I INTRODUCTION

A. Expand training in the roughing and shaping procedures and automotive sheet metal necessary to make satisfactory body repairs. Emphasis on the alignment of component parts such as doors, hood, front-end assemblies, and deck lids.

B. Structural Analysis and Damage Repair I (ABDR 1471) is a required course for the completion of a two year Associate of Applied Science degree in Auto Collision Repair or a Level I or Level II certificate of completion in the Auto Collision Repair Technician Program.

C. This course is occupationally related and serves as a preparation for a career in the Auto Collision Repair field.

D. Prerequisites: This course has a prerequisite or co-requisite of ABDR 1419 or consent of the Department Chair.

E. Alphanumeric coding used throughout this module book denotes integration of SCANS occupational competencies (C1, etc.) and Foundation skills (F1, etc.).

II LEARNING OUTCOMES

Upon successful completion of this course, Basic Metal Repair, the student will:

A. Describe the effects of collision and repair on sheet metal. (C15)

B. Select the proper tools and equipment to correctly perform rough-out procedures. (C18, 19)

C. Apply correct rough-out procedures to specific repair requirements. (C18, 19)
D. Describe major body alignment problems. (C15)

E. Use appropriate adjustment methods. (C18, 19)

F. Perform effective shrinking procedures using proper tools and techniques on scrap body panels. (C18, 19)

G. Recognize the types of damage which require shrinking. (F9)

H. Describe the effects of heat on both mild, High Strength Steel (HSS), and High Strength Low Alloy (HSLA) steel and its relationship to their repair procedures. (C15)

I. Perform annealing processes on body steel. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

J. Identify and describe the basic damage conditions and the type of panel crown in which they form. (C15)

K. Finish repaired areas to contour with body filler through the proper selection, application, and shaping/finishing operations. (C18, 19)

L. Practice shop safety and properly and safely use and maintain tools and equipment. (F9)

M. Analyze movable outer body panel and bumper misalignment and perform repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

N. Define and use damage analysis terms. (C5, 6, 7)(F1, 6, 8, 9)

O. Describe methods for identifying structural metals. (C5, 6, 7)(F1, 6, 8, 9)

P. Explain the principles of reversed motion as it applies to the use of body jacking equipment. (C5, 6, 7)(F1, 6, 8)

Q. Name and demonstrate five (5) factors involved in the use of tension for panel repair. (C5, 6, 7)(F1, 6, 8)

R. Identify rust problems and perform rust repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)
III INSTRUCTIONAL MATERIALS

A. Text:
The instructional materials identified for this course are viewable through www.ctcd.edu/books

B. Supplemental Reading: as assigned by the instructor.

C. References: As selected by the instructor.

D. Audio Visual Aids: (Recommended)
   1. “Aligning Hoods, Doors and Decklids,” Prentice Hall, #940.05 (Filmstrip).
   2. “Shrinking Metal,” Teaching Aid Inc. #LFC-8 (Filmstrip).
   5. “Rear Deck Lid Repair,” Prentice Hall, #JH2365F (Filmstrip).
   6. “Repairing a Door,” Prentice Hall, #JH2364F (Filmstrip).
   7. “Quarter Panel Repair (plastic filling),” Prentice Hall, #JH2362F (Filmstrip).
   8. “Quarter Panel Repair (solder filling),” Prentice Hall, #JH2361F (Filmstrip).

E. Other instructional material: As selected by the instructor.

IV COURSE REQUIREMENTS

A. Your first responsibility is scholarship. The grade you receive will be the result of your efforts both in the classroom and in the laboratory.

B. This course is designed to require a steady, continuous effort form the student. Class participation, initiative, attendance and work efforts will be considered in grade computation.

C. Reading and study assignments will be made by the instructor. Reading of all study assignments is required, as well as specific tasks outlined by the instructor or listed on handouts, or laboratory activity sheets. Specific reading assignments
will be assigned by the instructor. Students are required to complete these assignments by the time specified by the instructor. Quizzes may be given on any or all reading assignments.

D. The study of a subject is not limited to the classroom, laboratory, or limits of the syllabus. Each student should seek out and study all available material available on the subject being taught. This might include use of the Internet or the library. In general, two hours of study outside the regular class period is recommended for each hour of classroom work.

E. Students are required to attend class and laboratory sessions regularly. Those who fail to do so may be dropped from the course with a grade of “FN”.

F. Students are required to be present for all examinations. See paragraph V (Examinations) for additional information.

G. Laboratory learning activities (lab tasks) will be completed on an individual basis except when limited by tools and/or materials. Learning activities will be subjectively graded by the instructor. Students assigned to a group must be present at all times when the project is being worked on. Students who are not present while a learning activity is in progress may be given a “0” for that activity. Students are required to complete all laboratory assignments by the time specified by the instructor.

V EXAMINATIONS

A. There will be a minimum of three major examinations:

1. Three Week Exam

2. Mid Term Exam

3. Final Exam (this is a comprehensive exam)

4. Additional examinations may be given if the instructor determines it is necessary for proper evaluation of the students in the class.

B. Students must be present for all examinations. Make up examinations will not be given. Students who know they will be absent on the day of an examination must make arrangements with the instructor prior to the absence. Students who are absent on the day of the examination due to illness or other extenuating circumstances must present to the instructor an acceptable reason for the absence on the day following the absence.

C. Students without an excused absence will be given a zero for that examination.
D. Students must take the final examination to receive a grade for the course.

VI SEMESTER GRADE COMPUTATIONS

A. Written examinations will count 45% of the student’s overall final grade.

B. Practical, hands-on lab work will count 45% of the student’s overall final grade.

C. Incentive points will count 10% of the student’s overall final grade. Incentive points are earned by doing additional work, written assignments, class participation, demonstrated initiative and positive attitude. Points will be deducted for each unexcused absence, each written assignment not turned in, each tardiness and each failure to secure tools and clean work areas.

D. Grade Computations (Example)

1. Written Exams (45%) (maximum 100 points)
   1st Exam     90
   2nd Exam     90
   3rd Exam     +90
   270 divided by 3 = 90 average

2. Lab score (45%) (maximum 100 points)
   Lab score = 80
   45% of 80 = 36 points for lab score

3. Incentive Score (10%) (maximum 100 points)
   Incentive score = 82
   10% of 82 = 8.2 points for Incentive Score

4. Final Overall Grade Computation
   Written Exam   40.5 Points
   Lab Score      36.0 Points
   Incentive Score 8.2 Points
   84.7 Total Points = a letter grade of “B”

E. Points/Score Equivalents:

<table>
<thead>
<tr>
<th>POINTS</th>
<th>GRADE</th>
<th>POINTS PER SEMESTER HOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>80-89</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>70-79</td>
<td>C</td>
<td>2</td>
</tr>
<tr>
<td>60-69</td>
<td>D</td>
<td>1</td>
</tr>
</tbody>
</table>
VII NOTES AND ADDITIONAL INSTRUCTIONS FROM THE INSTRUCTOR

A. **Course Withdrawal:** It is the student’s responsibility to officially withdraw from a course if circumstances prevent attendance. Any student who desires to, or must, officially withdraw from a course after the first scheduled class meeting must file a Central Texas College Application for Withdrawal (CTC Form 59). The withdrawal form must be signed by the student.

CTC Form 59 will be accepted at any time prior to Friday of the 12th week of classes during the 16-week fall and spring semester. The deadline for sessions of other lengths is:

- 10-week session  Friday of the 8th week
- 8-week session  Friday of the 6th week
- 5-week session  Friday of the 4th week

The equivalent date (75% of the semester) will be sued for session of other lengths. The specific last day to withdraw is published each semester in the Schedule Bulletin.

A student who officially withdraws will be awarded the grade of “W” provided the student’s attendance and academic performance are satisfactory at the time of official withdrawal. Students must file a withdrawal application with the College before they may be considered for withdrawal.

A student may not withdraw from a class for which the instructor has previously issued the student a grade of “F” or “FN” for nonattendance.

B. **Administrative Withdrawal:** An administrative withdrawal may be initiated when the student fails to meet College attendance requirements. The instructor will assign the appropriate grade on CTC Form 59 for submission to the registrar.

C. **Incomplete Grade:** The College catalog states, “An incomplete grade (“IP”) may be given in those cases where the student has completed the majority of the course work but, because of personal illness, death in the immediate family, or military orders, the student is unable to complete the requirements for a course...” Prior approval from the instructor is required before the grade of “IP” for Incomplete is recorded. A student who merely fails to show for the final examination will receive a zero for the final and an “F” for the course.
D. **Cellular Phones and Beepers**: Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

E. **American’s With Disabilities Act (ADA)**: Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at [www.ctcd.edu/disability-support](http://www.ctcd.edu/disability-support) for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

F. **Instructor Discretion**: The instructor reserves the right of final decision in course requirements.

G. **Civility**: Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning environment. Failure to do so can result in disciplinary action up to and including expulsion.

H. Absence from the class may be unavoidable in some situations. These include illness, military/civilian job requirements, or a death in the immediate family. Documentation is required in the case of excused absences for job requirement’s, excuses will be on company letterhead stationary signed by the immediate supervisor stating the reason for the absence for civilian jobs. Excuses for military personnel must be signed by the 1st Sergeant or the Company Commander. In cases of illness, one day absences may be excused on a statement from the individual stating the reason. For more than one day of illness, the individual must have a statement from the doctor treating the illness.

**VIII COURSE OUTLINE**

A. **Lesson One**: Introduction

1. **Learning Outcomes**: Upon successful completion of this lesson, the student will:
   a. Be able to describe the effects of collision and repair on sheet metal. (C15)
   b. Describe major body alignment problems. (C15)
   c. Describe the effects of heat on both mild, High Strength Steel (HSS), and High Strength Low Alloy (HSLA) steel and its relationship to their repair procedures. (C15)
d. Perform annealing processes on body steel. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 3, 8, 9, 10, 12)
e. Identify and describe the basic damage conditions and the type of panel crown in which they form. (C15)
f. Practice shop safety and properly and safely use and maintain tools and equipment. (F9)
g. Define and use damage analysis terms. (C5, 6, 7) (F1, 6, 8, 9)
h. Describe methods for identifying structural metals. (C5, 6, 7) (F1, 6, 8, 9)

2. Learning Activities:

a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:

a. Oxy-acetylene welding equipment
b. Hammers and dollies
c. Personal safety equipment
d. Scrap
e. Body panels illustrating the five basic damage conditions
f. Body steel plates approx. 6" x 12"

4. Audio Visual Aids: (Recommended)

a. To be selected by the instructor from those listed in Section III D above.
b. Others as selected by the instructor.

5. Lesson Outline:

a. Introduction
b. Safety
c. Effects of force on shape
d. Basic damage conditions
(1) Displaced areas
(2) Simple bands
(3) Rolled buckles
(4) Upsets
(5) Stretches

e. Variable factors in collision
   (1) Angle of impact
   (2) Speed of impact object
   (3) Size, rigidity, weight
   (4) Construction of impact object
   (5) Relationships to damage extent

f. Effects of heat on sheet metal
   (1) Scale
   (2) Color ranges
   (3) Temperature indications
   (4) Effect of light conditions
   (5) Effect of over reheating

g. Grain structure
   (1) High carbon
   (2) Low carbon
   (3) Tempering
   (4) Annealing

h. Expansion and contraction
   (1) Free
   (2) Restricted

B. Lesson Two: Basic Roughing Methods-Minor Damage

1. Learning Outcomes: Upon successful completion of this lesson, the student will:

   a. Be able to describe the effects of collision and repair on sheet metal. (C15)
   b. Select the proper tools and equipment to correctly perform rough-out procedures as needed for specific tasks. (C18, 19)
   c. Apply correct rough-out procedures to specific repair requirements. (C18, 19)
   d. Describe major body alignment problems. (C15)
   e. Use appropriate methods of adjustment and alignment checking procedures. (C18, 19)
   f. Perform effective shrinking procedures using proper tools and techniques on scrap body panels. (C18, 19)
   g. Recognize the types of damage which require shrinking. (F9)
h. Describe the effects of heat on both mild, High Strength Steel (HSS), and High Strength Low Alloy (HSLA) steel and its relationship to their repair procedures. (C15)

i. Perform annealing processes on body steel. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

j. Identify and describe the basic damage conditions and the type of panel crown in which they form. (C15)

k. Finish repaired areas to contour with body filler through the proper selection, application, and shaping/finishing operations. (C18, 19)

l. Practice shop safety and properly and safely use and maintain tools and equipment. (F9)

m. Analyze movable outer body panel and bumper misalignment and perform repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

n. Define and use damage analysis terms. (C5, 6, 7)(F1, 6, 8, 9)

o. Describe methods for identifying structural metals. (C5, 6, 7)(F1, 6, 8, 9)

p. Explain the principles of reversed motion as it applies to the use of body jacking equipment. (C5, 6, 7)(F1, 6, 8)

q. Name and demonstrate five (5) factors involved in the use of tension for panel repair. (C5, 6, 7)(F1, 6, 8)

r. Identify rust problems and perform rust repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

2. Learning Activities:

a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)

b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)

c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)

d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)

e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:

a. Hammers
b. Dollies
c. Spoons
d. Pry Picks
e. Pull rods
f. Slide hammers with attachments

g. Hydraulic body jacks

h. Oxy-acetylene welding equipment

i. Damage dozer and attachments

j. Demonstration vehicles or parts having both open and closed construction.

4. **Audio Visual Aids:** (Recommended)

a. To be selected by the instructor from those listed in Section III D above.

b. Others as selected by the instructor.

5. **Lesson Outline:**

a. Planning rough-out
   (1) Direction of collision impact
   (2) Reversing force for correction
   (3) Equipment available

b. Unlocking strains (work hardened)
   (1) Hammering
   (2) Annealing
   (3) avoiding stretch

b. Application of Forces
   (1) Direct blow
   (2) Resistance to a direct blow
   (3) Leverage to dry or push against the surface

d. Hammer & dolly
   (1) On-dolly
   (2) Off-dolly
   (3) Crown selection and weight
   (4) Force of hammer and dolly tension
   (5) Spring-hammering

e. Spoons
   (1) Bumping spoons-spring-hammering
   (2) Body spoons
      (a) Dolly substitute
      (b) Driving tool
      (c) Prying
      (d) Twisting

f. Pry picks and bars
   (1) Limited internal access use
   (2) Location and use of existing body openings
   (3) Locations for and procedures for opening and closing access holes.
(4) Lifting
   (a) Small area
   (b) Large areas
   (c) Force precautions
   (d) Use with hammer

g. Pull rods
   (1) Standard rod
   (2) Close tolerance rod
   (3) Assuring straight pulls
   (4) Use of proper drill bits and hole spacing
   (5) Use of rods and hammer
   (6) Proper pull sequence
   (7) Straight edge checking
   (8) Over-pull precautions
   (9) Hole filling with solder

h. Slide hammer
   (1) Screw attachment
   (2) Similarities to pull rods
   (3) Punching vs. drilling holes
   (4) Hole spacing
   (5) Use restrictions
   (6) Stretch precautions
   (6) Flange and bead hooks
   (8) Pull plate
   (9) Chain and hook

C. **Lesson Three:** Shrinking Metal

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will:

   a. Be able to describe the effects of collision and repair on sheet metal. (C15)
   b. Select the proper tools and equipment to correctly perform rough-out procedures as needed for specific tasks. (C18, 19)
   c. Apply correct rough-out procedures to specific repair requirements. (C18, 19)
   d. Describe major body alignment problems. (C15)
   e. Use appropriate methods of adjustment and alignment checking procedures. (C18, 19)
   f. Perform effective shrinking procedures using proper tools and techniques on scrap body panels. (C18, 19)
   g. Recognize the types of damage which require shrinking. (F9)
h. Describe the effects of heat on both mild, High Strength Steel (HSS), and High Strength Low Alloy (HSLA) steel and its relationship to their repair procedures. (C15)

i. Perform annealing processes on body steel. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

j. Identify and describe the basic damage conditions and the type of panel crown in which they form. (C15)

k. Finish repaired areas to contour with body filler through the proper selection, application, and shaping/finishing operations. (C18, 19)

l. Practice shop safety and properly and safely use and maintain tools and equipment. (F9)

m. Analyze movable outer body panel and bumper misalignment and perform repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

n. Define and use damage analysis terms. (C5, 6, 7)(F1, 6, 8, 9)

o. Describe methods for identifying structural metals. (C5, 6, 7)(F1, 6, 8, 9)

p. Explain the principles of reversed motion as it applies to the use of body jacking equipment. (C5, 6, 7)(F1, 6, 8)

q. Name and demonstrate five (5) factors involved in the use of tension for panel repair. (C5, 6, 7)(F1, 6, 8)

r. Identify rust problems and perform rust repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

2. **Learning Activities:**

a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)

b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)

c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)

d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)

e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. **Equipment and Materials:**

a. Oxy-acetylene welding equipment

b. Personal safety equipment

c. Hammers

d. Dollies

e. Water
f. Sponge
g. Fire extinguisher
h. Scrap body panel

4. Audio Visual Aids: (Recommended)

a. To be selected by the instructor from those listed in Section III D above.
b. Others as selected by the instructor.

5. Lesson Outline:

a. Stretched metal
   (1) Change in surface area dimensions
   (2) Increase in width or length
   (3) Proportional decreases
   (4) Determination of directions of changes
   (5) Reverse damage condition for correction
b. Types of damage requiring shrinking
   (1) Direct damage
      (a) Gouges
      (b) Flanges
   (2) False stretch
      (a) Unrelieved upsets
      (b) Improper use of tools

c. Proper use of heat in shrinking metal
   (1) Proper application
      (a) Size of stretched area
      (b) Severity of stretch
      (c) Color to softening effect
   (2) Incorrect application
      (a) Insufficient heat
      (b) Insufficient softening for proper upset
      (c) Rough and/or wavy surface
      (d) Excess heat
      (e) Collapse of surface - no upset
      (f) Rough and/or uneven surface

d. Quenching
   (1) Controlled rate of cooling and contraction
   (2) Controlled yielding to tension by contraction
   (3) Visual checking methods

e. Overshrinking
D. **Lesson Four:** Basic Alignment Methods-Outer Metal

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will:

   a. Be able to describe the effects of collision and repair on sheet metal. (C15)
   b. Select the proper tools and equipment to correctly perform rough-out procedures as needed for specific tasks. (C18, 19)
   c. Apply correct rough-out procedures to specific repair requirements. (C18, 19)
   d. Describe major body alignment problems. (C15)
   e. Use appropriate methods of adjustment and alignment checking procedures. (C18, 19)
   f. Perform effective shrinking procedures using proper tools and techniques on scrap body panels. (C18, 19)
   g. Recognize the types of damage which require shrinking. (F9)
   h. Describe the effects of heat on both mild, High Strength Steel (HSS), and High Strength Low Alloy (HSLA) steel and its relationship to their repair procedures. (C15)
   i. Perform annealing processes on body steel. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)
   j. Identify and describe the basic damage conditions and the type of panel crown in which they form. (C15)
   k. Finish repaired areas to contour with body filler through the proper selection, application, and shaping/finishing operations. (C18, 19)
   l. Practice shop safety and properly and safely use and maintain tools and equipment. (F9)
   m. Analyze movable outer body panel and bumper misalignment and perform repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)
   n. Define and use damage analysis terms. (C5, 6, 7)(F1, 6, 8, 9)
   o. Describe methods for identifying structural metals. (C5, 6, 7)(F1, 6, 8, 9)
   p. Explain the principles of reversed motion as it applies to the use of body jacking equipment. (C5, 6, 7)(F1, 6, 8)
   q. Name and demonstrate five (5) factors involved in the use of tension for panel repair. (C5, 6, 7)(F1, 6, 8)
r. Identify rust problems and perform rust repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

2. **Learning Activities:**
   
a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   
b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
   
c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   
d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. **Equipment and Materials:**

   a. Hand tools
   b. Door hinge and striker bolt
   c. Wrenches
   d. Floor jack
   e. 2 x 4 blocks
   f. Body shims
   g. Undamaged demonstration vehicles

4. **Audio Visual Aids: (Recommended)**

   a. To be selected by the instructor from those listed in Section III D above.
   b. Others as selected by the instructor.

5. **Lesson Outline:**

   a. Purpose for alignment
      (1) Appearance
      (2) Function
      (3) Finishing-sealing
   b. Determining procedure
      (1) Recognize problem
      (2) Locate correct position
      (3) Determine proper procedure (sequence)
   c. Methods of adjustment
      (1) Slotted holes
      (2) Caged plates
      (3) Adjustable stops
      (4) Shims
      (5) Bending
   d. Adjustment checks (sequence)
      (1) alignment to body
         (a) Hood to cowl
         (b) Door to rocker panel
         (c) Deck lid to upper rear body panel
      (2) Opening dimensions
         (a) Up and down
         (b) Fore and aft
(c) In and out
(d) Latching mechanism position

(3) Application of methods and sequence
(a) Hood
(b) Deck lid
(c) Doors
(d) Fender
(e) Front and assembly
(f) Bumpers
INSTRUCTIONS FOR ALL STUDENTS: Student texts, notes and service manuals may be used in performance of the tasks. The instructor must verify satisfactory completion of each task by entering the date and his initials in the date column for each task. The instructor will not verify satisfactory completion of the task until all standards have been met. The grade earned will be entered in the task# column. To meet minimum requirements, the student must correctly complete each task listed below one time. Each performance exam will count 3.2 points. A maximum of 100 points will be awarded. NOTE: Failure to follow instructions, record required data, use correct tools in correct manner, clean work area, secure tools and equipment, absence, or unsafe act will result in a deduction of points from your total lab score.

<table>
<thead>
<tr>
<th>TASK #</th>
<th>LEARNING ACTIVITY DESCRIPTION</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Remove, replace, and adjust the doors on a 4 door sedan with bolt-on hinges.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Describe the procedure for the replacement of weld-on hinges and the adjustments available to their corresponding doors.</td>
<td></td>
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<tr>
<td>3.</td>
<td>Remove, replace, and adjust a deck lid.</td>
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<tr>
<td>4.</td>
<td>Remove, replace, and adjust a hood.</td>
<td></td>
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<tr>
<td>5.</td>
<td>Remove, replace, and adjust an adjustable fender.</td>
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<tr>
<td>6.</td>
<td>Remove, replace, and adjust a complete front sheet metal assembly (dog house).</td>
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<tr>
<td>7.</td>
<td>Overhaul a fixed bumper.</td>
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<tr>
<td>8.</td>
<td>Overhaul an energy absorbing type bumper.</td>
<td></td>
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<tr>
<td>9.</td>
<td>Demonstrate the testing procedures needed to diagnose water, dust, and wind leaks and their corresponding corrective procedures.</td>
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<tr>
<td>10.</td>
<td>Define the following terms; describe the type of construction in which they are found, and detail what effect (if any) they have on adjacent areas of the panel.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Direct damage</td>
<td>h. Valley buckle</td>
</tr>
<tr>
<td></td>
<td>b. Indirect damage</td>
<td>i. Break-over path</td>
</tr>
<tr>
<td></td>
<td>c. Displaced metal</td>
<td>j. Tension area</td>
</tr>
<tr>
<td></td>
<td>d. Simple rolled buckle</td>
<td>k. Pressure area</td>
</tr>
<tr>
<td></td>
<td>e. Collapsed rolled buckle</td>
<td>l. Upset</td>
</tr>
<tr>
<td></td>
<td>f. Simple hinge buckle</td>
<td>m. Stretch</td>
</tr>
<tr>
<td></td>
<td>g. Collapsed hinge buckle</td>
<td></td>
</tr>
</tbody>
</table>
11. Describe how damage force flows through the following panel shapes and what resulting damage conditions are possible.
   a. Double crown
   b. Single crown
   c. Low crown
   d. Combination crown
   e. Reverse crown

12. Analyze thoroughly collision damage to panels displayed by your instructor.

13. Describe the safety precautions to follow while using heat for repair operations.


15. Describe the methods for identifying stretched metal.

16. Perform shrinking procedures on body steel using:
   a. Red heat
   b. Blue heat

17. Shrink a gouge.

18. Identify, describe and demonstrate the methods for shrinking false stretch.

19. Demonstrate the techniques for correcting over-shrinking.

20. Demonstrate the techniques for raising small dents with the acetylene torch.

21. Define the principle of reversed motion as it applies to the use of the body jack.

22. Describe the principle affecting in the use of tension for panel repair and the five (5) factors involved in its use.

23. Properly set up body jacking equipment to accomplish tasks indicated by the instructor.

24. Perform 40 hours of sheet metal repair as estimated by your instructor. This exercise includes filling, feather edging, and priming. One project must contain a cut or tear to repair.

25. Form a single crowned panel from flat sheet metal.

26. Form a 3/4" flange on a single crowned panel.

27. Weld a 3/4" flange on a reverse crowned panel.

28. Form a 90 degree bend in flat sheet metal.

29. Repair a rust-out requiring a partial panel replacement. Must require two flanges too be formed.

30. Repair a rust-out requiring a partial panel replacement. Must require two flanges to be formed.

31. Properly and safely use and maintain tools and equipment and practice shop safety. Graded throughout the course.

**TOTAL POINTS/GRADE AWARDED (Possible 100 points)**

ABDR 1441
<table>
<thead>
<tr>
<th>Program:</th>
<th>Auto Collision Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course:</td>
<td>ABDR 1441 Structural Analysis and damage Repair I (144 clock hours) (4 credits)</td>
</tr>
<tr>
<td>Entry Occupation:</td>
<td>Auto Body Repair Helper/Apprentice</td>
</tr>
<tr>
<td>Instructor:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Name:</th>
<th>SSAN:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Enrolled:</td>
<td>Date Completed/Withdraw:</td>
</tr>
<tr>
<td>Total Hours Absent:</td>
<td>Final Grade</td>
</tr>
</tbody>
</table>

**RATING SYSTEM**

The instructor will evaluate the student by placing a check mark in the appropriate number block to indicate the student’s degree of competency. (Enter N/A if the item is not applicable or not observed.) The rating for each task reflects the instructor’s evaluation of employability readiness rather than the grade given in the class. The final grade is not an average of ratings. The rating scale listed below will be used to rate the student.

**RATING SCALE**

1 = 95(A) = Mastered competency: Highly proficient. Can perform task without supervision. Can teach others. Meets or exceeds SCANS requirements.

2 = 85(B) = Mastered Competency: Proficient. Can perform task with limited supervision. Meets most SCANS requirements.

3 = 75(C) = Mastered Competency: Can perform task but requires close supervision. Meets minimum SCANS requirements.

4 = 0(F) = Did NOT master competency: Unable to or did not attempt to perform task. Does not meet SCANS requirements.
Learning Outcome 1: Be able to describe the effects of collision and repair on sheet metal. (C15)

Learning Outcome 2: Select the proper tools and equipment to correctly perform rough-out procedures as needed for specific tasks. (C18, 19)

Learning Outcome 3: Apply correct rough-out procedures to specific repair requirements. (C18, 19)

Learning Outcome 4: Describe major body alignment problems. (C15)

Learning Outcome 5: Use appropriate methods of adjustment and alignment checking procedures. (C18, 19)

Learning Outcome 6: Perform effective shrinking procedures using proper tools and techniques on scrap body panels. (C18, 19)

Learning Outcome 7: Recognize the types of damage which require shrinking. (F9)

Learning Outcome 8: Describe the effects of heat on both mild, High Strength Steel (HSS), and High Strength Low Alloy (HSLA) steel and its relationship to their repair procedures. (C15)

Learning Outcome 9: Perform annealing processes on body steel. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

Learning Outcome 10: Identify and describe the basic damage conditions and the type of panel crown in which they form. (C15)

Learning Outcome 11: Finish repaired areas to contour with body filler through the proper selection, application, and shaping/finishing operations. (C18, 19)

Learning Outcome 12: Practice shop safety and properly and safely use and maintain tools and equipment. (F9)

Learning Outcome 13: Analyze movable outer body panel and bumper misalignment and perform repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12)

Learning Outcome 14: Define and use damage analysis terms. (C5, 6, 7)(F1, 6, 8, 9)

Learning Outcome 15: Describe methods for identifying structural metals. (C5, 6, 7)(F1, 6, 8, 9)
| Learning Outcome 16: Explain the principles of reversed motion as it applies to the use of body jacking equipment. (C5, 6, 7)(F1, 6, 8) |
| Learning Outcome 17: Name and demonstrate five (5) factors involved in the use of tension for panel repair. (C5, 6, 7)(F1, 6, 8) |
| Learning Outcome 18: Identify rust problems and perform rust repair operations. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 3, 8, 9, 10, 12) |
Workplace Know-How and Personal Characteristics

The rating system listed below will be used by the Worksite Supervisor to evaluate the student’s workplace know-how and personal characteristics. The Worksite Supervisor will evaluate the student on the following competency (task) listed by circling the appropriate rating from the rating scale below that best describes his/her observation of the student during the entire length of this course for the rated area (task). Enter the date the task was completed in the date column.

Rating Scale

1 = Above Average
2 = Average
3 = Below Average
N/A = Not Observed

<table>
<thead>
<tr>
<th>Work Place Know-How and Personal Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPETENCIES: Effective workers can productively use:</td>
</tr>
<tr>
<td>Resources: allocating time, money, materials, space, staff.</td>
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<tr>
<td>Interpersonal Skills: working on teams, teaching others, serving customers, leading, negotiating and working Well with people from culturally diverse backgrounds.</td>
</tr>
<tr>
<td>Information: acquiring and evaluating data, organizing and maintaining files, interpreting and communicating and using computers to process information.</td>
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<tr>
<td>Systems: understanding social, organizational, and technological systems, monitoring and correcting performance and designing or improving systems.</td>
</tr>
<tr>
<td>Technology: selecting equipment and tools, applying technology to specific tasks and maintaining and troubleshooting technologies.</td>
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<tr>
<td>THE FOUNDATION: Competence requires:</td>
</tr>
<tr>
<td>Basic Skills: reading, writing, arithmetic an mathematics, speaking and listening.</td>
</tr>
<tr>
<td>Thinking Skills: thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn and reasoning.</td>
</tr>
<tr>
<td>Personal Qualities: individual responsibility, self-esteem, sociability, self-management and integrity.</td>
</tr>
<tr>
<td>PERSONAL CHARACTERISTICS</td>
</tr>
<tr>
<td>Relations with others: Effectiveness in working with students, instructors and others; cooperation; shows respect.</td>
</tr>
</tbody>
</table>
**Dependability:** attendance; loyalty; punctuality; adherence to schedules and deadlines; consistency and results; perseverance.

**Work Attitudes:** willingness to learn; willingness to accept and profit from evaluation; enthusiasm; initiative; commitment; pride in work.

**Communication:** listening; speaking; and nonverbal skills; effectiveness in communicating with students, teachers and others.

**Personal Hygiene-Grooming:** personal health care and cleanliness, dresses and maintains self appropriately for a business environment.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>N/A</th>
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<tbody>
<tr>
<td><strong>Dependability</strong></td>
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<td><strong>Work Attitudes</strong></td>
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<td><strong>Communication</strong></td>
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<tr>
<td><strong>Personal Hygiene-Grooming</strong></td>
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</tbody>
</table>

Based on my observation/evaluation of the student he/she has: (place a “√” in the appropriate block).

<table>
<thead>
<tr>
<th>Entry level skills now.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry level skills but requires additional external learning experience.</td>
</tr>
<tr>
<td>Entry level skills but requires additional course work.</td>
</tr>
<tr>
<td>Entry level skills but requires additional course work and additional external learning experience.</td>
</tr>
</tbody>
</table>

**Instructor Comments:** (Please provide additional information regarding your evaluation of the student’s performance.)

______________________________

______________________________

______________________________

**INSTRUCTOR CERTIFICATION**

I certify this competency profile to be true and accurate to the best of my knowledge.

Signature: ___________________________________________ Date: __________________

I have seen this evaluation and discussed it with my Instructor.

Student Signature: ___________________________ Date: __________________

<table>
<thead>
<tr>
<th>Written Exam</th>
<th>First</th>
<th>Second</th>
<th>Exit</th>
</tr>
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<tbody>
<tr>
<td><strong>Final Score</strong></td>
<td></td>
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