refinish Standards*

#### CRN1-Non-Structural Analysis and Damage Repair

#### *Academic Standards*

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.

## Secondary Automotive Collision Repair Technology

- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A4 Explore and communicate the characteristics and operations of polynomials.
- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E6 Explore cultural contributions to the history of the English language and its literature.

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### *21<sup>st</sup> Century Skills*

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- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

## **SUGGESTED REFERENCES**

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*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

### Texts

- Auto collision technology—Automotive collision technology supplementary units for special needs.* (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 1: Introduction to auto collision.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 2: Welding.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 3: Panel repairs.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 5: Exterior and interior trim.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 6: Mechanical services.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 7: Frame and unibody construction and repair.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Auto collision technology—Module 8: Steering and suspension systems.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)
- Duffy, J. (2001). *I-CAR professional automotive collision repair.* Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)
- Duffy, J., & Scharff, R. (2004). *Auto body repair technology.* Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

- Films Media Group. (2005). *Auto body repair-12 part series.* (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)



Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Body alignment*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Replacing and adjusting panels*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Structural analysis and damage repair*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Surface preparation and refinishing*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>

## Automotive Collision Repair Technology II

### Unit 3: Advanced Structural Analysis and Damage Repair

(20 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explore frame inspection and repair.</p> <ol style="list-style-type: none"> <li>a. Remove and replace damaged structural components according to manufacturer's specifications/procedures.</li> <li>b. Restore corrosion protection to repaired or replaced frame areas.</li> </ol> <p><b>INSTRUCTOR NOTE:</b> For all the following tasks, recognize that measuring, dimensioning, and tolerance limits in unibody vehicles are critical to repair of these vehicles; recognize that suspension/steering mounting points and engine power train attaching points are critical to vehicle safety, handling, and performance..</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Review and reinforce safety procedures.</li> <li>• Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task. The student will develop several questions from the video. Lead a group discussion that addresses each question that students listed.</li> <li>• Have students write the answers to the following questions in their notebooks:             <ul style="list-style-type: none"> <li>○ What should I know and be able to do at the end of this unit or experience?</li> <li>○ What do I already know that will be useful in learning this new material or working in this way?</li> <li>○ How is this knowledge and how are these skills important in the world outside of school?</li> <li>○ When are the important checkpoints and deadlines?</li> <li>○ How will I be able to tell when I have done a really outstanding job when applying this new knowledge?</li> </ul> </li> <li>• Review student answers and have students discuss their answers when appropriate.</li> <li>• Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class.</li> <li>• Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.</li> </ul>

	<ul style="list-style-type: none"><li>• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into “touring groups” to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have “toured” each chart. When students return to their seats, allow some time for discussion and reactions.</li><li>• Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources to use technology tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns.</li><li>• Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task.</li><li>• Display pictures from the lab and facilitate discussion about the specific task. Have students develop a descriptive paragraph about each picture. Have students perform each task assigned.</li><li>• Have students work in groups to examine case studies related to task(s) and have students recommend the needed action.</li><li>• Have students complete job shadowing experiences.</li><li>• Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer’s concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action.</li></ul>
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	<ul style="list-style-type: none"> <li>• Have student observe and record notes in a journal about the conversations the technician has with customers.</li> <li>• Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit.</li> <li>• After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the questions and answers for content and clarity.</li> <li>• Assess field trip participation using the Field Trip Participation Checklist located in Appendix D.</li> <li>• Evaluate the poster using the Poster Assessment Rubric located in Appendix D.</li> <li>• Assess student participation in role play using the Role-Play Rubric located in Appendix D.</li> <li>• Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D.</li> <li>• Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D.</li> <li>• Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.</li> </ul>
<p>2. Explore unibody inspection, measurement, and repair.</p> <ol style="list-style-type: none"> <li>a. Determine and inspect the locations of all suspension, steering, and power train component attaching points on the vehicle.</li> <li>b. Diagnose and measure unibody vehicles using a dedicated (fixture) measuring system.</li> <li>c. Diagnose and measure unibody vehicles using a universal measuring system (mechanical, electronic, laser).</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

<p>d. Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair.</p> <p>e. Remove and replace damaged sections of structural steel body panels in accordance with manufacturer's specifications/ procedures.</p> <p>f. Restore corrosion protection to repaired or replaced unibody structural areas.</p>	
<p>3. Explore fixed glass.</p> <p>a. Remove and reinstall or replace modular glass using manufacturer's specifications/procedures and recommended materials.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>4. Explore metal welding and cutting principles and practices.</p> <p>a. Perform the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and lap joints.</p> <p>b. Perform visual and destructive tests on each weld type.</p> <p>c. Identify the causes of various welding defects; make necessary adjustments.</p> <p>d. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.</p> <p>e. Identify cutting process for different materials and locations in accordance with manufacturer's procedures; perform cutting operation.</p> <p>f. Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, silicone bronze, etc.)</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

## STANDARDS

### 2006 ASE/NATEF Collision Repair & Refinish Standards

#### CRS2-Structural Analysis and Damage Repair

##### Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E6 Explore cultural contributions to the history of the English language and its literature.

##### 21<sup>st</sup> Century Skills

- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

## SUGGESTED REFERENCES

### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

## Secondary Automotive Collision Repair Technology

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 2: Welding*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 3: Panel repairs*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 4: Painting and refinishing*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 7: Frame and unibody construction and repair*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 8: Steering and suspension systems*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J. (2001). *I-CAR professional automotive collision repair*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)

Duffy, J., & Scharff, R. (2004). *Auto body repair technology*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

Films Media Group. (2005). *Auto body repair-12 part series*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Body alignment*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Structural analysis and damage repair*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Surface preparation and refinishing*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Welding*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>



## Automotive Collision Repair Technology II

### Unit 4: Advanced Mechanical and Electrical Components

(20 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explore suspension and steering systems.</p> <ol style="list-style-type: none"> <li>Inspect, remove, and replace upper and lower control arms.</li> <li>Inspect, remove, and replace upper and lower control arm bushings, shafts and rebound bumpers.</li> <li>Inspect, remove, and replace upper and lower ball joints.</li> <li>Check for front wheel setback; determine needed repairs.</li> </ol> <p><b>INSTRUCTOR NOTE:</b> When a technician is replacing components with torque values, it is imperative that fasteners are torqued according to manufacturer's specifications.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task.</li> <li>Review and reinforce safety procedures.</li> <li>Have students write the answers to the following questions in their notebooks: <ul style="list-style-type: none"> <li>What should I know and be able to do at the end of this unit or experience?</li> <li>What do I already know that will be useful in learning this new material or working in this way?</li> <li>How is this knowledge and how are these skills important in the world outside of school?</li> <li>When are the important checkpoints and deadlines?</li> <li>How will I be able to tell when I have done a really outstanding job when applying this new knowledge?</li> </ul> </li> <li>Review student answers and have students discuss their answer when appropriate.</li> <li>Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task. Have students develop several questions and answers from the video and the discussion or develop a video anticipation guide for students to complete as they watch the video.</li> <li>Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class.</li> <li>Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss</li> </ul>

	<p>their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.</p> <ul style="list-style-type: none"><li>• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into “touring groups” to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have “toured” each chart. When students return to their seats, allow some time for discussion and reactions.</li><li>• Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns.</li><li>• Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task.</li><li>• Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned.</li><li>• Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer’s concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action.</li><li>• Have students complete job shadowing</li></ul>
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	<p>experiences. Have students observe and record notes in a journal about the conversations the technician had with customers.</p> <ul style="list-style-type: none"> <li>• Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit.</li> <li>• After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the questions and answers for content and clarity.</li> <li>• Assess field trip participation using the Field Trip Participation Checklist located in Appendix D.</li> <li>• Evaluate the poster using the Poster Assessment Rubric located in Appendix D.</li> <li>• Assess student participation in role-play using the Role-Play Rubric located in Appendix D.</li> <li>• Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D.</li> <li>• Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D.</li> <li>• Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.:</li> </ul>
<p>2. Explore electrical/electronic systems.</p> <ol style="list-style-type: none"> <li>a. Aim headlamp assemblies and fog/driving lamps; determine needed repairs.</li> <li>b. Inspect, test, and repair or replace switches, relays, bulbs, sockets, connectors, and wires of all interior and exterior light circuits.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the student using the Activity Performance Rubric located in Appendix</li> </ul>

	D.
<p>3. Explore brakes and braking systems.</p> <ol style="list-style-type: none"> <li>Remove and reinstall caliper assembly.</li> <li>Clean and inspect caliper mountings for wear and damage.</li> <li>Check parking brake system operation.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>4. Explore heating and air conditioning systems.</p> <ol style="list-style-type: none"> <li>Maintain and verify correct operation of certified refrigerant recovery and recharging equipment.</li> <li>Identify and recover refrigerant from A/C system.</li> <li>Recycle refrigerant in accordance with EPA regulations.</li> <li>Test recycled refrigerant for non-condensable gases</li> <li>Inspect, adjust, and replace A/C compressor drive belts; check pulley alignment.</li> <li>Remove and replace A/C compressor; inspect and repair/replace A/C compressor mount.</li> <li>Inspect and repair/replace A/C system mufflers, hoses, lines, fittings, and seals.</li> <li>Inspect, test, and replace A/C system condenser and mounts.</li> <li>Inspect and replace receiver/drier or accumulator/drier.</li> <li>Inspect and repair A/C component wiring.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>5. Explore cooling systems.</p> <ol style="list-style-type: none"> <li>Inspect, remove, and replace auxiliary oil/fluid coolers; check oil levels.</li> <li>Inspect, remove, and replace electric fan sensors; check operation.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p>

	<ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>6. Explore active restraint systems procedures and practices.</p> <ol style="list-style-type: none"> <li>Inspect, remove, and replace seatbelt and shoulder harness assembly and components in accordance with manufacturer's specifications/procedures.</li> <li>Inspect restraint system mounting areas for damage; repair in accordance with manufacturer's specifications/procedures.</li> <li>Verify proper operation of seatbelt in accordance with manufacturer's specifications/procedures.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
<p>7. Explore passive restraint systems.</p> <ol style="list-style-type: none"> <li>Inspect, remove, and replace seatbelt and shoulder harness assembly and components in accordance with manufacturer's specifications/procedures.</li> <li>Inspect restraint system mounting areas for damage in accordance with manufacturer's specifications and procedures.</li> <li>Verify proper operation of seatbelt in accordance with manufacturer's specifications/procedures.</li> <li>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.</li> </ol>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

## STANDARDS

*2006 ASE/NATEF Collision Repair & Refinish Standards*

CRS3-Mechanical and Electrical Components

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### Academic Standards

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- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A4 Explore and communicate the characteristics and operations of polynomials.
- B7 Investigate the interdependence and interactions that occur within an ecosystem.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E6 Explore cultural contributions to the history of the English language and its literature.

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### 21<sup>st</sup> Century Skills

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- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

### SUGGESTED REFERENCES

#### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs*. (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 2: Welding*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 3: Panel repairs*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 6: Mechanical services*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 7: Frame and unibody construction and repair*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 8: Steering and suspension systems*. (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J., & Scharff, R. (2004). *Auto body repair technology*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

Films Media Group. (2005). *Auto body repair-12 part series*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Body alignment*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>



**Automotive Collision Repair Technology II**  
**Unit 5: Advanced Painting and Refinishing**

(180 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explore paint mixing, matching, and applying.</p> <ol style="list-style-type: none"> <li>Apply single stage topcoat for refinishing.</li> <li>Apply basecoat/clearcoat for panel blending or partial refinishing.</li> <li>Apply basecoat/clearcoat for overall refinishing.</li> <li>Denib, buff, and polish finishes where necessary.</li> <li>Refinish rigid, semi-rigid, and flexible plastic parts.</li> <li>Apply multi-stage (tricoat) coats for panel blending or overall refinishing.</li> <li>Identify and mix paint using a formula.</li> <li>Identify poor hiding colors; determine necessary action.</li> <li>Tint color using formula to achieve a blendable match.</li> <li>Identify alternative color formula to achieve a blendable match.</li> </ol> <p>NOTE: All practices and procedures related to the servicing of a sealed refrigeration system must be performed under the direct supervision of an instructor who has been certified to service air conditioning and refrigeration equipment. All practices and procedures must be performed according to current mandates and standards regarding the servicing of refrigerant systems. Students would be qualified for the ASE Certificate in Automotive Heating and Air Conditioning.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task.</li> <li>Review and reinforce safety procedures.</li> <li>Have students write the answers to the following questions in their notebooks: <ul style="list-style-type: none"> <li>What should I know and be able to do at the end of this unit or experience?</li> <li>What do I already know that will be useful in learning this new material or working in this way?</li> <li>How is this knowledge and how are these skills important in the world outside of school?</li> <li>When are the important checkpoints and deadlines?</li> <li>How will I be able to tell when I have done a really outstanding job when applying this new knowledge?</li> </ul> </li> <li>Review student answers and have students discuss their answer when appropriate.</li> <li>Show a video (<a href="http://www.unitedstreaming.com">http://www.unitedstreaming.com</a>) on the given task and discuss the procedures in completing the task. Have students develop several questions and answers from the video and the discussion or develop a video anticipation guide for students to complete as they watch the video.</li> <li>Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class.</li> <li>Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually</li> </ul>

	<p>only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.</p> <ul style="list-style-type: none"><li>• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into “touring groups” to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have “toured” each chart. When students return to their seats, allow some time for discussion and reactions.</li><li>• Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns.</li><li>• Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task.</li><li>• Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned.</li><li>• Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer’s concerns</li></ul>
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	<p>about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action.</p> <ul style="list-style-type: none"> <li>• Have students complete job shadowing experiences. Have students observe and record notes in a journal about the conversations the technician had with customers.</li> <li>• Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit.</li> <li>• After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>• Evaluate the questions and answers for content and clarity.</li> <li>• Assess field trip participation using the Field Trip Participation Checklist located in Appendix D.</li> <li>• Evaluate the poster using the Poster Assessment Rubric located in Appendix D.</li> <li>• Assess student participation in role-play using the Role-Play Rubric located in Appendix D.</li> <li>• Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D.</li> <li>• Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D.</li> <li>• Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.</li> </ul>
<p>2. Explore paint defects (causes and cures).  a. Identify blistering (raising of the paint surface); determine the cause(s) and</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>• Teaching strategies for this unit can be found in Competency 1. Safety will be</li> </ul>

<p>correct the condition.</p> <p>b. Identify blushing (milky or hazy formation); determine the cause(s) and correct the condition.</p> <p>c. Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition.</p> <p>d. Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition.</p> <p>e. Identify lifting; determine the cause(s) and correct the condition.</p> <p>f. Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition.</p> <p>g. Identify orange peel; determine the cause(s) and correct the condition.</p> <p>h. Identify overspray; determine the cause(s) and correct the condition.</p> <p>i. Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition.</p> <p>j. Identify sags and runs in paint surface; determine the cause(s) and correct the condition.</p> <p>k. Identify sanding marks (sandscratch swelling); determine the cause(s) and correct the condition.</p> <p>l. Identify color difference (off-shade); determine the cause(s) and correct the condition.</p> <p>m. Identify tape tracking; determine the cause(s) and correct the condition.</p> <p>n. Identify low gloss condition; determine the cause(s) and correct the condition.</p> <p>o. Identify poor adhesion; determine the cause(s) and correct the condition.</p> <p>p. Identify paint cracking (crow's feet or line-checking, micro-checking, etc.), determine the cause(s) and correct the condition.</p> <p>q. Identify corrosion; determine the cause(s) and correct the condition.</p> <p>r. Identify dirt or dust in the paint surface;</p>	<p>reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</p> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>
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<p>determine the cause(s) and correct the condition.</p> <p>s. Identify water spotting; determine the cause(s) and correct the condition.</p> <p>t. Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.</p> <p>u. Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition.</p> <p>v. Identify chalking (oxidation); determine the cause(s) and correct the condition.</p> <p>w. Identify bleed-through (staining); determine the cause(s) and correct the condition.</p> <p>x. Identify pin-holing; determine the cause(s) and correct the condition.</p> <p>y. Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition.</p> <p>z. Measure mil thickness.</p>	
<p>3. Explain and apply final detail practices to a vehicle.</p> <p>a. Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc.</p> <p>b. Buff and polish finish to remove defects as required.</p>	<p><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives.</li> </ul> <p><b>Assessment:</b></p> <ul style="list-style-type: none"> <li>Evaluate the student using the Activity Performance Rubric located in Appendix D.</li> </ul>

## STANDARDS

### *2006 ASE/NATEF Collision Repair & Refinish Standards*

#### CRP4-Painting and Refinishing

#### *Academic Standards*

A1 Recognize, classify, and use real numbers and their properties.

## Secondary Automotive Collision Repair Technology

- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.

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### 21<sup>st</sup> Century Skills

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- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

### SUGGESTED REFERENCES

#### Journals

*ASE Blue Seal News Tech News*. Leesburg, VA: National Institute for Automotive Service Excellence. Retrieved July 4, 2006, from <http://www.ase.com>

*Automotive Inc.* Bedford, TX: Automotive Service Association. Retrieved July 1, 2006, from <http://www.autoinc.org/>

*BodyShop Business*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.bodyshopbusiness.com/>

*Collision Expert and Collision News*. Charlotte, NC: Collision Expert News. Retrieved July 1, 2006, from <http://collisionexpert-news.com/index.html>

*Tomorrow's Technician*. Akron, OH: Babcox. Retrieved July 1, 2006, from <http://www.tomorrowstechnician.com/>

#### Texts

*Auto collision technology—Automotive collision technology supplementary units for special needs.* (1990). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 1: Introduction to auto collision.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 4: Painting and refinishing.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 5: Exterior and interior trim.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

*Auto collision technology—Module 9: Detailing.* (1997). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

Duffy, J. (2001). *I-CAR professional automotive collision repair*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-1398-3. (Instructor's text, student workbook, and interactive DVD available)

Duffy, J., & Scharff, R. (2004). *Auto body repair technology*. Albany, NY: Delmar Thompson Learning. ISBN 0-7668-6272-0. (Instructor's text, student workbook, and interactive DVD available)

#### Videos

Films Media Group. (2005). *Auto body repair-12 part series*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto body repair basics*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Auto construction*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Body alignment*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

Films Media Group. (2005). *Surface preparation and refinishing*. (Available in CD-ROM or DVD from Films Media Group, P.O. Box 2053, Princeton, NJ 08543, 1-800-257-5126, <http://www.filmsmediagroup.com/>)

#### Web Sites

*How stuff works*. Retrieved June 12, 2006, from <http://www.howstuffworks.com/>

*I-Car*. Retrieved September 10, 2006, from <http://www.i-car.com/>

*National Institute for Automotive Service Excellence*. Retrieved June 10, 2006, from <http://www.asecert.org/>



## Recommended Tools and Equipment

### CAPITALIZED ITEMS

1. A/C recovery and recycle system (1)
2. Antifreeze/coolant recovery and recycle system (1)
3. Bench, steel work (6)
4. Booth, down draft heated paint with baking system (1)
5. Charger, battery with testing and diagnostic systems (1)
6. Cleaner, steam (1)
7. Cleaner, vacuum, minimum 15 gallon (1)
8. Collision estimating manuals and/or software (1)
9. Compressor, air (25 hp screw) (1)
10. Computer w/operating software w/multimedia kit (1)
11. Dent removal system in kit form (1)
12. Dryer, infrared paint (4)
13. Gun, spray gravity (basecoat/clearcoat) (2)
14. Gun, spray high volume low pressure (HVLV) (1)
15. Headlight set, aiming (1)
16. Jack, body and fender (10T) (1)
17. Lift, automobile hydraulic (1)
18. Masking machine station (1)
19. Plasma arc cutting equipment (1)
20. Respirator, fresh air supply (4-man system) (1)
21. Shaker, paint (1)
22. Tester, radiator pressure (1)
23. Washer, paint gun (1)
24. Washer, portable pressure (1)
25. Welder, spot (resistance gun) with all accessories 1)
26. Welder, GMAW (220V) (150 Amp) with all accessories (1)
27. Welder set, oxyacetylene w/cutting torch, with all accessories (1)
28. Welder, GMAW (220V) (225 Amp) with all accessories (1)

### NON-CAPITALIZED ITEMS

1. Blade, razor scraper (5)
2. Block, sanding short (6)
3. Block, sanding long (6)
4. Board, file (6)
5. Brush, striping 1)
6. Brush, wire (4)
7. Cables, jumper (1)
8. Chains, bumper (1)
9. Chisel set, assorted metal (1)
10. Chuck, air (5)
11. Clamp, welder (vise grip) (6)

12. Clamp, sheet metal (vise grip) (6)
13. Clamp set, assorted body (2)
14. Clamp, C-clamp (vise grip) (3") (2)
15. Clamp, C-clamp (vise grip) (7") (2)
16. Clamp, C-clamp (vise grip) (11") (2)
17. Clamp, C-clamp (vise grip) (18") (2)
18. Clip removal tools (assorted) (1)
19. Come-along (2T) (2)
20. Cord, extension (50') (4)
21. Cover, fender (4)
22. Cover, wheel (set of 4) (2)
23. Cup, viscosity (#2 Zahn) (1)
24. Cutter, sheet metal, hand (2)
25. Cutter, sheet metal, power (1)
26. Cutter set, panel (air drive) (1)
27. Cutter, disc (1)
28. Dollies set, assorted (4)
29. Drill, air (3/8") (2)
30. Drill, electric (3/8") (2)
31. Drill set, twist, 1/16" to 5/8" (2)
32. Drill, pneumatic (3/8") (2)
33. Drill, electric (1/2") (1)
34. Driver, hand impact (3/8" drive) (3)
35. Extractor set, screw (Easy Out) 3/32" to 15/16" including metric (1 set each)
36. File, air (orbital or straight line) (6)
37. File, body round (2)
38. File, body flat (2)
39. Gauge, tram (1)
40. Gauge set of 4, center line (1)
41. Gloves, cutting goggles (4)
42. Gloves, pair welding (4)
43. Goggles, safety (6)
44. Grater, cheese (24)
45. Grinder, bench (1)
46. Gun, air dusting (4)
47. Gun, spray enamel siphon (2)
48. Gun, spray detail (1)
49. Gun, spray (primer) (3)
50. Gun, sandblast (1)
51. Gun, heat (1)
52. Gun, staple (1)
53. Gun, caulking (2)
54. Hacksaw (2)
55. Hammer, machinist (4)
56. Hammer set, body (4)
57. Hammer, slide large (snatch bar) (2)

58. Hammer, slide small (snatch bar) (2)
59. Hammer, sledge (1)
60. Helmet, welding (4)
61. Hoist, chain or pneumatic (2ton) (1)
62. Hose, air w/quick couplings (50') (20)
63. Jack, floor w/casters (2ton) (4)
64. Jack, mechanical (1)
65. Jack, twin saddle (1)
66. Jack, body and fender w/attachments (4T) (1)
67. Jigsaw (2)
68. Jitterbug, orbital (4)
69. Knife, putty (1 ½") (2)
70. Knife, putty (3") (2)
71. Knife, putty (2") (2)
72. Light, flash (2)
73. Light, extension (3)
74. Machine, masking (2)
75. Mallet, rubber (2)
76. Mallet, plastic (1)
77. Mask, particle (4 boxes)
78. Nut Extractor, 3/32" to 15/16" (1 set)
79. Oiler (1)
80. Pan, drain (2)
81. Picks, assorted (2)
82. Pliers, hog ring (1)
83. Pliers set, assorted (3)
84. Pliers, drip molding (2)
85. Pliers, vise grip (10)
86. Polisher, power (variable speed up to 2,000 rpm) (2)
87. Printer, Ink Jet Color (2)
88. Puller, fuse (1)
89. Punch set, metal assorted (1)
90. Rag, tack (20)
91. Regulator, air w/extractors (12)
92. Rod, tram (1)
93. Sander, dual action (6") (8)
94. Sander/Grinder, automotive disc electric (2)
95. Sander, dual action (8") (2)
96. Sander/Grinder, automotive disc pneumatic (2)
97. Saw set, hole assorted (1)
98. Saw, reciprocating (1)
99. Screwdriver set, Phillips (#1, 2, 3, 4) (4)
100. Screwdriver set, Torx (#5-27) (2)
101. Screwdriver set, clutch (1)
102. Screwdriver set, flat blade (6)
103. Scribe (scratch awl) (4)

104. Soldering kit (gun or iron) (1)
105. Spoons, assorted (1)
106. Spreader, plastic (50)
107. Stands, adjustable (20)
108. Strap, fender pull (1)
109. Tap and die set (standard) (1)
110. Tap and die set (metric) (1)
111. Tape, steel (25') (2)
112. Tester, circuit load (1)
113. Tester, multimeter (VOM) (1)
114. Tool, door handle clip remover (2)
115. Tool, door handle pin removing (1)
116. Tool, pop rivet, large (2)
117. Tool, pop rivet, small (2)
118. Tool, magnetic pickup (2)
119. Torx driver set (1/4" and 3/8" drive #5-55) (2)
120. Tubing set, flaring tool (1)
121. Vise (5") (4)
122. Welder, airless plastic (1)
123. Wrench set, combination metric (5mm - 21mm) (2)
124. Wrench, pneumatic ratchet (1/4" drive) (1)
125. Wrench, pneumatic ratchet (3/8" drive) (1)
126. Wrench, pneumatic impact (3/8" butterfly) (2)
127. Wrench, pneumatic impact (1/2") (1)
128. Wrench set, box end (3/16" - 1 1/4") (1)
129. Wrench, pneumatic impact (3/8" standard) (1)
130. Wrench set, socket (1/4", 3/8", and 1/2" drive) (4)
131. Wrench set, Allen (2)
132. Wrench set, combination SAE (3/16" - 1 1/4") (4)

#### RECOMMENDED INSTRUCTIONAL AIDS

It is recommended that instructors have access to the following items:

1. Cart, AV (for TV-VCR/DVD) (1)
2. Cart, AV (for overhead projector) (1)
3. Mylar board (1)
4. Internet connection (1)
5. TV – VCR/CD/DVD (1)
6. Video out (Microcomputer to TV monitor) (1)
7. Smart board
8. Laptop computer
9. Microcomputer with monitor, printer (CD-ROM/DVD and cables) (Instructor use)
10. Light box projector (1 per program)

## Student Competency Profile for Automotive Collision Repair Technology I

Student: \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

### Unit 1: Introduction and Orientation

- \_\_\_\_\_ 1. Introduce concepts and terms associated with the collision repair industry.
- \_\_\_\_\_ 2. Describe local program and vocational/career technical center policies and procedures.
- \_\_\_\_\_ 3. Explore employment opportunities and responsibilities.
- \_\_\_\_\_ 4. Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA.
- \_\_\_\_\_ 5. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on- the-job situations.
- \_\_\_\_\_ 6. Discuss the history of the collision repair industry to include materials, terminology, and techniques.

### Unit 2: Safety

- \_\_\_\_\_ 1. Describe general safety rules for working in a shop/lab and industry.
- \_\_\_\_\_ 2. Identify and apply safety around collision operations.
- \_\_\_\_\_ 3. Explain lifting.
- \_\_\_\_\_ 4. Explain the Material Safety Data Sheet (MSDS).
- \_\_\_\_\_ 5. Explain fires.
- \_\_\_\_\_ 6. Explain safety in and around collision repair and electrical situations.

### Unit 3: Tools, Technical References, Measurement, and Fasteners

- \_\_\_\_\_ 1. Demonstrate safe and proper use and storage of tools and equipment in an automotive collision repair lab.
- \_\_\_\_\_ 2. Locate and apply service specifications and information.
- \_\_\_\_\_ 3. Demonstrate measurement practices used in the automotive service.
- \_\_\_\_\_ 4. Identify common fasteners and describe their use.
- \_\_\_\_\_ 5. Explain the computerized systems used for estimating collision repairs, measuring damage, and mixing or matching paint.

#### Unit 4: Basic Non-Structural Analysis and Damage Repair

- \_\_\_\_\_ 1. Explore preparation of body components.
- \_\_\_\_\_ 2. Explore outer body panels (repairs, replacement, and adjustments).
- \_\_\_\_\_ 3. Explore metal finishing and body filling.
- \_\_\_\_\_ 4. Explore metal welding and cutting procedures for non-structural applications.

#### Unit 5: Basic Structural Analysis and Damage Repair

- \_\_\_\_\_ 1. Explore frame inspection and repair.
- \_\_\_\_\_ 2. Explore unibody inspection, measurement, and repair.
- \_\_\_\_\_ 3. Explore procedures for fixed glass removal and installation.
- \_\_\_\_\_ 4. Explore metal welding and cutting for non-structural applications.

#### Unit 6: Basic Mechanical and Electrical Components

- \_\_\_\_\_ 1. Explore suspension and steering components and systems.
- \_\_\_\_\_ 2. Explore electrical/electronic systems.
- \_\_\_\_\_ 3. Explore brakes and braking systems.
- \_\_\_\_\_ 4. Explore heating and air conditioning.
- \_\_\_\_\_ 5. Explore cooling systems.

#### Unit 7: Basic Painting and Refinishing

- \_\_\_\_\_ 1. Explore and apply safety precautions for painting and refinishing operations.
- \_\_\_\_\_ 2. Explore surface preparation.
- \_\_\_\_\_ 3. Explore paint spray guns and related equipment.
- \_\_\_\_\_ 4. Explore mixing, matching, and applying paint.
- \_\_\_\_\_ 5. Discuss and perform final detail operations to a vehicle.

## Student Competency Profile for Automotive Collision Repair Technology II

Student: \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

### Unit 1: Safety (Review)

- \_\_\_\_ 1. Describe general safety rules for working in a shop/lab and industry.
- \_\_\_\_ 2. Identify and apply safety around automotive operations.
- \_\_\_\_ 3. Explain lifting.
- \_\_\_\_ 4. Explain the Material Safety Data Sheet (MSDS).
- \_\_\_\_ 5. Explain fires.
- \_\_\_\_ 6. Explain safety in and around automotive collision repair and electrical situations.

### Unit 2: Advanced Non-Structural Analysis and Damage Repair

- \_\_\_\_ 1. Explore metal finishing and body filling.
- \_\_\_\_ 2. Explore moveable glass and hardware.
- \_\_\_\_ 3. Perform the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and lap joints.
- \_\_\_\_ 4. Explore plastics and adhesives.

### Unit 3: Advanced Structural Analysis and Damage Repair

- \_\_\_\_ 1. Explore frame inspection and repair.
- \_\_\_\_ 2. Explore unibody inspection, measurement, and repair.
- \_\_\_\_ 3. Explore fixed glass.
- \_\_\_\_ 4. Explore metal welding and cutting principles and practices.

### Unit 4: Advanced Mechanical and Electrical Components

- \_\_\_\_ 1. Explore suspension and steering systems.
- \_\_\_\_ 2. Explore electrical/electronic systems.
- \_\_\_\_ 3. Explore brakes and braking systems.
- \_\_\_\_ 4. Explore heating and air conditioning systems.
- \_\_\_\_ 5. Explore cooling systems.
- \_\_\_\_ 6. Explore active restraint systems procedures and practices.
- \_\_\_\_ 7. Explore passive restraint systems.

## Unit 5: Advanced Painting and Refinishing

- \_\_\_\_\_ 1. Explore paint mixing, matching, and applying.
- \_\_\_\_\_ 2. Explore paint defects (causes and cures).
- \_\_\_\_\_ 3. Explain and apply final detail practices to a vehicle.



## ASSESSMENT

### BLUEPRINT

Title of Program: Automotive Collision Repair 10LM

Program Level: Secondary

This program is assessed using the MS-CPAS. The following blueprint summary contains the competencies that are measured when assessing this program. Competencies are grouped into *clusters* and a weight is given to each cluster to determine the number of items needed from each cluster. The numbers of C1s and C2s (item difficulty levels) are also indicated on the blueprint.

Cluster/Competency	Level 1 (C1)	Level 2 (C2)	TOTAL	%
Cluster 1 : Fundamentals Automotive Collision Repair I Unit 2: Safety Unit 3: Tools, Technical References, Measurement Automotive Collision Repair II Unit 1: Safety (Review)	8	3	11	11%
Cluster 2 : Non-Structural Automotive Collision Repair I Unit 4 Basic Non-Structural Automotive Collision Repair II Unit 2 Advanced Non-Structural	12	6	18	18%
Cluster 3 : Structural (Analysis and Repair) Automotive Collision Repair I Unit 5 Basic Structural Automotive Collision Repair II Unit 3 Advanced Structural	12	6	18	18%
Cluster 4 : Mechanical and Electrical Automotive Collision Repair I Unit 6 Basic Mechanical and Electrical Components Automotive Collision Repair II Unit 4 Advanced Mechanical and Electrical Components	12	6	18	18%
Cluster 5 : Painting & Refinishing Automotive Collision Repair I Unit 7 Basic Painting and Refinishing Automotive Collision Repair II Unit 5 Advanced Painting and Refinishing	25	10	35	35%

Cluster/Competency	Level 1 (C1)	Level 2 (C2)	TOTAL	%
<b>Total Questions:</b>	69	31		100%

## Appendix A: ASE/NATEF 2006 Collision Repair and Refinishing Standards<sup>1</sup>

CRN1-Non-Structural Analysis and Damage Repair

CRS2-Structural Analysis and Damage Repair

CRS3-Mechanical and Electrical Components

CRP4-Painting and Refinishing

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<sup>1</sup> 2006 ASE/NATEF Collision Repair and Refinishing standards. Retrieved August 10, 2006, from <http://www.natef.org>

## Appendix B: Academic Standards

### Algebra I<sup>2</sup>

#### Competencies and Suggested Objective(s)

- A1 Recognize, classify, and use real numbers and their properties.
- Describe the real number system using a diagram to show the relationships of component sets of numbers that compose the set of real numbers.
  - Model properties and equivalence relationships of real numbers.
  - Demonstrate and apply properties of real numbers to algebraic expressions.
  - Perform basic operations on square roots excluding rationalizing denominators.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- Analyze relationships between two variables, identify domain and range, and determine whether a relation is a function.
  - Explain and illustrate how change in one variable may result in a change in another variable.
  - Determine the rule that describes a pattern and determine the pattern given the rule.
  - Apply patterns to graphs and use appropriate technology.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- Solve, check, and graph linear equations and inequalities in one variable, including rational coefficients.
  - Graph and check linear equations and inequalities in two variables.
  - Solve and graph absolute value equations and inequalities in one variable.
  - Use algebraic and graphical methods to solve systems of linear equations and inequalities.
  - Translate problem-solving situations into algebraic sentences and determine solutions.
- A4 Explore and communicate the characteristics and operations of polynomials.
- Classify polynomials and determine the degree.
  - Add, subtract, multiply, and divide polynomial expressions.
  - Factor polynomials using algebraic methods and geometric models.
  - Investigate and apply real-number solutions to quadratic equations algebraically and graphically.
  - Use convincing arguments to justify unfactorable polynomials.
  - Apply polynomial operations to problems involving perimeter and area.
- A5 Utilize various formulas in problem-solving situations.
- Evaluate and apply formulas (e.g., circumference, perimeter, area, volume, Pythagorean Theorem, interest, distance, rate, and time).
  - Reinforce formulas experimentally to verify solutions.

<sup>2</sup> *Mississippi mathematics framework—Algebra I*. (2003). Retrieved September 10, 2003, from [http://www.mde.k12.ms.us/curriculum/index\\_1.htm](http://www.mde.k12.ms.us/curriculum/index_1.htm)

- c. Given a literal equation, solve for any variable of degree one.
  - d. Using the appropriate formula, determine the length, midpoint, and slope of a segment in a coordinate plane.
  - e. Use formulas (e.g., point-slope and slope-intercept) to write equations of lines.
- A6 Communicate using the language of algebra.
- a. Recognize and demonstrate the appropriate use of terms, symbols, and notations.
  - b. Distinguish between linear and non-linear equations.
  - c. Translate between verbal expressions and algebraic expressions.
  - d. Apply the operations of addition, subtraction, and scalar multiplication to matrices.
  - e. Use scientific notation to solve problems.
  - f. Use appropriate algebraic language to justify solutions and processes used in solving problems.
- A7 Interpret and apply slope as a rate of change.
- a. Define slope as a rate of change using algebraic and geometric representations.
  - b. Interpret and apply slope as a rate of change in problem-solving situations.
  - c. Use ratio and proportion to solve problems including direct variation ( $y=kx$ ).
  - d. Apply the concept of slope to parallel and perpendicular lines.
- A8 Analyze data and apply concepts of probability.
- a. Collect, organize, graph, and interpret data sets, draw conclusions, and make predictions from the analysis of data.
  - b. Define event and sample spaces and apply to simple probability problems.
  - c. Use counting techniques, permutations, and combinations to solve probability problems.

### Biology I<sup>3</sup>

#### Competencies and Suggested Objective(s)

- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- a. Demonstrate the proper use and care for scientific equipment used in biology.
  - b. Observe and practice safe procedures in the classroom and laboratory.
  - c. Apply the components of scientific processes and methods in the classroom and laboratory investigations.
  - d. Communicate results of scientific investigations in oral, written, and graphic form.
- B2 Investigate the biochemical basis of life.
- a. Identify the characteristics of living things.
  - b. Describe and differentiate between covalent and ionic bonds using examples of each.
  - c. Describe the unique bonding and characteristics of water that makes it an essential component of living systems.

<sup>3</sup> *Mississippi science framework—Biology I*. (2003). Retrieved September 10, 2003, from [http://www.mde.k12.ms.us/curriculum/index\\_1.htm](http://www.mde.k12.ms.us/curriculum/index_1.htm)

- d. Classify solutions using the pH scale and relate the importance of pH to organism survival.
  - e. Compare the structure, properties and functions of carbohydrates, lipids, proteins and nucleic acids in living organisms.
  - f. Explain how enzymes work and identify factors that can affect enzyme action.
- B3 Investigate cell structures, functions, and methods of reproduction.
- a. Differentiate between prokaryotic and eukaryotic cells.
  - b. Distinguish between plant and animal (eukaryotic) cell structures.
  - c. Identify and describe the structure and basic functions of the major eukaryotic organelles.
  - d. Describe the way in which cells are organized in multicellular organisms.
  - e. Relate cell membrane structure to its function in passive and active transport.
  - f. Describe the main events in the cell cycle and cell mitosis including differences in plant and animal cell divisions.
  - g. Relate the importance of meiosis to sexual reproduction and the maintenance of chromosome number.
  - h. Identify and distinguish among forms of asexual and sexual reproduction.
- B4 Investigate the transfer of energy from the sun to living systems.
- a. Describe the structure of ATP and its importance in life processes.
  - b. Examine, compare, and contrast the basic processes of photosynthesis and cellular respiration.
  - c. Compare and contrast aerobic and anaerobic respiration.
- B5 Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
- a. Compare and contrast the molecular structures of DNA and RNA as they relate to replication, transcription, and translation.
  - b. Identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes.
  - c. Analyze the applications of DNA technology (forensics, medicine, agriculture).
  - d. Discuss the significant contributions of well-known scientists to the historical progression of classical and molecular genetics.
  - e. Apply genetic principles to solve simple inheritance problems including monohybrid crosses, sex linkage, multiple alleles, incomplete dominance, and codominance.
  - f. Examine inheritance patterns using current technology (gel electrophoresis, pedigrees, karyotypes).
- B6 Investigate concepts of natural selection as they relate to diversity of life.
- a. Analyze how organisms are classified into a hierarchy of groups and subgroups based on similarities and differences.
  - b. Identify characteristics of kingdoms including monerans, protists, fungi, plants and animals.
  - c. Differentiate among major divisions of the plant and animal kingdoms (vascular/non-vascular; vertebrate/invertebrate).
  - d. Compare the structures and functions of viruses and bacteria relating their impact on other living organisms.

- e. Identify evidence of change in species using fossils, DNA sequences, anatomical and physiological similarities, and embryology.
  - f. Analyze the results of natural selection in speciation, diversity, adaptation, behavior and extinction.
- B7 Investigate the interdependence and interactions that occur within an ecosystem.
- a. Analyze the flow of energy and matter through various cycles including carbon, oxygen, nitrogen and water cycles.
  - b. Interpret interactions among organisms in an ecosystem (producer/consumer/decomposer, predator/prey, symbiotic relationships and competitive relationships).
  - c. Compare variations, tolerances, and adaptations of plants and animals in major biomes.
  - d. Investigate and explain the transfer of energy in an ecosystem including food chains, food webs, and food pyramids.
  - e. Examine long and short-term changes to the environment as a result of natural events and human actions.

## English II<sup>4</sup>

### Competencies and Suggested Objective(s)

- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- a. Produce individual and/or group compositions and/or projects to persuade, tell a story, describe, create an effect, explain or justify an action or event, inform, entertain, etc.
  - b. Produce writing typically used in the workplace such as social, business, and technical correspondence; explanation of procedures; status reports; research findings; narratives for graphs; justification of decisions, actions, or expenses; etc.
  - c. Write a response, reaction, interpretation, analysis, summary, etc., of literature, other reading matter, or orally presented material.
  - d. Revise to ensure effective introductions, details, wording, topic sentences, and conclusions.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- a. Listen to determine the main idea and supporting details, to distinguish fact from opinion, and to determine a speaker's purpose or bias.
  - b. Speak with appropriate intonation, articulation, gestures, and facial expression.
  - c. Speak effectively to explain and justify ideas to peers, to inform, to summarize, to persuade, to entertain, to describe, etc.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- a. Read, view, and listen to distinguish fact from opinions and to recognize persuasive and manipulative techniques.

<sup>4</sup> *Mississippi language arts framework—English II*. (2003). Retrieved September 10, 2003, from [http://www.mde.k12.ms.us/curriculum/index\\_1.htm](http://www.mde.k12.ms.us/curriculum/index_1.htm)

- b. Access both print and non-print sources to produce an I-Search paper, research paper, or project.
  - c. Use computers and audio-visual technology to access and organize information for purposes such as resumes, career search projects, and analytical writings, etc.
  - d. Use reference sources, indices, electronic card catalog, and appropriate research procedures to gather and synthesize information.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- a. Interact with peers to examine real world and literary issues and ideas.
  - b. Show growth in critical thinking, leadership skills, consensus building, and self-confidence by assuming a role in a group, negotiating compromise, and reflecting on individual or group work.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- a. Share, critique, and evaluate works in progress and completed works through a process approach.
  - b. Communicate effectively in a group to present completed projects and/or compositions.
  - c. Edit oral and written presentations to reflect correct grammar, usage, and mechanics.
- E6 Explore cultural contributions to the history of the English language and its literature.
- a. Explore a variety of works from various historical periods, geographical locations, and cultures, recognizing their influence on language and literature.
  - b. Identify instances of dialectal differences which create stereotypes, perceptions, and identities.
  - c. Recognize root words, prefixes, suffixes, and cognates.
  - d. Relate how vocabulary and spelling have changed over time.
- E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
- a. Listen to and read aloud selected works to recognize and respond to the rhythm and power of language to convey a message.
  - b. Read aloud with fluency and expression.
  - c. Analyze the stylistic devices, such as alliteration, assonance, word order, rhyme, onomatopoeia, etc., that make a passage achieve a certain effect.
  - d. Demonstrate how the use of language can confuse or inform, repel or persuade, or inspire or enrage.
  - e. Analyze how grammatical structure or style helps to create a certain effect.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- a. Read and explore increasingly complete works, both classic and contemporary, for oral discussion and written analysis.
  - b. Read, discuss, and interpret literature to make connections to life.
  - c. Read from a variety of genres to understand how the literary elements contribute to the overall quality of the work.



- d. Identify qualities in increasingly complex literature that have produced a lasting impact on society.
  - e. Read for enjoyment, appreciation, and comprehension of plot, style, vocabulary, etc.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- a. Infuse the study of grammar and vocabulary into written and oral communication.
  - b. Demonstrate, in the context of their own writing, proficient use of the conventions of standard English, including, but not limited to, the following: complete sentences, subject-verb agreement, plurals, spellings, homophones, possessives, verb forms, punctuation, capitalization, pronouns, pronoun-antecedent agreement, parallel structure, and dangling and misplaced modifiers.
  - c. Give oral presentations to reinforce the use of standard English.
  - d. Employ increasingly proficient editing skills to identify and solve problems in grammar, usage, and structure.
- E10 Use language and critical thinking strategies to serve as tools for learning.
- a. Use language to facilitate continuous learning, to record observations, to clarify thought, to synthesize information, and to analyze and evaluate language.
  - b. Interpret visual material orally and in writing.

### U. S. History from 1877<sup>5</sup>

#### Competencies and Suggested Objective(s)

- H1 Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
- a. Apply economic concepts and reasoning when evaluating historical and contemporary social developments and issues (e.g., gold standard, free coinage of silver, tariff issue, laissez faire, deficit spending, etc.).
  - b. Explain the emergence of modern America from a domestic perspective (e.g., frontier experience, Industrial Revolution and organized labor, reform movements of Populism and Progressivism, Women’s Movement, Civil Rights Movement, the New Deal, etc.).
  - c. Explain the changing role of the United States in world affairs since 1877 through wars, conflicts, and foreign policy (e.g., Spanish-American War, Korean conflict, containment policy, etc.).
  - d. Trace the expansion of the United States and its acquisition of territory from 1877 (e.g., expansionism and imperialism).
- H2 Describe the impact of science and technology on the historical development of the United States in the global community.
- a. Analyze the impact of inventions on the United States (e.g., telephone, light bulb, etc.).
  - b. Examine the continuing impact of the Industrial Revolution on the development of our nation (e.g., mass production, computer operations, etc.).

<sup>5</sup> *Mississippi social studies framework—U.S. History from 1877*. (2003). Retrieved September 10, 2003, from [http://www.mde.k12.ms.us/curriculum/index\\_1.htm](http://www.mde.k12.ms.us/curriculum/index_1.htm)

- c. Describe the effects of transportation and communication advances since 1877.
- H3 Describe the relationship of people, places, and environments through time.
  - a. Analyze human migration patterns since 1877 (e.g., rural to urban, the Great Migration, etc.).
  - b. Analyze how changing human, physical, geographic characteristics can alter a regional landscape (e.g., urbanization, Dust Bowl, etc.).
- H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).
  - a. Interpret special purpose maps, primary/secondary sources, and political cartoons.
  - b. Analyze technological information on graphs, charts, and timelines.
  - c. Locate areas of international conflict (e.g., Caribbean, Southeast Asia, Europe, etc.).
- H5 Analyze the contributions of Americans to the ongoing democratic process to include civic responsibilities.
  - a. Examine various reform movements (e.g., Civil Rights, Women's Movement, etc.).
  - b. Examine the government's role in various movements (e.g., arbitration, 26th Amendment, etc.).
  - c. Examine the role of government in the preservation of citizens' rights (e.g., 19th Amendment, Civil Rights Act of 1964).
  - d. Examine individuals' duties and responsibilities in a democratic society (e.g., voting, volunteerism, etc.).

## Appendix C: 21<sup>st</sup> Century Skills<sup>6</sup>

### CS1 Global Awareness

- Using 21<sup>st</sup> century skills to understand and address global issues
- Learning from and working collaboratively with individuals representing diverse cultures, religions, and lifestyles in a spirit of mutual respect and open dialogue in personal, work, and community contexts
- Promoting the study of non-English language as a tool for understanding other nations and cultures

### CS2 Financial, Economic, and Business Literacy

- Knowing how to make appropriate personal economic choices
- Understanding the role of the economy and the role of business in the economy
- Applying appropriate 21<sup>st</sup> century skills to function as a productive contributor within an organizational setting
- Integrating oneself within and adapting continually to our nation's evolving economic and business environment

### CS3 Civic Literacy

- Being an informed citizen to participate effectively in government
- Exercising the rights and obligations of citizenship at local, state, national, and global levels
- Understanding the local and global implications of civic decisions
- Applying 21<sup>st</sup> century skills to make intelligent choices as a citizen

### CS4 Information and Communication Skills

- Information and media literacy skills: Analyzing, accessing, managing, integrating, evaluating, and creating information in a variety of forms and media; understanding the role of media in society
- Communication skills: Understanding, managing, and creating effective oral, written, and multimedia communication in a variety of forms and contexts

### CS5 Thinking and Problem-Solving Skills

- Critical thinking and systems thinking: Exercising sound reasoning in understanding and making complex choices, understanding the interconnections among systems
- Problem identification, formulation, and solution: Ability to frame, analyze, and solve problems
- Creativity and intellectual curiosity: Developing, implementing, and communicating new ideas to others, staying open and responsive to new and diverse perspectives

### CS6 Interpersonal and Self-Directional Skills

- Interpersonal and collaborative skills: Demonstrating teamwork and leadership, adapting to varied roles and responsibilities, working productively with others, exercising empathy, respecting diverse perspectives
- Self-direction: Monitoring one's own understanding and learning needs, locating appropriate resources, transferring learning from one domain to another
- Accountability and adaptability: Exercising personal responsibility and flexibility in personal, workplace, and community contexts; setting and meeting high standards and goals for one's self and others; tolerating ambiguity

<sup>6</sup> 21<sup>st</sup> century skills. (n.d.). Washington, DC: Partnership for 21<sup>st</sup> Century Skills.

- Social responsibility: Acting responsibly with the interests of the larger community in mind; demonstrating ethical behavior in personal, workplace, and community contexts

## Appendix D: Rubrics and Resources

### Activity Performance Rubric

Student Name \_\_\_\_\_ Date \_\_\_\_\_

Task to be Performed \_\_\_\_\_

	Possible Points	Points Awarded
<b>Safety</b>	25	
Personal safety (glasses, clothing, etc.)		
Safe use of tool		
Safely performs the task		
<b>Performance of the Task</b>	50	
Follows the task instructions		
Performs the task efficiently		
Performs the task satisfactorily		
<b>Lab Maintenance</b>	25	
Area clean-up (clean and tidy)		
Area organization (before, during, and after the task)		
<b>Total</b>	100	

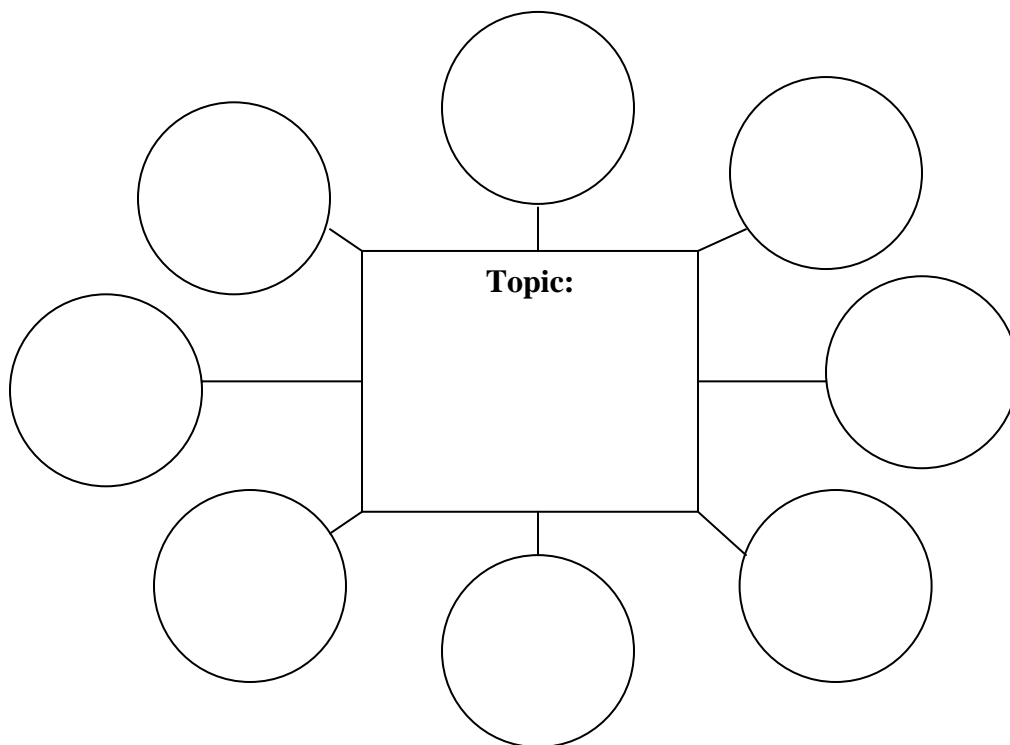
Comments for Deductions:

### Case Study Assessment Rubric

	<b>Excellent 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Needs Improvement 2 Points</b>	<b>Unsatisfactory 1 Point</b>
<b>Comprehension</b>	Shows complete understanding of the issues, and grasps implications beyond the immediate issue	Asks for more details to clarify understanding of the issue	Shows partial understanding of the issue but does not ask for clarification	Resists attempts to get clarification
<b>Strategizing</b>	Develops realistic strategies that would provide a satisfactory conclusion	Chooses appropriate strategies that may satisfy	Shows evidence of strategy that may or may not satisfy	Needs assistance to choose a strategy
<b>Innovation</b>	Devises more than one resolution to the problem	Offers a solution	Offers a solution with a limited point of view	Shows some understanding of the problem
<b>Communications</b>	Convincingly communicates resolution	Explains solution so others can understand	Conveys an opinion	Unsure of how to explain

### Cluster Word Web

A Cluster Word Web can be used to help students determine main and supporting ideas. Have students place their topic in the square and details about their topic in the circles:



### Fact or Opinion

Have students writing their topic in the top rectangle. Have students add details to the fact or the opinion blocks:

Topic:

Fact:

Opinion:



### Field Trip Participation Checklist

- \_\_\_\_\_ 1. The student arrived at the designated meeting place on time with all materials and supplies required for the field trip.
- \_\_\_\_\_ 2. The student observed all safety rules and policies while traveling to and participating in the field trip.
- \_\_\_\_\_ 3. The student demonstrated interest in the content of the field trip by paying attention to the exhibits and speakers, asking pertinent questions, and taking notes.
- \_\_\_\_\_ 4. The student exhibited a positive attitude toward the events and activities of the field trip.
- \_\_\_\_\_ 5. The student remained on task throughout the field trip.
- \_\_\_\_\_ 6. The student exhibited cooperative workplace skills with other students throughout the field trip.

### Group Participation Assessment Rubric

	<b>Beginning</b> 1 point	<b>Developing</b> 2 points	<b>Accomplished</b> 3 points	<b>Exemplary</b> 4 points	<b>Score</b>
<b>Group Discussions</b>	Contributed exceptional effort to discussions of the group	Contributed great effort to discussions of the group	Contributed good effort to discussions of the group	Rarely contributed to discussions of the group	
<b>On-task Behavior</b>	Exhibited on-task behavior consistently	Exhibited on-task behavior most of the time	Exhibited on-task behavior some of the time	Exhibited on-task behavior inconsistently	
<b>Helping Others</b>	Assisted other group members	Occasionally assisted other group members	Seldom assisted other group members	Did not assist other group members	
<b>Listening</b>	Always listened to ideas of group members	Occasionally listened to ideas of group members	Seldom listened to ideas of group members	Ignored ideas of group members	

### Group Presentation Assessment Rubric

	<b>Exemplary</b> 4 points	<b>Accomplished</b> 3 points	<b>Developing</b> 2 points	<b>Beginning</b> 1 point	<b>Score</b>
<b>Content</b>	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
<b>Clarity</b>	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
<b>Presentation</b>	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
<b>Visual Aids</b>	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, or some grammatical errors	Weak, inaccurate, or many grammatical errors	
<b>Length</b>	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
<b>Participation</b>	Well-balanced participation by all group members	All group members have significant participation	Most group members participate	One main speaker with little participation from other group members	
<b>Eye Contact</b>	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	

### Interview Rubric

The Student	Excellent 4	Good 3	Needs Improvement 2	Unacceptable 1
Arrives prior to the interview.				
Displays confidence with body language.				
Maintains eye contact.				
Maintains proper facial expression.				
Provides a self-introduction.				
Extends hand and shakes hands firmly with the interviewer(s).				
Dresses appropriately for the interview.				
Responds in a concise, grammatically correct, and appropriate manner.				
Asks appropriate questions and demonstrates awareness of background of company and requirements of the job.				
Cues on interviewer's closure and responds appropriately.				

*Notes:*

## KWL Chart

### Purposes:

- To help students access prior knowledge through brainstorming
- To identify areas of student interest or concern
- To aid the teacher in planning lessons as well as checking for understanding
- To track student learning throughout the unit
- To identify areas for further student research/study

### Process:

- Use this strategy prior to, during, or at the close of any unit of study. The process can be done individually, in small groups, or as a class activity.
- Post the charts or have students record their information in groups.
- During the brainstorming phase, emphasize getting lots of ideas rather than debating or discussing the ideas as they are generated. Debates, clarifications, and discussions of ideas occur once the brainstorming is over. Do not clarify any confusion or react in any way other than to record the data. Conflicting data may be recorded.
- During the lesson or unit of study, misconception, confusion, or curiosity should be addressed.

### Sample Chart:

**K**  
What do you already Know  
about the topic?

**W**  
What do you Want to learn  
about the topic?

**L**  
What have you Learned about  
the topic?

### Poster Assessment Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Required Content</b>	The poster includes all required content elements as well as additional information.	All required content elements are included on the poster.	All but 1 of the required content elements are included on the poster.	Several required content elements were missing.	
<b>Labels</b>	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read or no important items were labeled.	
<b>Attractiveness</b>	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
<b>Grammar</b>	There are no grammatical or mechanical mistakes on the poster.	There are 1-2 grammatical or mechanical mistakes on the poster.	There are 3-4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	

### Presentation Assessment Rubric

	<b>Exemplary 4 points</b>	<b>Accomplished 3 points</b>	<b>Developing 2 points</b>	<b>Beginning 1 point</b>	<b>Score</b>
<b>Content</b>	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
<b>Clarity</b>	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
<b>Presentation</b>	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
<b>Visual Aids</b>	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, or some grammatical errors	Weak, inaccurate, or many grammatical errors	
<b>Length</b>	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
<b>Eye Contact</b>	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	

### Problem Solution Chart

Have students write the task in the task area. Then have students brainstorm possible problems and solutions.

Task:

Possible Problem:

Possible Solution:

Possible Problem:

Possible Solution:

Possible Problem:

Possible Solution:

Possible Problem:

Possible Solution:

Possible Problem:

Possible Solution:

Possible Problem:

Possible Solution:



### Reflective Writing Rubric

	4	3	2	1
<b>Writing Structure</b>	Sentences and paragraphs are complete, well-constructed, and of varied structure.	All sentences are complete and well-constructed (no fragments, no run-ons). Paragraphing is generally done well.	Most sentences are complete and well-constructed. Paragraphing needs some work.	There are many sentence fragments or run-on sentences OR paragraphing needs lots of work.
<b>Content</b>	The writing contains a description of all components of the communication process.	The writing contains a description of 3 components of the communication process.	The writing contains a description of 2 components of the communication process.	The writing contains a description of 1 component of the communication process.
<b>Content Accuracy</b>	The writing contains at least 3 accurate examples of types of communications.	The writing contains at least 2 accurate examples of types of communications.	The writing contains at least 1 accurate example of types of communications.	The writing contains no examples of types of communications.
<b>Content Understanding</b>	Ideas were expressed in a clear and organized fashion.	Ideas were expressed in a pretty clear manner, but the organization could have been better.	Ideas were somewhat organized, but were not very clear.	The writing seemed to be a collection of unrelated sentences.

### Resume Rubric

	Excellent 25	Well Done 20	Meets Standards 15	Beginning 10	No evidence 0	Score
<b>Format</b>	Resume contains: Name Address Phone Number Objective Education Experience References No Spelling Errors	Resume contains 6 of the criteria. No more than 2 spelling errors.	Resume contains 5 of criteria. No more than 4 spelling errors.	Resume contains minimal information. More than 4 spelling errors.	Assignment was not turned in.	
<b>Education</b>	Education includes all of the following: All schools attended. Graduation dates. Diploma/Degree awarded. Major field of study.	Education includes 3 of the following: All schools attended. Graduation dates. Diploma/Degree awarded. Major field of study.	Education includes 2 of the following: All schools attended. Graduation dates. Diploma/Degree awarded. Major field of study.	Education includes 1 of the following: All schools attended. Graduation dates. Diploma/Degree awarded. Major field of study.	Assignment was not turned in.	
<b>Experience</b>	Experience includes: Internships in the field. Entry level jobs relevant to current position. Current position	Experience includes: Internships in the field. Entry level jobs relevant to current position.	Experience includes: Entry level jobs relevant to current position as well as current job.	Experience includes current position only.	Assignment was not turned in.	
<b>Realism</b>	Resume contains realistic names and dates. Resume is believable.	Resume is fairly believable with realistic names OR dates.	Resume has unrealistic dates or names.	Resume is obviously unrealistic and contains conflicting information.	Assignment was not turned in.	

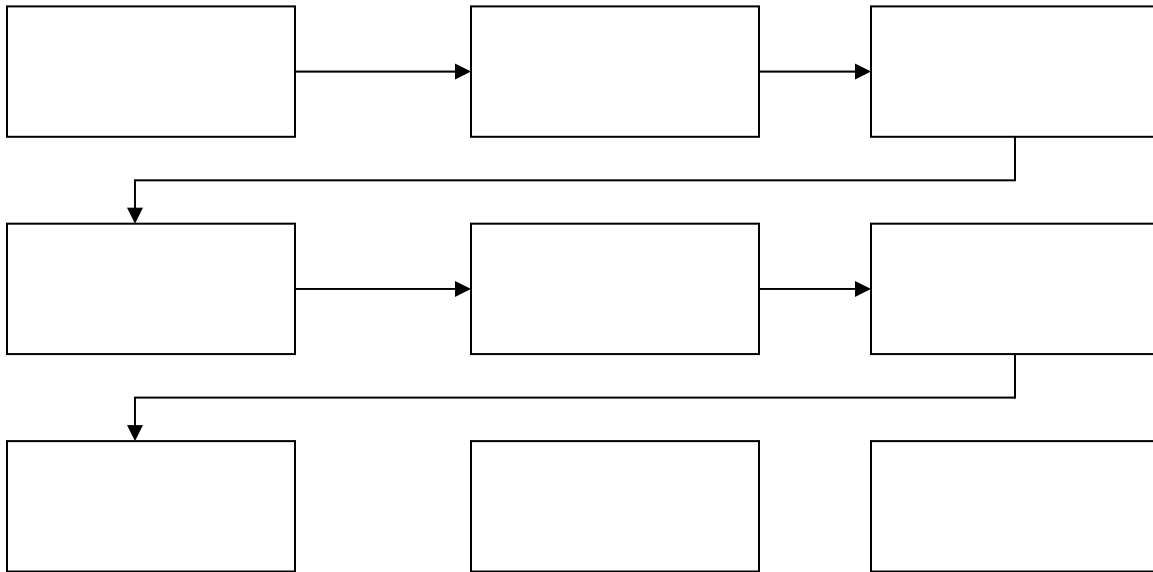
Written by D Cordero. Last updated 12/01/99

### Role-Play Rubric

Indicators	Proficient 4	Strong 3	Basic 2	Weak 1
<i>Assessment Outcomes</i>	<i>Highly creative, inventive, mature presence of outcome</i>	<i>Detailed and consistent evidence of outcome</i>	<i>Beginning of or some evidence of outcome</i>	<i>Little or no evidence of outcome</i>
Focus Question Provided	Group provides a clear, relevant focus question to the audience to give the anticipatory set.	Group provides a focus question to the audience to give the anticipatory set.	Group provides a vague focus question to the audience to give the anticipatory set.	Group provides a very vague or no focus question to the audience to give the anticipatory set.
Knowledge of Content	Group of students is obviously well-prepared and knowledgeable about the content; highly credible in role; information is completely accurate.	Group of students is mostly prepared and knowledgeable about the content; somewhat credible in role with little or no vagueness; little or no errors in information.	Group of students is slightly prepared and somewhat knowledgeable about the content they are role-playing; little or no credible in role with vagueness; errors in information.	Group of students is not prepared and vaguely knowledgeable about the content they are role-playing; no credibility in role with multiple errors in information.
Creativity in Presentation	Group of students is serious and methodical in the presentation, using believable role playing that creatively conveys the knowledge desired.	Group of students is somewhat serious in the presentation, using mostly convincing role playing that conveys the knowledge desired.	Group of students is slightly serious in the presentation, using slightly convincing role playing that conveys the knowledge desired.	Group of students is not serious in the presentation, not using convincing role playing that conveys the knowledge desired.
Use of Props	Group of students has collected the relevant props to include the tools demonstrated plus additional props to create the scene and used them effectively to role-play.	Group of students has collected the relevant props to include the tools demonstrated and used them effectively to role-play.	Group of students has collected little or no props to include the tools demonstrated and used them.	Group of students has not collected props to include in the role play.
Collaboration Among Team Members	Group of students assumed necessary roles and carried out their duties in the roles to work in a highly effective collaborative team.	Group of students assumed necessary roles and somewhat carried out their duties in the roles.	Group of students somewhat assumed roles and slightly carried out their duties in the roles.	Group of students showed no signs of collaboration.
Interactive Closure Activity	Group of students provided a highly effective, interactive closure activity that was unique and provided a check for understanding of the role play.	Group of students provided effective closure activity that provided a check for understanding of the role play.	Group of students provided a vague closure activity.	Group of students provided no closure activity.

### Sequential and Chronological Map

Have students list the process in sequential and/or chronological order:



### Step-by-Step Chart

Have students write the task that they are to accomplish in the task area. Then have students determine and write each step of their procedure with details.

Task:

Step 1:

Details:

Step 2:

Details:

Step 3:

Details:

Step 4:

Details:

Step 5:

Details:

Step 6:

Details:

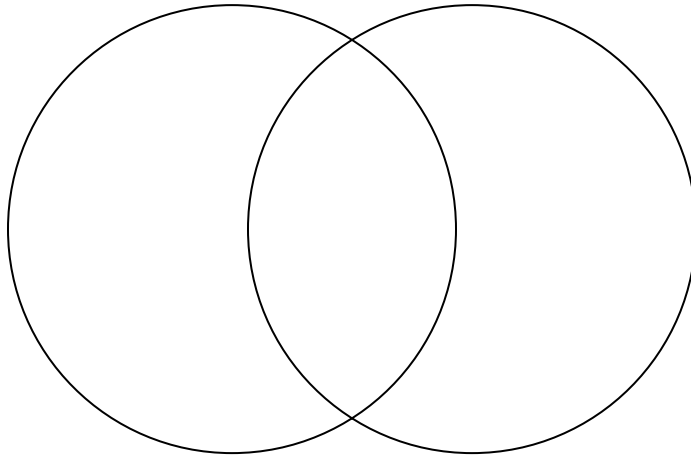
### Student Journal Rubric

	<b>Excellent 4</b>	<b>Very Good 3</b>	<b>Satisfactory 2</b>	<b>Needs Work 1</b>	<b>Score</b>
<b>Writing Quality</b>	There is a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There is a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style which conveys meaning adequately. Some minor grammatical, syntax, and spelling errors.	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
<b>Content</b>	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
<b>Insight and Understanding</b>	Definite insights into the implications of the activity are recorded. Awareness of complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
<b>Application</b>	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of agriculture.	Content of the activity is related to life in general.	Only limited connections are made between the content of the activity and the surrounding world.	
<b>Total Score:</b>					

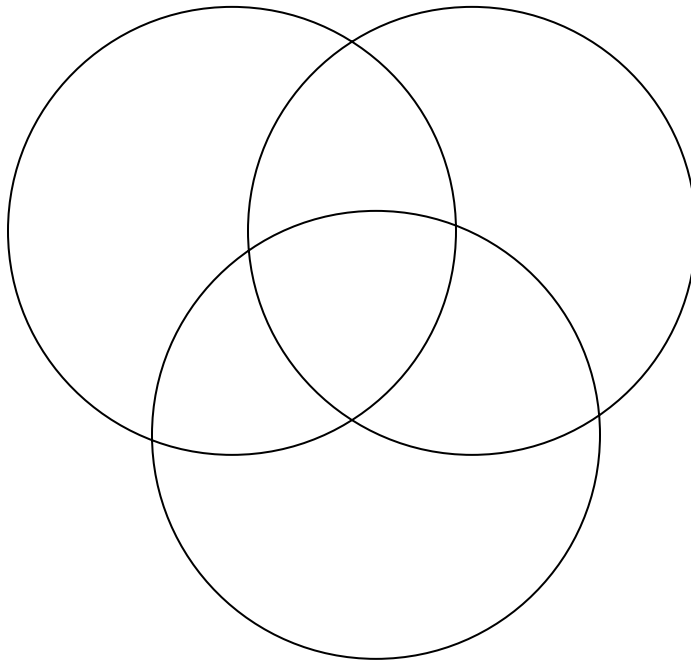
## Venn Diagram

Have students use a Venn Diagram to compare and contrast subjects. Have students write details that tell how subjects are different in the outer circles and details that tell how the subjects are alike where circles overlap. After students present their ideas in the graphic, have them organize their ideas into a writing summary.

Use the following Venn Diagram to compare and contrast two subjects:



Use the following Venn Diagram to compare and contrast three subjects:



### Weekly Learning Reflections

Name: \_\_\_\_\_ Week of: \_\_\_\_\_

What did I learn this week?

How can I use this information in the real world?

In what areas am I making progress?

In what areas do I need to improve?

What learning goals do I have for next week?

What did I enjoy most about this week?

Parent's Signature and Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Student's Signature and Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## Workplace Skills Weekly Checklist

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

<b>Behavior Skill</b>	<b>Never</b>	<b>Rarely</b>	<b>Most of the Time</b>	<b>Always</b>
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### **On Time and Prepared**

1. Arrives to class on time.
2. Brings necessary materials.
3. Completes homework.

### **Respects Peers**

1. Respects others' property.
2. Listens to peers.
3. Responds appropriately to peers.
4. Respects others' opinions.
5. Refrains from abusive language.

### **Respects Teachers/Staff**

1. Follows directions.
2. Listens to teacher/staff.
3. Accepts responsibility for actions.

### **Demonstrates Appropriate Character Traits**

1. Demonstrates positive character traits  
(kindness, trustworthy, honesty).
2. Demonstrates productive character traits  
(patient, thorough, hardworking).
3. Demonstrates a level of concern for  
others.

### **Demonstrates a Level of Concern for Learning**

1. Remains on task.
2. Allows others to remain on task.

## The Writing Process

### Step 1: Prewriting

During this step, allow students to brainstorm and determine ideas for their content. Students may complete the following during prewriting activities:

- Free writing
- Journaling
- Image streaming (transplant yourself to another place or time and describe from a first person point of view)
- Lists
- Visualization
- Brainstorming - individually or as a group
- Webbing/mapping/clustering
- Graphic organizers
- Topic or word chart

### Step 2: Writing

During this step, allow students to develop a rough draft of their writing. Encourage students to be selective in the ideas they choose to include. Have students focus on developing content and putting their ideas on paper. Do not require students to count words, but have them complete ideas instead.

### Step 3: Revising

During this step, have students make decisions about how they want to improve their writing. Have students look at their writing from a different point of view. Encourage students to focus on making their writing clearer, more interesting, more informative, and more convincing. To help students revise their writing product, use the following strategies:

- Divide students into groups of 3 – 5 in varying ability. Distribute student writing samples to all group members. Make sure there are no names on the pieces of writing. Have everyone in each group read one paper and make marks for improvement. Have the reader write positive and corrective comments about each piece for later discussion within the group. Have the reader present the piece of writing to the group and discuss his/her comments. Have each group member add comments to each piece of writing.
- Have students ask themselves the following questions:
  - Can I read this piece of writing out loud without stumbling?
  - Is the series of events logical? Do they relate?
  - Is it clear what my goal is throughout the piece of writing?
  - Are vivid/descriptive words used to describe characters and/or events?
  - Is my train of thought clear?
  - Do I use a variety of verbs throughout the piece?
  - Is my writing wordy or redundant? Am I using the same words and phrases over and over again?
  - Is there a catch introduction?
  - Are transitional devices used throughout?

## The Writing Process, Continued

- Is there a strong hook, main idea or theses, and lead-in?
- Is proper format followed throughout?
- Are all sentences complete?
- Did I use a thesaurus?

### Step 4: Editing

Editing is checking spelling, capitalization, punctuation, grammar, sentence structure, subject/verb agreement, consistent verb tense, and word usage. During this step, have students do the following:

- Have students read their own work backwards. Encourage them to read the last sentence, then the second to last sentence, etc. Have students ask themselves:
  - Does each sentence make sense when you read it on its own?
  - Do you see or hear any errors in the sentence?
- Have students use a checklist to peer- or self-edit.

### Step 5: Publishing

During this step, have students publish their final document. Students may use a word processing program or a blue or black pen to present their final copy. Give students a set of guidelines before they begin to publish their writing. Have students submit the following when they turn in their writing to ensure that they followed all of the steps in the writing process:

- Prewriting document
- Rough draft
- Edited copy
- Final document

### Written Report Assessment Rubric

	<b>Exemplary 4 points</b>	<b>Accomplished 3 points</b>	<b>Developing 2 points</b>	<b>Beginning 1 point</b>	<b>Score</b>
<b>Content</b>	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
<b>Grammar</b>	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
<b>Organization</b>	Ideas flow smoothly and logically with clarity and coherence	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	