TVET CERTIFICATE IV IN WELDING

SHEET METAL

WLDSM401

Perform Sheet Metal

Competence

Credits: 12

Learning hours: 120

Sector: Manufacturing

Sub-sector: Welding

Module Note Issue date: August, 2020

Purpose statement

This specific module describes the performance outcomes, skills and knowledge required to make different surface developments and to perform metal forming processes and metal joining methods.

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Total Number of Pages: 28

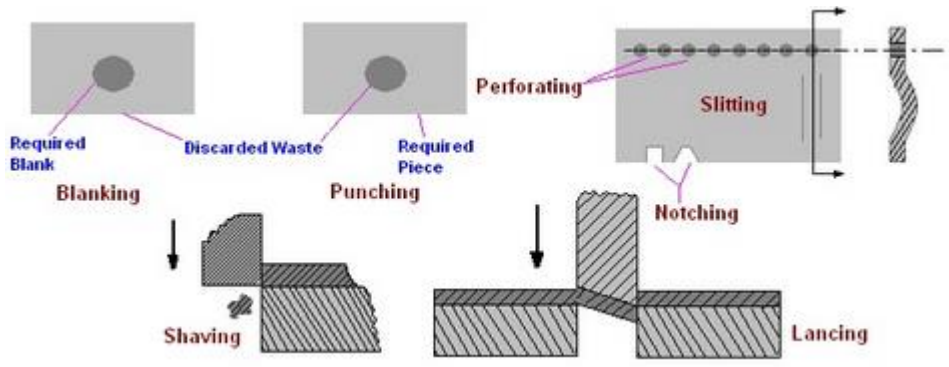
LEARNING UNIT 1 – Analyze the sheet metal work.

Sheet metal is simply metal formed into thin and flat pieces. It is one of the fundamental forms used in metalworking, and can be cut and bent into a variety of different shapes. Countless everyday objects are constructed of the material. Thicknesses can vary significantly, although extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6 mm (0.25 in) are considered plate.

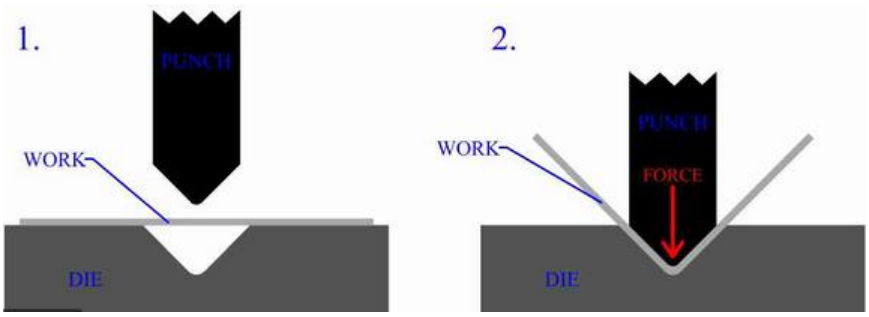
LO 1.1 Identify the work.

Content /Topic 1: Classification of sheet metal work operations.

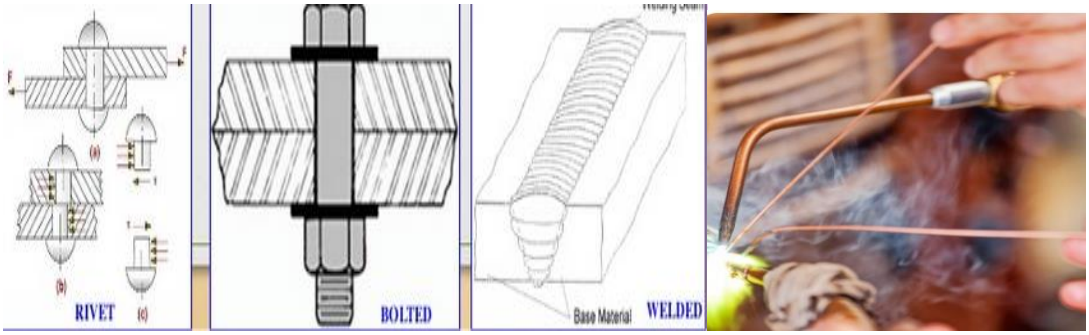
A1. Cutting operations: Machining uses many techniques to transform raw materials into their final state. Cutting is one of the known methods in industrial mechanics. It allows to mass producing metal parts such as connectors or electrical motor shafts.



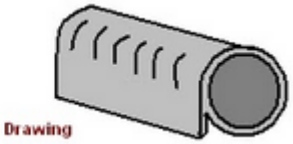
A2. Bending operations: Bending is a forming operation in which a sheet metal is subjected to bending stress thereby a flat straight sheet is made into a curved sheet. The sheet gets plastically deformed without change in thickness. Die and punch are used for bending. If a v shaped die and punch are used, the bending is called v-bending.



A3. Joining operations: are the processes that are used for joining metal parts and metal fabrication work. It consists of four types: (a) Welding (b) Soldering (c) Brazing and (d) Adhesive Bonding



A4. Forming operations: process make use of suitable stresses like compression, tension, shear or combined stresses to cause plastic deformation of the materials to produce required shapes. In forming, no material is removed.



Content /Topic 2: Advantages and disadvantages:

A1. Advantages

- High strength
- Good dimensional accuracy
- Good surface finish
- Economical mass production (low cost).

A2. Disadvantages

- Forming times are long
- Production rates are low
- The parts are not suitable for high-temperature use

Content /Topic 3: Applications of sheet metal:

A1. Application of sheet metal

- For decorative uses.
- Sheet metal is also utilized as a catalyst.
- Sheet metal is used in automobile and truck (lorry) bodies, airplane fuselages and wings, medical tables, roofs for buildings (architecture).

LO 1.2 – Perform Hand Draft Drawing

Content /Topic 1: Sheet metal annotations in drawings

A1. Bend notes, Bend tables and bend tags.

- **A bend note** adds fabricating information to sheet metal bend centerlines. Bend notes are associated with a drawing view.
- **A bend table** lists propertied of all bends in a flat pattern view of a sheet metal part.
- **Bend tags** associate rows in a bend table with the view geometry.

After you insert the bend table in the drawing, bend tags are added to the selected drawing view automatically. Bend tags are formatted by the Dimension style, and do not have a leader by default. Drag the bend tag text away from the original position to add a leader to the bend tag.

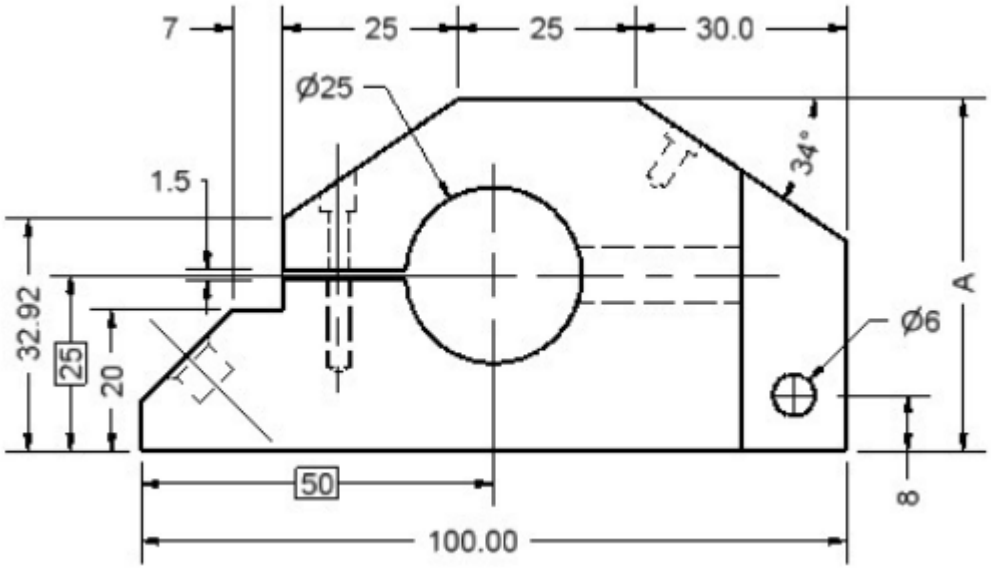
A2. Punch notes, Punch center recovery and Punch tables

- **A punch note** includes data related to the punch, for example the punch ID, angle, direction, depth, quantity note, and so on. The default style of punch notes is set on the Notes and Leaders tab of the Dimension Style panel.
- **Punch centers** are represented by center marks in a drawing view.

Before you create a punch table, recover punch centers. Punch centers are represented by center marks in a drawing view. If you create a view-based hole table and select to include recovered punch centers, all visible punch center marks are included in the hole table as individual rows. The corresponding tags are created in the drawing view.

Use the Hole Table command to create a punch table. If appropriate, change Default Filters in Hole Table Style to include recovered punch centers in the hole table by default.

A3. Dual dimensions in bend and Punch annotations



LO 1.3 - Estimate the cost.

Content /Topic 1: Elements of Bill of quantity

A.1. Types of materials: is the king or categories of the material.

A.2. Quantity of materials: is the total of materials in number.

A.3. Unit price: the cost of a single material, good or service.

A.4. Tax: a compulsory contribution to state revenue, levied by the government on workers' income and business profits, or added to the cost of some goods, services, and transactions.

A.5. Labor: is the cost payed for the worker (who's working).

A.7. Depreciation of equipment: a statement or account giving the characteristics of someone or something.

A.8. Transports: is the money given for taking goods from one location to another.

A.9. Total Cost: is the total amount of all activity in money

Sample of bill of quantity

S. N	*Description*	*Unit*	*Quantity*	*Rate per Unit*		*Tax*	*Labor cost*	*Transport*	*Total cost*	*Remark /Depreciation*
				In figure	*In word*					
1	Sheet metal	pc	2	27,000 frw	Twenty-seven thousand.	1,400 frw	340 frw	120 frw	28,860 frw	
2	Bending accessories	pc	4	1,300 frw	One thousand and three hundred.	72 frw	50 frw	30 frw	1,352 frw	
3	electrodes	pck	2	2,700 frw	Two thousand and seven hundred.	112 frw	40 frw	15 frw	2,867 frw	
4	Cutting discs	pc	1	1,800 frw	One thousand and eight hundred	97 frw	15 frw	10 frw	1,922 frw	
Total			**9**	**32,800 frw**	**Thirty-three thousand and eight hundred francs**	**1,681 frw**	**445 frw**	**175 frw**	**35,001 frw**	

Learning unit 2 – Organize the workplace.

LO 2.1. Arrange the workplace.

Content /Topic 1: Workshop Layout.

One of the best ways to avoid workplace strains and sprains is to design a workspace that reduces injury risk factors. Factors to consider include:

A.1. Height of the work to be performed: Workers should be able to sit or stand erect without having to lean forward. Storage should be organized such that the heaviest items are stored between knee and shoulder height to avoid bending and reaching overhead.

A.2. Standing workstations: Long-term standing can place excessive stress on the back and legs. Where long-term standing is required, a footrest or rail, resilient floor mats, height-adjustable chairs or stools, and opportunities for workers to change positions should be provided.

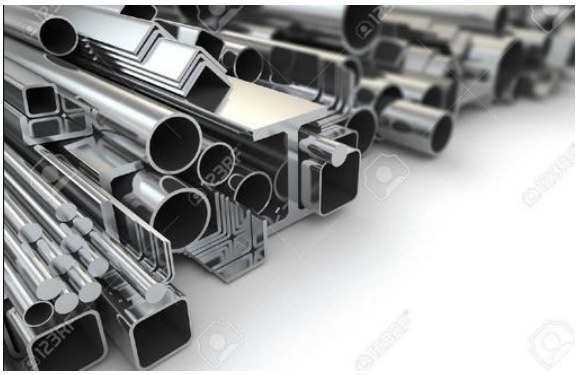
A.3. Seated workstations: Chairs should be fully adjustable, especially where workstations are used by multiple users.

A.4. Overhead storage: If items must be stored overhead, a warehouse ladder, stepstool or other means should be provided to achieve better lifting conditions.

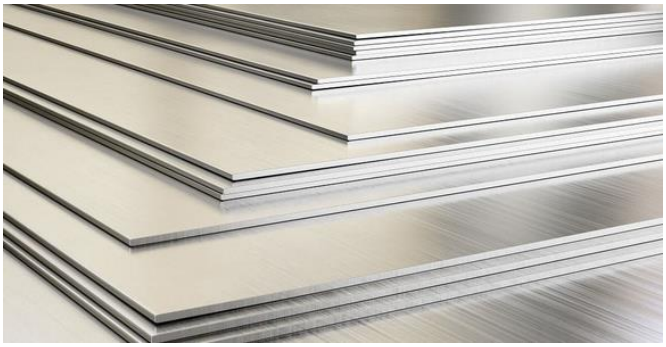
LO 2.2: Select the tools, materials and equipment.

Content /Topic 1: Sheet metal shapes

A1. Profiles: Metal profile sheet systems are used to build efficient, reliable and cost-efficient envelopes of mostly commercial buildings

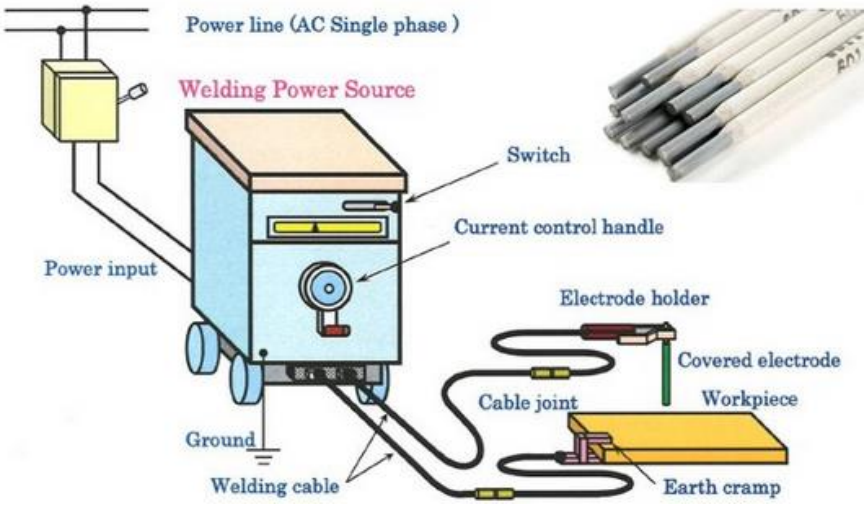


A2. Sheets: Sheet metal is metal formed by an industrial process into thin, flat pieces. Sheet metal is one of the fundamental forms used in metalworking, and it can be cut and bent into a variety of shapes. Countless everyday objects are fabricated from sheet metal. Thicknesses can vary significantly; extremely thin sheets are considered foil or leaf, and pieces thicker than 6 mm (0.25 in) are considered plate steel or "structural steel".



Content /Topic 2: Sheet metal working machines

A1. Welding machine: is device that provides an electric current to joint materials, usually metals or thermoplastics, by causing coalescence (most often by melting small parts of them).



A2. Rolling machine: rolling machine is a machine that will roll different kinds of metal sheet into a round or conical shape. It can be also called a "roll bending machine"

A3. Roll forming machine

A roll forming machine (or metal forming machine) fabricates specific configurations out of long strips of metal, most commonly coiled steel. In most applications, the required cross-section profile of the piece is specifically designed for the machine to bend the metal as

necessary. Other than roll forming, these machines perform a number of metalworking duties, including material cutting and roll punching.

A4. Bending machines: is a forming machine tool. Its purpose is to assemble a bend on a workpiece. A bend is manufactured by using a bending tool during a linear or rotating move.

A5. Shear machines: A machine with blades or rotary disks for cutting sheets, plates, or bars (as of metal); a machine for shearing cloth usually consisting of a roller with cutters operating against a ledger blade.

A6. Folding machine: A machine is used to bend (or fold) the metal in order for it to reach its intended form.

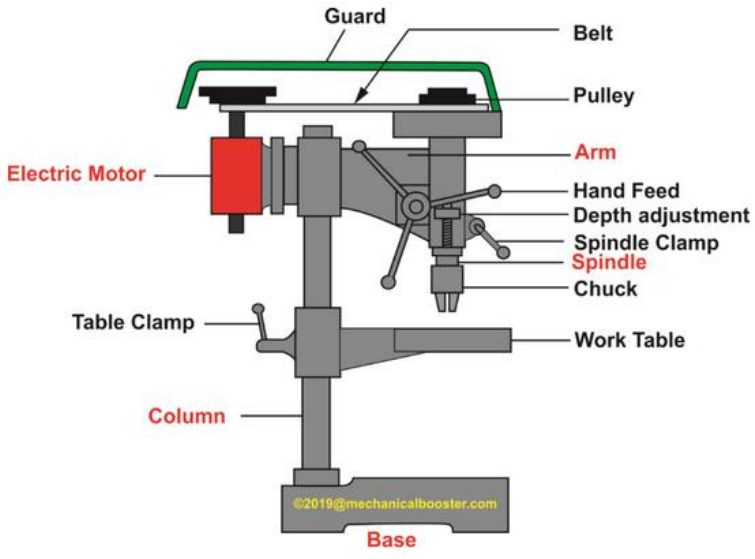
A7. Curling machine

Curling is a **forming** process that involves de burring **sheet metal** to produce smooth edges. Other parts are curled to perform their primary function such as door ...

A8. Spinning machine: A machine that spins fibers continuously

A9. Riveting machine: is used to automatically set (squeeze) rivets in order to join materials together. The riveting machine offers greater consistency, productivity, and lower cost when compared to manual riveting.

A10. Drilling machine: a machine for drilling, reaming, counter boring, and tapping holes, especially a power machine for drilling holes in metal (as a drill press or radial drill).



Main Parts of Drilling Machine

A11. Pressing machine: Is machine that forms ceramic shapes by forcing plastic or semi plastic raw materials into a die or mould. A machine in which the whole forming operation is carried out by *pressing* the plastic glass by a plunger forced into a die or mould.

A12. Cut off machine: Also known as a cut-off saw or chop saw, is a circular saw (a kind of power tool) which is typically used to cut hard materials, such as metals, tile, and concrete. The cutting action is performed by an abrasive disc, similar to a thin grinding wheel.

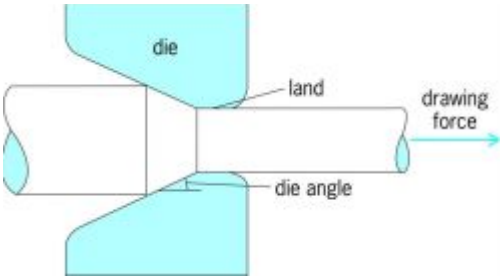
A13. Swaging machine: is used to change the diameter of a metal fitting for the purpose of retaining it onto the end of a hose.

A14. Shaving machine: A machine with a high speed revolving spiral knife for smoothing off the flesh side of a hide.

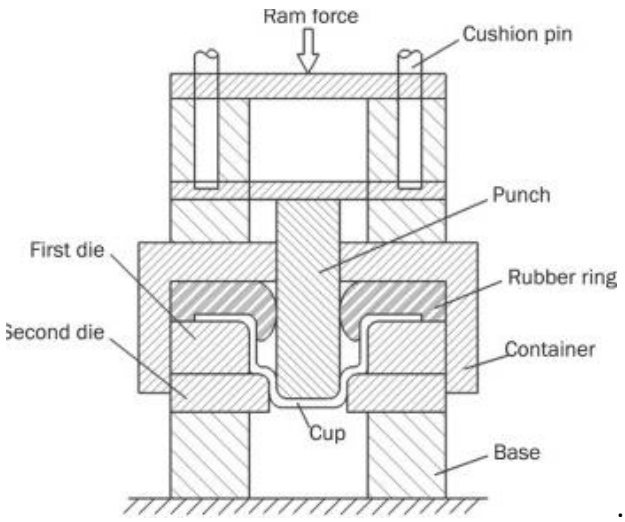
Content /Topic 3: Tools

A1. Drawing die and punch:

- **Drawing die:** Drawing dies are used for shaping or drawing up sheet metal



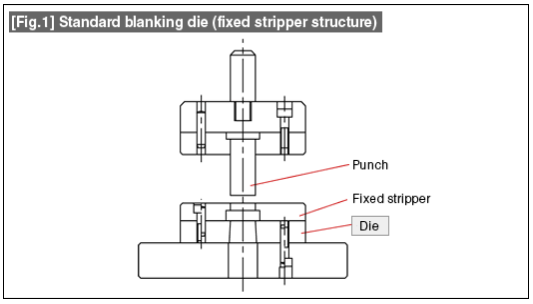
- **Drawing punch:** The tool used in a drawing process in which the punch forces the metal into a die cavity to form a seamless, shell-like shape



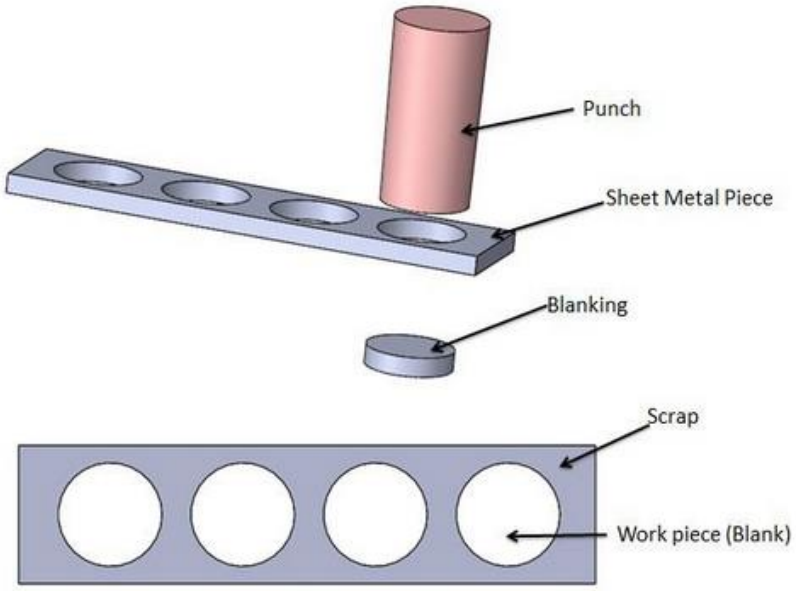
A2. Blanking die and punch

- **Blanking die:** It produces a flat piece of material by cutting the desired shape in one operation. The finished part is referred to as a blank. Generally, a blanking die may

only cut the outside contour of a part, often used for parts with no internal features.



- **Blanking punch:** Punching blanking are sheet metal shearing operations to modify existing blank.



LEARNING UNIT 3 – PERFORM SHEET METAL WORK.

LO 3.1: Set up the sheet metal equipment.

Content /Topic 1: Assemble the equipment

A. Bending machine assemble

Before starting the machine, check whether there is any foreign matter on the machine tool and whether the electrical system of the machine tool is normal.
When the machine tool is used, the main power supply of the machine tool must be started first, and then other power supplies can be started.
When turning on the power, turn the power button until it doesn't move.
When selecting the die, the angle of the upper die should be less than or be equal to the angle of the lower die.
The knife mould shall be handled with care and shall not collide with other metal objects to avoid damage to the knife mould.
Before mold calibration, wipe the Vera fixture, and then place the knife mold on the workbench to wipe it. Pay special attention to the lower mold v.
There can be iron scraps and sundries, and it can be installed into the machine tool only after wiping them.
The upper and lower die should be staggered when the die clamp is used to calibrate the cutter rapidly.
It is not allowed to calibrate the mould with the length less than 300 mm.
During die calibration, when the distance between the upper die tip and the lower die V groove is relatively close (4-5mm), it is necessary to use slow rise mode, and we should pay close attention to the change of the pressure value. When the pressure reaches the set pressure at the origin, the D value will automatically return to zero.
After mold calibration, lower the worktable to the lowest point.

These various mechanical assembly methods provide us flexibility of ways to assemble parts based on fit, form, function, and budget. This also allows us to work with various industries that require different types of mechanical assembly for their particular industry standards. VIP acts as a one-stop shop for your manufacturing needs by manufacturing your part, providing industrial assembly, and metal finishing.

We also have considerable experience designing parts for dip brazing assembly. This unique process is done by one of our tested and approved subcontractors. A wide variety of assembly methods allow your designers to consider more options for structural benefits, cost savings, and efficient final assembly. Our engineers are available to provide advice or recommendations to benefit your project.

To keep our hardware insertion costs to a minimum, we utilize automated as well as manual insertion machines. All our insertion presses are equipped with positive stops and process counters to assure accurate and consistent hardware installation.

Below are the types of Hardware machines we have in our state-of-the-art 153,000 square foot facility.

Machine Brand and Type	***Highlights***
Hager Hydraulic Hardware Press with Automatic Vibratory Feeder	Quantity: 10
Hager Hydraulic Hardware Press with Automatic Vibratory Feeder	Quantity: 2
Adel Speed Riveter	Quantity: 4
Air Squeezers	Assorted variety

Recognizing that customers are looking for value-added suppliers that offer comprehensive service, we also provide competent and efficient mechanical, electromechanical, and industrial assembly. We can provide custom wiring harnesses and plastic molded panels or trim through our qualified and approved subcontractor sources. When assembling or adding components to your sheet metal fabrications, we offer a cost-effective way to produce your subassemblies. Using VIP for contract assembly allows for better inventory management and reduced customer overhead. Our Business Development Department would be happy to discuss the benefits of using VIP for your assembly needs.

For more information on our mechanical assembly equipment, take a look at our complete equipment list.

Content /Topic 2: Current setting and timing

It is not the question of voltage alone. To answer your query, in Flat position welding,

1. To weld one mm thick sheet metal, 0.8 filler wire with an average current of 65 to 70 (A), 16.00 to 16.50 Volts and with travel speed of 25 to 30 cms per minute.
2. Can use 1.0 mm size wire with 80 to 90 Amps and 17 to 18 volts and a travel speed of 30 to 35 cms per min. Of course, if any copper backing is used the parameters can be increased to 110 A 18–19 V and 40–45 cms travel speed.
3. Parameters may change if position of weld gets changed.

4. Inverter Pulse controlled power source will provide good results and help to increase optimum parameters

The arc voltage is related closely to the welding current and results in following feature:

i) Bead-Form
ii) Transfer Appearance
iii) Short Circuiting Arc, Spray Arc
iv) Amount of Spatter
v) Penetration
vi) Blow Holes

Thumb Rule and procedure for selection of Arc Voltage as below:

Sheet Metal up to 1.2 mm thick (Short ckt transfer) = Welding current *0.04 + 16 ± 1 = Voltage
Sheet Metal above 2.0 mm thick (Spray transfer) = Welding current *0.04 + 18 ± 1 = Voltage.
[an example]

In case of the welding current is 90A=90*0.04+16 +-1=19.6～20.6 (V), 310 A=310*0.04+18 +-2=28.4～32.4(V). In case Small diameter welding wire, it may require to increase 2 voltage higher than setting value of 1.2 mm diameter.

Content /Topic 3: Setting pressure and adjustment

The basic components of a brake are: Table – the base or major frame; Clamp – the top which holds against the material being formed; and Apron – the front plate which you swing up to form material.

Use test strips of metal, approximately 3 inches by 3 inches each, of the thickness you will be forming for the following adjustments.

Step:1
Check clamping pressure by clamping test strips in the brake approximately 3 or 4 inches away from each end of the brake. Set the clamping pressure so that it is enough to keep the material from slipping during a bend. It is not desirable to use excessive clamping pressure. To change clamping pressure, see the stem going from the bottom of the locking cam. There are two nuts on the stem. One end of the stem is reverse threaded. By loosening both nuts, you can turn the stem and increase or decrease clamping pressure.

Step:2
Look at your brake from behind. Under the clamp and near each end of the table find a bolt

going down through a slotted bracket and through the table. Loosening this bolt allows you to move the clamp forward or back on the table. Now from the front, look at the distance between the leading edge of the clamp and the apron. Move the clamp back from the apron at least 1 ½ times the thickness of material being formed when forming up to 18ga (.050), and at least 2 times the thickness of material being formed when forming 16ga (.0625) or more, re-check clamping pressure.

Step:3
Check end to end alignment by clamping two test strips in the brake, about 3 or 4 inches away from each end of the brake. Bend to about 90 degrees, and see if they appear to be bent to the same degree. Remove them from the brake and stack one inside the other. Compare the sharpness of the radius. If one test strip is over bent or has a sharper radius, move the end of the clamp which that strip came from back slightly. Test again.

Step:4
Center truss rods are adjustable to make the center of the brake bend the same as the ends, or, to compensate for flexing during a bend. There is a large nut on each of the three struts which when turned can add pressure in the center of the clamp, apron, or table. Do the test using strips of material again, but add a third strip near the middle of the brake. See if the middle one matches the ends for degree and sharpness. If adjustment is needed, usually the strut under the table is the one to adjust first. A combination of the three struts may be adjusted. If two or three turns of the adjusting nuts do not produce the desired effect, back off all three and start again. Over tightening can distort brake permanently.

Step:5
When adjusted, a hand brake should form with the same sharpness the full length of the brake except for the last 2 or 3 inches at each end, which is normal and acceptable in hand brakes. Reasonably accurate is what we are going for here – you don't need to get out your protractor and dial gage. It may be necessary to change adjustments when different material is formed.

Step:6
Oil the apron pins, the cams, and the vertical guides behind the clamp.

LO 3.2: Prepare the work pieces.

Content /Topic 1: Surface development

Surface development is a full-size layout of an object drawn on a plane, some objects are made of flat sheet metal? When the sheet is cut as per this layout, folded and joined together, it takes the shape of an object.

A1. Parallel line development method: The parallel line method *of pattern* development is based on a system of lines drawn parallel to one. (allowance for beaded piece).

A2. Radial line development method: The radial line method of pattern development is used to develop patterns for objects that have a tapering form with lines converging to a common point, called the apex point. The radial line method uses a series of radial generator lines drawn from a common apex point to develop a specified pattern or shape.

A3. Triangular line development method: Triangulation is a geometric development process used to create patterns of conical and transition shapes. Triangulation allows you to determine the true length of a line or surface on a drawing by creating a right-angled triangle.

Content /Topic 2: Cutting operations

A1. Punching or Piercing: It is a cutting operation by which various shaped holes are made in sheet metal. Punching is similar to blanking except that in punching, the hole is the desired product. The material punched out from the hole being waste.

A2. Shearing also known as die cutting: is a process which cuts stock without the formation of chips or the use of burning or melting.

A3. Notching: This is cutting operation by which metal pieces are cut from the edge of the sheet, strip or blank.

A4. Filing: It is an operation of removing fine amounts of material from a work piece or unwanted material from work piece by using file tool.

A5. Grinding: These eliminate material, like excess weld metal, weld spatter, burrs, and the rough edges of oxy-cut material. These are used to remove weld spatter and slag from welds without altering the surface of the base or weld metal.

A6. Blanking: Is the operation of cutting a flat shape from sheet metal. the product punched out is called the "blank" and the required product of the operation the hole and the metal left behind is discarded as waste.

A7. Trimming: This operation consists of cutting unwanted excess of material from the periphery of a previously formed component.

A8. Perforating: This is a process by which multiple holes are very small and close together are cut in a flat sheet metal.

A9. Slitting: It refers to the operation of making incomplete holes in a work piece.

Content /Topic 3: Forming operations

A1. Bending: In this operation the material in the form of flat sheet or strip is uniformly strained around a linear axis, which lies in the neutral plane and perpendicular. It's the length wise direction of the sheet or metal.

A2. Hemming: is a process of folding the edge of sheet metal onto itself to reinforce that edge

A3. Flanging: Is the act of swiping sheet metal in a direction contrary to its previous position.

A4. Seaming: Seaming is a process of folding two sheets of metal together to form a join

A5. Curling: The curling process is used to form an edge on a ring. This process is used to remove sharp edges. It also increases the moment of inertia near the curled end. The flare/burr should be turned away from the die. It is used to curl a material of specific thickness. Tool steel is generally used due to the amount of wear done by operation.

A6. Spinning: Spinning process is used to produce small or large axisymmetric parts. This process produces good surface finish and has low tooling costs. However, labor costs can be high unless operations are automated

A7. Rolling: This process is for long parts with constant complex cross-sections. It produces good surface finish and has high production rates. However, this process has high tool costs.

A8. Embossing: Are the processes of creating either raised or recessed relief images and designs in paper and other materials. An embossed pattern is raised against the background.

A9. Necking: In engineering or materials science, is a mode of tensile deformation where relatively large amounts of strain localize disproportionately in a small region of the material. The resulting prominent decrease in local cross-sectional area provides the basis for the name "neck".

A10. Bulging: The friction effect resulting from the contact area on block surface, which is a sharply contrast to hydrostatic bulging that is free contact without friction and the flattened effect resulting from the separation of bulging blocks due to stretching.

A11. Drawing: This is a process of forming a flat work piece into a hollow shape by means of a punch which causes the blank into a die cavity.

LO 3.3: Join the sheet metals.

Content /Topic 1: Joining operations

A1. Riveting: Is metal joining Process in which the two metallic parts are joined by the use of rivets. In this process, the metallic parts to be joined do not undergo any change in their physical structure or atomic structure. However, Force is required for riveting. Riveting is used widely in automobile and aerospace industry and in many other applications where we require permanent/semi-permanent bonding and where bolting and welding is not an option, mostly done for low thickness sheet metals and Aluminium.

A2. Welding: Is a process of permanently joining materials. Welding joins different metals/alloys with a number of processes, in which heat is supplied either electrically or by

means of a torch. Welding is done by application of heat or both heat and pressure. The most essential requirement is Heat. Pressure may be employed, but this is not in many processes essential. The welding process evolves applying heat to the work piece. The heat applied should be such that the work piece should melt, i.e. the temperature at which welding is done, should be more than the melting point of the work piece to be welded.

A3. Soldering: Is a process in which two or more metal items are joined together by melting and then flowing a filler metal into the joint. The filler metal having a relatively low melting point; Soldering is used to form a permanent connection between electronic components.

A4. Bolting: Is a type of fastener usually made from metal, that commonly comprises a head at one end, a chamfer at the other, and a shaft characterized by an external helical ridge known as a 'thread'. Bolts are typically used to hold materials or objects together, or to position objects.

A5. Seaming: Is metalworking process in which a sheet metal edge is rolled over onto itself.

A6. Brazing: Is metal joining Process in which the filler metal or alloy is heated to a temperature above $450^{O}C$ and melted only filler metal melts and deposits fusing the work piece, Work piece doesn't melt. Base Metal is heated and filler metal is distributed between two close fitting parts by capillary action Torch and Dip/ Furnace/ Induction/ Salt-bath Brazing Filler metals: Aluminium- Silicon; Copper; Brass; Copper-Silver; Nickel alloy etc.

LEARNING UNIT 4 – PERFORM HOUSEKEEPING.

LO 4.1: Clean tools, equipment and workplace.

Content /Topic 1: Cleaning tools and equipment

A.1. Brush: It is used for cleaning the working surface prior to welding and general cleaning of the weldment.

A.2. Cloth rug: is the process of cleaning workplace (area) by using a rag, A rug is a small carpet made of old pieces of cloth stitched or woven together.

A.3. Mop: a tool for cleaning floors made of a bundle of cloth or yarn or a sponge fastened to a long handle, something that looks like a cloth or yarn mop. a mop of hair.

A.4. Soapy water: A metallic salt of a fatty acid, as of aluminum or iron, that is not water soluble and may be used as a lubricant, thickener, or in various coating applications, ointments, or disinfectants. 3. Slang Money, especially that which is used for bribery.

A.5. Compressed air: Compressed air is a concentrated stream of air at high pressure and high speed that can cause serious injury to the operator and the people around him. First, compressed air is itself is a serious hazard. It has been known for compressed air to enter the blood stream through a break in the skin or through a body opening. An air bubble in the

blood stream is known medically as an embolism, a dangerous medical condition in which a blood vessel is blocked, in this case, by an air bubble.

An embolism of an artery can cause coma, paralysis or death depending upon its size, duration and location. While air embolisms are usually associated with incorrect scuba-diving procedures, they are possible with compressed air due to high pressures. This may all seem to be improbable, but the consequences of even a small quantity of air or other gas in the blood can quickly be fatal so it needs to be taken seriously.

Potential dangers

Unfortunately, horseplay has been a cause of some serious workplace accidents caused by individuals not aware of the hazards of compressed air, or proper work procedures.

1. Compressed air accidentally blown into the mouth can rupture the lungs, stomach or intestines.
2. Compressed air can enter the navel, even through a layer of clothing, and inflate and rupture the intestines.
3. Compressed air can enter the bloodstream, and death is possible if it makes its way to blood vessels in the brain. Upon reaching the brain, pockets of air may lead to a stroke.
4. Direct contact with compressed air can lead to serious medical conditions and even death. Even safety nozzles which regulate compressed air pressure below 30 psi should not be used to clean the human body. If an air pocket reaches the heart, it causes symptoms similar to a heart attack.
5. As little as 12 pounds of compressed air pressure can blow an eye out of its socket.

Content /Topic 2: Methods of cleaning:

A.1. Dusting: is the process of removing unwanted materials to the workplace by putting it the dust bin.

A.2. **Removal of dirt:** Before starting any welding project, make sure the work piece is as clean as possible. Use a clean cloth, wire brush, or sandpaper to remove rust, dirt, paint, grease, oil, or any other contaminant.

A.3.Chemical spraying: Good for industrial painting interior decoration chemical production chemical pesticide spraying and other operations produce toxic gas odor protection.

LO 4.2-Store Tools, Equipment and materials

Content /Topic 1: **Care and storage procedures of tools, equipment and materials:**

- Equipment has to be cleaned and maintained in accordance with manufacturers specifications and/or local instructions to ensure correct functionality of equipment.

- Any unserviceable tools are repaired, replaced or reported to relevant personnel to ensure correct functionality.
- Tools are transported in a safe, secure, efficient manner to minimize risk of injury to personnel and damage to equipment.
- Tools are stored and secured according to manufacturers or workplace procedures to prevent damage to, and losses of, equipment.

Below are some more tips for storing your gardening equipment:

1. According to the sizes:

The tools and equipment should be stored according to the sizes, where the tools of the same sizes can be kept in a convenient area depending on their sizes.

2. According to their types

The tools or equipment of the same types should be kept or stored together if possible, this will help it to be easily available when needed and provide a safe storage of them.

3. According to their use

All tools and equipment of the same use should be stored in the same place with respect to their physical, chemical and/or mechanical properties, sometimes it is better to store in a dry place.

Overall, be sure to take care of your tools to ensure their longevity and efficiency. Inspect your tools as possible and take the proper steps, some of which are mentioned above, to keep them in good condition.

LO 4.3– Clean the Work place

Content/Topic 1. Elements to be considered in workplace cleaning

Workplace cleaning cannot be overlooked as it protects the employees from getting injured, strengthens the brand image, and enhances the environment. If proper cleaning is not done at the workplace, then the regulatory bodies may compel the organization to close the facility. Apart from regular cleaning and dusting, here are some of the most crucial elements of workplace cleaning:

1. Keep the Light Equipment Clean

Good lighting is essential for commercial facilities. Therefore, the light fixtures ought to be cleaned regularly so that the accumulated dust doesn't affect the quality of light intensity in the room. Improper lighting has an impact on the performance of the workforce and also makes the place appear dingy.

2. Floor and Building Maintenance

Effective housekeeping involves floor and surface maintenance. The walls and the floors ought to be cleaned with perfection. If there are any oil, grease, or liquid spillages, then these must be cleaned immediately to prevent hazards from occurring. Warning signs must be placed if there are any spillages to make people aware. The walls should be painted in light color and the floors should be skid resistant. The plumbing, electrical, and other utility systems should work efficiently. The doors and windows of the building must be stable.

3. Upkeep the Tools and Equipment

One of the basic elements of good cleaning is to check that the tools and equipment are functional. Inspection of tools should be done periodically in order to detect faulty equipment. Well-maintained tools and machinery prevent accidents from happening. Tools and equipment mist also be stored properly and should also have appropriate labels.

4. Remove Clutter from Aisles and Stairways

Most people trip over the stairways because of unnecessary clutter. Therefore, theses should always be kept clean and no object should be place in between that obstructs the path. Likewise, the aisles should be kept clean so that the movement between them is safe. Mirrors must be placed in blind corners so that no unforeseen injury takes place.

5. Clean Storage Space

A kempt storage space is a necessary element of good housekeeping. The packages must be stored on a solid base. The products must be secured in the storage areas properly so that they do not fall over. All hazardous products that can cause fore or any other catastrophe should be stored separately.

6. Waste Disposal

Waste management is also an important element of workplace housekeeping. The waste should be disposed off in a proper manner as suggested by the regulatory bodies.

LO 4.4– Handle the product

Content/Topic 1. Product handling, lifting and storing techniques

- Handling and storing product involve diverse operations such as hoisting and carrying products from working place to the storage.
- The product must be Stored in dry place free from atmospheric contamination to prevent rust, corrosion and or wear degradation
- During product handling and storing technics, Positioning the product and Labeling are also important. Labelling may include marking the product; batch number; production date and/or serial number.

The efficient handling and storing of materials or products are vital to workshop or industry. In addition to raw materials, these operations provide a continuous flow of parts and assemblies through the workplace and ensure that materials are available when needed.

Most methods of Protections the products for storing are:

- Protection against scratches and mechanical impact
- Protection against chemical attack
- Oiling and greasing the finished products if necessary
- Painting the finished products.

Note: Remember that the improper handling and storing of the Products, materials, tools and equipment may often result in product deterioration which lead to high cost of maintenance and/or injuries.

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