



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

REMOTE LEARNING ACTIVITY BOOK

(RELAB)

SUBJECT: WELDING & METALWORK

GRADE: 11

TEACHER GUIDE

(EXPECTED ANSWERS)



INTRODUCTION AND PURPOSE OF THE RELAB

The Covid 19 pandemic has caused serious impact to schooling resulting in major learning loss and instructional time. This scenario has resulted in school implementing rotational timetables-where learners attend school on alternate days or weeks. The Remote Learning Activity Book was conceptualized to engage learners in constructive learning on days they are at home. Hence the RELAB was developed as a strategy to enhance remote learning.

The RELAB is underpinned by the following Legislative demands:

- a) Responding to GDE Strategic goal 2 promoting quality education across all classrooms and schools
- b) **DBE Circular S13 of 2020** the requires the GDE to support the implementation of the Recovery Annual Teaching Plan (RATP)
- c) **GDE Circular 11 of 2020** requiring districts to issue Learning Activity Packs to support schools for lockdown learning. Understanding learning constraints at home as majority of learners do not have access to devices or data to use for online learning. Many households are depending on schools to provide them with learning resources packs

RELAB is designed as workbook with activities based on the Revised Annual Teaching Plan. The exercises are pitched at a standard to expose learners at Grade 10 & 11 to content at different cognitive levels. The NSC diagnostic reports in different subjects have revealed that learners fail to analyse questions and as a result fail to respond accordingly.

The RELAB is intended to ensure that learners work on exercises that consolidate and reinforce topics taught while at school. These exercises are be completed at home and would receive feedback as groups or individually when at school. It is therefore of paramount importance that teachers assess the work with learners in class, as a way of providing constructive feedback. Teacher are also required to diagnose learner responses, remediate where necessary and plan further intervention.

Educators are encouraged to create whatsapp groups to remind learners on what is expected of them in a particular week/ day(s). Effective utilisation of the RELAB activity book would further ensure that all topics in the RATP are covered simultaneously. Feedback from learners at home will confirm usage of the RELAB material and assist to prepare learners for formal assessments.

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QUESTIONS

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WELDING AND METALWORK - Grade 11

TERM ONE

Memorandums/ Expected Answers:

(Question 1 and 2)

Level of Achievement	General Approach	Comprehension
Exemplary (10 pts)	<ul style="list-style-type: none"> •Addresses the question. •States a relevant, justifiable answer. •Presents arguments in a logical order. •Uses acceptable style and grammar (no errors). 	<ul style="list-style-type: none"> •Demonstrates an accurate and complete understanding of the question. •Backs conclusions with data and warrants. •Uses 2 or more ideas, examples and/or arguments that support the answer.
Adequate (6 pts)	<ul style="list-style-type: none"> •Does not address the question explicitly, although does so tangentially. •States a relevant and justifiable answer. •Presents arguments in a logical order. •Uses acceptable style and grammar (one error). 	<ul style="list-style-type: none"> •Demonstrates accurate but only adequate understanding of question because does not back conclusions with warrants and data. •Uses only one idea to support the answer. •Less thorough than above.
Needs Improvement (3 pts)	<ul style="list-style-type: none"> •Does not address the question. •States no relevant answers. •Indicates misconceptions. •Is not clearly or logically organized. •Fails to use acceptable style and grammar (two or more errors). 	<ul style="list-style-type: none"> •Does not demonstrate accurate understanding of the question. •Does not provide evidence to support their answer to the question.
Not Answered well. Poor attempt (1 pts)		

Question 3

Should there be an emergency, that mean somebody got hurt or seriously hurt, that immediate attention can be given to the wound before professional help can be obtained.

Question 4

- Adhesive Plaster Strips
- Bandage
- Cotton Wool
- CPR Resuscitation Barrier Device
- First Aid Dressing
- Gauze Swabs
- Gloves
- Gloves
- Scissors (General)
- Splints
- Tweezers (Metal)
- Wound Cleaner
- Any other that may not appear in this memorandum

Memorandum Lesson 2

First aid multiple choice answers

1. A
2. A
3. C
4. D
5. A
6. C
7. C
8. A
9. A
10. C
11. B
12. A
13. D
14. C
15. A

Memorandum Lesson 3**Angle grinder**

Any six of the following:

- The safety guard must be in place before you can start the grinding process.
- Protective shields must be placed around the grinding object to protect people passing by.
- Use the right blade for the grinding job.
- Do not force the grinding stone on the object.
- Make certain that there are no cracks in the stone before you start the job.
- Protective clothes and eye protection are essential when working with an angle grinder.
- Wear ear plugs or muffs.
- Wear safety boots with steel toe caps.
- Wear overalls or other close-fitting clothing.
- Wear gloves.

Grinding wheel

Any five of the following:

Observe the following safety precautions when working with a grinding wheel:

- . Use a machine only once the guards have been correctly fitted.
- Wake sure that there is no oil or grease on the floor around the machine which could cause you to slip.
- Check that the tool rest is not more than 3 mm from the surface of the grinding wheel. Gaps exceeding 3 mm increase the risk of material being drawn in between the tool rest and grinding wheel.
- When starting the machine, don't stand in front of the wheel. Before you start grinding, let the machine idle for a few seconds. The risk of the grinding wheel rupturing is higher at start-up than when it is running at its operating speed.
- If the wheel is running unevenly, dress it with an emery-wheel dresser.
- Grind only on the face of a straight grinding wheel and never on the side of the wheel.
- Use wheels only for their intended purpose. Certain types of grinding wheels should only be used for their corresponding materials. Most grinding wheels are only suitable for grinding ferrous metals. The appropriate degree of coarseness should also be selected for the finish required in the material.
- Approach the wheel carefully and gradually, and don't 'jab' materials onto it. Jabbing puts uneven pressure on the wheel surface causing uneven wear or structural damage to the wheel.
- Never 'force grind' so that you cause the motor to slow or stop.
- Adjust the tool rest only when the wheel is stationary.
- Clamp work pieces and holding devices safely and firmly.
- Never allow the wheel to stand in cutting fluid as this may cause the wheel to run 'off balance' when you switch the machine on again

Grinding wheel

Any five of the following:

Steps to be followed when installing the wheel:

- Select the correct type of wheel for the job.
- Inspect the wheel for cracks and tap it to apply the 'ringing test'. Never use a grinding wheel which is damaged or not properly dressed.
- Make sure that the wheel's speed does not exceed the manufacturer's recommendation.
- Never force the wheel onto the spindle.
- Use only one smooth paper spacer on each side of the wheel.
- Use true and correctly recessed flanges of the same size and at least one-third the diameter of the wheel.
- Using a spanner, gently tighten the grinding wheel so that it is held firmly.
- Replace the guards correctly.
- Stand aside and set the machine in motion. Let the machine idle before you dress the wheel, using an emery-wheel dresser.
- Finally, stop the machine and reset the tool rest to within 2 mm of the wheel surface.
- Ensure that the tool rest is parallel to the wheel surface.

Surface Grinder

Any five of the following:

Observe the following safety precautions when using a surface grinder:

- The safety precautions applicable to other types of grinders are applicable when using a surface grinder.
- Protective clothes and eye protection are essential when working with a surface grinder.
- Before operating the surface grinder, be sure you have been taught how to control it and are aware of the potential dangers associated with it.
- Do not operate the surface grinder unless all guards and safety devices are in place and working correctly.
- Make sure that you understand the operating instructions applicable to your machine.
- Never clean or adjust the machine while it is in motion.
- Report any dangerous aspect of the machine immediately and stop using it until it has been repaired by a qualified person.
- You may have to stop your machine in an emergency. Learn how to do this quickly and automatically.

Portable drilling machine

Any six of the following:

Observe the following safety precautions when using a portable drilling machine:

- Wear safety goggles.
- Choose the correct size and type of drill bit. A metal bit is used to drill into iron and a masonry bit to drill into a brick wall.
- The bit must be placed into the chuck of the drill and tightened into place by using the chuck key. Make sure that the bit is centred.
- Place the key in the key holder provided at the bottom of the drill's handle.
- If you are drilling into metal, mark the position with a centre punch.
- Stand firmly with your legs slightly apart and one leg more forward than the other.
- Hold the drill firmly and squeeze the trigger.
- If you are drilling through a metal plate, you must decrease your pushing pressure when you come close to drilling through the last piece of the metal plate.

Drill press

Any five of the following:

Observe the following safety precautions when using a drill press:

- Choose a correctly sharpened drill bit for the type of work you need to do and the material of the work piece.
- Do not leave the key in the chuck when you are not at the machine.
- Never leave the machine running if it is unattended.
- Clamp the work piece securely to the table and do not hold it by hand.
- Never try to stop the work piece by hand if it slips from the clamp.
- A drill should run at the correct speed for the job.
- Don't force a drill bit into the work piece - this may cause broken or splintered drill bits and possible injuries.
- Use a brush or wooden rod to remove chips from the drill. Do not use your fingers, waste or rags.
- When reaching around a revolving drill, be careful that your clothes do not get caught in the drill or drill chuck.
- Do not use a drilling machine with a faulty switch.
- Do not wear loose clothing or jewellery when drilling.

Power saw

Any five of the following:

Observe the following safety precautions when using a power saw:

- See that all guards are in place.
- Make sure that no oil, grease or obstacles are around the machine.
- Select the right blade for the material to be cut.
- When changing blades, ensure that the machine is switched off at the main switch.
- Remove or replace the blade gently Quick movements, such as pulling off the blade, may result in a badly cut hand.
- Do not adjust guides while the machine is running.

- All material must be clamped properly before cutting is started.
- Long pieces of material must be supported at the end.
- Always stop the machine when you leave it unattended.

Memorandum Lesson 4

Press machines, Arc Welding, Gas Welding, Gas Cylinders

1. Shears, guillotines, presses. — (1) Where the opening at the point of operation of shears, a guillotine or a press is greater than 10 mm, the user shall cause such machine to be provided with —
 - (a) a fixed guard which prevents hands or fingers reaching through, over, under or around the guard into the point of operation; or
 - (b) a self-adjusting guard which automatically adjusts itself to the thickness of the material being worked and which prevents hands or fingers reaching through, over, under or around the guard into the point of operation; or
 - (c) a manually or automatically operated moving guard which completely encloses the point of operation of such machine and which is so arranged that the working stroke cannot be commenced unless the guard is closed and which cannot be opened unless the ram or blade is stationary; or
 - (d) an automatic sweep-away or push-away which pushes any part of the operator's body out of the danger zone when the working stroke commences; or
 - (e) an electronic presence-sensing device which prevents or arrests a working stroke if it senses that any part of a person's body or any other foreign object is in the danger zone:
Provided that the guarding provided in terms of this sub regulation shall not in itself create any threat to the safety of persons.
- (2) The user may use or permit the use of shears, a guillotine or a press without the guarding contemplated in sub regulation (1) if the operating controls to set it in motion require the simultaneous engagement of both hands of all the operators involved in the operation of the machine, and such operating controls —
 - (a) are situated at such distance from the point of operation that none of the operators has enough time to reach the danger zone with any part of his body before the working stroke is completed; or
 - (b) are so designed that the working stroke will be arrested if any one of the operators removes one of his hands from the controls:

Provided that the operating controls shall be so arranged that they cannot be bypassed.

(3) The user shall cause any full-revolution clutch shear, guillotine or press which is fed by hand to be provided with an anti-repeat device.

2. Any of the following:

Safe distance safeguarding,
 Safe holding safeguarding,
 Safe work procedures,
 Work-holding equipment (such as back gauges),
 Properly designed and protected foot pedals, and
 Hand-feeding tools.

3. Safety rules to observe when working with an arc welding machine

- Make sure the area around which one is going to work is clear of obstruction.
- Use as small a rod as possible when tackling the job. This will give a much better and neater weld on completion of the job.
- Only weld in well-ventilated areas.
- Seek medical attention if one is burnt in any way.
- Do not weld near flammable materials or liquids.
- Do not weld on petrol tanks or any container that has any flammable liquids or gas in it.
- Radiation from the arc is dangerous to the eyes.
- Avoid striking an arc when other people are nearby.
- Take precautions to avoid electric shock.

4. The following are some safety precautions that should be followed when using oxy-acetylene apparatus:

Welding or flame-cutting operations may not be undertaken, unless:

- An operator has been instructed on how to use the oxy-acetylene welding plant safely.
- The workplace is effectively partitioned off.
- An operator uses protective equipment.
- Effective ventilation is provided and maintained.

- Masks or hoods maintaining a supply of safe air for breathing are provided and used by the people performing such operations.
- Additionally, any vessel that contains a substance which, when heated, may ignite or explode (or react to form dangerous or poisonous substances) must not be welded or heated until it has been properly cleaned.
- Where hot work involving welding, cutting, brazing or soldering operations is carried out at places other than workplaces, steps must be taken to ensure proper and adequate fire precautions. When in doubt, the manufacturer's instructions are always the final authority on safety precautions and procedures. African Oxygen (Afrox) freely supplies safety booklets from their outlets and depots on all aspects of welding safety.
- Never use damaged equipment.
- Never use oil or grease on or around oxygen equipment.
- Never use oxygen or fuel gas to blow dirt or dust off clothing or equipment.
- Never light a torch with matches or a lighter.
- Always use a striker.
- Always crack cylinders before assembling the regulators to remove any dust. Always make sure regulators have their adjusting screws released by turning them anticlockwise until free before opening cylinder valves.
- Stand to the side of a regulator and not in front of it when opening cylinder valves.
- Always wear proper welding goggles, gloves and clothing when operating oxy-acetylene equipment.
- Always have a fire extinguisher handy when operating oxy-acetylene equipment.
- Always use the proper regulator for the gas in the cylinder.
- Always use cylinders in the upright position only.
- Always keep the valve wrench on the acetylene cylinder valve when in use. Open the cylinder valve a maximum half of a turns.
- Do not carry lighters, matches or other flammable objects in your pockets when welding or cutting.

5. Every gas cylinder should have a plate attached with the following particulars:

- name of the manufacturer
- country of origin
- year of manufacture
- manufacturers serial number
- name, number and date of the standard of design
- design gauge pressure in Pascal
- maximum permissible operating pressure in Pascal
- operating temperature

6. The following safety precautions must be observed when handling gas cylinders:

- Store full cylinders separately from empty ones.
- Keep cylinders in a cool place and protect them from sunlight and other sources of heat.
- Always store and use acetylene cylinders in an upright position.
- Store oxygen cylinders apart from acetylene cylinders.
- Never stack cylinders on top of one another.
- Do not bang or work on cylinders.
- Never allow cylinders to fall.
- Do not allow oil or grease to come into contact with oxygen fittings as they form an inflammable mixture.
- Keep the caps on the cylinders for protection.
- The thread on an oxygen cylinder is a right-hand thread.

Memorandum Lesson 5

Hydraulic press

1.

- The predetermined pressure must never be exceeded. This operating pressure is always less than the maximum safe pressure and is shown by a pressure gauge on the apparatus.
- Pressure gauges must be tested regularly and adjusted or replaced if any malfunction occurs.

- The platform on which the work piece rests must be rigid and square with the cylinder of the press.
- The platform must rest on the supports provided and should not be supported by the cable by which it is raised or lowered.
- Objects to be pressed must be placed in suitable jigs. Ensure that the direction of pressure is always at 90° to the platform.
- To prevent damage to soft material, the prescribed equipment must be applied.
- The level of the hydraulic fluid in the reservoir should be checked regularly. If fluid has to be added frequently, it is an indication that there may be an internal leak.
- Regularly inspect the apparatus for rigidity and tighten all nuts and bolts.
- Pins and/or other equipment that keep the platform at a desired height on the frame must be inspected regularly for damage.
- When the apparatus is equipped with cables to alter the working height of the platform, the cable and pulleys must be inspected for damage and lubricated with grease.

Memorandum Lesson 6

Templates

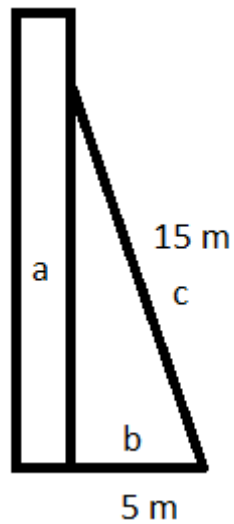
1. Five criteria of effective marking out are?
 - A sound knowledge of Engineering Graphics and Mathematics
 - Competence in setting out plans
 - Good quality of tools
 - Working in a well-lit area
 - A good quality floor
2. Name five tools used to make templates?
 - a. Circular saw / Jig saw
 - b. planes
 - c. braces
 - d. drill bits
 - e. chisel
 - f. nipple punches.
 - g. Fret-saws

- h. Hammers
- i. centre punches
- j. clamps
- k. snips and scissors
- l. Rules
- m. tapes
- n. squares
- o. straight edge
- p. dividers,
- q. trammel points
- r. scribes
- s. chalk lines
- t. French chalk
- u. coloured pencils
- v. callipers
- w. marking pegs
- x. special gauges protectors
- y. scientific calculator

All the tools needed to construct the project should be at hand to determine if it can be done.

3. Describe why wood is used in the making of templates?
 - a. The template should be sturdy but lightweight
 - b. The template will be used for a lot of artefacts and should contain its form.
4. How should a template loft's floor be constructed?
 - a. Wooden floors must be diagonally across floor.
 - b. If cement floor must be painted black
5. How do you transfer a set out project to a template?
 - By placing paper or template material over the set out project and transfer it to the material.
 - By lifting the project and placing the template material under it. Then the project can be replicated and all markings can be added.

6. $a^2 + b^2 = c^2$



$$a^2 = 15^2 - 5^2$$

$$a^2 = 225 - 25$$

$$a^2 = 200$$

$$a = \sqrt{200}$$

$$a = 14.1 \text{ m}$$

7. Right

8. When the length of 2 sides are known and the length of 3rd side is needed

9. Draw and label triangle

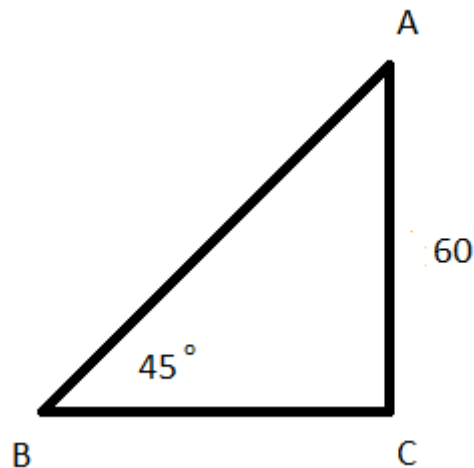
10. Check to see whether the answer should be rounded or not

11. To construct a right triangle.

When a 90° angle is needed

Memorandum Lesson 7**45 and 60 degree setting out**

1. Determine the length of AB

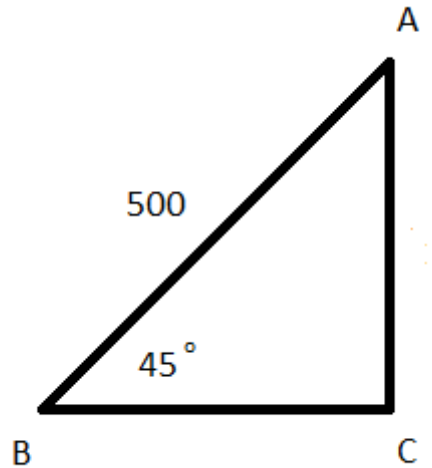


$$AC = 60$$

$$\angle ABC = 45^\circ$$

$$\begin{aligned} AB &= AC \times \sqrt{2} \\ &= 60 \times 1.414 \\ &= 84.85 \end{aligned}$$

2. Determine the length of BC



$$AB = 500$$

$$\angle ABC = 45^\circ$$

$$CB = \frac{AB}{\sqrt{2}} = \frac{500}{\sqrt{2}} = \frac{500}{1.414}$$

$$CB = 353.61$$

Memorandum Lesson 8

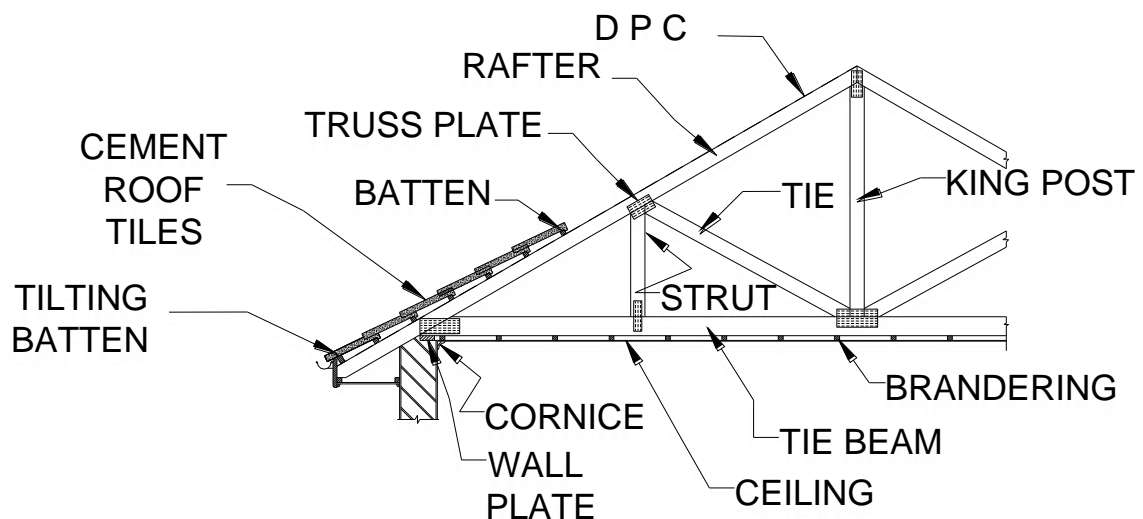
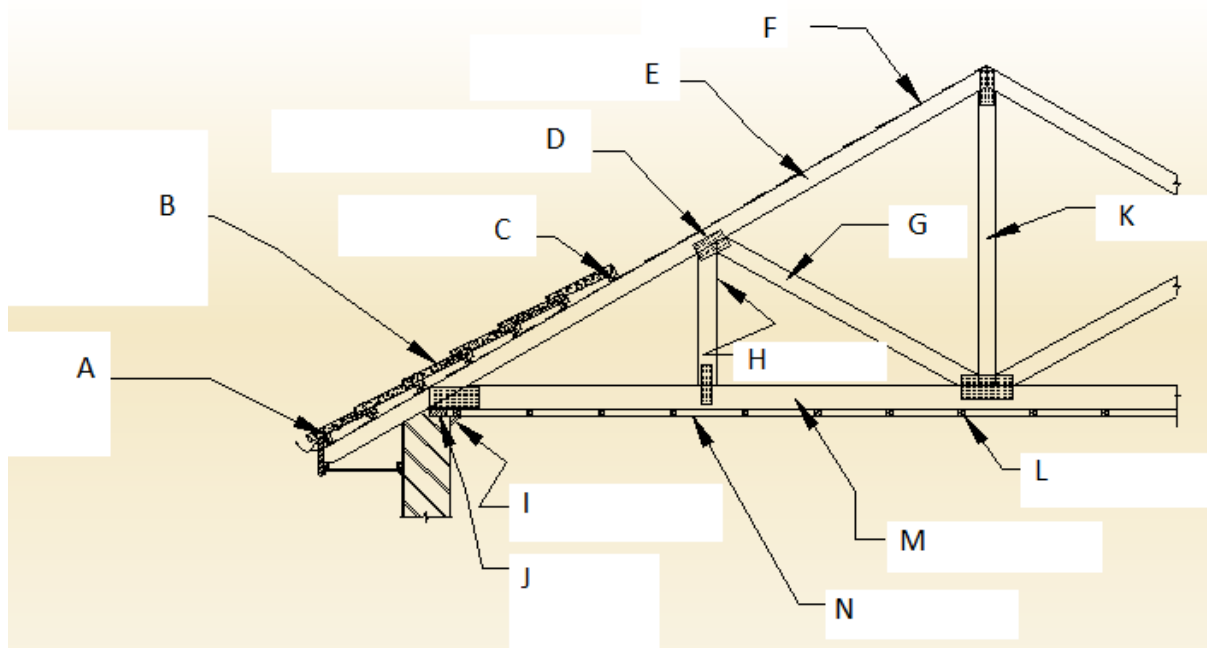
Back marks and cross centres

1. Where do we use back marks?
 - Also known as back marks
 - To indicate the minimum distance of holes from edges
 - If holes are too close to an edge it will break
2. Where do we use cross centres?
 - Used for marking holes in flanges
 - Used in marking holes in channel
 - Used in marking holes in angle
 - Any holes in work that require a certain level of strength and should not break.
3. Name 5 criteria for cross centres and back marks?
 - Clear indication of holes

- Standard dimensions of holes in angle and channel should be used if none is given.
- Cross centres are indicated as CC on drawings
- Back marks are indicated as B.M
- Where templates should align correctly

Memorandum Lesson 9

Roof trusses - slope



Memorandum Lesson 10

TEMPLATES – Roof truss layout

1. What are a roof truss?

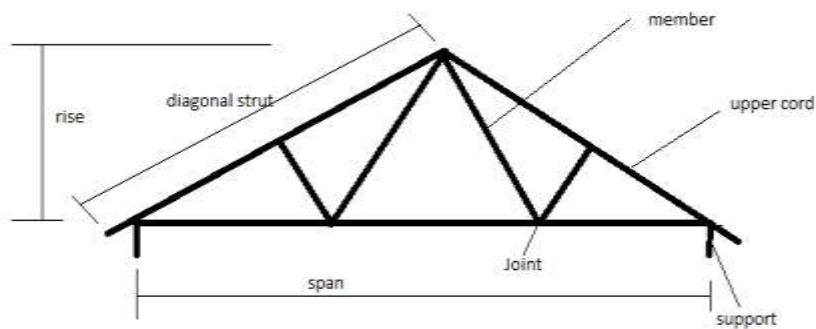
A Truss is a rigid structural framework of timbers or steel bridging a space with each end of the truss resting on some form of support.

The trusses provide support for bracing or purlins which in turn support the roof covering.



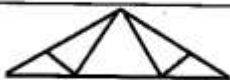
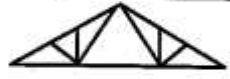





2. Where are roof trusses fabricated?


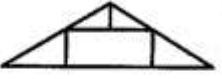

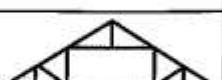

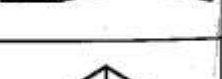



It can be pre-fabricated or build on site.

3. Identify the different sections on the roof?



4. Different truss configurations can be used. Name four that can be used for a roof with a span more than 10 meter?

Name Configuration	Max. Span Span (m)	
King Post	5	
Queen Post	6	
Fink	9	
Fan	10	
Howe Scissors	8	
Double Howe Scissors	12	
Triple Howe Scissors	16	
Mono-Half Howe Comp	7	
Mono-Half Scissors Howe	7	

Name Configuration	Max. Span Span (m)	
Polynesian/Bell/Gambrel	12	
Simple Attic Frame	10	
Queen Post Attic Frame	14	
Howe Attic Frame	14	
Vaulted Ceiling	8	
Vaulted Ceiling	13	
Vaulted Ceiling	18	
Bowstring 5 to 9 Panels	18	
Howe Girder	6	

Memorandum Lesson 11

Calculation of cost

1. Name two factors that influence production cost.

Production economy

Material cost

2. Welding material cost is determined by which factors?

The cost of the welding material and production cost.

3. How can payment for work be done?

Work done per hour (hours x set payment)

Artefacts completed (artefacts x set payment)

Bonus method (bonus paid for time finished in advance)

4. What are indirect cost?

Lease

Tax

Quantity and quality of stock

Petrol

Office accessories

Electricity costs

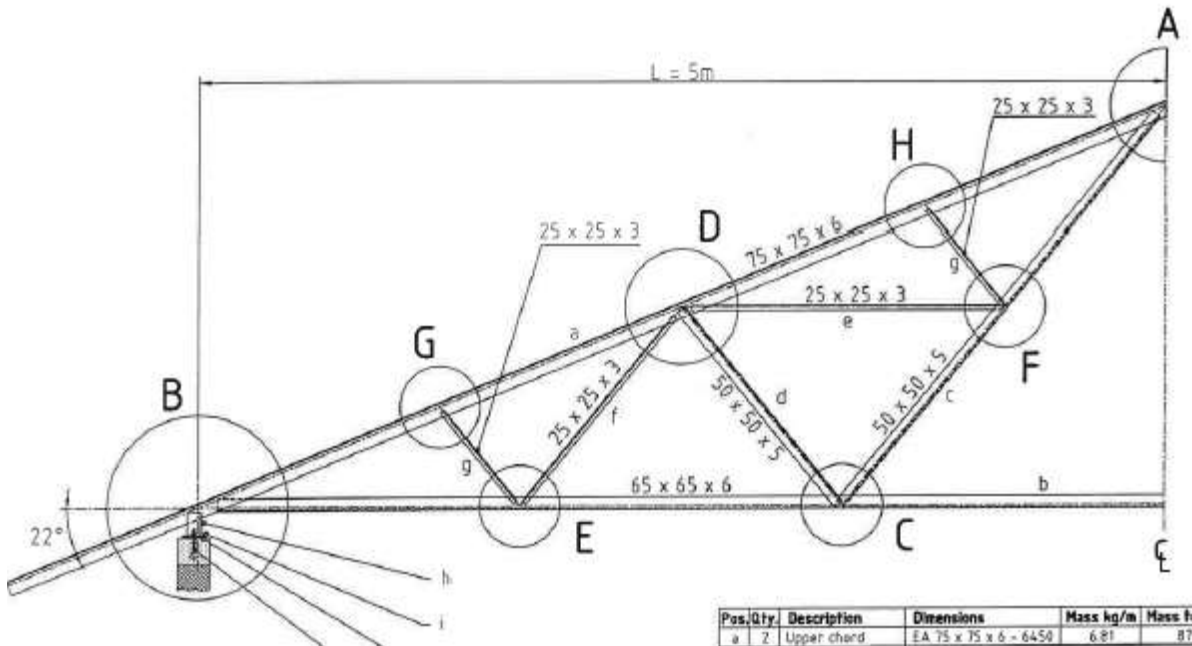
Indirect material

Indirect payment for workers

Communication and advertising

Memorandum Lesson 12

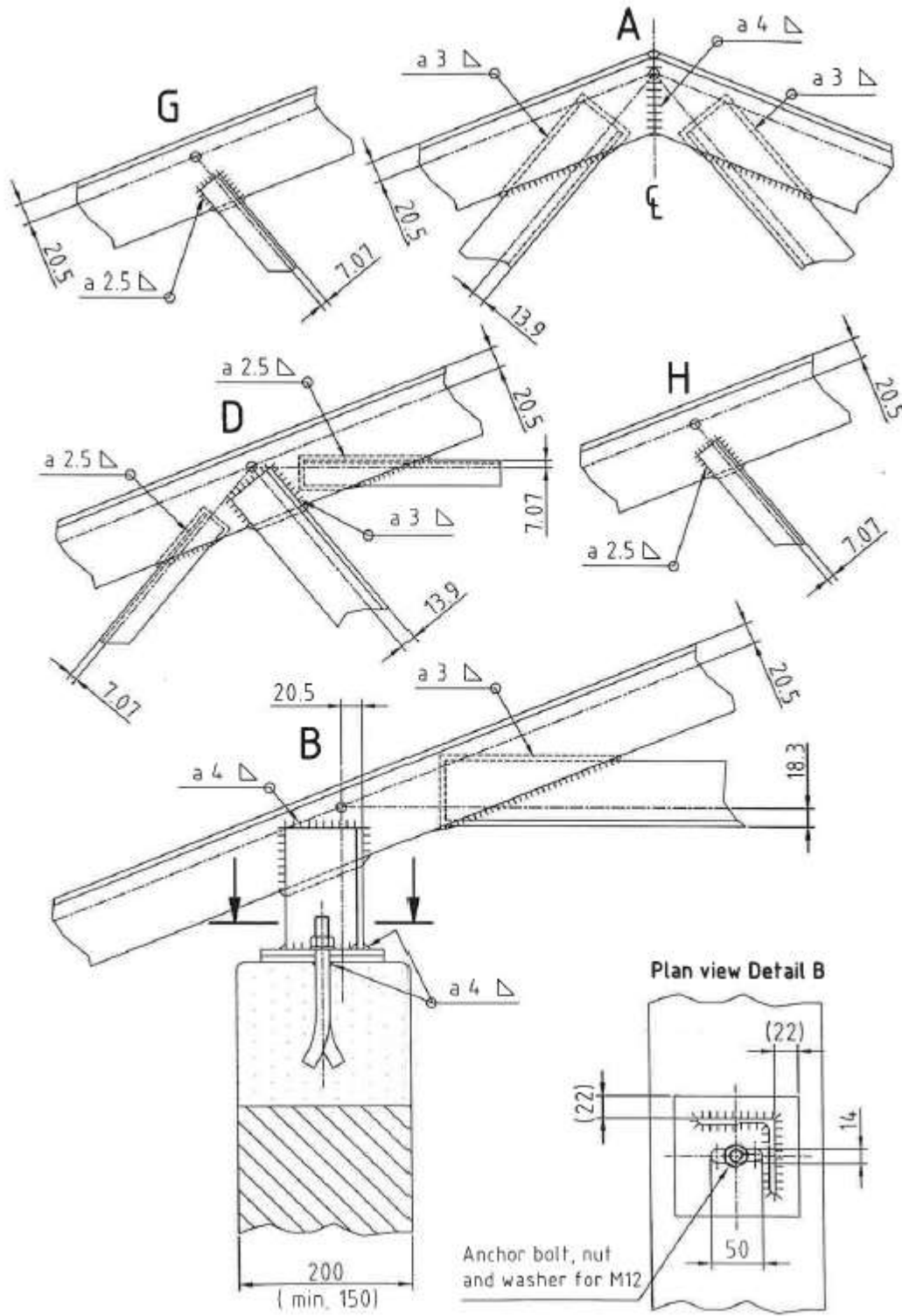
Compiling cost for roof trusses



Pos.	Qty.	Description	Dimensions	Mass kg/m	Mass kg
a	2	Upper chord	EA 75 x 75 x 6 - 6450	6.81	87.9

Pos.	Qty.	Description	Dimensions	Mass kg/m	Mass total kg
a	2	Upper chord	EA 75 x 75 x 6 - 6450	6.81	87.9
b	1	Lower chord	EA 65 x 65 x 6 - 9800	5.87	57.5
c	2	Tie	EA 50 x 50 x 5 - 2550	3.48	17.75
d	2	Strut	EA 50 x 50 x 5 - 1200	3.48	8.9
e	2	Tie	EA 25 x 25 x 3 - 1600	1.12	3.6
f	2	Tie	EA 25 x 25 x 3 - 1220	1.12	2.7
g	4	Strut	EA 25 x 25 x 3 - 600	1.12	2.7
h	2	Support	EA 75 x 75 x 6 - 120	6.81	16.5
i	2	Sliding plate	FB 120 x 6 - 120	5.65	13.5
k	2	Anchor plate	FB 120 x 6 - 120	5.65	13.5
l	2	Anchor bolt/nut/washer M12 - 120	---	---	0.60
				Mass total	186.0

[EA = equal angle / FB = flat bar]



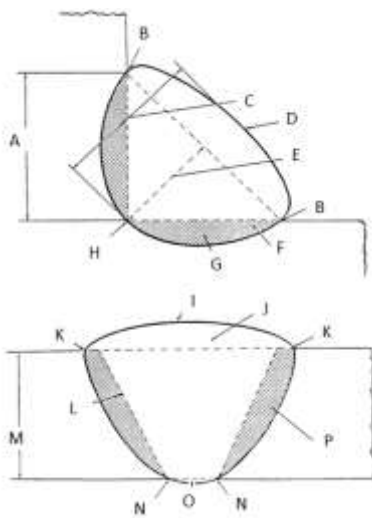
Memorandum Lesson 13

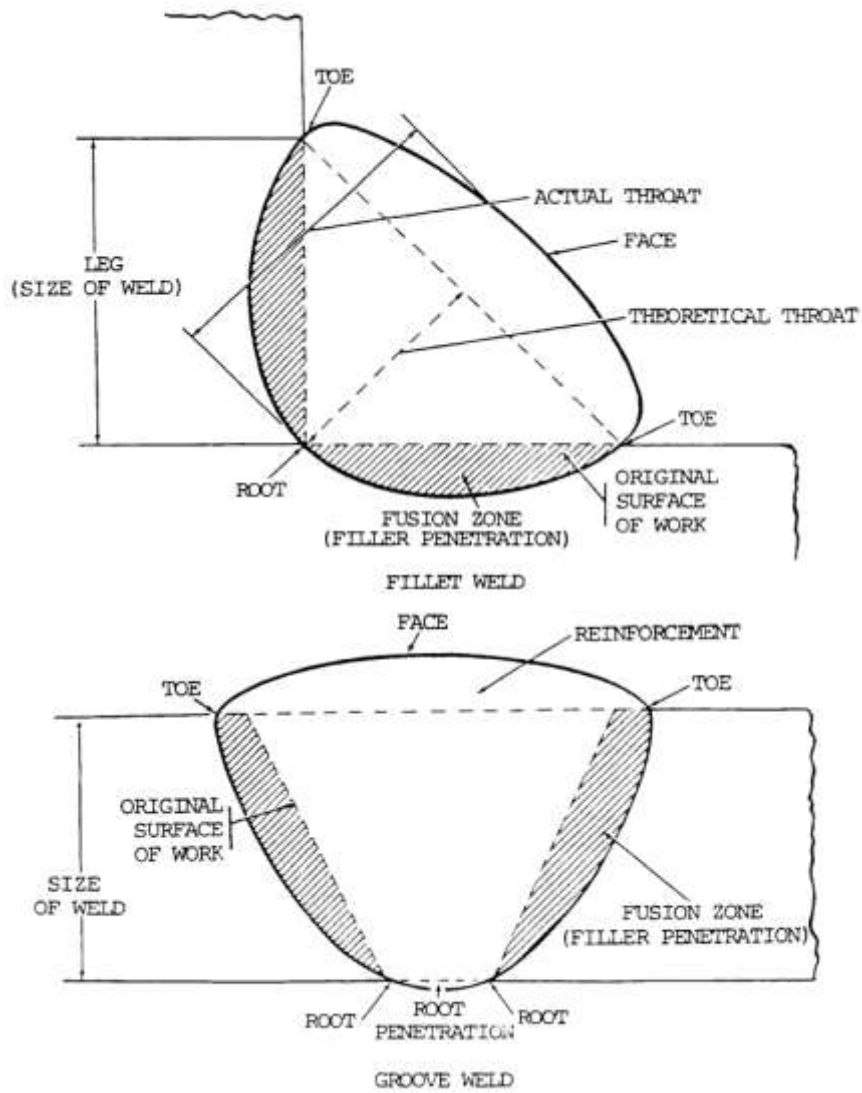
Welding terms

1. Name four advantages of welding?

- · Provides a permanent joint.
- · One of the most economical ways to join components in terms of material usage and fabrication costs.
- · Not restricted to a factory environment.
- · Withstands high temperature and Pressure equal to joined material
- · Quick Process
- · Gives no colour change to joints
- · Any type of metal of any thickness can be joined.
- · Strongest joint of all joints
- · Needs less space

2. Identify A – P





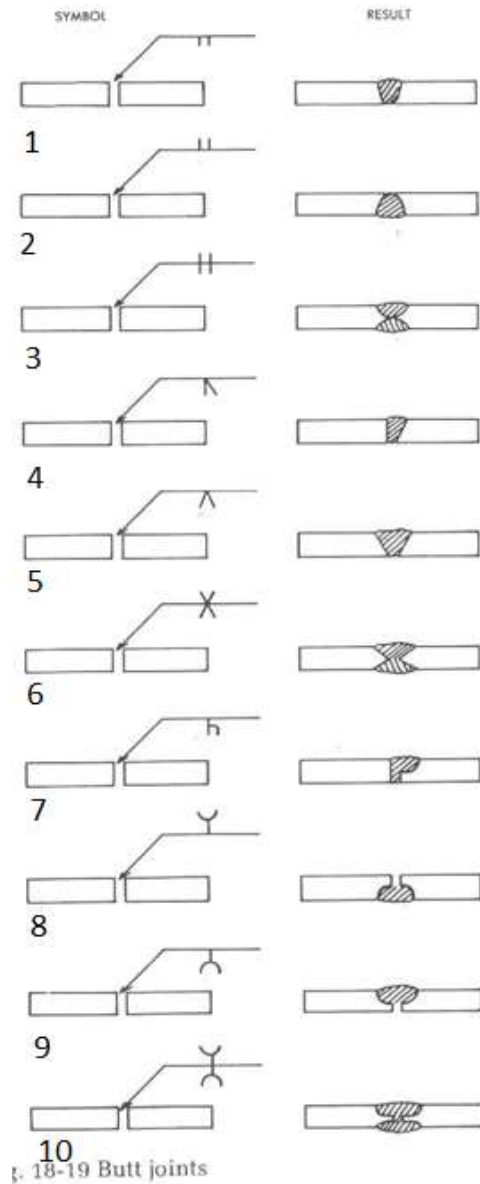
3. What is the deposition rate?

- The weight of the material deposited in a unit of time

Memorandum Lesson 14

Welding symbols

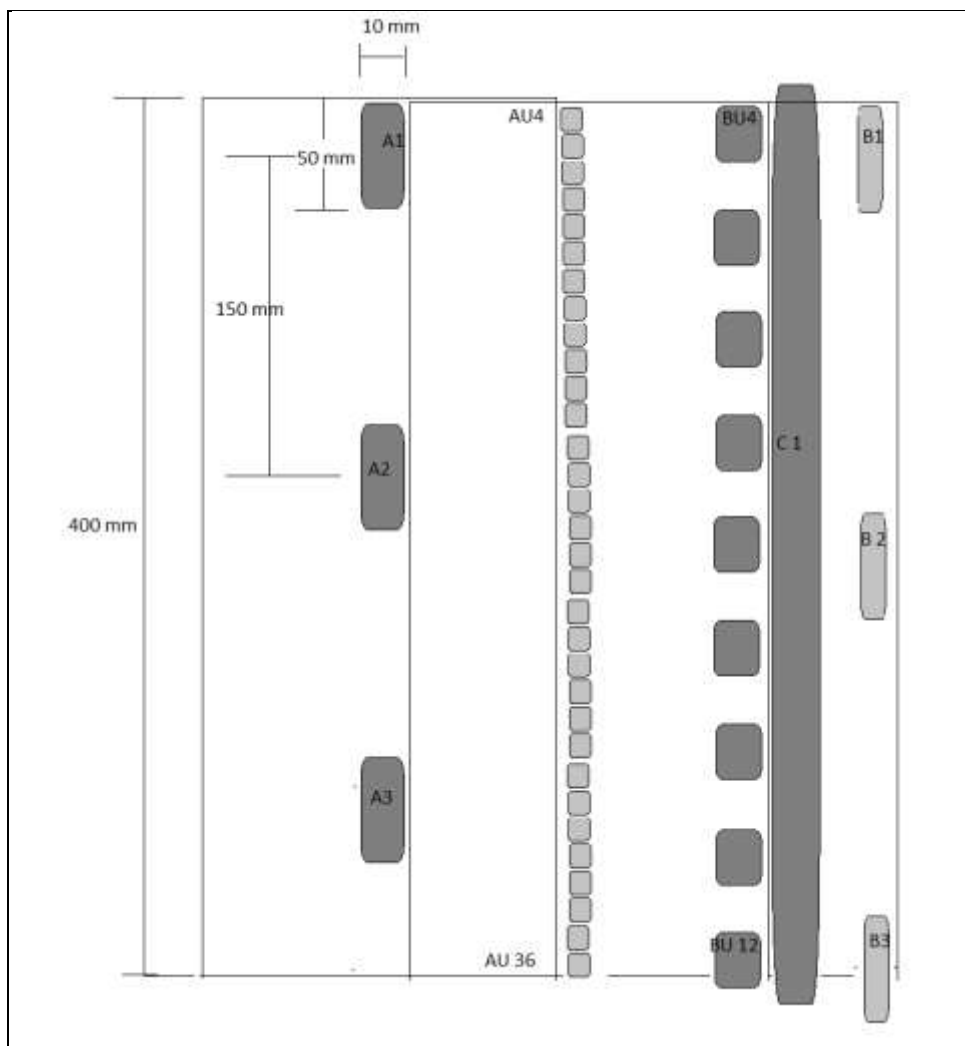
1. Draw how the following butt welds must be welded:



Memorandum Lesson 15

WELDING SYMBOLS

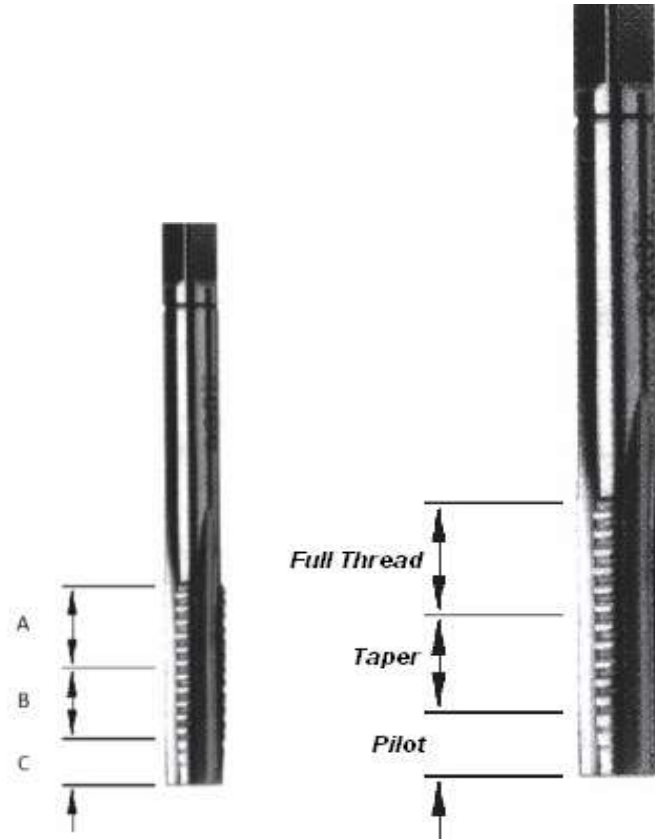
1. Write welding symbols for the following welding artefact.
2. Draw a neat orthographic top view of the artefact that indicates where the artefact must be welded. The length of the plates that must be welded is 400 mm. All the dimensions must be shown. Number the welds i.e. A1, B1 etc.



Memorandum Lesson 16

TAPS AND DIES

1. Identify A-C?



2. Where do you usually use the bottoming taps?

This kind of tap is the last of the set to be used and is necessary when a blind hole has to be tapped.

3. Discuss the precautions then using taps and dies?

Taps must be used in the correct order (taper tap first).

A tap must be entered squarely in the tap wrench.

The correct size tapping drill must be used.

A tap is at a right angle to the stock once cutting has started.

Take care not to bear too heavily on only one handle of the tap wrench or to force the tap as it is likely to break off in the hole.

Memorandum Lesson 17

Grinding machines

1. What should be checked before a grinder is used?

Electrical insulation.

Blades

Covers

Work piece clamped

Personal protection

Earth for electricity

2. What type of blades can be used on an angle grinder?

Metal – grinding and cutting

Stone

Diamond blade

Sandpaper

Wire brush

3. How should a pedestal grinding stone be checked for cracks?

It could break apart if cracked and used

4. What is a surface grinder?

It is machine basically used to grind flat surface.

Job is mounted to a table which moves longitudinally as well as in transverse direction.

Manual feed or power feed.

Work piece can be clamped in two ways

- a. Manual clamps.

- b. Magnetic chuck.

Internal pump and piping arrangement for coolant.

Protective guard for safety.

Memorandum Lesson 18

Cutting machines

1. List five different cutting methods for cutting steel?

Abrasive cut – off machine

Cold cut machine

Guillotine

Band saw

Laser cutter

Plasma cutter

Gas cutting

Lathe

2. What are the basic principles for cutting machines?

Metal is cut by shear force

Metal is cut by blowing away of molten metal

Metal is cut by shearing away with a harder metal or material

3. Why should a guillotine's blade be able to adjust?

There should be allowance for metal thickness

Memorandum Lesson 19

Guillotine

1. Describe the working principle of a guillotine?

Metalworking guillotines operate by a clamp securing the sheet of material.

Similar to the action of scissors, the blade shears the material, starting at one side of the sheet

2. Name two factors to produce a clean cutting edge?

The clearance between the blades as well as the sharpness of the blade edges

3. How much should the blade clearance be increased for every 1mm increase in metal thickness?

0.1 mm increase

Memorandum Lesson 20

PRESS MACHINES

Watch the clip. “Hydraulic press doing fabrication for Stainless steel pot, sink forming process”

1. Discuss the safety issues observed in the clip.
 - Hands inside the press area
 - Metal being held by hand while press is operational
 - Metal being handled with bare hands
2. How can the operation be improved?
 - One machine with different bits can be operated.
 - Any answer that is relevant.

Memorandum Lesson 21

Joining equipment

1. Name 3 advantages of shielded metal arc welding (SMAW)?

- Low Start Up Costs
- Portability
- Outdoor Weldability
- All Position Welding
- Variety of Materials
- Good Mechanical Properties

2. Name 3 limitations of SMAW?

Low Efficiency (65%)

Low Operating Factor

High Operator Skill

More Restarts

Amperage Limit

Slag (Cleaning)

Spatter (Cleaning)

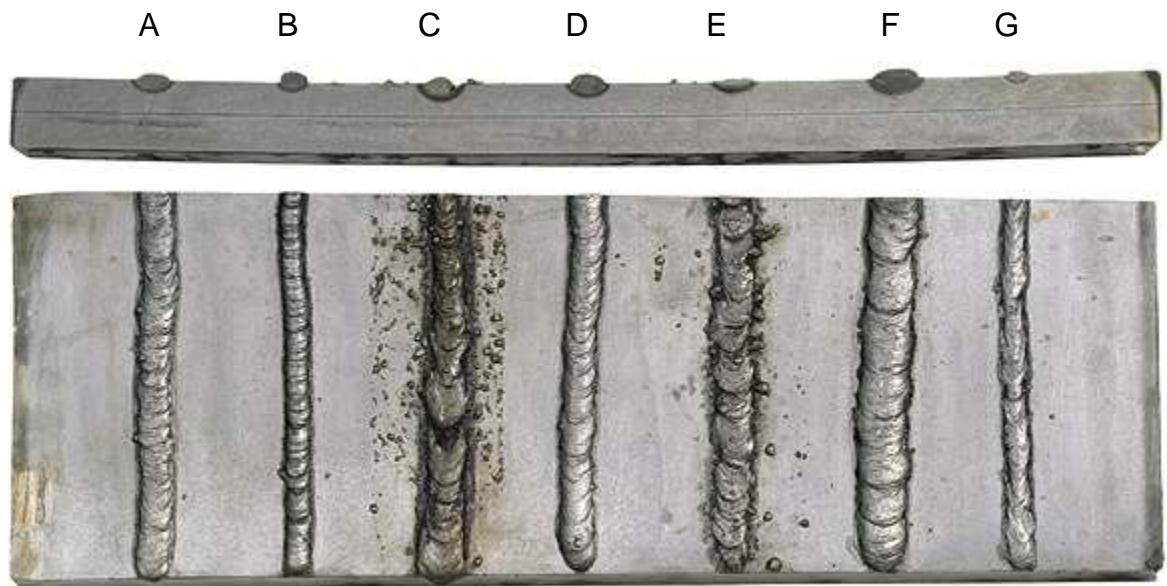
3. Describe the process of SMAW?

- An arc welding process with an arc between a covered electrode and the weld pool. The process is used with shielding from the decomposition of the electrode covering, without the application of pressure and with filler metal from the electrode

4. What is a duty cycle?

- *The Duty Cycle of a power source is the percentage of a ten (10) minute period that it can operate at the rated output current setting*

5. Discuss the following welds



- A. Good Weld: Proper Current, Travel Speed and Arc Length
- B. Current too low: Ropey, convex bead appearance
- C. Current too High: Excess spatter and possible burn-through of base materials
- D. Arc Length too short: Poor wet-in at toes, electrode can 'short' to base material
- E. Arc Length too Long: Excess spatter, undercut and porosity
- F. Travel Speed too slow: Wide weld with excess metal deposit
- G. Travel Speed too high: Ropey and convex bead

Memorandum Lesson 22

Resistance welding

1. Describe the process of resistance welding?

The weld is created by first applying pressure on the two parts to be joined. Once the correct amount of pressure is applied, current is passed between the two (or more) overlapped sheets. Resistive heating results in melting and the formation of a “weld nugget” or a “weld seam”.

2. Name 3 different tip configurations?

Truncated cone

Dome

Pointed

3. Name 3 advantages of resistance welding?

High speed, < 0.1 seconds in automotive spot welds

Excellent for sheet metal applications

No filler metal

4. Name 3 different types of resistance welding?

Spot welding

Projected spot welding

Seam welding

Memorandum Lesson 23

Gas welding

Discuss how to assemble the equipment?

- Secure bottles
- Crank the bottles
- Attach regulators
- Attach the hoses
- Turn the pressure adjusting screw is turned out.
- Attach the welding tip to torch
- Turn cylinder valves open slowly only 1,5 turns

- Discuss the shutting down process?
- Make sure torch valves are closed and turn pressure-adjusting screws in until desired pressure is obtained
- Test for leaks with soapy water and paint brush or by smell.

- Discuss the shutting down process?
Close the acetylene cylinder valve.
- Close the oxygen cylinder valve.
- Open the acetylene torch valve to drain the gas from the hose and the regulator.
- Close the acetylene torch valve.
- Release the pressure-adjusting screw. Turn the screw counterclockwise (to the left).
- Open the oxygen torch valve to drain the hose and the regulator.
- Close the oxygen torch valve.
- Release the pressure-adjusting screw (as in step 5)

Memorandum Lesson 24

Rolling machine

1. Describe the working principle of the slip roll?
Two rollers are used to clamp the sheet metal and the third back roller is adjusted to get a curve. The more the back roller is adjusted the smaller the diameter of the bend will get.

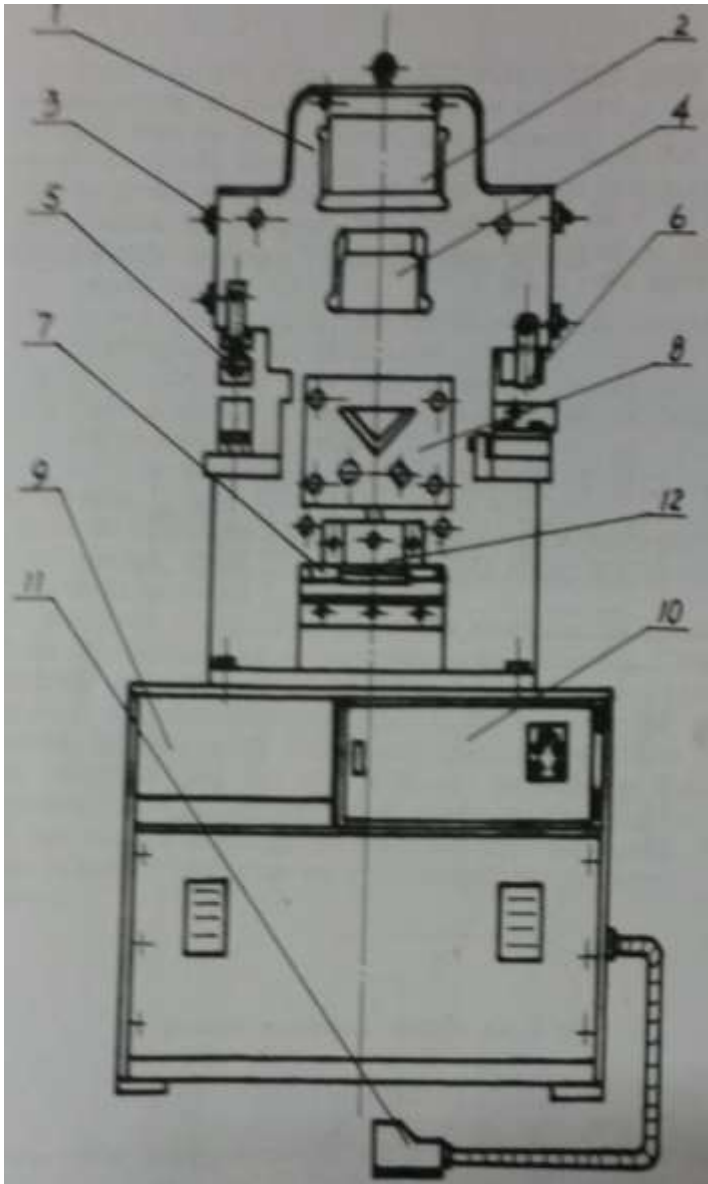
2. How do you get rid of the flat spot on the work piece?
By running the metal through the roller from the other side.
By turning your metal around after going through on the first and second passes

3. How do you get your work piece out of the machine?
By releasing the clamp rollers.
Disengage the top clamp roller
Slide the roller outward and slide the work piece from the roller

Memorandum Lesson 25

Cropper

1. Identify the parts of the machine.



1. Frame
2. Pressure cylinder
3. LUB adjusting screw
4. Backstroke cylinder

5. Punching hole area
6. Shearing area
7. Plate shearing area
8. Shaped steel shearing area
9. Base
10. Electric system
11. Pedal switch
12. Hold down device

Memorandum Lesson 26

Plasma cutting

Question 1: Which metals will plasma cut?

- A) Mild steel
- B) Stainless
- C) Aluminium
- D) All of the above**

Question 2: What is Plasma?

- A) Gas is heated to a point where it is capable of conducting electricity
- B) Electric shock cutting
- C) Using the welding arc for cutting steels**
- D) Electric oxy-fuel cutting

Question 3: Which of the following is NOT an advantage of Plasma cutting

- A) Cuts any conductive material
- B) Easy to use
- C) No preheat
- D) Noise and fumes**

Question 4: Which is not a commonly used Plasma application

- A) Steel less than 25 mm
- B) Aluminium
- C) Stainless
- D) Materials greater than 35 mm**

Question 5: Nitrogen is a suitable gas for Plasma cutting. (Circle the most appropriate answer)

True

False

Question 6: Which of the following is NOT a plasma cutting consumable?

- A) Electrode
- B) Nozzle
- C) Drag Cup
- D) Contact tip**

Question 7: Is gouging possible with plasma?

Yes

No

Memorandum Lesson 27

Cut off machine

1. Discuss the working principle of the cut off machine?
 - An abrasive wheel rotates at high speed.
 - The wheel grinds metal away to create a clean cut.
 - Metal is clamped to the base of the cut-off machine and the wheel is brought against it.
2. Discuss the advantages and disadvantages of the machine?
 - Machine are less expensive to buy and maintain.
 - Fairly accurate
 - Portable and lightweight
 - Quick cutting method
 - Cutting wheels must be replaced
 - Cutting wheels can break or bend
 - A little metal is lost while cutting.
 - Make a lot of noise
 - Metal is hot after cutting
 - Burrs must be cleaned

Memorandum Lesson 28

Heat treatment of steel

1. Three elements are: - Heating, Soaking and Cooling.
2. Methods of heat treatment: - Annealing, Tempering, Hardening, Normalising, and Case-hardening.
3. Quenching methods: - oil, brine, air, water, metal salts.
4. Tempering- reheat the steel to a temperature below the critical range to allow some of austenite to return to its original state, and then quenched.

Memorandum Lesson 29

Iron Carbon Equilibrium Diagram

1. A - Ferrite + Perite
B - Perite + Cementite
C - Ferrite + Austenite
D – Cementite + Austenite
2. AC1- Temperature point at which the change starts regardless of their carbon content.

Memorandum lesson 30

materials

1. Name 3 materials used in steel production?

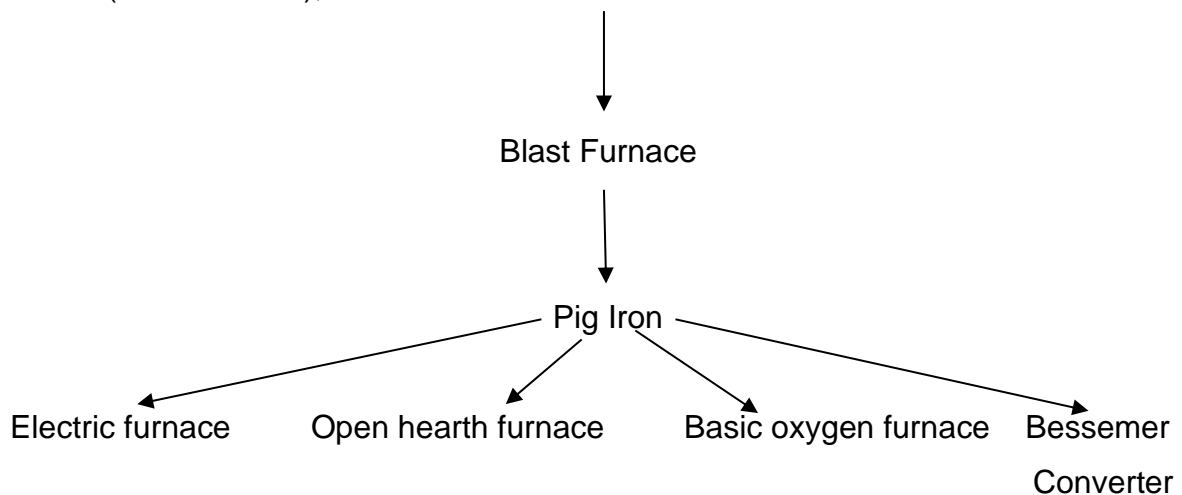
- Iron ore
- Coal
- Limestone

2. Describe the steel production process in the blast furnace?

The Blast furnace is charged with layers of iron ore, coke and limestone at the top. Hot air is blown through the nozzles known as tuyeres. Smelting of Iron Ore takes place at the bottom of the blast furnace with coke acting as a fuel, limestone as a flux to produce pig iron which will act as the base material of all steel furnaces.

3. Draw and describe a flow line for the whole steel production process?

Iron Ore (stone is mined under the ground), coke (acts as a fuel), Limestone (acts as a flux), Hot air



Lesson 31- Properties of material

1. Describe **Toughness** in metal.
Allows materials to resist bending, breaking, cracking or stretching. Also withstands impact, penetration and shock loads – hard but not brittle.
2. Describe **Elasticity** in metal.
Allows materials to absorb forces, flex in different directions and return to its original shape after force has been removed.
3. Describe **Malleability** in metal.
Allows materials to be reshaped in all directions without cracking or breaking.

Lesson 32- Developments

Graphic development of a round to square transition (on centre).

square = 60mmx60mm

Circle = diameter 40mm

Height of transformer/ transition= 60mm (perpendicular height)

Lesson 33- Developments

Graphic development of a rectangular to round transition (off centre)

Rectangular = 330mmx400mm

Circle = diameter 250mm (100mm from right and along centre of 330mm side)

Height = 300mm.

Lesson 34- Developments- cones

Graphic development of a cones using the radial method.

Lesson 35- Developments- Oblique cones

Graphic development of an Oblique cone using the radial method.

Lesson 36- Developments- Cylindrical Y - connection

Graphic development of a cylindrical Y – connection of pipe with a diameter of 43mm.

Lesson 37- Developments- Transitions- Square to Square

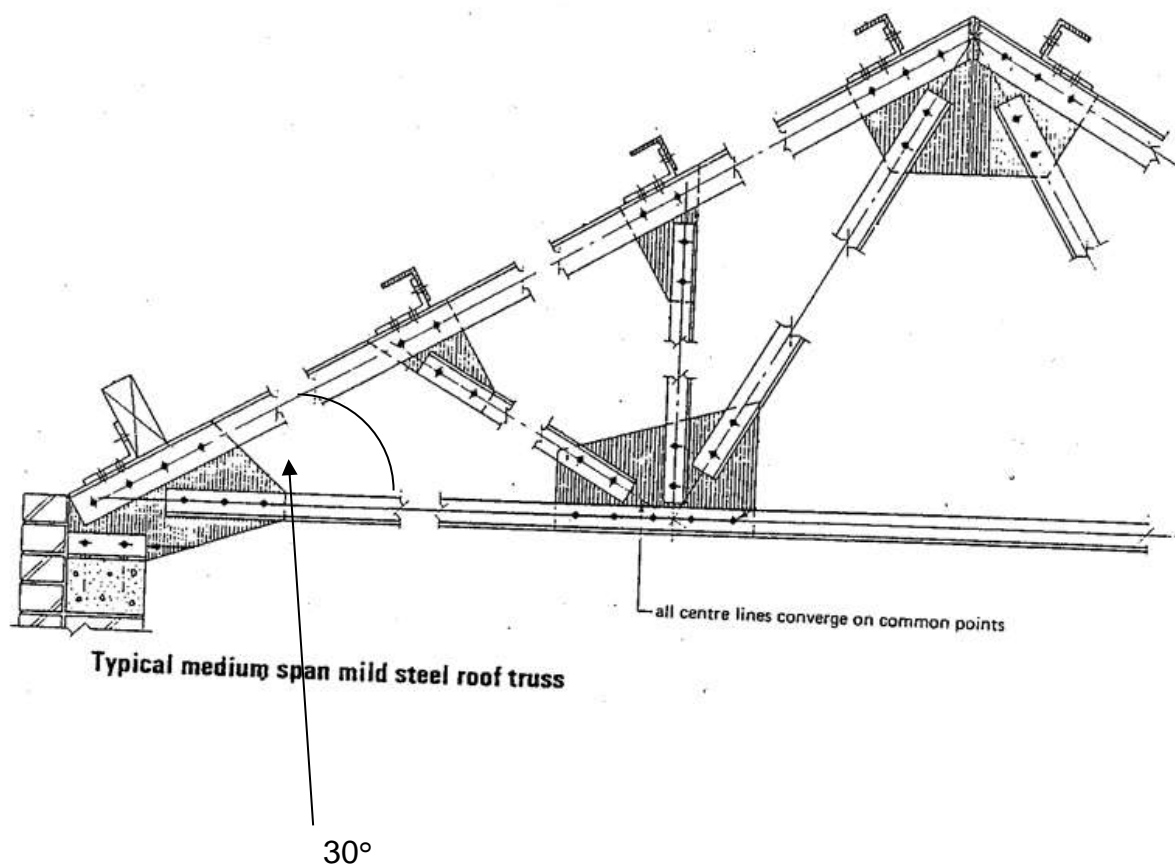
Graphic development of a square to square transition.

Square = 60mmx60mm

Height = 75mm.

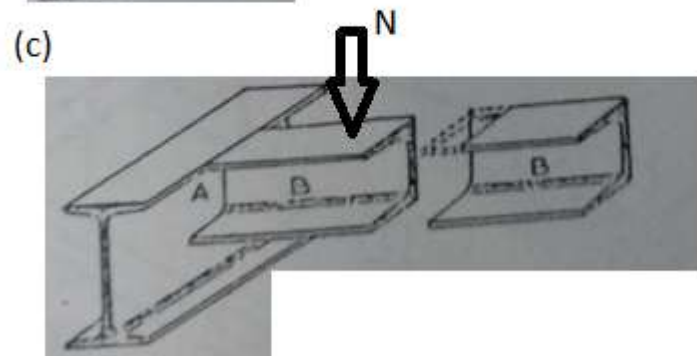
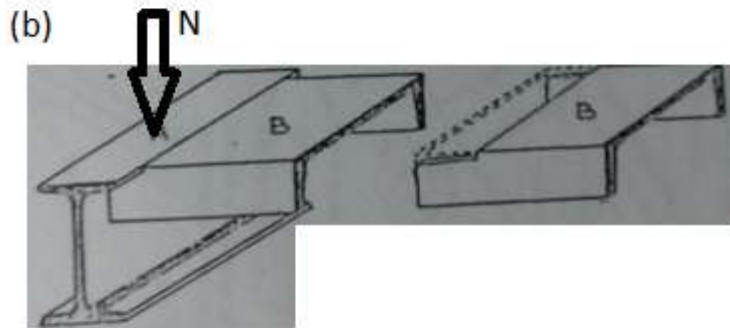
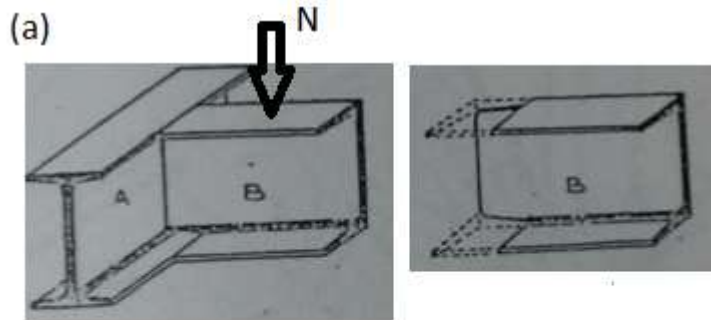
Lesson 38- Angle Steel Sections

1. The following roof truss is being made out of angle iron. Identify the section of the truss and indicate the size of the angle you would use.



Lesson 39- Channel Sections

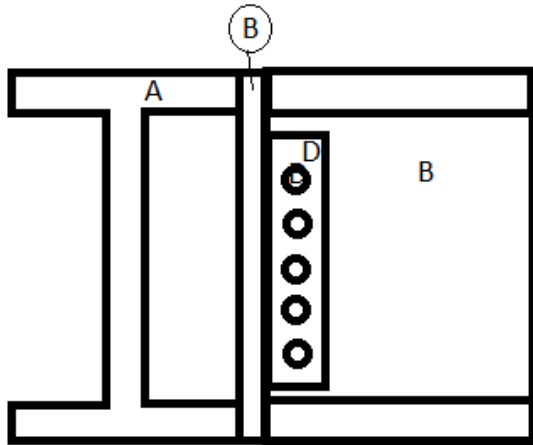
1. Figures a-c show connections with a force being applied at different points. Identify the forces inside the beam by indicating it with arrows.



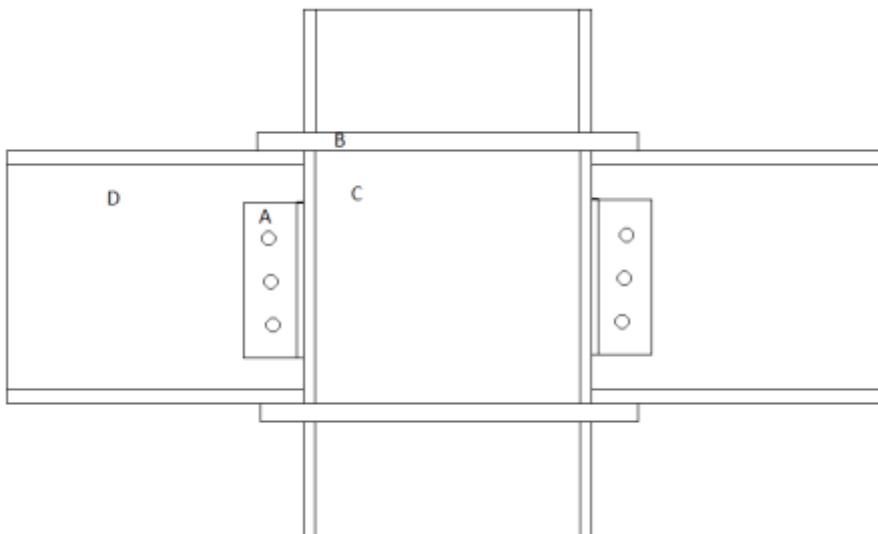
Lesson 40- Beam Connections

1. Identify the connection and indicate the material profile and size for A - D?

1.1



1.2



Lesson 41- Uses of profiles

1. Identify metal structures at school.
2. Take worksheet and identify all the metal profiles used.
3. Discuss why the profiles were used in the structure.
4. Identify where a profile was used incorrectly
5. Where could another profile have been used to minimize the weight of the structure without compromising on the strength of the structure?
(practical activity)

Lesson 42- Joining of Sections

1. Identify 5 types of joints obtained in any profile?
 - Knee brace
 - Welded gantry bracket
 - Plate anchor
 - Welded stay
 - Welded column
 - Beam end
2. Name one permanent joining method?
 - Notching and welding.