Weekly Summary

TAPPER TURNING ON A SHAFT

Tapper turning => Is the process of reducing or increasing the diameter of any material or Is the uniform of increase or decrease of diameter of any material.

Types of tapper
i) External tapper
ii) Internal tapper

i) External tapper
=> Is the type of tapper where by the diameter of any material is decreased.

ii) Internal tapper
=> Is the type of tapper where by the diameter of any material is increased.

Method for tapper turning Surfaces.
i) Compound Slide Method
ii) Forming tool Method
iii) Setting over the tail Stock.
iv) Long tapper holes

Machine Used for tapper turning (tappering) is the LATHE MACHINE

PROCEDURES FOR TAPPER TURNING

i) Set the tool at the Centre.
ii) Hold a jab in a Chuck.
iii) Obtain the Large diameter.
iv) Obtain the Small diameter.
v) Obtain the length of the Material
vi) Obtain the Angle in which you use to make the tapper.
vii) Select one of the method among of the four

methods for tapper turning.

viii) Set ~~the feed~~ at the required angles.

ix) Adjust the machine to run the job at required revolution and obtain the usual Cutting Speed

x) Give the feed and depth of Cut.

xi) Finish Shauld be taking with Slightly increased Speed and fire feed of tool.

FORMULAR FOR TAPPER TURNING

⇒ Tapper turning = $\frac{D-d}{L} \times 29°$

Where by

D = Large diameter

d = Small diameter.

L = Length of the Material

29° = Constant (degrees).

⇒ Note

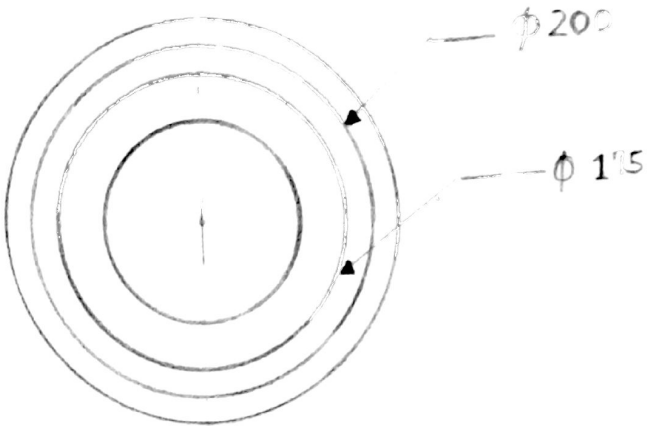
- If Some one is willing to Change the angle then they Can adjust the Compound Slide as they like

Note

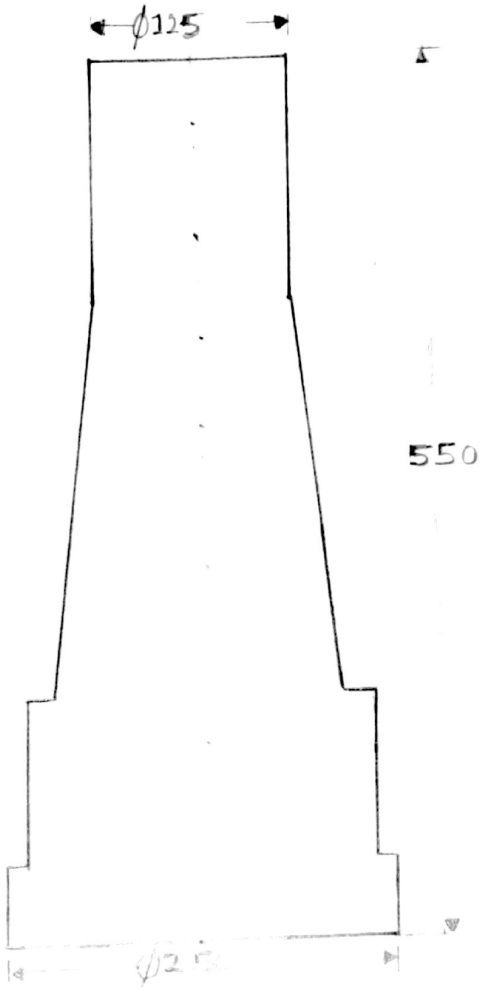
⇒ There are many Standard tapers, which differ based on the following.

- The diameter at the Small end of the truncated Cone (The minor diameter)
- The diameter at the large end of the truncated Cone (The major diameter) and
- The axial distance between the two ends of the truncated Cone.

The Standard are grouped into families that may include different Sizes. The taper within a family may or may not be Consistent.



FRONT VIEW



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MUST P.O.BOX 131, MBEYA.	**TITLE:** TAPERED SHAFT (TAPER TURNING)	IRINGA TECHNOLOGY DEVELOPMENT CENTRE P. O. Box 760 IRINGA	**DRW No:** 01 — **A4**

Weekly Summary

DRILLING OF MAIZE DE-SHELLER STANDS

Drilling ⇒ Is the process of producing or enlarging a hole or is the operation of producing a circular hole using a drill bit as a tool.

Conditions for drilling

- A drill bit material should be harder than that of an object or workpiece.
- Lubricant is applied where neccessary.
- Drilling can be accomplished in some other machine by holding the drill bit stationary and rotating the workpiece
- If the drill bit is small the cutting speed should be higher, also if drill bit is large the cutting speed should be lower.

Machines ~~that~~ can be used in drilling are.

- Lathe machine
- Drilling machine and hand drill machine, But the the most used machine for drilling are hand drill and drilling machine.

Procedures for drilling.

i) Hold the workpiece properly in a vice to prevent it from spinning round.
ii) Set the job or work at the centre.
iii) Select and set the proper tool acording to the hole in which you want to drill
iv) Tight a drill bit at the drill chuck properly.
v) Adjust the machine to run the job at the required revolution and obtain the usual cutting speed.
vi) Give the feed of cut.
vii) Make sure that the drill bed is cleaned of swarf and metal chippings.

Weekly Summary

Tools holding devices for drilling process are:
- Drill Chucks
- Drill Sleeves
- Collet.

Whereby there is types of Shank drill which are
i) Taper Shank drill
ii) Parallel Shank drill.
iii) Jobbers drill

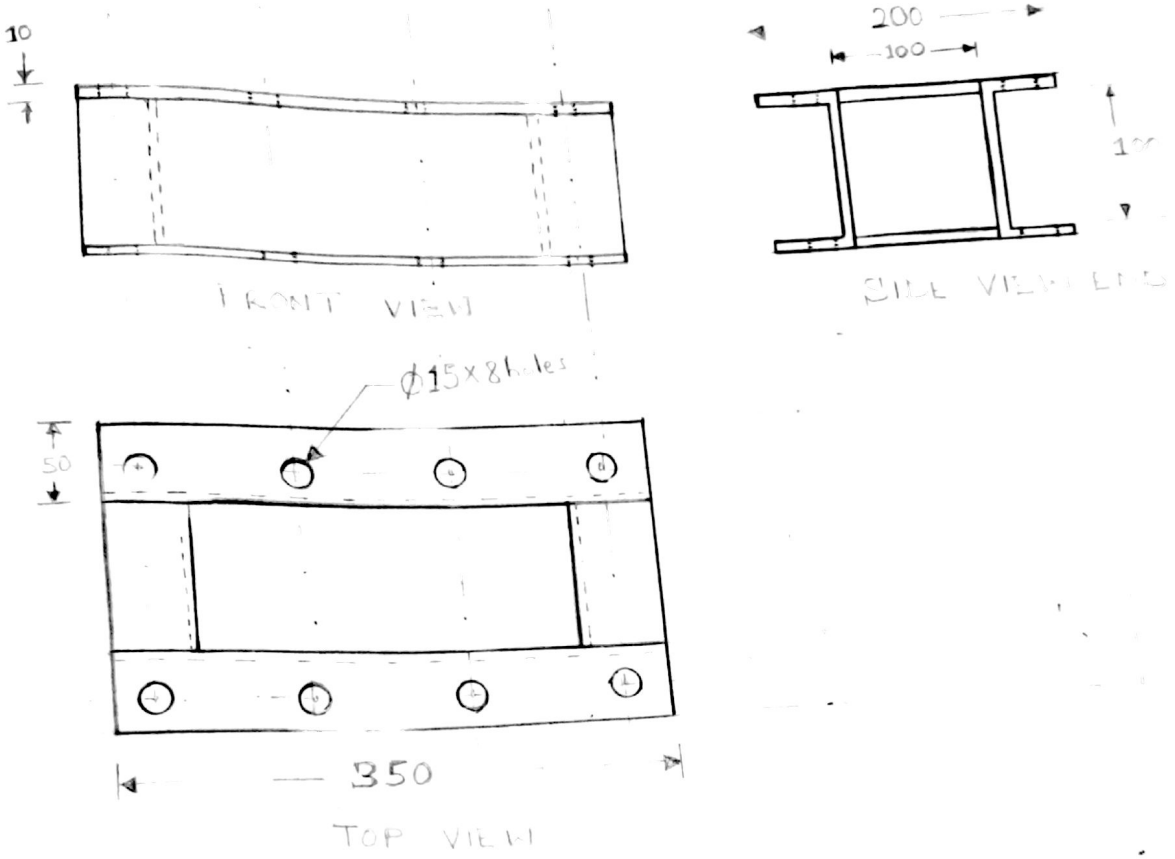
The Improvements of Using Coolant or Lubricant during the drilling process are as:
i) The tool and work are cooled and higher Cutting Speed may be used.
ii) The Cutting fluid (Coolant) helps in Lubricating the Severe rubbing action taking place between the Chip and the top face of the tool.
iii) A heavy flow of Lubricant or Coolant helps to Wash away the Chips and keep the Cutting point Clean.

FORMULAR FOR CUTTING SPEED (DRILLING SPEED)

- Cutting Speed for drilling means the measures of peripheral Speed of the drill bit in metre per minutes

$$C.S = \frac{\pi D N}{1000} \ (m/min)$$

Where
C.S = Cutting Speed (m/min)
D = Diameter in mm.
N = revolution per minutes.



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MUST P.O.BOX 131, MBEYA.	TITLE: MAIZE [illegible] STAND (DRILLING)	DRW No: 02	A4

Weekly Summary

ARC WELDING PROCESS ON A FAN BOX

Arc Welding ⇒ Is the type of welding that uses a welding power Supply to create an electric arc between an electrode and the base metal (Material) to melt the metal at the Welding point

Types of Arc Welding are as
i) Shielded or Stick Welding
ii) Tungsten inert gas Welding (TIG)
iii) Metallic inert gas Welding or Gas Welding
iv) Submerged Welding.

Safety precautions on Arc Welding (during Welding).
- Wear leather boots and leather apron
- Use the Shield during the Welding process (Use helmet).
- Wear goggles and graves when operating the welding processing to prevent hand and eyes
- Keep Combustible materials away from the workplace.
- Donot permit unathorized persons to use welding
- Keep a Suitable fire extinguisher near by at all times. Ensure the fire extinguisher is in operable Condition.
- Mark all hot metal after welding operations are Completed.

Tools/Equipments Used during Welding
⇒ Gloves, goggles, helmet, electrode, Wire brush, Chipping hammer, leather apron, Safety boots, Jigs and fixtures.

Advantages of Arc Welding
⇒ There are number of Using Arc Welding as.
- Cost - Equipment for arc welding is well priced and affordable, and the process often requires less equipment in the first place because of the lack of gas
- Can Work on dirty Metal.

- Portability - These materials are very easy to transport.
- Shielding gas isnot necessary - processes Can be Complete d during Wind or rain, and Spatter isnot a major Concern.

Disadvantages of Arc Welding

There are few reasons Why Some people look to other options beyond arc Welding than many other types, Which Can increase project costs in Some Cases.

- Lower efficiency - More waste is generally produced during arc welding than other types.
- High Skill Level - Operators of arc welding projects need a high Level of Skill and training, and not all proffessionals have this.
- Thin materials - It Can be tough to use arc welding on Certain thin metals.

Voltages Used in Arc Welding process.

- Arc Welding involves open circuit (When not Welding) Voltages Which are typically from as low 20Volts to as high as 100 Volts

Welding Techniques.

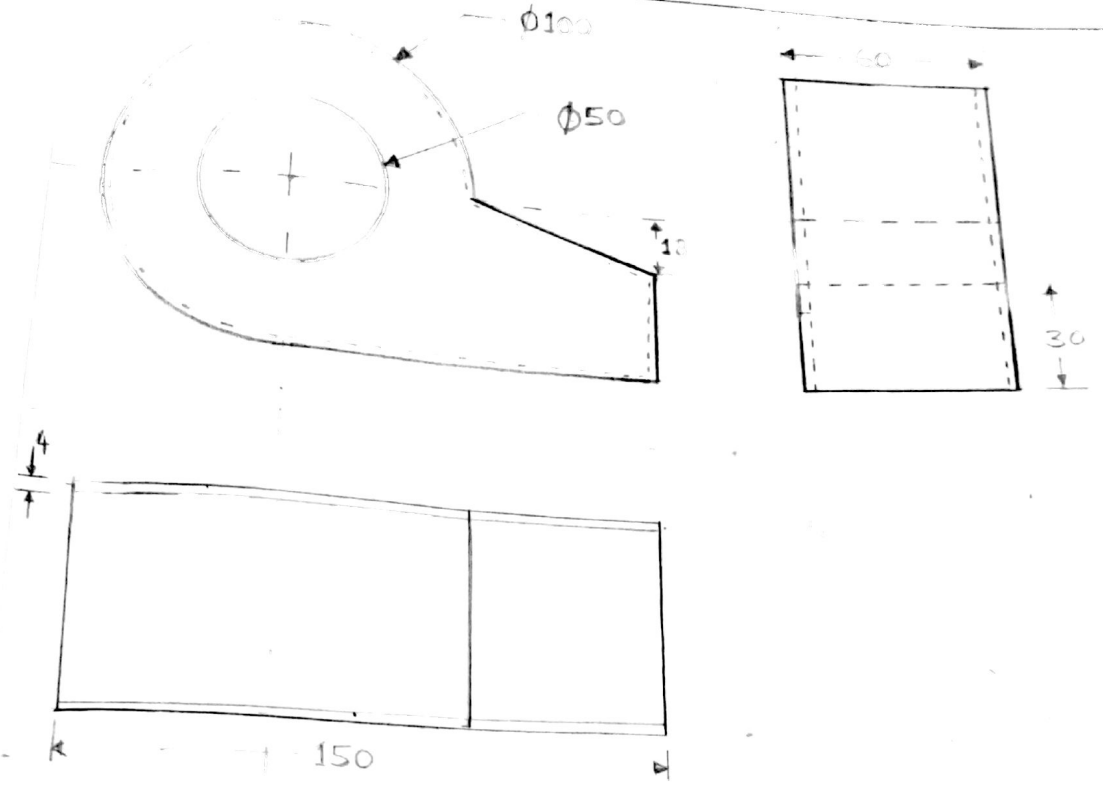
=> During Welding process different techniques Can be Used as:

i) Left Ward technique.

=> The welding is done from right to the left, it is Suitable for Welding Thin metals.

ii) Right ward technique.

=> Here you weld from left to the right. It is Suitable for Welding thick metals.



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IRINGA TECHNOLOGY DEVELOPMENT CENTRE
P. O. Box 760 IRINGA

MAINTEINANCE OF DRILLING MACHINE

Maintainance =P is a Set of organised activities that are carried out in order to keep an item in its best operational Condition with minimum Cost acquired.

Types of maintainance.

There are two types of maintainance which are.

i) Preventive Maintainance
ii) Break down (Corrective) Maintainance.

i) Preventive Maintainance

=P Is a daily maintainance designed to retain the heathy Condition of equipment and prevent failure through the prevention of deterioration, periodic inspection or equipment Condition diagnosis, to measure deterioration.

=P This includes

- Lubrication, Cleaning, Inspection adjusting, Calibration, Minor replacement to extend the life of the equipment and facilities

ii) Break down (Corrective) Maintainance

=P Implies that repairs are made after the equipment is failed and can not perform its normal function any more.

=P This include

- The knocking of the Car engine.

Activities and Actions Performed includes

- Removal and replacement of failed items
- Repair of failed items
- Lubrication of the parts
- Servicing (Includes replacements)

- Fault Isolation
- Fault detection
- Testing equipment.

Objectives of Maintainance

i) Maximising production or increasing facilities availability at the lowest cost and at the highest quality and Safety Standards.
ii) Reducing breakdowns and emergency Shutdowns
iii) Optimising resources utilisation
iv) Reducing downtime
v) Improving Spares Stock Control.
vi) Minimising energy Usage.
vii) Optimising The Useful life of Equipment.

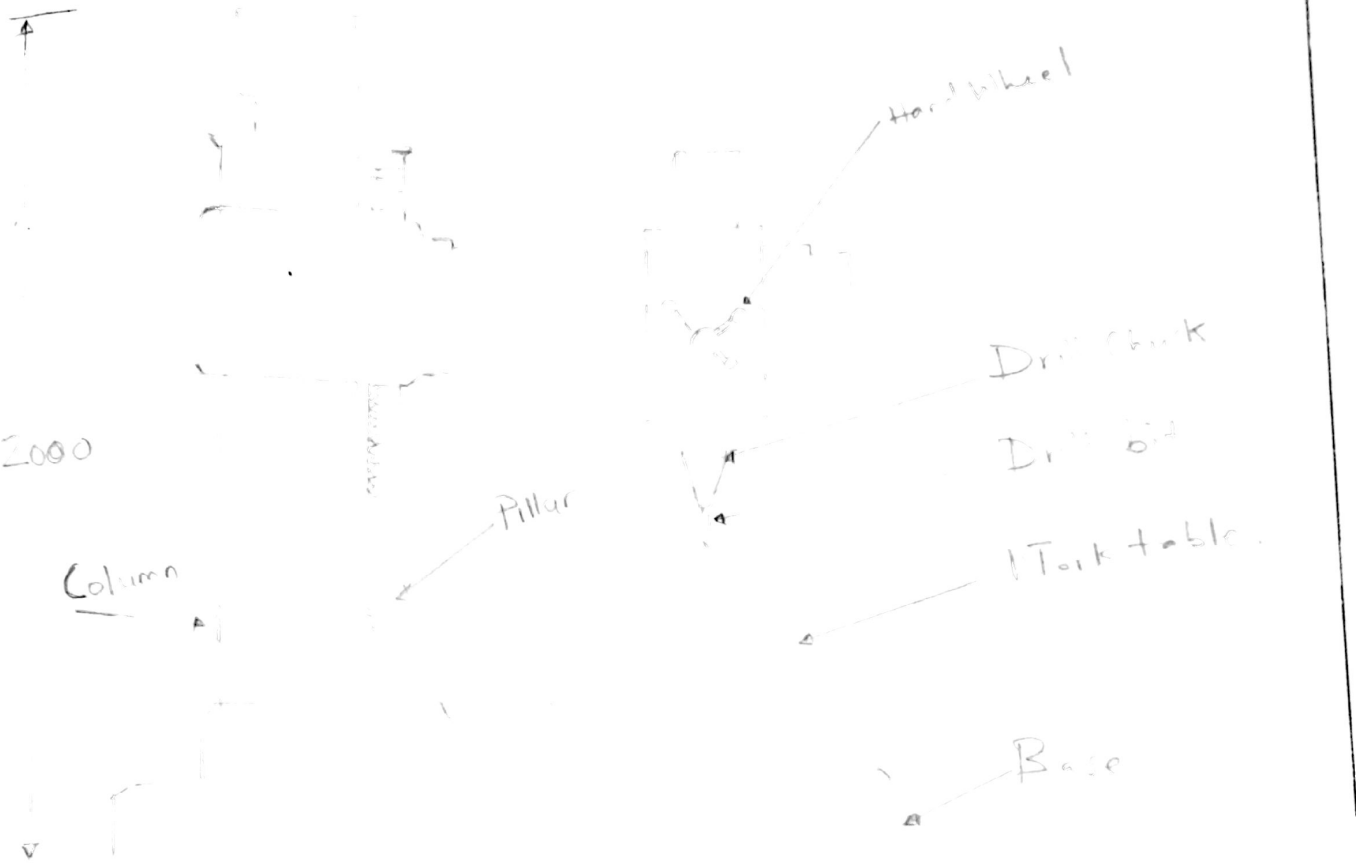
THINGS TO CONSIDER AFTER COMPLETING MAINTAINANCE

Things Which we Supposed to Consider after Completing maintainance operation are as.

- Ensure equipment meets manufactures Specifications.
- Review job hazard analysis to ensure equipment alterations or equipment maintainance did not introduce new hazards
- Conduct machine Checks to ensure all feature especially Safety devices, are functioning properly
- Ensure employees are aware of any Changes to equipment and/or operating procedures.

ADVANTAGES OF MAINAINANCE

i) Less risk factor in working places
ii) Longer equipment/building life
iii) Money Saving - over time (You will see that less money is being Spend because you will not have to replace as much)
iv) Less energy Wasting and Less disruptions.



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MUST P.O.BOX 131, MBEYA.	**TITLE:**	**DRW No:** 04	**A4**

IRINGA TECHNOLOGY DEVELOPMENT CENTRE P. O. Box 760 IRINGA

BORING OF PULLEY CENTRE HOLE

Boring => Is the process of enlarging a hole that has already been drilled (or cast), by means of a single-point cutting tool (or of a boring head containing several such tools), for examples as in boring a cannon barrel. Boring is used to achieve greater accuracy of the diameter of a hole, and can be used to cut a tapered hole.

Types of boring

There are various types of boring. The boring bar may be supported on both ends (which only works if the existing hole is a through hole). or it may be supported at one end

i) Line boring (Line boring) :
   => Implies the former

ii) Back boring
   => Is the process of reaching through an existing hole and then boring on the "back" side of the workpiece (relative to the machine headstock).

Types of Boring Machines

Boring Machines are of two types which are.
i) Horizontal boring and drilling machine and
ii) The Vertical boring and turning mill

Methods of Locating holes in JIG boring Machine

- Lead Screw Method
- Mechanical and electrical gauging
- Optical Measuring Method.

Condition for boring is

=> Since boring is an operation quite similar to turning, the same type of cutting conditions could be considered.

Cutting tool for boring

When boring with a rotating tool Size is is Controlled by changing the radial position of the tool side, which hold the boring bar with respect to the Spindle axis of rotation. For finishing machining, the boring bar is additionally mounted in an adjustable boring head for more precise Control of the bar radial position

The prime factors to be Considered for Succesful boring are.

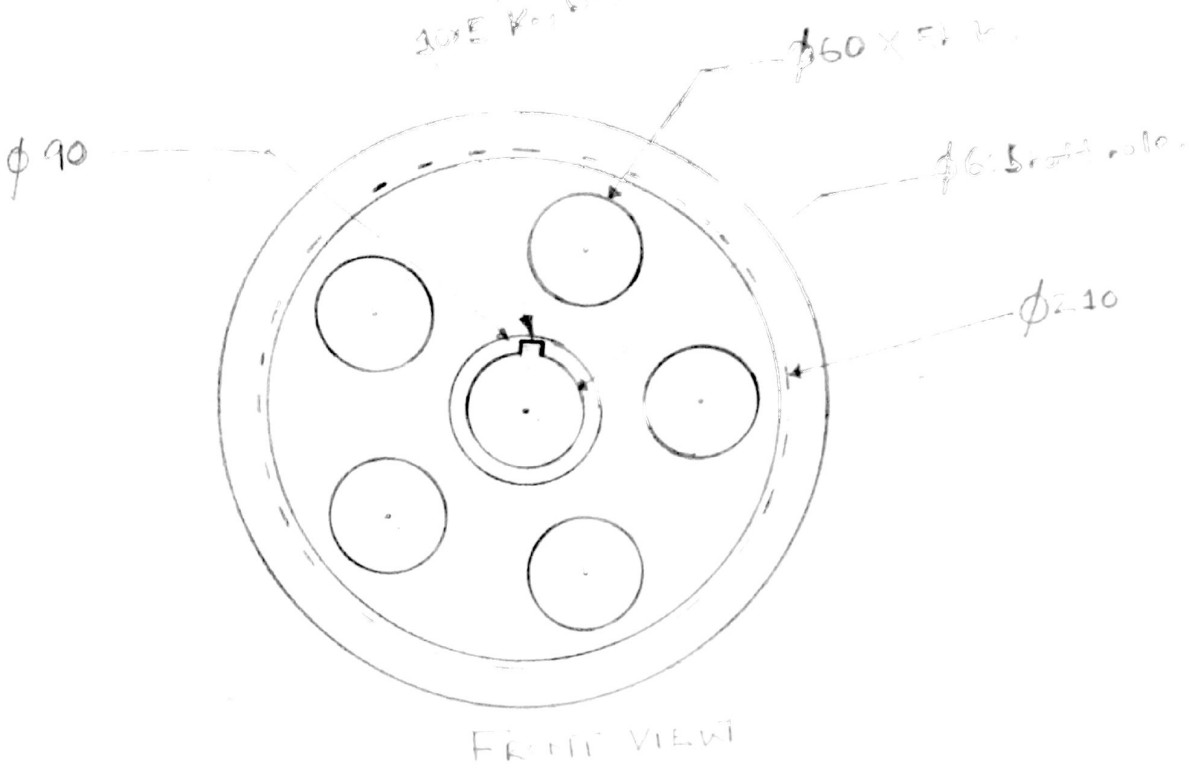
i) Tool overhang.
ii) Geometry
iii) Speeds and feeds
iv) Chip Control
v) Coolant.

Suggestions for Better Boring head performance

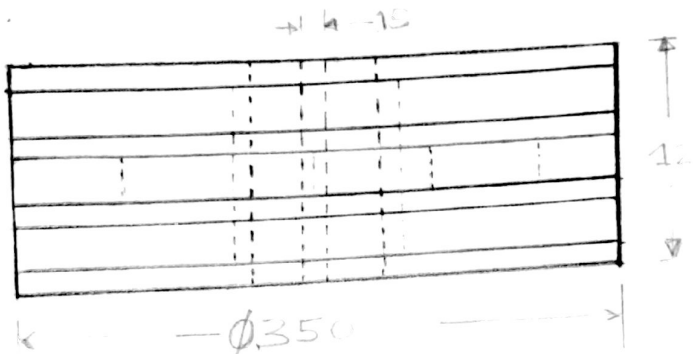
1) Cutting edge of tool must be on centre line
2) Tool Sharpness for boring is more Critical than for O.D works
3) Keep tool overhang to a minimum to maximize its rigidity
4) Use power feed whenever available
5) Make allowances for "Spring" or deflection when taking a heavy cut. Additional material will be removed on finish Cut even though an additional adjustment has not been made.
6) When using Carbide, avoid reversing or Stopping the Spindle in the middle of a Cut. This can Cause Chipping or breakage.
7) For best Surface finish Spindle Should be turning while tool is being ~~not~~ retracted from the bore.
8) Avoid bottoming out in blind hole. A boring tool is not designed for end Cutting.

In order of Importance regarding the elimination of Chatter, Consider the foll

i) Surface feet per minute ii) Feed per revolution
iii) Depth of Cut.



FRONT VIEW



TOP VIEW

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MUST P.O.BOX 131, MBEYA	TITLE: PULLEY (BORING)		DRW No: 05

TURNING PROCESS ON MAIZE DE-SHELLER INTERNAL SHAFT.

Turning ED Is the process where undesired material is removed from a rotating workpiece in a form of chips with a help of tool which is transwersed across the work and can be feed deep in a work

Condition for turning

- The material should be harder the workpiece
- The tool may be given in linear motion in any direction
- Lubricant should be applied due to heading where recommended.

Machine Used for turning

- Turning process can be done (operated) only in the Lathe Machine

Advantage of Using Lubricant during turning

i) The tool and workpiece are cooled and higher cutting speed may be used.
ii) The cutting fluid help in lubricating the severe rubbing action taking place btn the chips and the top face of the tool.
iii) A heavy flow helps to wash away the chips and keep the cutting point clear.

Steps for turning.

i) Hold a job in a chuck.
ii) Face the projecting end of the work
iii) Drill a centre hole at other end.
iv) Fix a centre in the tailstock sleeve apply grease on the tip of the centre and support the work.

v) Run the work or adjust the machine to run the job at required revolution and obtain the usual Cutting Speed.

vi) Traverse the tool longitudinally to the required length using the Carriage hand wheel

vii) Return the tool to the start and take another depth of Cut.

viii) Engage the automatic feed if present to traverse the tool to the length

N:B: Depth of Cut; Means radial distance btn unmachined and machined surface.

The Speed at which material may be turned depends Upon the following factors.

i) The material being Cut.

ii) The rigidity and Condition of the machine and the rigidity of of the Work.

iii) The material of which the tool is made.

Cutting Speed: means the number of metres measured on the Circumference of job that passes the Cutting edge of a tool in a one minute.

$$\text{Cutting Speed (C.S)} = \frac{\pi DN}{1000} \left(\text{m/minute} \right)$$

Where by:

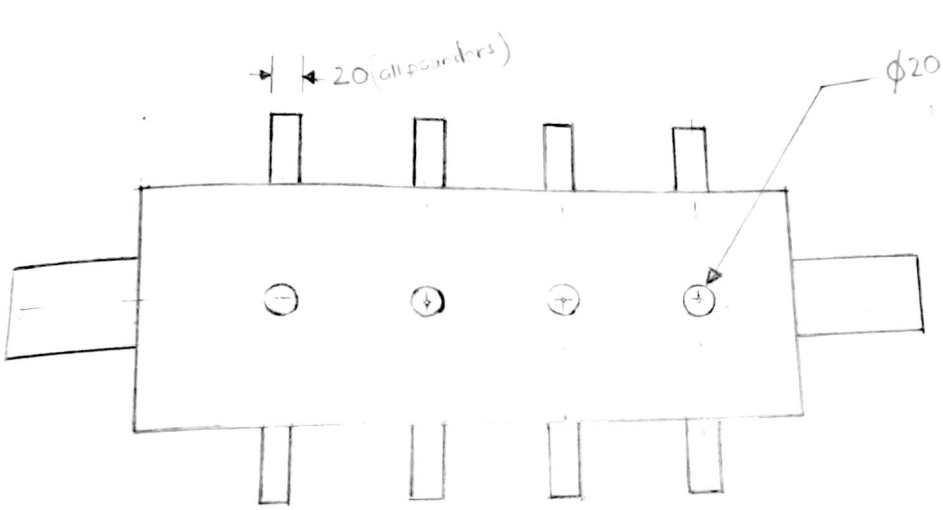
D - Diameter of a workpiece

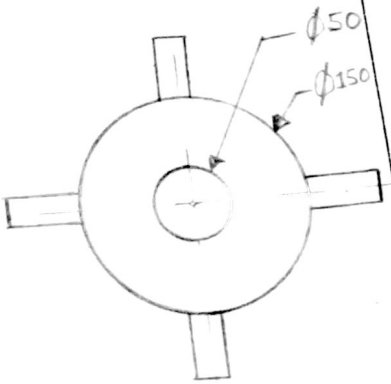
N - Number of RPM or Spindle Speed.

π - Pie $(22/7)$ or (3.14)

Feed - ~~Amount~~ of a tool advancement per revolution of the job parallel to the ~~Spindle~~ Surface being machined.

N.B: During The turning process the tool post Should be in ninety angles degree and tool ~~parallel~~ perpendicular to the work.





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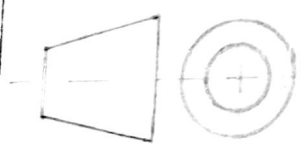	DIMENSIONS:	NTA LEVEL UGF 7B	
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MUST P.O.BOX 131, MBEYA.	TITLE:	DRW No: 06	A4

Weekly Summary

SAWING OF TROLLEY BUSHES.

Sawing ⇒ Is the process of cutting components, Stocker materials. This process is done by using either hand hacksaw or power hacksaw.

Hand hacksaw :- Is the type of hacksaw where by the materials are to be cut by using hand.

Power hacksaw - Is the type of hacksaw where by the materials are to be cut by using machine power.

Procedures of Sawing.

i) Hold a job or work in a vice.
ii) Select the proper blade according to the nature of the material to be cut.
iii) Make sure that atleast three consecutive teeth should be in contact with the materials.
iv) When installing the blade it should be placed upon the frame
v) Tight the blade to the proper tension so that the blade is rigid without receiving too much strain
vi) When using hacksaw, start cutting on the widest surface of the workpiece

Hacksaw blades have teeth from 14-32 per inch (TPI) Using a blade with wrong number of teeth may lead to breakage of teeth of blade.

The blades are made of alloy - steel mostly high speed steel (HSS).

Classification of blades.

i) Coarse blades (Teeth per inch 14 - 18)
ii) Fine blades (Teeth per inch 24 to 32).

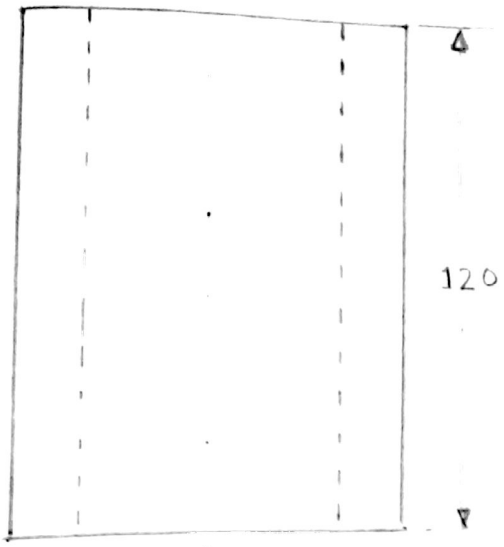
Saw teeth for different Materials.

Teeth/25mm	Materials to be Cut.
14	-For Solid Sections of Soft Materials.
18	-Suitable for general Uses. - Solid Section for Soft materials and large Sections of hard materials (eg: alloy Steel).
24	- Small Solid Sections between 3mm and 5mm (eg: heavy duting and Sheets)
32	- For Sections less than 3mm thick

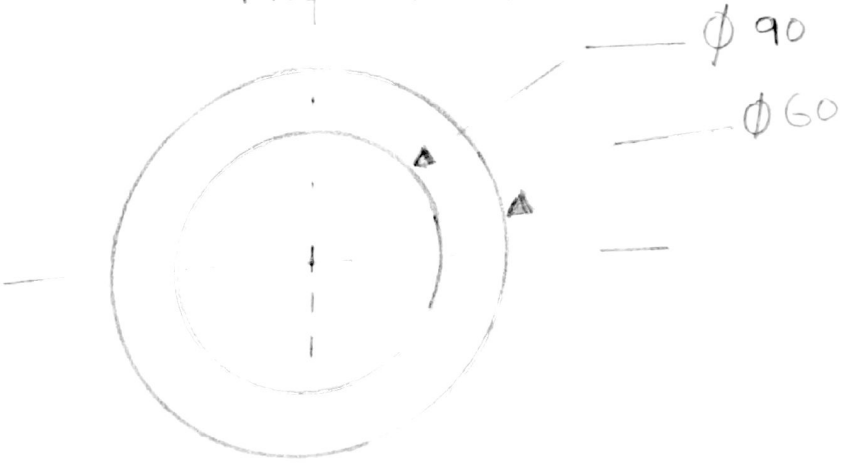
Two Important factors in the Choice of the blade are.
i) The pitch or distant between each tooth.
ii) The material from which the blade is made.

During Sawing Consider the table for Material Thickness Hard Materials and Soft material for proper operation of the blade or for prevention of blades from breakage Now for:-

Material Thickness (in mm)	For Hard Material (Teeth per Inch)	For Soft Material (Teeth per Inch)
0 Up to 3	32	32
3 Up to 6	24	24
6 Up to 13	24	18
13 Up to 25	18	14



FRONT VIEW



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MUST P.O.BOX 131, MBEYA.	TITLE: BUSH (SAWING)	DRW No: 07	A4

GRINDING OF HOPPER

Grinding is the most common form of abrasive machining. It is the material cutting process which engages an abrasive tool whose cutting elements are grains of abrasive material known as grit. (For fixed grinder machines)

OR

Grinding - Is an abrasive machining process that uses a grinding disk / wheel as the cutting tool, to reduce the roughness from the material or from the surface or machine into the fine or smooth surface (By using portable grinding machine or grinder).

Advantages of of Grinding

- Good Surface finish of the work/machine/machine part.
- Dimensional accuracy
- Good form of and Location accuracy.
- Applicable to both hardened and unhardened material.

Application of Grinding

- Surface finishing
- Sitting and parting
- descalling deburring
- Stock removal (Abrasive milling).
- finishing of flat as well as Cylindrical Surface.

Pre-Operational Safety during the Grinding process-

1. Use only in designated grinding area
2. Examine the power cord, extensions lead plugs, Socket and power outlet for damage
3. Ensure That the grinding disk, guard and attachments (Including handle) are Secure and Correctly fitted.
4. Inspect the grinding disc for damage. Do not use damaged grinding disc

5. Always inspect the work place to ensure that there are no any items which might damage the grinding disk or cause the injuries to the operator.
6. Secure and Support the work place Using Clamps, bench vices etc.

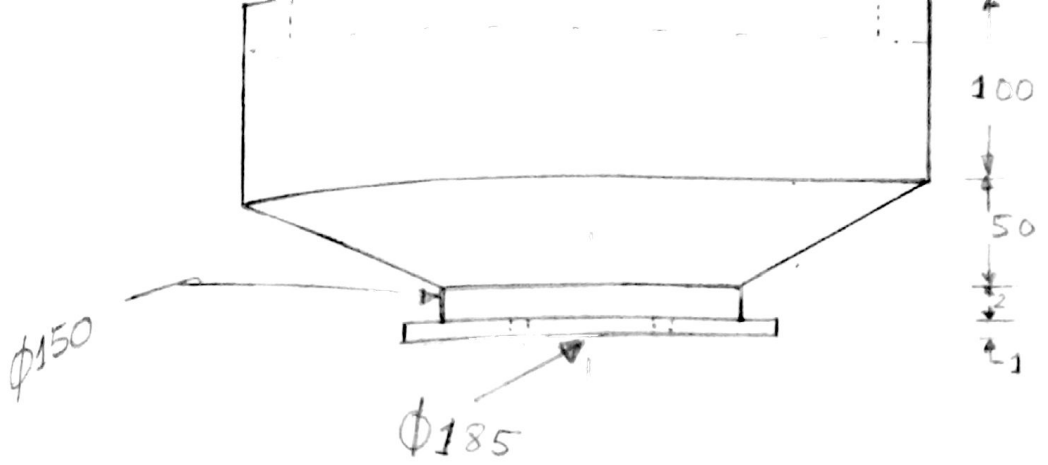
Types of Grinding Operation

1. Ruff ~~or precision~~ grinding
   a) Snagging
   b) off - hand.

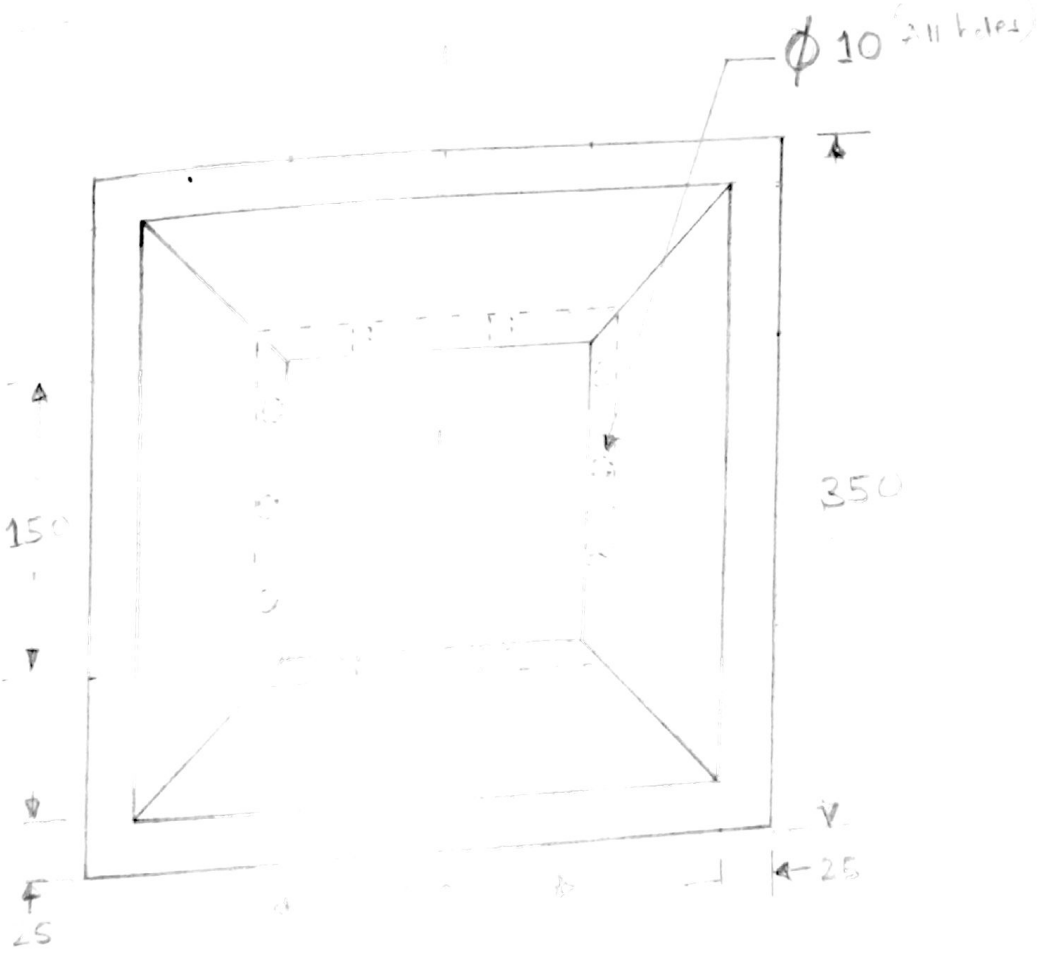
2. Precision grinding
   (a) Surface (b) Cylindrical (c) Center less grinding d) Form and profile grinding e) Plunge Cut grinding.

Procedures of Grinding / Operational Safety checks during Grinding.

1. Ensure all other Students are clear of immediate Work area.
2. Keep fingers and hands & power Cords Clear of the grinding disk.
3. Never make adjustments while the angle grinder is running
4. Donot Switch off the ~~the~~ angle grinder when it is under the load, except in an emergency.
5. Allow grinder to reach operating Speed before applying to Work piece and increase load gradually
6. Donot lift or drag angle grinders by The Cord.
7. Keep flexible electrical Cords Clear of oil, grease, machines and Sources of heat.
8. Be aware of flying Sparks. hold grinder So that Sparks fly away from you, other people and flammable materials
9. Donot leave the angle grinder running and only use the grinder when hand held.
10. Donot touch the Work place immediately after grinding operation as it may be extremely hot.



FRONT VIEW



TOP VIEW

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MUST P.O.BOX 131, MBEYA.	TITLE: HOPPER (GRINDING)	DRW No: 08	A4

GAS WELDING PROCESS

Gas welding => Is the welding process that melts and joins metals by heating them with a flame caused by reaction of fuel gas and oxygen.

Types of Gas Welding

1. Oxygen fuel Gas Welding (OFW) (Oxy-fuel)
=> Is a group of welding processes which join metals by heating with a fuel gas flame or flames with or without the application of pressure and with or without the use of filler metal

2. Oxygen - Acetylene (Oxy-Acetylene).
=> Is the type of gas welding which known as fusion welding performed by a high temperature flame from Combustion of acetylene and Oxygen.

Equipments Used during gas Welding (Gas Welding Equipments)

1) Gas Cylinders.
Pressure
Oxygen - 125 kg/cm²
Acetylene - 16 kg/cm².

2) Regulator
- Working pressure of Oxygen 1 kg/cm²
- Working pressure of acetylene 0.15 kg/cm²
- Working pressure ~~of variety~~ Vaines depends upon the thickness of the work places welded.

3) Pressure gauges
4) Hoses.
5) Welding torch
6) Check Valve.
7) Non return Valve.

Gas Welding Techniques

There are two gas Welding techniques which are.
1) Fore hand Welding - Welding in right side (from left to Right
2) Back hand Welding - Is the Weld technique from righthand side to the left hand Side

Advantages of Gas Welding.

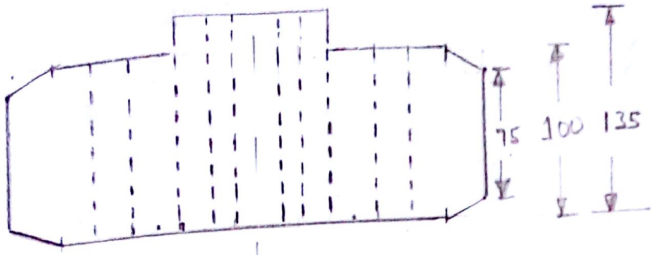
- It is probably the most versatile processes. It Can be applied to a wide Variety of manufacturing and maintainance Situations.
- Since the Sources of heat and ~~of~~ filler metal are Separate the welder has Control over filler - metal deposition rates.
- The equipment is versatile low Cost, Self - Sufficient and usually portable.
- The Cost and maintainance of the welding equipment is low when Compared to that of Some other welding processes.

Disadvantages of Gas Welding.

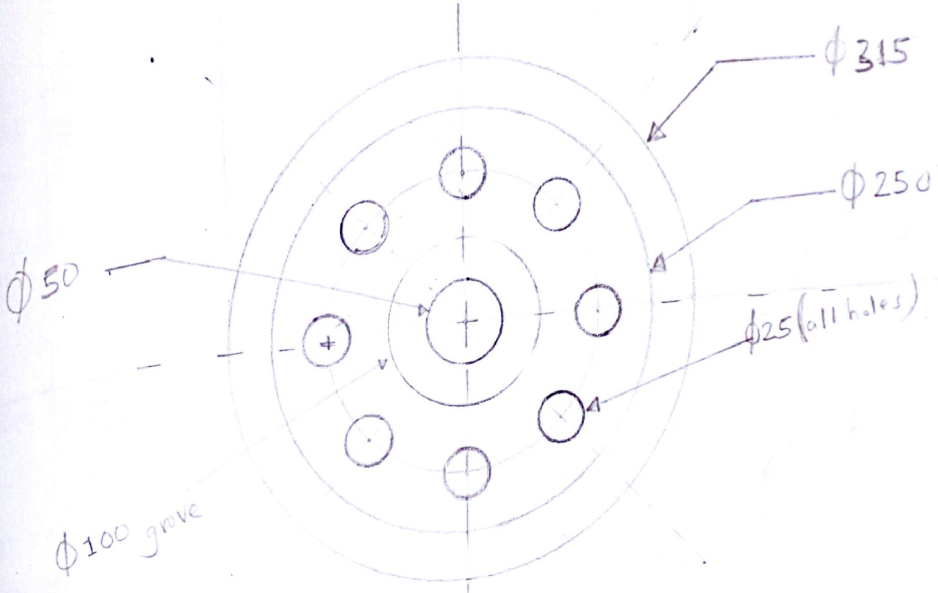
- Heavy Sections Cannot be joined economically
- Flame temperature is less than the temperature of arc.
- Fluxes used with Certain Welding and brazing operations produces fume that are irritating to the eyes, nose, throat and lungs.
- Refractory metals (eg: tungsten, Molybdenum, tantalum, etc) and reactive metals (eg titanium and zirconium) Can not be gas Welded).
- More Safety problems are associated with the handling and Storing of gases.

Types of flames that are Used in Gas Welding are.

1. Carburizing flame
2. Neutral flame
3. Oxidizing flame.



FRONT VIEW



TOP VIEW

PROJECTION	SCALE: 1:5	DRAWN BY: KARIM B. KAVINDI	SCORE
	DIMENSIONS: mm	NTA LEVEL UQF 7B	
	DATE: 17/11/2017	CHECKED BY: SIDO	
MUST P.O.BOX 131, MBEYA.	TITLE: FAN PLATE (GAS WELDING PROCESS)	DRW No: 09	A4

IRINGA TECHNOLOGY DEVELOPMENT CENTRE P. O. Box 760 IRINGA

BENDING OF SHEET METALS

Bending ⇒ Is the straining of metal around a straight axis. The metal on the inside of the neutral axis is compressed (length decrease) while the metal on the outside of the neutral axis is stretched (length increase).

Types of bending.

1) V-bending
⇒ Is the type where by the sheet metal blank is bent between a V-shaped punch and die.

2) Edge or Wipe bending.
⇒ Edge or wipe bending involves cantilever loading of the material.
⇒ Pressure pad is used to apply a force to hold the blank against the die, while the punch forces the workpiece to yield and bend over the edge of the die.

Bending Operations

There several bending operations which are as:,
(a) Channel bending (b) U-bending (c) air bending (d) offset bending (e) Corrugating (f) Tube forming (g) Straight (h) Stretch flanging (i) Shrink flanging (j) Hemming (k) Seaming (l) Curling.

Advantages of bending process by bending machine

- In air bending different bend angles can be produced by adjusting the punch travel alone into the die, without the need for tool changes and this makes the technique more flexible than closed die bending.
- Provide the face to the designed part of machine
- Provide the fine / smoothness to the bend,
- To obtain the desired Angle / Shape of the machine part and the reduce of welded part

Weekly Summary

Bending Allowance formula's in Bending process:

$$A_b = 2\pi \frac{\alpha}{360} (R + K_{ba} t)$$

Where by:

A_b = bend Allowance
α = Bend Angle
R = Bend radius
t = Stock thickness
K_{ba} = factor of estimate Stretching

but

- If $R < 2t$, $K_{ba} = 0.33$
- If $R \geq 2t$, $K_{ba} = 0.50$.

Methods of eliminating Springback during bending process. are as:

1. Overbending
2. bottoming the punch
3. Stretch forming

Factors influencing Springback are as

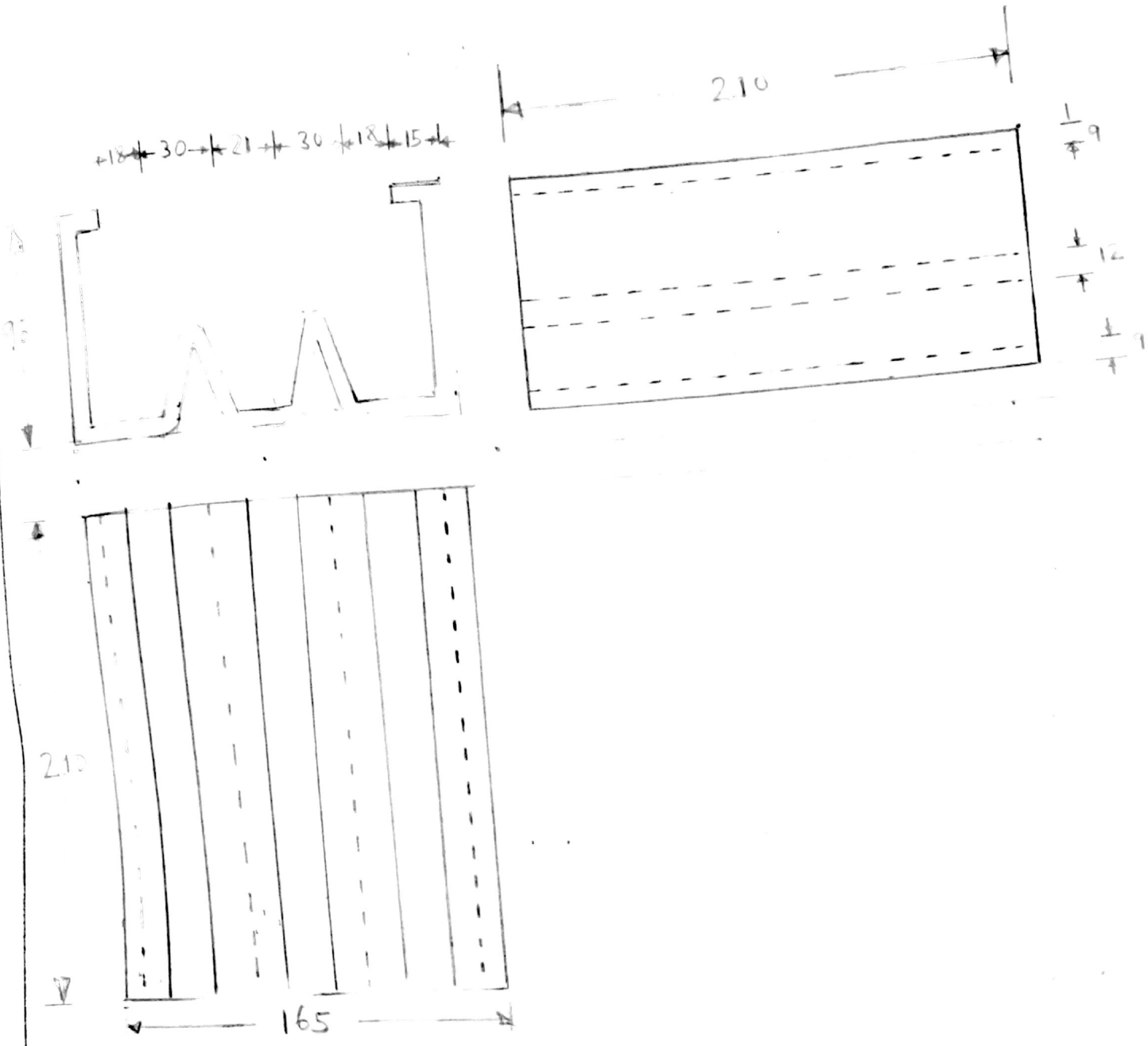
i) Material properties (Yield Strength, Strength Coefficient etc)
ii) Sheet metal geometry (thickness, width)
iii) tooling dimensions (punch radius, die radius, die opening
iv) process parameters (punch travel, punch velocity).

Bend force: formular.

$$P = \frac{K(\sigma_u) L t^2}{W}$$

Where by:

K = Die opening factor
W = Die openi
σ_u = Ultimate tensile Strength
L = Length of the bend
t = Sheet thickness



PROJECTION	**SCALE:** 1:3	**DRAWN BY:** KARIM B. [illegible]	**SCORE**
	DIMENSIONS: mm	**NTA LEVEL** UQF 7/8	
	DATE: 24/9/2017	**CHECKED BY:** SIDO	
MUST P.O.BOX 131	**TITLE:** SHEET METAL		**DRW No.**

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