Automotive Body Repair and Paint Work

LEVEL-IV

Based On October, 2023 Curriculum Version-II

Module Title: Fabricating Vehicle Body Panels and Components

Module Code: EIS BRP4 M07 1023

Nominal Duration: 80 Hours

Prepared by: Ministry of Labor and Skills

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Addis Ababa, Ethiopia

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Table of Contents

Acronyms

GPa----------Gega Pascal

MPa----------Meg Pascal

MIG ----------Metal Inert Gas

GMAW ----------Metal Arc Welding

Introduction to the Module

This module describes the skills and knowledge required to measure, develop patterns and templates, and fabricates body panels and components. It involves preparing for the task, selecting and using specialist tools and equipment, selecting and cutting materials according to patterns, templates and specifications, preparing cut edges, fabricating panels, and completing workplace processes and documentation. Auto Body fabrication is the process of creating or repairing body parts and components for cars in the automotive industry, whether for renovation purposes or for building distinctive vehicles. Fabricating parts from scratch, restorers can ensure that the vehicle remains true to its original design and specifications.

This module covers the units:

- Fundamental of fabricate vehicle body panel and components
- Produce patterns and templates
- Cutting panel steel or aluminum sections material
- Fabricating required shapes to pattern

Learning Objective of the Module

- Understand the fundamental of fabricate vehicle body panel and components
- Perform patterns and templates Production
- Perform Cutting panel steel or aluminum sections material
- Apply fabricating required shapes to pattern

Module Instruction

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” giver at the end of each unit and
5. Read the identified reference book for Examples and exercise

Unit One: Fundamental of Fabricate Vehicle Body Panel and components

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- purpose of fabricate vehicle body panel
- construction of vehicle body panel
- inspecting quality for panel materials
- WHS requirements

This unit will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- understand purpose fabricate vehicle body panel
- apply the construction of vehicle body panel
- apply inspecting quality for panel materials
- apply WHS requirements

1.1. Purpose fabricate vehicle body panel

Auto Body fabrication is the process of creating or repairing body parts and components for cars in the automotive industry, whether for renovation purposes or for building distinctive vehicles. Fabricating parts from scratch, restorers can ensure that the vehicle remains true to its original design and specifications.

1.2. Construction of vehicle body panel

What Are Auto Body Panels?

Auto body panels refer to the assortment of large steel sections installed around the vehicle. These steel sections provide a solid covering for the vehicle's parts and systems as well as protect the passengers from environmental elements and during collisions.

Fender (Guard):- is a plastic. Metal. or rubber curved panel over the wheels on the side of a car. Extending from the front bumper of (lie car to the door. The main purpose of fenders is to keep dirt, Mud, and other debits off of the tires and braking system. Making them safer and more efficient.

Fig 1.1:-Fender (Guard)

Root Panel Assembly. The root panel is one of the largest body panels. But it is also one of the simplest in construction. Usually. the roof is a one piece steel construction.

Fig 1.2. Root Panel Assembly

Rear Quarter Panel (Side Panel): has both inner and outer construction. The outer construction or outer panel is smooth, except for the breaks caused by the design of the vehicle. The inner construction of a rear quarter panel is made up of many strong reinforcement brackets welded or bolted together.

Fig1.3.Rear Quarter Panel (Side Panel)

Doors: are composed of two main panels: outer and inner. Both panels are normally of all steel construction. Doors derive most of their strength from the inner panel. The inner panel acts as a frame for the door.

Fig1.4:-Door

Deck Lid (Tail Gate): is another door that allows access to the luggage compartment.

It consists of an outer and inner panel. These panels are spot welded together along their flanged edges to form a single unit

Fig1.5.Deck Lid (Tail Gate)

Bonnet (Hood):- protects your engine and other essential components of your truck. Whether you have a rusted or damaged hood, repairing/replacing it is often relatively easy.

Fig1.6.Bonnet (Hood)

Bumper I Energy Absorber I cover: - are located at the front of the vehicle. Below the front grille. They are intended to be the first thing to hit an object in front of them (such as another vehicle) and to minimize the impact and damage to the rest of the vehicle, minimizing repair costs.

Fig1.7. Bumper I Energy Absorber I cover

Radiator Support. Header panels: - are an important part of the body that provides support and mounting locations for gril1e assemblies, radiator and headlights.

Fig1.8. Radiator Support. Header panels

Grille: - front-end of the *vehicle* has seen considerable developments over the past few years. The principal friction of the guile is to admit cooling air to the car's radiator.

Fig 1.9 Grilles

1.3. Inspecting quality for panel materials

The main materials used for making cars and their parts are steel, aluminum, magnesium, copper, plastics, composites, rubber, glass, fabric/leather and a few more. These materials have been around for quite some time but have evolved greatly and diversely.

Materials for car bodies are diverse, these materials are used to obtain advantages, qualities or features that each of them can offer. Therefore, components, structures or car bodies are often found in which elements of a different nature are combined.

As a rule, the main reasons that determine the existence of various materials in the manufacture of the body are the goals to achieve weight reduction and increase the strength and safety of the collection through the use of lighter, but more durable materials.

Material selection

There are four basic steps to be followed while selecting materials for specific purposes/ requirements [13].

1) Translation: express design requirements as constraints and objectives

2) Screening: eliminate materials that cannot do the job

3) Ranking: find materials that best do the job

4) Supporting Info: handbooks, expert systems, web, etc.

Step 1) Translation:

An engineering component has boundary condition for Materials Selection

I. Function: to carry load, transmit heat, contain a pressure, etc. (What does the component do?)

II. Objectives: as cheap as possible, light, safe, strong, etc. (What is to be Maximized or Minimized?)

III. Constraints: subject to constraints such as carry load without failure, certain dimensions are fixed; cost is within limits etc…

What non-negotiable conditions are to be met? (Rigid)

What negotiable but desirable conditions? (Soft)

IV. Free Variables: materials choice, cross-section area, thickness, and length are free

Which design variables are free? (Variables which can be changed)

Step 2) Screening: Is a method to evaluate large range of materials by the help of material Bar charts, material Property Charts (density vs. Young's Modulus…), screen on constraints, rank on objectives etc.

Step 3) Ranking: What if multiple materials remain after screening?

Rank on Objectives

Objectives define performance metrics

Step 4) Selection: select then verify with any supporting materials.

Generally two concepts are used in the selection procedure:

1.3.1. Mild steel sheeting

Mild steel is a type of carbon steel that has low carbon content, typically around 0.05% to 0.25% by weight. Contrast this with high-carbon steel containing up to 2.5% carbon by weight. It is prized for being weld able, machinable, and ductile. It is utilized in many applications, including fences, signs, and the automotive and construction industries.

Mild steel is not an alloy steel and therefore does not contain large amounts of other elements besides iron; you will not find vast amounts of chromium, molybdenum, or other alloying elements in mild steel. Since its carbon and alloying element content are relatively low, there are several properties it has that differentiate it from higher carbon and alloy steels.

Mechanical Properties of Mild Steel

Mild steel is low-carbon steel with good mechanical properties such as strength, ductility, and hardness. Some of the typical mechanical properties of mild steel are:

Modulus of elasticity: When a material is forced, its modulus of elasticity indicates how stiff it will become. Mild steel can resist deformation under stress because it has an elastic modulus of roughly 200 GPa.

Brielle hardness: Brinell hardness measures a material's resistance to being indented by a hard ball. Mild steel can sustain moderate wear and tear due to its Brinell hardness, which ranges from 95 to 126 BHN.

Ultimate tensile strength: "Ultimate tensile strength" refers to the maximum force a material can withstand before failing. Mild steel can withstand high tension without breaking because its ultimate tensile strength ranges from 340 to 440 MPa.

Yield strength: Yield strength is a measurement of the amount of pressure a material can withstand before permanently deforming. Mild steel can stretch or bend without losing its shape since it has a yield strength of roughly 250 MPa.

Some mild steel's physical properties are as follows:

High tensile strength.

High impact strength.

Good ductility and weld ability.

A magnetic metal due to its ferrite content.

Good malleability with cold-forming possibilities.

Suitable for various heat treatment options to improve properties.

Advantages of Mild Steel

Some of the advantages are:

It is portable and straightforward to use.

It is reasonably priced and economical.

Ideal mechanical qualities, including strength, ductility, and weld ability, are present in it.

It has advantageous chemical characteristics like little Sulphur and copper.

Disadvantages of Mild Steel

You should consider many disadvantages before using it for your work. Some of the disadvantages of mild steel are:

Compared to other forms of steel, mild steel is less robust.

It is less resilient.

It has lower corrosion resistance.

Other varieties of steel are easier to weld than mild steel, which is more difficult.

Mild steel is less heat resistance

1.3.2. Aluminum sheeting

Aluminum sheet are widely used in fabricating metal Insulation jacketing. Aluminum is light weight, flexible to fabricate easily at site and has good resistance to corrosion. Apart from this Aluminum has many characteristics due to which it is commonly used as an insulation jacketing metal.

Advantages:

Longer Life: Aluminum Sheets have a very long service life and are totally maintenance free.

EASY TO FABRICATE: Aluminum is easy to fabricate, because it is non brittle metal and hence it do not break or crack during or after erection.

CORROSION RESISTANCE: Aluminum has excellent corrosion-resistance in almost all kinds of environment, and it retains its aesthetics throughout its life. These features translate

it into long life. Even in highly corrosive industrial Environments, Aluminum is particularly resistant to fumes and vapors of organic compound and to chemical like Ammonia, Carbon Dioxide and Acids like Hydrochloric, Nitric Sulphur acid.

APPEARANCE: Bright and beautiful aluminum enliven the atmosphere. It stays bright and reflective for a very long time. Aluminum Corrugated Sheets can be available in variety of finishes, color and textures, which add further to its beauty, protection and improves the aesthetics of the building.

BETTER THERMAL INSULATION: Through Aluminum is a good conductor of heat, it's very high reflectivity of radiant heat and light (75 to 80% when new; 60 % after several years) keeps the interiors of an aluminum building up to 50C – 80C cooler in summer while its low emissivity cuts the heat losses in winters. Thus, it interiors more comfortable from the extremities of the surroundings.

NO CREEP OR DAMAGE: unlike heavier materials such as lead and zinc, aluminum supports its own weight in widely varying temperature conditions, without creep or damage to the roofing sheet.

1.3.3. Paper for pattern

A basic pattern can be prepared by one of two methods either by drafting or by draping fabric on a model (or person concerned). Drafting is otherwise called as block pattern method. Drafting may be defined as a system of drawing patterns on paper with mechanical precision, on the basis of body measurements.

Methods of Pattern Making

Drafting.

Draping.

Flat paper patternmaking

1.3.4. Cardboard for templates

- What are the tools for making carton car?
- Safety glasses,
- Scissors,

- knife,
- cutters,
- hot glue gun,
- soldering iron,
- screwdrivers,
- pliers,
- exacto knife,
- cardboard,
- 2 bottle caps,
- copper wire,
- telephone wire,
- craft sticks,
- wooden dowels,
- old ink pen,
- hole punch,
- Elmer’s glue all,
- 4 nuts, electrical tape, rubber bands,

Self-Check 1.1

Part-I: Choose the correct answer from the given alternative and write the answer on the space provided.

_____1.Aluminum Sheets have a very long service life and are totally maintenance free

A. Long Life
B. Easy To Fabricate
C. Corrosion Resistance
D. All

____2. Which of the following is Disadvantages of mild steel are:

A. It is less resilient.
B. It has lower corrosion resistance.
C. Other varieties of steel are easier to weld than mild steel, which is more difficult.
D. All

_____3.__Is composed of two main panels: outer and inner. Both panels are normally of all steel construction.

A. Fender (Guard) B.Root Panel Assembly
C. Rear Quarter Panel (Side Panel) D. Doors

_____ 4. Which of the following is Advantages of Mild Steel?

A. It is portable and straightforward to use.
B. It is reasonably priced and economical
C. A and B
D. No answer

_____ 5. are located at the front of the vehicle. Below the front grille.

A. Fender (Guard) B. Root Panel Assembly
C. Bumper I Energy Absorber I cover D. Rear Quarter Panel (Side Panel)

Unit Two: Produce patterns and templates

This unit to provide you the necessary information regarding the following content coverage and topics:

- purpose of patterns and templates
- Produce paper patterns from sample panel or simulated frame

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Understand the purpose of patterns and templates
- Perform Produce paper patterns from sample panel or simulated frame

2.1. Purpose of patterns and templates

Purpose of patterns

Patterns are simply a repetition of more than one design element working in concert with each other.

A seamless pattern is one where every element within a design (no matter how often it's repeated) combines to form a whole.

Purpose of templates

Template method design pattern is to define an algorithm as a skeleton of operations and leave the details to be implemented by the child classes. The overall structure and sequence of the algorithm are preserved by the parent class.

2.2. Produce paper patterns from sample panel or simulated frame

It's made almost entirely of cardboard with the exception of the toothpicks used for wheel spokes & wooden dowels for the axles & a layer of paper Mache. The paper Mache not only covered the hot glue joints & corrugated edges of the cardboard but also allowed for a more precise finish on certain small corners & edges. In the next few steps we will show you exactly how I made it.

Step 1: Tools and Materials.

Materials: Corrugated cardboard (mine is from 24 pack of cumber land gap water) heavy cardstock (mine is from dividers from meow mix canned cat food) sheets of paper (mine from old Harry Potter book) Elmers glue all clear dry glue, Hot glue, Acrylic paints of various colors, Spray paint, wooden toothpicks, wooden dowels (a bit smaller than your hole puncher) Gel pens of various colors, Cup of flour bleached or unbleached will work just not wheat (Wheat flour won't stick) 2 cups warm tap water, teaspoon of salt. Not pictured but towels will be needed too for when your paper Mache. Cardboard party drinking straws (for steering column & exhaust pipes).

Tools: Safety glasses, Hot glue gun, hole punch, scissors (bandage cutting ones work best for cutting more precisely & the thick cardboard) Exacto knife, Compass for making circles, Paint brushes, Tree limb cutters (makes cutting the wood axles & toothpick spokes much easier) Pencil, Whisk or fork (for mixing up the paper Mache recipe) Large plastic container, needle nose pliers (handy for hard to reach spots) Tweezers (handy to remove annoying stringy strands of hot glue).

Step 2: Making the Cardboard Car Body.

The great thing about cardboard is it's easy to work with & you can cut & bend it how you wish. I started by simply sketching the side body panels onto the cardboard & cutting them out. I cut out cross members to help hold the shape of the car as I hot glued them in place. Remember to cut the panels out to where the place you will need bends matches up to the corrugation lines in the cardboard to get a smooth bend that don't crinkle & look bad.

Step 3: Making the Wheels.

Once I had the body of my car I figured out how big my wheels needed to be. I cut the wheels out by first marking them with my compass onto the cardboard & cutting 1 out. I then used that piece as a template for marking all the other pieces I would need to cut out for all 4 wheels. Also the compass center hole I used to find the center of each of my other wheel pieces. I had to cut 5 for each wheel out of the corrugated cardboard. 2 of each of the 5 per wheel I had to cut the center out to allow for my toothpick spokes. I used my limb cutters to cut the toothpicks in half & stuck the pointed end into the 2nd layer down cardboard piece with the cut out center & angled them out toward the center of the wheel. I used my Elmer's glue to glue the center of the spokes together as well as the ends where they entered the cardboard. I used cardstock & my compass to make a trim ring to go around the spokes cutting one out as a template & used my pencil to mark 3 more just like it. I used chrome spray paint to spray the spokes & trim ring being sure to walk around spraying into it to cover all areas beneath the spokes as well as all the spokes. I also cut out a spare wheels holder for the back of the car to give it that fancy continental kit look. Now I mixed my paper Mache paste in the container adding 1 part flour 2 parts warm tap water with around a teaspoon of salt (salt prevents molding) & used a whisk to stir it all up until I had something with the consistency of chicken noodle soup. I found that for the wheels & other curved areas thin strips works the best. The sheets from the Harry Potter book were about too thick so I recommend something thinner like newspaper or phone book to make it easier for you. Now is the time to make your wheel wells & use one of your wheels as a guide on how large it will need to be being sure to allow plenty of room for the wheel to rotate without rubbing the wheel well.

Step 4: Paper Mache the Car Body.

With my body & wheel wells done I could now begin placing paper Mache over my car. I cut paper of various sizes & shapes before getting my hands messy & I recommend cutting several thin strips, small squares, larger rectangles, etc...Because you will be needed all types as you cover the project. Be sure to have towels under where you are working and in the floor where you are standing because it can get a bit messy. After getting the paper Mache satisfactory allow it 24 hours to dry (more if you live in humid area).

Step 5: Painting the Body.

After it all was dry as a bone, I sprayed a few coats of chrome spray paint over the entire body. This was done to not only provide a nice painting surface for easier application of my brush on acrylic paints but also since many parts of the car would have chrome this allowed

me to just paint the black on where needed avoiding areas where chrome would be on the car. It would have been much more difficult to try to paint the chrome on over the black & required lots of masking which I had to avoid.

The black would have been most likely impossible to cover with silver acrylic paint (plus the acrylic silver don't pop like the chrome spray paint) so this saved me many hours of extra work & the acrylic paint goes on over the silver spray paint so good with great coverage.

Step 6: Details Such As Interior, Trunk, & Adding the Wheels.

Now the work was getting at a more detailed level with interior work. I used gel pens to draw my car a dash with instruments and such on heavy cardstock that I had spray painted chrome first. I cut out my steering wheel using compass & made the steering column from cardboard party drinking straws. Since I made the trunk so as it could be opened I added a jack and tire iron in there which I simply quickly sketched out onto my chrome painted cardstock & cut out. I made interior door handle armrest & ashtrays the same way. I used the cardboard drinking straws to make the dual exhaust tips coming out of the side rear of the car painting the inside black & outside gray. Lots of other details went into the car body as well & I used a silver gel pen to draw on the body lines & hood & door closing points. I made side mirrors using the chrome painted heavy cardstock. For the wheels I wanted whitewalls so I used the

heavy cardstock with glossy white side out to cut them out using compass & gluing them onto the wheels with a clear dry glue all & used rubber bands to hold them in place til glue dried. After those dried I placed the wheels onto the wooden dowel axles after measure & getting everything spinning in the right place. I used the heavy cardstock to cut out axle place holders with the glossy side facing toward the car leaving a little side to side play so the wheels could turn easily & used hot glue to hold them in place on the wood dowel axle. I then made the hole of the inner part of the wheel large enough to where it would slide firmly over the would dowel through 2 layers of the wheel cardboard test fitting and spinning it all before I hot glued the wheels in place. I'm happy to say my car rolls really great.

Step 7: Ready to Hit a Drive Thru.

Operation sheet 2.1.

Operation Title: Produce paper patterns from sample panel

Instruction:

Safe working area

Properly operated tools and equipment

Appropriate working cloths fit with the body

Purpose: Ensure the Produce paper patterns from sample panel

Precautions:

Wearing proper clothes, eye glass, glove

Make working area hazard free

Read and interpret manual which guide you how to use tools and equipment's

Procedures:

Step 1: Tools and Materials.

Step 2: Making the Cardboard Car Body.

Step 3: Making the Wheels.

Step 4: Paper Mache the Car Body.

Step 5: Painting the Body.

Step 6: Details Such As Interior, Trunk, & Adding the Wheels.

Step 7: Ready to Hit a Drive Thru.

Quality criteria: Perform all activities Produce paper patterns from sample panel in accordance with the given procedures

Unit Three: Cutting Panel Steel or Aluminum Sections Material

This unit to provide you the necessary information regarding the following content coverage and topics:

- Inspect Panel Steel or Aluminum Fabrication Sections
- Cutting Paper Patterns And Templates Steel Or Aluminum Sheet Surface
- File Panels To Remove Sharp Edges

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Perform inspect panel steel or aluminum fabrication sections
- Perform cutting paper patterns and templates steel or aluminum sheet surface
- Perform File panels to remove sharp edges

3.1. Panel steel or aluminum fabrication sections

Using patterns or templates

The use of patterns or templates greatly speeds marking out for multiple quantities.

It is often worthwhile to make a template if more than three or four items of the one or a similar design are called for. Templates can be quite complex. A typical template and examples of the codes used with it are shown in Fig 1.9. In many jobbing workshops however, templates will be much simpler than in this example.

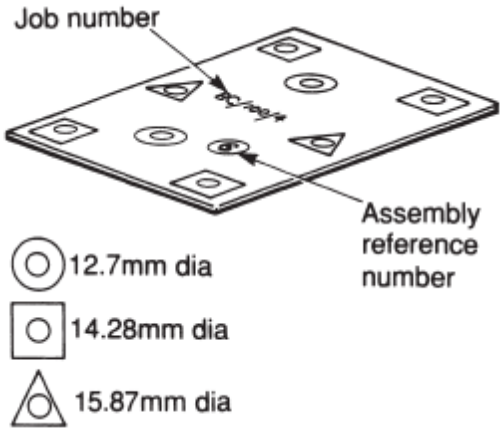
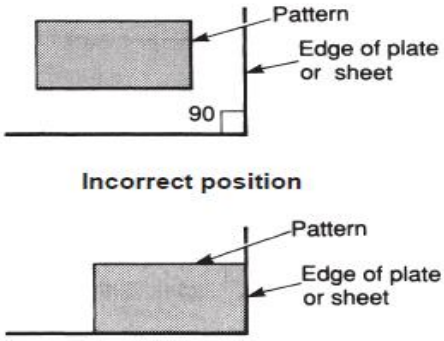


Fig 1.9 – Templates

Patterns or templates must always be correctly positioned to avoid unnecessary scrap.

Incorrect position



Correct position

Fig 1.10 – Patterns must be correctly positioned

At one level, templates are patterns used when cutting, shaping, profiling or marking out for drilling or punching.

Templates are also used as supports as well as for checking the accuracy of the final shape, particularly when a curved product is required.

Templates can be made of steel, wood, or any other suitable material. Often they are the same three-dimensional shape as the finished product, or the first run of a batch becomes the

template for the rest. When using templates with sheet stock, the template must be held secure to the sheet. This can be done by using a magnet, vice grips, G clamps, weights, panel pins or dowels depending on the material from which the template is made.

Tack welds are sometimes used to secure templates to heavy plate. Once the template is secured, it is marked around with a suitable tool such as a scriber. If using a scriber, be careful to place the point of the scriber correctly into the corner between the template and the plate.

Identifying templates

- Templates are marked with information needed to complete a job.
- Typically, this will include:
- a job number
- the quantity required
- drilling information
- bending information
- Assembly or reference numbers.

3.2. Patterns and templates steel or aluminum sheet surface

Metal-Cutting Shears - Most body repair technicians have at least one pair of shears or tin snips. *Snips* are used to trim panels or metal pieces to size. Several types of metal cutters are useful.

A Tin Snips -Tin snips (Figure 4–64) are perhaps the most common metal cutting tool. They can be used to cut straight or curved shapes in sheet metal and aluminum.

A Sheet metal cutting pliers come in right- and left-hand configurations for cutting in different directions.

B Straight-jaw sheet metal cutting pliers are handy when you have plenty of room for cutting.

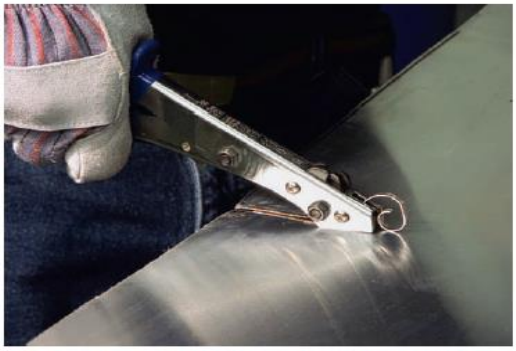
FIGURE 4-64 Study the types of snips often used in collision repair.

A. Metal Cutters - Metal cutters, also called aviation snips, are used to cut through metal panels. The narrow profile of the jaws allows the snips to slip between the cut metal. The jaws are serrated to cut through the tough metal.

B.Panel Cutters - Panel cutters are special snips used to cut through body sheet metal. These are used to make straight or curved cutouts in panels that require spot repair for rust or damage. They are designed to leave a clean, straight edge that can be welded easily (Figure 4–65).

A A panel cutter, or two-way nibbler, will cut thicker panels easily. (*Courtesy of S&G Tool Aid Corporation*)

FIGURE 4-65 A panel nibbler will cut thick sheet metal easily even when making curved cuts.



B The center jaw pinches between two stationary jaws to shear a thin strip of sheet metal away for cutting. (*Courtesy of Eastwood Company, www.eastwood.com*)

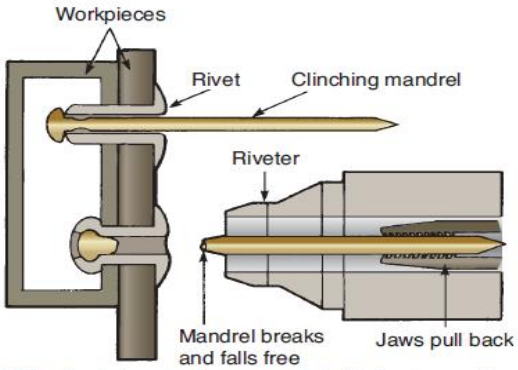
1. Rivet Gun - Pop rivets are sometimes used to hold panels in place while repairs are made. They can be inserted into a blind hole through two pieces of metal and then drawn up with a riveting tool. This locks the pieces of metal together (Figure 4–66). There is no need to have

access to the back of the rivets. They are used as temporary fasteners before the replacement sheet metal is welded. This prevents the extreme heat from distorting the metal or creating a safety hazard (such as around the gas tank). A good rivet gun does not cost much. The most commonly used rivets in bodywork are 1⁄8 inch and 3⁄16 inch.

A few others of assorted sizes might be needed for special jobs (Figure 4–67).

A heavy-duty riveter is used to rivet hard-to-reach places and heavier mechanical assemblies, such as a window glass regulator. It has long handles, a long nose, and sets 3⁄16- to 1⁄4-inch blind rivets.

A A hand riveter in kit form for blind rivets. (*Courtesy of Marson Corporation and Alcoa Fastening Systems*)



B When the rivet gun handle is squeezed, it will pull and expand the back side of the rivet head to secure parts together.

FIGURE 4–66 Note how rivets can hold two panels together. Factory-installed rivets are becoming common again.

A These spring-loaded rivets and clamps can be installed and removed easily using special pliers. (*Courtesy of Eastwood Company, www.eastwood.com*)

B These spring-loaded rivets can be installed and removed easily. They are ideal for holding panels together while welding.

FIGURE 4–67 Panel holding tools will temporarily align parts before welding.

1. Trim and Upholstery Tools - Any repair work that requires removing interior trim and some-body moldings will be facilitated with an *upholstery tool* (Figure 4–68). This prong-

shaped prying tool is used to slip under and pry up upholstery tacks, springs, clips, and other fasteners.

3.3. File panels to remove sharp edges

Step 1. – Secure the sheet metal to prevent slipping.

Step 2. – Use a die grinder with the mounted point and simply run the point over the edge of the sheet metal.

Step 3. – Repeat. Run the point over the other sides to break those sharp edges

Operation Sheet 2.1.

Operation Title: File panels to remove sharp edges

Instruction:

- Safe working area
- Properly operated tools and equipment
- Appropriate working cloths fit with the body

Purpose: Ensure the File panels to remove sharp edges

Precautions:

- Wearing proper clothes, eye glass, glove
- Make working area hazard free
- Read and interpret manual which guide you how to use tools and equipment's

Procedures:

Step 1. – Secure the sheet metal to prevent slipping.

Step 2. – Use a **die grinder** with the mounted point and simply run the point over the edge of the sheet metal.

Step 3. – Repeat. Run the point over the other sides to break those sharp edges

Unit Four: Fabricating required shapes to pattern

This unit to provide you the necessary information regarding the following content coverage and topics:

- Use Panel shaping equipment and hand tools and machine

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Using Panel shaping equipment and hand tools and machine

4.1. Vehicle shaped panel sections against pattern and template

Panel shaping equipment

Air Planishing Hammer: This is an air-operated sheet-metal shaping tool for light shaping and the smoothing of highs and lows in sheet metal.

Bead Roller: This is a manual operated machine used for forming a bead or swage in sheet metal.

Bead or Swage: Bead or swage is a technique in which cold metal is formed over a grooved tool for decorative or strengthening purposes.

Design

Design is problem setting and problem solving.

Design is a fundamental economic and business tool. It is embedded in every aspect of commerce and industry and adds high value to any service or

Product—in business, government, education and training, and the community in general.

FR1/Fundraiser No.1

This is a concept car being built be team of volunteers with the Auto Horizon Foundation. When complete, the car will be auctioned and the money raised will go to four chosen children's charities

Head dolly

Head dolly is a steel dolly attached to a post or stand.

Kick and Hand Shirker/Stretcher

These are used for shrinking or stretching small flanges on sheet metal and similar applications.

Lathe:-A lathe is a machining tool that spins the work piece in order for the operator to perform various operations like cutting, sanding, knurling and drilling.

Metal Inert Gas (MIG) Welder:-Metal Inert Gas (MIG) welding, also known as Gas Metal Arc Welding (GMAW), is a an automatic arc welding process in which both a continuous consumable welding electrode and shielding gas are fed through a welding

LAP Test

Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instruction: Given necessary templates, tools and materials you are required to perform the following tasks.

Task 1: Secure the sheet metal to prevent slipping.

Task 2: Use a die grinder with the mounted point and simply run the point over the edge of the sheet metal.

Task 3: Repeat. Run the point over the other sides to break those sharp edges

References

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