PROMOTING PRODUCTIVITY THROUGH WORK - STUDY

Project Report 1998 - 99

Submitted by
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MIE,FIV,C.Engg(I),MISTE

In partial fulfilment of the requirements
for the award of the Degree of
BACHELOR OF ENGINEERING
in Mechanical Engineering Branch
of Bharathiar University, Coimbatore

Department of Mechanical Engineering
Kumuraguru College of Technology
Coimbatore - 641 006

Dedicated
To our Beloved
Parents, Teachers & Friends

DEPARTMENT OF MECHANICAL ENGINEERING

KUMARAGURU COLLEGE OF TECHNOLOGY
COIMBATORE – 641 006.

Certificate

This is to certify that the Project Report entitled
"PROMOTING PRODUCTIVITY THROUGH WORK-STUDY"
Is a bonafide record of the project work submitted by

Mr._____Register No._____

In partial fulfillment for the award of the degree of

Bachelor of Engineering
In Mechanical Engineering

Branch of the Bharathiar University, During the academic year 1998 – 99.

Head of the Department

K. Kandasamy
Guide

Submitted for the University Examination Held on 16.3.99

Internal Examiner

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CERTIFICATE

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This is to certify that the following students :

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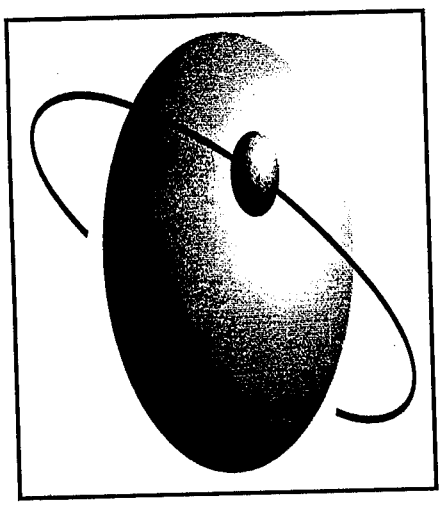
3. G.Gopalakrishnan

Studying final year class of B.E.(Mechanical) in **KUMARAGURU COLLEGE OF TECHNOLOGY** have successfully completed the project work titled **"PROMOTING PRODUCTIVITY THROUGH WORK STUDY "** in our company. They have evinced great sincerity and discipline throughout the course of their project work.

This project work is done in partial fulfillment for award of Bachelor of Engineering.

(GENERAL MANAGER)



SYNOPSIS

SYNOPSIS

This project " **PROMOTING PRODUCTIVITY THROUGH WORKSTUDY**" was carried away at **GEDEE WEILER** private limited, Vellalore Road, Podanur, Coimbatore.

The aim of the project work was to increase the output of the fabrication shop with negligible increase in resources like men, money, material, machine etc.

Work-study was selected as the management tool for improving the productivity.

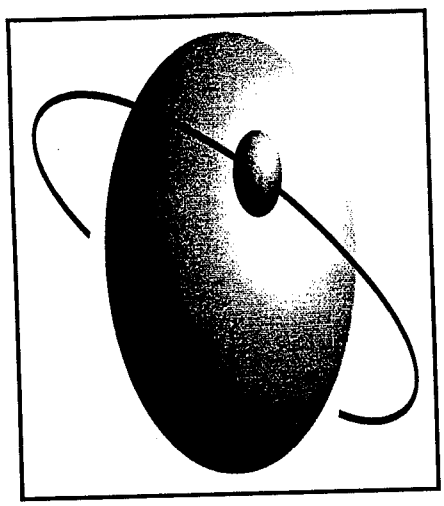
In this project work, the existing method of manufacture of the selected job namely cabinet-LZ350 was recorded. The existing method was analysed using Questioning Technique and the new method of manufacture was designed , which saved considerable time of fabrication , by about 12 man-hours.

This was being done with negligible additional investment.

The existing layout was thoroughly analysed for material flow and backtracking using questioning technique. From the analysis an improved

layout was developed, which saved material movement by around 70 percent.

The new method was also implemented and tested. That is, a fixture was designed and fabricated and a cabinet was fabricated as per our procedure successfully.



ACKNOWLEDGEMENT

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We are grateful to our principal, Dr.K.Padmanaban and Dr.T.L.Seetharamarao, Professor and H.O.D of Mechanical Engineering Department for providing all the necessary facilities.

We take the privilege to express our deepest gratitude to our guide Prof.K.Kandaswamy who has given us valuable guidance and help based on his vast industrial knowledge and experience.

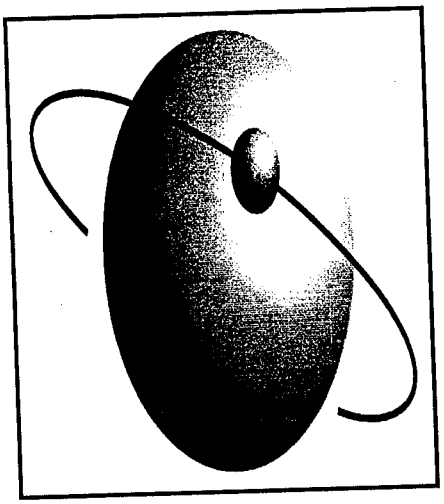
We also express our thanks to all the staff members of the Mechanical Engineering Department for their help rendered during the project.

We express our sincere and heartfelt thanks to Mr.G.Rajendran General Manager of GEDEE WEILER (P) Ltd., Coimbatore, for giving us the permission to do the project in their esteemed concern.

We are indebted to Mr. G. Naveen Kumar Shenoy, Manager, Fabrication shop and Mr. T. Paul Devanesan, Supervisor, Fabrication shop.

We also thank other workers of Fabrication shop for their kind cooperation.

We take this opportunity to thank our friends who helped us in preparing the project report.



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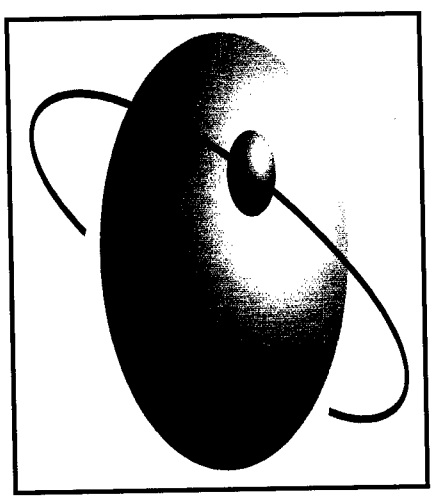

INTRODUCTION

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The project was being undertaken in the fabrication shop at GEDEE-WEILER (Pvt.) limited, Vellalore Road, Podanur, Coimbatore.

This project particularly aims at increasing the daily production of the lathe cabinets by the fabrication shop without a remarkable increase in the input resources.

The fabrication shop at Gedee-Weiler (Pvt.) limited manufactures six types of cabinets. The six types of lathes namely LZ-250, LZ-350,and D-25, CNC Slantbed, RDU and watch case lathe. Out of this LZ-350 alone comes into the purview of this project.

The layout of the fabrication shop was also improved, after conducting method study.

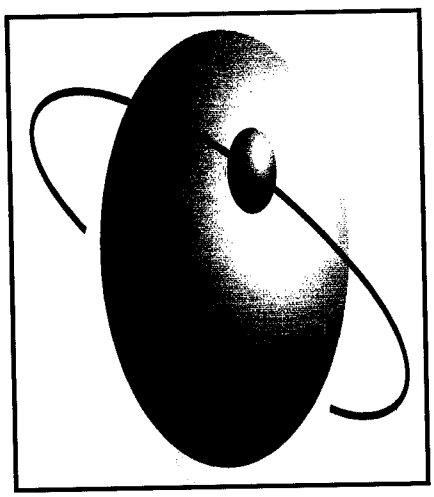
A welding fixture was also designed to reduce the time taken to fabricate one cabinet.

The cabinet comprises of many components to get it to final shape. Based on the functions the components are being named. A component itself

sometimes has to be fabricated to finally incorporate in the cabinet. The important components are listed below :

COMPONENTS OF LZ-350

1. Head stock box.
2. Tail stock box.
3. Top tray.
4. Bottom tray.
5. Back plate.
6. Strips.
7. Bed plate on each box.
8. Two doors and
9. Wire pipe.



METHOD STUDY

METHOD STUDY

Method Study is the systematic recording and critical examination of ways of doing things in order to make improvements.

It consists of the following steps:

1. Select
2. Record
3. Examine
4. Develop
5. Install
6. Maintain

SELECT

While selecting a job to be studied the following three factors are considered.

They are

* **Economic Consideration**
* **Technical Consideration**
* **Human reactions**

ECONOMIC CONSIDERATION:

It is very important at all stages. The job selected should be worth studying.

The economical benefit of study must be greater than the amount of money spend.

The jobs with the following features may be selected from the economic point of view.

1. High manufacturing cost.
2. More material handling.
3. Repetitive jobs.
4. Low production rate.

TECHNICAL CONSIDERATIONS:

All technical details about the job to be studied shall be available. Otherwise the improvements suggested by the method study may not be feasible.

For example for bending of 8mm sheet we must want to consider that the technical factors such as capacity of machine to take up the load. Thus in selecting a job for study, technical feasibility is also considered.

HUMAN REACTIONS:

Human tendency is to resist any change at first. Hence emotional reactions at all levels of people (Management, Supervisors and Workmen) to the method study have to be considered.

The workmen may resist study because of the fear of

(i) Unemployment

(ii) Increased workload.

(iii) Reduction in comfortable working conditions and

(iv) Loss of prestige.

The supervisors may not also co-operate with the study because of their feeling that

(i) their prestige will be lost.

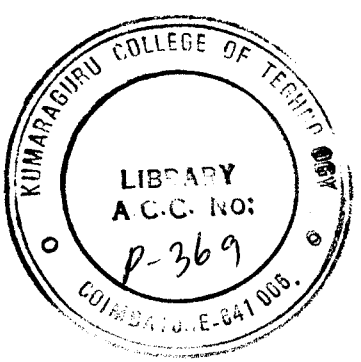
(ii) The work study man will take away their authority .

(iii) The workman will give more respect only to workstudy man .

Therefore everyone shall be well instructed about the objective of study and his or her confidence shall be gained. After all this we conduct the workstudy.

SELECTION OF THE CABINET MODEL LZ-350:

- Out of the six type of lathes mentioned earlier, the fast moving variety is LZ-350.
- It involves maximum of material handling out of all the types.
- It takes the longest time for fabrication out of all the types.
- Since it is fast moving, the revenue and profit from this type is high which is an important factor under economic considerations.



RECORD

OUTLINE PROCESS CHART

An outline process chart is a chart on which sequence of only operations and inspections involved process is recorded.

It is a valuable chart to obtain overall picture of a manufacturing process before taking up a detailed study.

Operation process chart for making LZ-350 cabinet fabrication.

Charting Conventions of Outline process chart

A few conventions used in the chart are listed below.

1) The chart should carry a title at the top. It includes the name of chart, subject charted, present or proposed method, process description etc.

2) The operations that are performed are charted on the extreme right side of the paper.

3) Vertical flow lines are used to indicate the sequence of events, here process chart symbols are used.

4) Horizontal flow lines feeding into the vertical lines are used to show the description of purchased material.

5) To the right of the symbol a brief description of the event is recorded. To the left of the symbol, the time required for the operation is recorded.

6) Operations taking place are numbered in one serial order in accordance with sequence.

7) After completion of the chart a summary of the chart is given at the end of chart. The summary contains the total number of each activities and time taken for the performance of all events.

Operation process chart for making final cabinet fabrication is shown in the figure.

FLOW PROCESS CHART:

A flow process chart is a chart on which the sequence of all operations, transportation's, inspections, delays and storage's occurring during a process are recorded.

The purpose of the chart is to study the sequence of all events occurring to a single components, operator or equipment.

There are three types of flow process chart.

- **Material type** flow process chart.

  This is a chart, which records what happens to materials.

- **Operator (Man) type** flow process chart.

  This is a chart, which records what the operator does.

- **Machine type** flow process chart.

  This is a chart, which records how the equipment's is used.

Here a material type flow process chart is constructed to study what is done for final cabinet assembly.

Flow process chart as a means of examining critically the job concerned with a view to developing an improved method, there are some points which most always be remembered in the preparation of process chart. There are important because process charts are the most useful tools

in the field of method improvement, whatever techniques may be used later, the making of a process chart is always the first steps.

1) Charting is used for recording because it gives a complete picture of what is being done and helps the mind to understand the facts and their relationship to one another.
2) The details, which appear on a chart, must be obtained from direct observations.
3) To maintain their value for future reference and to provide as complete information as possible all charts should carry a heading giving the following information.
    a) The name of product, material or equipment charted
    b) The job or process being carried out, clearly stating point and the end point and whether the method is the present or the proposed one.
    c) The location in which the operation is taking place.
    d) The observer's name and if desired that of the person approving the chart.
    e) A summary of distance, time and if desired cost of labor and material, for comparison of old and new methods.

By keeping the above points in mind we have constructed a material type flow process chart for final cabinet fabrication.

Flow process Chart	Material Type
Chart No. 1 Sheet No. 1 of 3	Summary
Subject Charted :	
Activity : Fabrication of cabinet - LZ 350	
Method : **PRESENT**	
Location : Fabrication shop	
Charted by :	
Approved	
Date :	

Activity	Present	Proposed	Savin g (%)
Operation ○	20	13	35%
Transport ⇨	19	9	53%
Delay D	-	-	-
Inspection □	-	-	-
Storage ▽	-	-	-
Distance (M)	437	158	64%
Time (man-minutes)	2654	1588	40%
KG x m	26576	14813	44%
Total		Flow Process Chart	

Description	Mass (KG)	Distance (m)	KG x m	Time man minutes	○	⇨	D	□	▽
Gasutting of 8mm sheets :				30					
Transportation - Gascutting to bending m/c									
8 x 700 x 577	25	15	378	2x5					
8 x 625 x 700	27	15	410						
Above two plates from beding M/c.to									
HSB fixture	52	24	1418	3x5					
Gascutting to plate for HSB				25					
Trasnporting top plate to 350 - fixture	37	42	1533	3					
Gascutting side plate for HSB				25					
Transporting side plate to 350 - Fixture	9	42	358	3					
Gascutting 8 mm sheets :				30					
610 x 700 218 x 700, 555 x 700									

Flow process Chart Chart No. 1 Sheet No. 2 of 3					Material Type
Transporting above plates tobending m/c.	61	45	2745	2x5	
Bending				3x7	
Bent plates to TSB - fixture	61	21	1281	10	
Gascutting TSB top plate				25	
Transporting top plate to 350 - fixture	9	42	368	3	
Shearing 460 x 1010 x Bottom tray				2x 5	
Transporting to bending m/c.	18	5	90	3	
Bending				3 x7	
Transporting to 350 - fixture	18	27	486	3	
shearing 630 x 1010 x 5 - Top tray				2 x5	
Transporting to Bending m/c	25	5	125	3	
Bending				3 x7	
Transporting to 350 - fixture	25	27	675	3	
Fabrication of HSB				2 x 120	
Transportin HSB to Full - welding	125	7	875	2x3	
Full welding of HSB cutting holes				2 x30	
Transporting HSB to 350 fixture	125	18	2250	2 x5	
Fabrication of TSB				2 x 120	
Transporting TSB to full welding	87	6	522	2 x 3	
Full welding of TSB & cutting holes				2x50	
Transporting of TSB & cutting holes	87	18	1566	2 x5	
Transporting TSB to 350 fixture				30	
Gascutting Back plate					

Flow process Chart Chart No. 1 Sheet No. 3 of 3					Material Type				
Transporting Back plate to 550 fixture	29	42	1236	3					
Fabrication of Cabinet				2 x360					
Cabinet to full welding	285	9	2565	3x5					
Full welding				480					
Transporting Cabinet to drilling	285	18	5130	3x5					
Drilling is done				300					
Transporting Cabinet to Cleaning	285	9	2565	3x5					
Cabinet is cleaned by handgrinding				120					
Total		437	26576	2654	20	19			

MULTIPLE ACTIVITY CHARTS:

1. ASSEMBLY OF TAILSTOCKBOX- PROCEDURES:

WORKER 1	WORKER 2
1. Plates 1 and 2 fixed using vice clamps	Idle
2. Measure distance between left end and right end of the box	Idle
3 Tight the vice on the right side.	Idle
4. Measure again	Idle
5. Fix clamp 3 at backside.	Idle
6. Remove clamp 3	Idle
7. Fetch welding equipment	Idle
8. Weld a block at right hand back side fixture(for ease of clamping).	Idle
9. Fix clamp 3 at on plate 2 at back	Idle
10. Check if plate 1 and 2 join smoothly.	Idle
11. Measure left-to right distance	Idle
12. Put tack along the height of joint b.(both inside of the box and outside)	Idle
13. Grind two pattas using HG (hand-Grinder)	Idle

14 Idle.	Keep a patta at base of fixture
15. Bring plate 3	Provide supports between plates 1 and 2 & the two projections in the fixture (p1 & p2).
16. Idle	Provide a support to the right bend of plate 2
17. Idle	Keep plate no.3 in place in the fixture.
18. Fix clamp 4 at right bend of plate 3.	Hammer 3 to bring it to place.
19. Idle	Measure left to right distance
20. Take welding equipment and put tacks at top at joint c (inside)	Idle
21. Put tack at just below middle of joint c (inside)	Idle
22. Repeat at bottom	Idle
22. Idle	Measurements
24. Put tack at joint 'a' (outside bottom)	Idle
25. Idle	Hammer and measure front to back near 'a'.
26. Measure left to right near 'a'	Idle
27. Idle	Use a plate strip and hammer at a with plate 1 as support.
28. Keep a long patta at top hooks of fixture and put clamp near 'a'.	Idle

29. Measure front to back.	Idle
30. Loosen clamp 5	Insert a wedge between fixture and patta near 'a' and hammer it.
31. Put tack at 'a' at inside top.	Idle
32. loosen clamp 5	Idle
33. Remove patta	Idle
34. Keep patta crossed from top left to bottom right.	Idle
35. Idle	Insert wedges between patta and plate 3.
36. Hammer wedge.	Idle
37. Insert a strip between patta and fixture and hammer.	Idle
38. Idle	Insert a wedge and hammer as before.
39. "	Insert another big wedge and hammer so that smaller wedge comes out.
40. Put tacks at 'a' (outside)	Idle
41. Idle	Remove strip, crossed patta and wedge.
42. Measure front to back at left and right side and left to right at back.	Idle
43. Remove supports given inside by hitting with A long strip and hammering.	Idle

44. Remove clamps.	Idle
45. Hammer a wedge between top strip of fixture and plate 2 and the bottom surface of fixture and plate1 to remove box from fixture.	Idle
46. Gas cut a thick strip for found edge to fix in the box.	Idle
47. Fetch welding equipment.	Hold the strip in place
48. Put tack to hold it.	Idle.

2. ASSEMBLY OF HEAD STOCK BOX- PROCEDURE:

WORKER 1	WORKER 2
1. Keep plate 1 and 2	
2. Put clamp 1 at bottom between plate 1 and fixture.	
3. Put clamp between plate 2 and fixture.	
4. Keep a patta supported between plates 1 and 2 to push plate 1 towards fixture	
5. Keep another patta between plates 1 and plate 2 towards fixture	
6. Measure left to right at front and back.	

7. Remove clamp plate 1 and 2. 8. Put clamp3 9. Remove clamp3 10. Measure left to right 11. Put clamp 4 12. Hammer 7 pattas and grind edges. 13. Hammer a small plate 14. Measure left to right at back (top) 15. Measure top to bottom at left and right 16. Keep patta at top between 'b' and 'c' 17. Put tack between patta and 'b' and patta 'c' 18. Once again well above two strongly 19. Measure left to right at back 20. Keep a patta at bottom between 'b' and 'c' 21. Put tacks 22. Measure left to right at front 23. Keep a patta between 'a' and 'd' at bottom.	

24. Hold patta.	HELPER ARRIVES
25. Put tack at same left joint.	
26. Measure front to back at bottom right	Put tack at left joint. Goes away to bring weld guard.
27. Put tack at right	Idle
28. Measure left to right at front	"
29. Measure top to bottom at left and right	"
30. Keep plate at top between 'a' and 'd'.	"
31. Measure left to right	"
32. Put clamp 3 again and tighten	"
33. Measure left to right (plate is taper on right edge)	"
34. Remove pattas put during steps 5 and 6 and clean the base of fixture.	Grind that edge (taken by 6' to grind).
35. Try to fit the plate (does not fit)	HELPER GOES AWAY
35. Measure plate and mark to remove excess length of plate.	
37. Take it to gas cutting spot, for gas cutting the extra portion of plate.	
38. Measure left to right at front.	

39. Weld inner edges all Four Corners.	HELPER RERURNS BACK
40. Hammer a strip.	Idle
41. Return back.	Grind the plate which was cut.
42. Keep strip close to plate 2 at bottom and wait for plate.	
43. Instruct helper the thickness to grind on the plate	Listen
44. Wait for helper to grind.	Take the plate to grind & then bring back.
45. Weld upper strip between 'b' and 'c' at inner side	Grind plate and bring it.
44. Measure left to right at front.	Idle
47. Keep the plate and hold	Put tack
48. Put stronger tack	Goes away
49. Keep top cover and weld.	Returned.

3.ASSEMBLY OF THE FINAL CABINET IN FIXTURE-PROCEDURE

WORKER 1	WORKER 2
1. Idle	Grind back plate
2. change position of it	Idle
3. Idle	"
4. Idle	"
5. Idle	"
6. Measure height of headstock box	"
7. Lift back plate and rest it on projections of fixture	"
8. Measure distance between top of backplate and top of head stock box and tail stock box	Hold back plate
9. Lift backplate and keep a strip on projection (left) to increase height at left side	Help to lift
10. Measure above distances (step 8)	Hold back plate
11. Measure distance between top of backplate and surface of fixture at left and right sides.	"
12. Measure distance between boxes	"
13. Hold back plate	Idle

14. Put tack between backplate and box 1 at bottom at left and right.	"
15. Check if backplate and box join smoothly	"
16. Put tack at top left and check again.	
17. Fix a welding rod, from shelf at backside of 3.	"
18. Adjust right side of backplate using a strip and hammer.The strip is supported on a hole surface on box2	
19. Put tack at top right of backplate and at 2 more places.	Pick up filter
20. Put 3 more tacks at left end of backplate.	Grind hole on tray
21. Idle	Idle
22. Fetch bottom tray from near table	"
23. Keep blocks to support bottom tray.	"
24. Put bottom tray between boxes	Fetch HG and grind
25. Bottom tray does not fit into spaces	Idle
26. Put bottom tray in place and hammer to fix it	"
27. Measure distance between end	"

of tray and backplate at left and right side.	
28. Remove back tray	Grind
29. Idle	Idle
30. Fix backtray again	"
31. Measure same distances.	"
32. Measure distances between bent end of backtray and front surfaces of boxes.	"
33. Move back tray back and forth and adjust.	"
34. Idle	Put tack
35. Measure distances between back plate and bent end of back tray hammer bent end out.	Idle
36. Idle	Put tack
37. Hold filter.	Weld filter
38. Idle	Fetch thin rods from shearing machine
39. Goto bench vice near bench grinder keep it in gap between filter and cut the wire pipe to bend it at ends.	Keep it in gap between filter and top tray for welding
40. Hold wire pipe.	Weld bent edge

PROCEDURE OF FABRICATING CABINET-LZ350

EXISTING METHOD

1. Gas cutting of 8mm sheet to the following sizes:

   For Tail Stock Box

   i) 610 X 700 X 8

   ii) 218 X 700 X 8

   iii) 555 X 700 X 8

   For Head Stock Box

   i) 577 X 700 X 8

   ii) 625 X 700 X 8

   iii) 420 X 700 X 8

   iv) 340 X 700 X 8

   v) 340 X 700 X 8

   For Back plate

   1010 X 467

2) Gas cutting of 20 mm plate to 499 X 469 and 2 number each 50 X 285 and 50 X 340 for Head Stock Box.

3) Gas cutting of 10 mm plate to 269 X 416 for Tail Stock Box.

4) Shearing of 4mm sheet to 460 X 1010 for Bottom tray.

5) Shearing of 4mm sheet to 630 X 1010 for top tray.

6) Shearing of 4mm sheet to 2 numbers of 60 X 1010.

7) Shearing of 3mm sheet for doors to size.

8) Bending of 3mm sheets as shown in figure.

9) Bending of 4mm sheet for trays.

10) Fabrication of tail stock box

The plates for tail stock box are assembled in the fixture and tack welded.

11) Tail stock box is full welded, at selected joints which cannot be reached after assembly.

12) Fabrication of head stock box

The plates for head stock box are assembled in the fixture for Head stock box and tack welded.

13) Head stock box is full welded at selected joints which cannot be accessed after cabinet assembly.

14) Required holes are gas cut on Head stock box and Tail stock box

15) Head stock box and Tail stock box are assembled in final assembly fixture.

16) Back plate is assembled and tacked.

17) Bottom tray is assembled and tacked.

18) Wire pipe is assembled and tacked.

19) Filter is fixed on top tray.

20) Top tray is assembled and tacked.

21) Door strips are tracked.

22) Screw-cups are assembled and tacked.

23) The cabinet is full welded.

24) Required holes are drilled on the full welded cabinet.

25) The cabinet is cleaned by hand grinding.

26) It is ready to go out of fabrication shop.

EXAMINE

" The questioning techniques is the means by which the critical examination is conducted, each activity being subjected in turn to a systematic and progressive series of questions".

The five sets of activities recorded on the flow process chart fall into two main categories namely.

1. Those in which something is actually happening to the material or workpiece under consideration.
2. Those in which it is not being touched (storage or delay).

Activities in the first category are further subdivided into:

3. **'Make ready'** activities required to prepare the material or workpiece and set it in position ready to worked on e.g., transporting of plates to fixtures etc.,
4. **'DO'** operations in which a change is made in the shape, chemical composition or physical condition of the product. e.g., bending of plates, gas cutting of plates etc.,
5. 'Put Away' activities in which the work is moved aside from the machine or workplace.

The "Put Away" activities of one operation may be the "make ready" activities of the next. e.g., transporting head stock box from fixture to full welding is "put away" for box fabrication but "make ready" for full welding operation.

However necessary, "Make Ready" and "Put Away" operations are "non-productive"; hence should be reduced as much as possible.

6. We follow the technique of systematic questioning:

THE PRIMARY QUESTIONS:

In the first stage of the questioning technique the purpose, place, sequence, person and means of every activity recorded are systematically queried and a reason for each reply is sought.

PURPOSE:	**What** is done?
	Why is it necessary?
PLACE:	**Where** is it done?
	Why is it done there?
SEQUENCE:	**When** is it done?
	Why is it done then?
PERSON:	**Who** does it?
	Why he?

MEANS: **How** is it done?

Why that way?

THE SECONDARY QUESTIONS:

"The secondary questions cover the second stage of the questioning technique, during which the answers to the primary questions are subjected to further query to determine whether possible alternatives of place, seaquake, persons and/or means are practicable and preferable as a means of improvement upon the existing method".

Thus in the second stage best alternatives are explored.

Combining the two primary and two secondary questions in each heading we get the full questioning techniques:

PURPOSE: **What** is done?

Why is it done?

What **else** might be done?

What **should** be done?

PLACE: **Where** is it done?

Why is it done there?

Where **else** might it be done?

Where **should** it be done?

SEQUENCE: **When** is it done?

Why is it done then?

When **might** it be done?

When **should** it be done?

PERSON: **Who** does it?

Why does that person do it?

Who **else** might do it?

Who **should** do it?

MEANS: **How** is it done?

Why is it done that way?

How **else** might it be done?

How **should** it be done?

APPLICATION OF QUESTIONING TECHNIQUE TO LZ-350 CABINET FABRICATION:

From the flow process chart we can observe there are 20 operations and 19 transportation's which is almost equal to the number of operations.

What is done?

LZ-350 cabinet is done.

How is this being done?

Head stock box is fabricated, tail stock box is fabricated and they are assembled with trays and backplated to make final cabinet.

Why is this done?

Many methods have been tried and this method yielded good results.

What **else** might be done?

The making of head stock box and tail stock box separately could be avoided .Fabricating the cabinet could be tried as one step process instead of 3 steps.

What **should** be done?

A fixture should be designed to facilitate the above procedure.

Let us continue the questioning technique.

What is done?

After drilling operation, the cabinet is take to cleaning, which involves backtracking.

What **else** might be done?

Cleaning area could be located near drilling.

DEVELOP

The improved method involves fabrication cabinet in one step instead of three steps, requires a new fixture to allow this new procedure. The fixture is shown.

In the proposed method the cutting design of the sheets also vary. The cutting design is shown in the figure.

FIXTURE DESIGN:

Points to be noted:

- Must have a structure that maintain the relationship between its various elements.
- This 'Structure" may be a machine table, a plate, a standard machine attachment which has been altered or a fabricated structure such as a box.
- Elements to 'Support' the work should be present.
- Locators which 'Position' to work should be present.
- 'Clamps' should be available in fixture to avoid moving off from support.

Flow process Chart	Material Type
Chart No. 2 Sheet No. 1 of 2	Summary
Subject Charted :	
Activity : Fabrication of cabinet - LZ 350	
Method : Present / **PROPOSED**	
Location : Fabrication shop	
Charted by :	
Approved	
Date :	

Activity	Present	Proposed	Savin g (%)
Operation ○	20	13	35%
Transport ⇨	19	9	53%
Delay D	-	-	-
Inspection □	-	-	-
Storage ▽	-	-	-
Distance (m)	437	158	64%
Time (man-minutes)	2654	1588	40%
kg x m	26576	14813	44%
Total			

Description	Mass (KG)	Distance (m)	KG x m	Time man minutes	○	⇨	D	□	▽
Gascutting of 8 mm sheet				22					
Transporting above plates to bending Mk	96	15	2625	6					
Beinding of plates				4x8					
				3x4					
Gascutting of holes on bent plates				30					
Transporting to 350 - fixture	96	21	3675	3x6					
Skearing for bottom tray	79	21		2x5					
Transporting bottom tray tobending m/ c	18	5	90	1x3					
Beinding bottom tray				3x5					
Shearing for top tray				2x5					

Flow Process Chart Chart No. 2 Sheet No. 2 of 2					Material Type				
Transporting top tray to bending m/c	25	5	125	3					
Bending top tray				3x5					
Transporting top tray & bottom tray	43	21	903	33					
to 350 fixture (new)									
Gascutting HSB top plate - 469 x 499 x 20				3					
Gascutting TSB top plate - 424 x 269 x 10				4					
Gascutting HSB side plate 8 x 420 x 325				20					
Transporting above three to350 - fixture				4					
frabricating cabinet	55	36	1980	2x220					
Cabinet transported to full welding	285	5	1425	3 x5					
Full welding done				240					
Cabinet transported to drilling	285	5	1425	3x5					
Drilling done				300					
Cabine transported to cleaning	285	9	2565	3x5					
Cleaning done by hand grinder				120					
Total		158	14813	1588	13	9			

DESIGN PROCEDURE:

1) Know all critical dimensions and surfaces.
2) Collection of related data which will affect the fixture design
    - type of material
    - physical properties.
    - Weight
    - Characteristics of raw material.
    - Available budget
    - Production quantity
    - Lot size etc.,
3) Determine whether fixtures already in plant can be altered ad used.
4) Consider possibilities and advisability of standard holding devices such as vises, parallels and clamps.
5) Once the series of operations are known, combine as many operations as possible in new fixture.
6) Suggest clampes in the fixture once operational for future use.

RULES IN DESIGN OF FIXTURE.

1) Main frame should be strong enough that it will deflect to a minimum amount due to forces of cutting, clamping etc.,

2) Frames may be built up from simple sections which may then be fastened with screws or welded.

3) Obstructions should be built to avoid placing workpieces in wrong position.

4) Easy insertion and removal of workpiece.

5) Easy and rapid clamping with less effort.

6) Clamps should be readily available, easily positioned or removed.

7) Clamps should be supported with springs so that clamp is held against the bolt head.

8) All clamps, supports and locators should be clearly visible to operator and easily accessible for cleaning, positioning or tightening.

9) All clamps and support points which needs a wrench should be of same size.

10) Loose parts (shims, wrenches and bushings etc) should be fastened to fixture with a chain.

11) The fixed point supports should circumscribe the centre of gravity of workpiece.

12) Contact surface area of support points should be as small as possible without causing damage to workpiece.

13) Clamping should take place above the fixed support points or inside the 3 support point triangle. Special care should be take that the clamping forces do not lift the workpiece off the support points or away from the banding points or that they do not disturb the workpiece. All side clamps should press down.

14) Support points and other parts should be designed so that they may be easily replaced of they break or wear.

15) Tolerances of the workpieces should be as liberal as interchange ability will permit. The closer tolerances of the workiece the greater the cost of the fixture and of the manufacturing of the workpiece simple fixtures are preferred to complicated fixtures.

16) All provisions safety to the operator should be observed when designing a fixture even if that means less output.

PROCEDURE OF FABRICATING LZ-350 CABINET

PROPOSED METHOD

1) Gas cutting of 8mm sheet to the following sizes

   (i) 2200 X 700 X 8

   (ii) 870 X 700 X 8

   (iii) 1065 X 700 X 8

2) Bending of cut plates as shown in figure.

3) Gas cutting of required holes as shown in figure.

   Gas cutting of 20 X 499 X 469 2 numbers each of 20 X 50 X 285 and 20 X 50 X340

   For Head stock box top plate.

4) Gas cutting of 10mm plate to 269 X 416 for Tail stock top plate.

5) Shearing of 4mm sheet to 460 X 1010 for bottom tray.

6) Shearing of 4mm sheet to 630 X 1010 for top tray.

7) Shearing of 4mm sheet to 2 number of 60 X 1010

8) Shearing of 3mm sheet for doors to size and bending.

9) Bending of 4mm sheets for top tray and bottom tray

10) Sheets bent in step 2 are assembled in 350 – fixture and tack welded.

11) Bottom tray is assembled and tack welded.

12) Seating strips for Head stock box and Tail stock box are fixed.

13) Wire pipe is assembled and tacked.

14) Top tray is assembled and tacked.

15) Door strips are fixed.

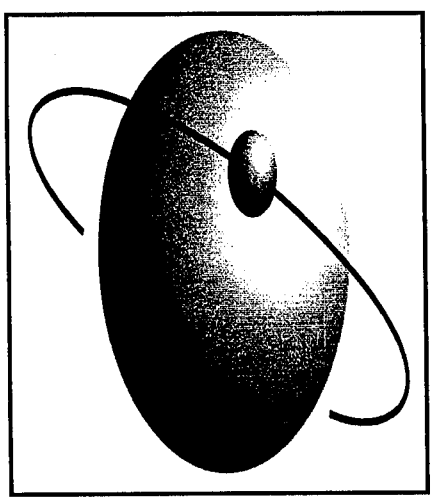
16) Top plate is fixed on Head stock box and Tail stock box.

17) Cabinet is transported to full welding.

18) Cabinet is transported to drilling of holes.

19) Cabinet is transported to cleaning using hand grinder.

The cabinet is now ready to go out of fabrication shop



SAVINGS IN PROPOSED SYSTEM

INSTALL

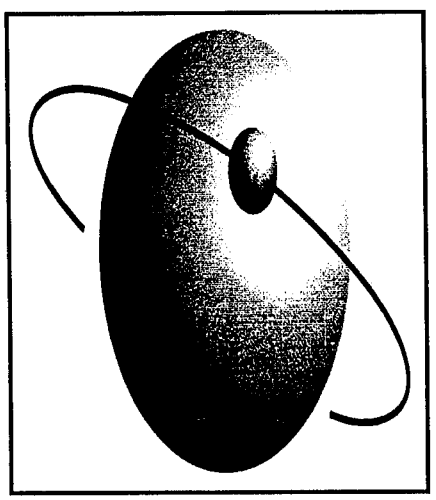
As per the method of fabrication of LZ350 cabinet developed in the previous step, the proposed system was tested. A cabinet was fabricated and the time taken and material movement were noted.

The flow process chart showing the proposed system illustrates the saving of time taken for the fabrication of cabinet. They are highlighted below:

SAVINGS IN THE PROPOSED SYSTEM:

ACTIVITY	PRESENT	PROPOSED	SAVING (%)
OPERATION	20	13	35
TRANSPORT	19	9	53
Distance of material transportation (m)	437	158	64
TIME(man-minutes)	2654	1588	40
Kg X m	26576	14813	44

The cabinet fabricated by the proposed method had good aesthetics, less number of joints which also implies good rigidity.



DESIGN OF IMPROVED LAYOUT

DESIGN OF IMPROVED LAYOUT

Plant layout is the arrangement of building, machinery, equipments, workplaces and other facilities of production to manufacture products in most effective manner.

OBJECTIVES OF PLANT LAYOUT:

1. Minimum material handling.
2. Effective use of floor space.
3. Easy and effective supervision.
4. Reduction in damage to materials and accidents.
5. Proper control of production.
6. Good house keeping.
7. Safe, healthy and comfortable working condition.
8. Improved morale and satisfaction of workers.
9. Better quality products of lower unit cost.

PRINCIPLES OF GOOD LAYOUT:

1) ***Principle of over-all integration:***

The best layout in one which integrates men, materials, machines, and other facilities of production that results in best compromise.

2) ***Principle of minimum distance:***

According to this principle, men and materials have to move the minimum distance between the operations.

3) ***Principle of flow:***

According to this principle, the work area for each operation or process shall be arranged in the same order or sequence of operations.

4) ***Principle of cubic space:***

All available space, both vertical and horizontal shall be economically and effectively used.

5) ***Principle of satisfaction of safety:***

The best layout is one which makes work satisfying pleasant and safer for workers.

6) ***Principle of flexibility***:

According to this principle the best layout is one which can be re-arranged at minimum cost and least inconvenience.

DESIGN OF NEW LAYOUT:

To develop a flow for only one product or process, it is customary to use the flow process chart supplementing it with a flow diagram. The flow process chart is useful in recording travel distances and the time taken for the various operations, distances and the time taken for the various operations. Its value lies in its use as an analytical tool to question the existing method. The flow diagram, on the other hand, is a plan (to scale) of the work area, correctly indicating the positions of machines and working positions.

As a result of on-the-spot observation, the paths of movement of the product or its components are traced, sometimes using the process chart symbols to denote the activities carried out at the various point.

RECORD

The sequence of activities are recorded on flow process chart and flow diagram. The sequence of activities involve gas cutting of 8mm sheets at gas cutting area, bending of these plates in bending machine and storing at storage area. 6mm sheets are out in shearing machine and then bent and stored at storage area. Plates for tail stock box are taken to tail stock box fixture and tail stock box is fabricated and sent to full welding. Similarly, plates for head stock box are taken to head stock box fixture and head stock box is fabricated and sent to full welding.

Tail stock box and Head stock box are taken to final assembly fixture and final cabinet is fabricated. Back plate, pipe, top tray and bottom tray are taken from storage area for the above step. The cabinet is then sent to full welding and then sent to drilling and then to cleaning. The cabinet is now ready to be sent out of fabrication shop.

EXAMINE

A study of the flow diagram shows that it involves certain amount of back tracking. Critical examination is done as follows using questioning technique:

Q: Why the full-welding area is present before the Head stock box and Taill stock fixtures as the full cabinet back tracks to it?

A: The place was found convenient and has been used since a long time.

Q: Where else the full-welding area be located?

A: It could be located after final cabinet assembly.

Q: Why the cleaning area is located at its present place?

A: Because it produces lot of noise.

Q: Where else could it be located?

A: It could be located as closer to drilling as possible.

Q: Why the drilling machine is located at its present place?

A: Because, it will be congested if put at the middle area of the fabrication shop.

Q: What should be done?

A: The equipments at the middle area of the shop should be adjusted and the drilling machine located little more inside (towards bending machine side –i.e. east). Refer proposed layout.

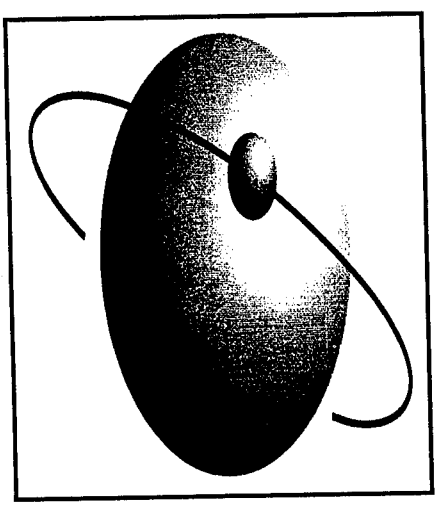
DEVELOP

From the foregoing questioning technique, the new layout is obtained as shown. The welding area is kept next to cabinet assembly and drilling machine is shifted up the shop.

Taking into consideration the principle of minimum movement of men, the bench grinder and vice are located close to cabinet assembly area. Also the storage shelf is shifted close to the cabinet assembly.

This layout is developed with reference to the improved method of fabricating the cabinet discussed earlier in this report. It is obvious from the new-flow process chart that the distance moved by the material has been reduced from 437m to 158m.

The number of man-hours involved has been calculated by multiplying the time taken for each item of activity by the number of workers involved.



COMPARISION OF PRESENT METHOD AND PROPOSED METHOD IN TERMS OF MONEY

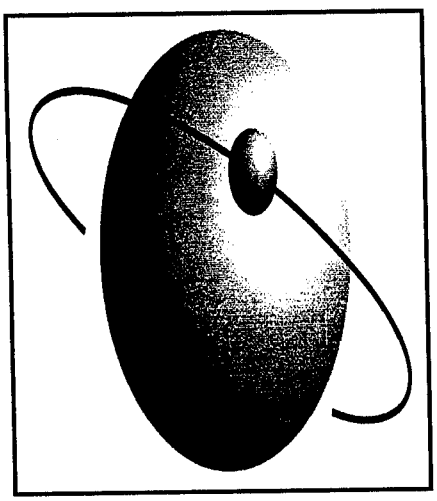
COMPARISION OF PRESENT METHOD AND PROPOSED METHOD IN TERMS OF MONEY

DESCRIPTION	PRESENT METHOD	PROPOSED METHOD	SAVING
Time taken for fabrication of a cabinet	44 man-hours	32 man-hours	40%
Labour cost (@ Rs.10 per hour)	Rs.440	Rs. 320	Rs.120.
Electrode consumption for welding	69electrodes	57 electrodes	12electrode
Welding cost (@ Rs.10 per electrode)	Rs. 690	Rs. 570	Rs.120
Distance moved by materials	437 m	158 m	64%
Distance X mass of material	26576 Kg-m	14813 Kg-m	44%
Time spent by labourers in moving materials	128man-minutes	85 man-minutes	43man-minutes
In terms of cost	Rs.21	Rs.14	Rs. 7
Saving in painting cost	-	Rs.100	Rs.100
Material Cost	Rs. 9712	Rs. 9537	Rs. 175

TOTAL SAVING IN COST PER CABINET =

	Rs. 120
	Rs. 120
	Rs. 7
	Rs. 100
	Rs. 175
Total	Rs. 522

MINIMUM TOTAL SAVING IN COST PER CABINET = Rs.522



COST ESTIMATION

COST ESTIMATION

COST OF CABINET - PRESENT METHOD:

Labour cost	=	Rs.10/hour X 44 man-hours	=	Rs. 440.00
Material cost (m.s)			=	Rs. 9712 .00
Welding cost	=	Rs. 10/electrode X 69 electrodes	=	Rs. 690.00
Gas cutting cost	=	Rs. 15/hour X 2 hours	=	Rs. 30.00
			Total =	Rs.10872.00

COST OF CABINET – PROPOSED:

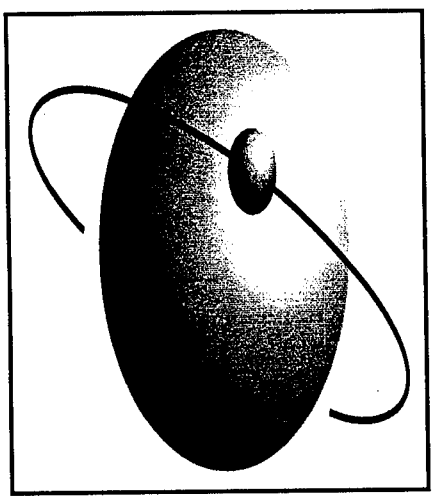
Labour cost	=	Rs. 10/hour X 32 man-hours	=	Rs. 320.00
Material cost			=	Rs.9537.00
Welding cost	=	Rs.10/electrode X 57 electrodes	=	Rs. 570.00
Gas cutting cost	=	Rs.15/hour X 79 minutes	=	Rs. 19.75
			Total =	Rs. 10446.75
			Less saving in painting cost =	Rs. 100.00
			Total =	Rs. 10346.75

SAVING IN COST PER CABINET:

Cost of Cabinet – Present = Rs.10872.00

Cost of Cabinet – Proposed = Rs.10346.75

Saving in Cost = Rs.10872 – Rs.10346.75 = Rs. 526.75 per cabinet



IMPROVEMENT OF PRODUCTIVITY

IMPROVEMENT OF PRODUCTIVITY

Productivity is defined as Productivity = Output / Input

This defenition applies in an enterprise, a sector of economic activity the economy as a whole. The term "Productivity" can be used to assess or measure the extent to which a certain output can be extracted from a given input. While this appears simple enough in cases where both the output and theinput are tangible and can be easily measured, productivity can be more difficult to estimate once intangbiles are introducted.

EXISTING METHOD :

Man hours required per cabinet	=	44 man - hours.
Number of hours per month	=	10 hours x 27 days.
(2 hours over time per day)	=	270 hours.
Therefore Number of cabinets per month	=	270 hours / 44 man-hours x 4 men.
	=	25 cabinets per month

PROPOSED METHOD

Man hours required per cabinet	=	32 man - hours.
Therefore Number of cabinets per month	=	270 hours / 32 man hours x 4 men
	=	34 cabinets, per month.

Increase in productivity in forms of number of cabinets :

Increase in productvity = 34-25/25 x 100 = 36%

Increase in productivity in monetary terms :

We know from cost estimation that the proposed method saves Rs. 526.75 per cabinet. This becomes mere profit.

The cost of investment to change to proposed method is Rs. 6500 which say, we plan to amortize over months.

Therefore cost of investment per month = 6500/65 = Rs. 100

This is deduced from monthly savings.

Old output = 25 x 10872 = Rs.271800

New output = 34 x 10346.75 = Rs.351789.50

Less Rs. 100 from the new output = Rs.351689.50

Therefore increase in productivity = (351689.5-271800) / 271800 x 100

Increase in productivity = 29.43%

Intangible benefits :

The aesthetices of the cabinet is improved by the proposed method.

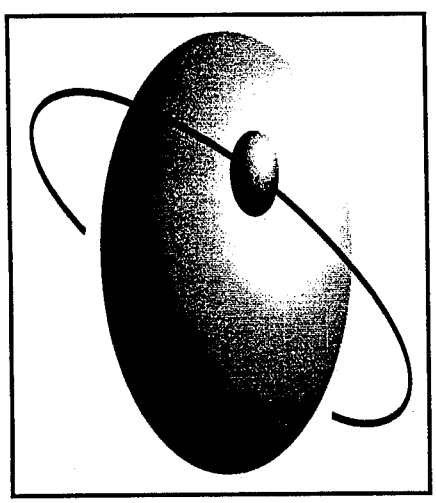
The rigidity of the cabinet is improved.

These cannot be qualified. But they do mean an increase in productivity.

Summary :

Increase in productivity in terms of number of cabinets = 36%

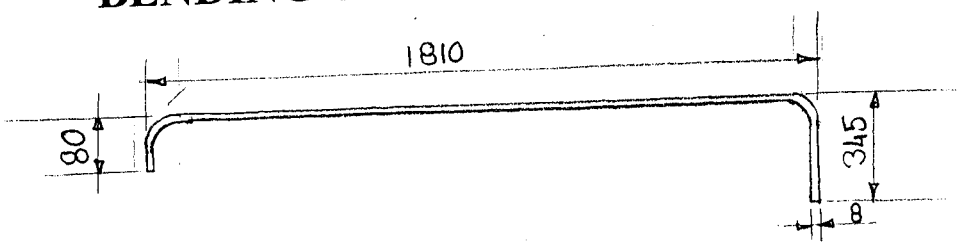
Increase in productivity in terms of monetary value = 29.43%



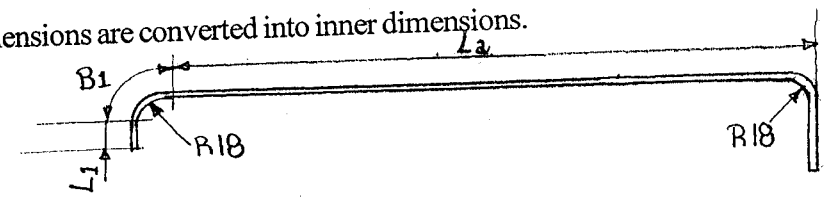
CALCULATIONS

BENDING CALCULATIONS

Plate 1 :



The outer dimensions are converted into inner dimensions.



Length $L_1 = 80 - (8 + 18) = 54$ mm

$L_2 = 1810 - (8 + 18) = 1784$ mm

$B1 = (\alpha /360) \ . \ 2\Pi (r + k)$

Constant $k = t/4$ if $r > 2t$

Bend angle, $\alpha = 90$

$\therefore B1 = 90/360 \times 2\Pi (18 + 8/3) = 32.46$ mm

Developed length $= L_1 + L_2 + B_1 = 54 + 1784 + 32.46$

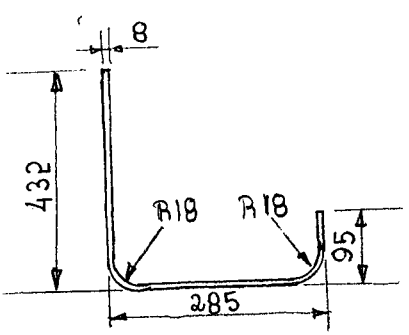
$= 1870.46$ mm.

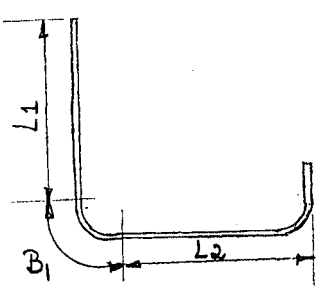
Difference in length $= 1810 + 80 - 1870.46 = 19.54$ mm

Length of blank $= 80 + 1810 + 345 - 2 \times 19.54 = 2195.92$ mm

Length of Blank 1 = 2195.92 mm

Plate 2 :





$L_1 = 432 - (8 + 18) = 406$ mm

$L_2 = 285 - (8 + 18) = 259$ mm

$B_1 = (90/360) \times 2 (18 + 8/3) = 32.46$ mm

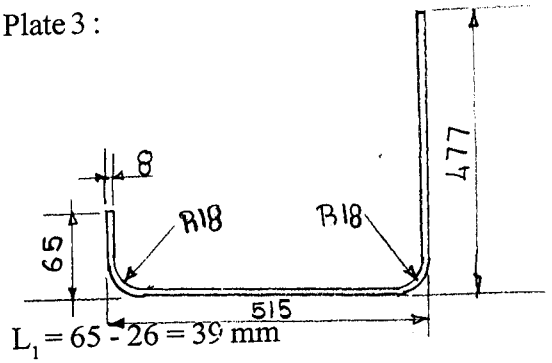
Developed length $= L_1 + L_2 + B_1 = 406 + 259 + 32.46 = 697.46$ mm

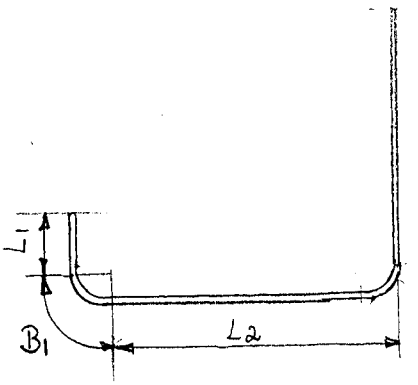
Difference in length = 432 + 285 - 697.46 = 19.54 mm

Length of blank = 432 + 285 + 95 - 19.54 x 2 = 772.92 mm

Length of blank 2 = 772.92 mm

Plate 3 :





L_1 = 65 - 26 = 39 mm

L_2 = 515 - 26 = 489 mm

B_1 = 32.46 mm

Developed length = 39 + 489 + 32.46 = 560.46 mm

Difference in length = 65 + 515 - 560.46 = 19.54 mm

Length of blank = 65 + 515 + 477 - 2 x 19.54 = 1017.92 mm

Length of blank 3 = 1017.92 mm

CALCULATION

DETERMINATION OF ELECTRODE CONSUMPTION

CALCALUTION OF WELDING - JOINTS LENGTH / (EXISTING METHOD)

HSB

1.	Outside strips	2 x 90	=	180	MM
		2 x 60	=	120	MM
2.	Outside Joint	2 x 100	=	200	
	(Opposite side)	2 x 325	=	650	
3.	Step in HSB		=	1094	(refer proposed method)
4.	Top plate		=	1936	
5.	Bottom strips	50 x 4 + 1936	=	2136	

TSB

6.	Frontside	700 x 2	=	1400
7.	Left side	700x2	=	1400
8.	Right side		=	700
9.	Top plate		=	1386
10.	Bottom strips	50 x 4 + 1386	=	1586

FINAL ASSEMBLY

11.	Bottom tray	1010 + 410x 2	=	1830
12.	Top tray	(470 x 2) + (80 x 2) x 2	=	1260

13. Door Strips

Top Strip		=	1010
Side Strip	530 x 2 + 60 x 6	=	890

BACK PLATE

14.	467 x 2	=	934
	Total Length of welding	=	18712

PROPOSED METHOD

HSB

1.	Left side Strips	=	180
			120
2.	Right side	=	325
3.	Right side step 410x2+275+13+6=		1094
4.	Top plate	=	1936
5.	Bottom Strips	=	2136

TSB

6.	Leftside	=	700
7.	Right side	=	700
8.	Top plate	=	1386
9.	Bottom strips	=	1586

TRAYS

10.	Top tray	=	1260
11.	Bottom tray	=	1830

DOOR STRIPS

12.	Top strip	=	1010	
13.	Side strips	=	890	
	Total Length of welding	=	**15153**	**mm**

SAVING IN LENGTH OF WELDING = 18712 - 15153 = 3559 MM

Average length of welding served by one electrode is 250 mm (4 x 450 SS electrode)

Therefore Number of electrodes saved = 3559 / 250 = 12 electrodes.

WEIGHT OF FINAL CABINET

HSB	**Volume mm^3**	**mass (kg) =VOI x Density (7.8 x 10^{-6} kg/mm^3**
8 x 577 x 700	- 3231200	25.2
8 x 625 x 700	- 3500000	27.3
8 x 420 x 325	- 1092000	8.52
8 x 340 x 60	- 163200	1.27
8 x 340 x 90	- 244800	1.91
8 x 420 x 60	- 4680620	36.21
20 x 499 x 469	- 798000	6.22
20 x 50 x 469	- 938000	7.32
		125.39

TSB

8 x 610 x 700	- 3416000	26.64	
8 x 218 x 700	- 1220800	9.52	
8 x 555 x 700	- 3108000	24.24	
20 x 50 x 424	- 848000	6.61	
20 x 50 x 169	- 338000	2.64	
20 x 269 x 416	- 2238080	17.46	
Back plate			**87.11**
8 x 4010 x 467	- 3773380	29.13	
Bottom tray	- 2323000	18.12	
Top tray			
5 x 630 x 1010	- 3181500	24.82	
		284.87=	**285.00**

Therefore Weight of Cabinet = 285kg.

EXISTING SYSTEM

Size of one MS sheet = 1.25 m. x 5.5 m x 0.008 m

Weight of one MS sheet = 0.008 m x 1.25 x 5.5 x 7800

= 429 kg

Number cabinets per sheet = 2

Cost of one MS sheet = 429 kg x Rs. 32 / kg = Rs. 13728

Average cost of raw material per cabinets = Rs. 6864

a. Weight of HSB top plate = 0.499 x 0.469 x 0.02 x 7800 = 37 kg

b. Weight of TSB top plate = 0.269 x 0.416 x 0.02 x 7800 = 9 kg

c. Weight of seating strips = 2 (0.285 x 0.05 x 0.02 + 0.340 x 0.05 x 0.02) x 7800 = 10 kg

d. Weight of top tray = 0.46 x 1.01 x 0.004 x 7800 = 14 kg

e. Weight of bottom tray = 0.63 x 1.01 x 0.004 x 7800 = 19 kg

Total weight of items a,b,c, d and e = 89 kg

Cost of items a to e = 89 x 32 = Rs. 2848

Therefore total average material cost per cabinet = Rs. 6864 + Rs. 2848 = Rs. 9712

The wastage of items a to e are not included. This will not affect furthercalculations for comparison of the two methods because, those parts are common to both existing and proposed systems and their cost remain the same in both systems.

Therefore material cost (in existing system) = Rs. 9712

Proposed system :

It is suggested that 1.5 m width and 6.7 m. length sheet be bought to reduce wastage. It is available in the market. But, purchasing will take little extra time than usual and it should be purchased in one lorry load full because it is not a standard size.

Size of one MS sheet = 1.5 x 6.7 x 0.008

Weight of one MS sheet = 1.5 x 6.7 x 0.008 x 7800 = 627 kg

Cost of one MS sheet @ Rs. Rs. 32 per kg = 627 x 32 = Rs. 20067.84

One sheet can be provide for three cabinets

Therefore average sheet cost per per cabinet = Rs. 6689.00

This cost includes wastage also.

Cost of items 'a' to 'e', as mentioned before, remains the same.

Therefore total average cost of mateiral per cabinet = Rs. 6689 + Rs. 2848

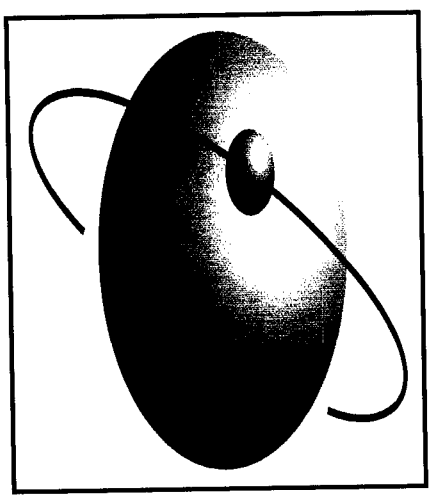
= Rs. 9537

Therefore average material cost per cabinet = Rs. 9537

Determination of Cost of Fixture :

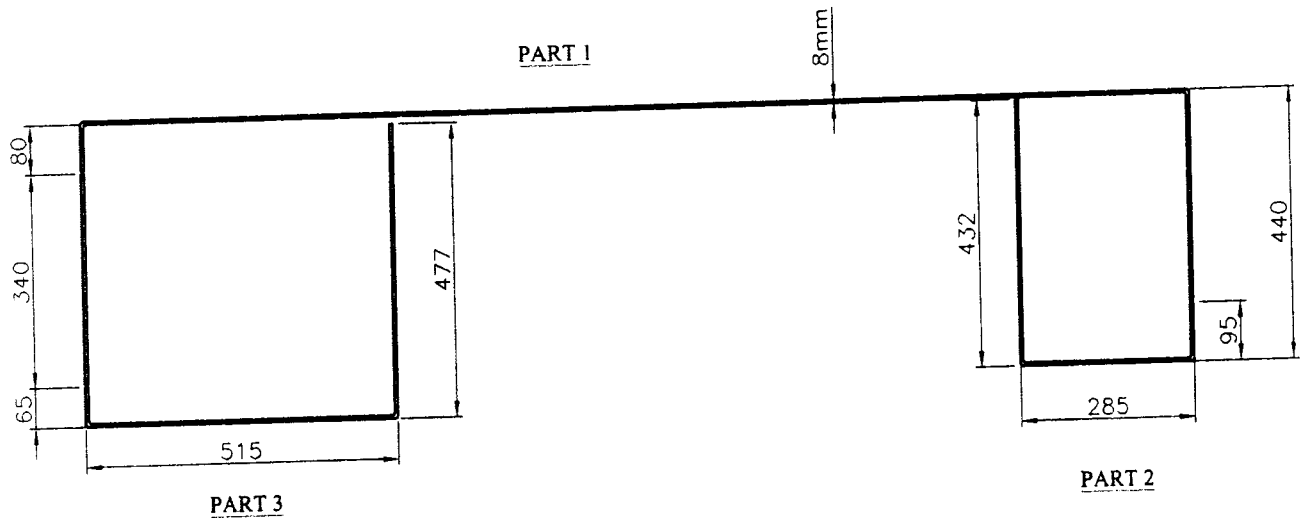
Material Cost	=	Rs. 32 / kg. x 200 kg.	=	Rs. 6400.00
Labour Cost	=	Rs. 10 / hour x 6 hours	=	Rs. 60.00
Welding Cost	=	Rs. 10 / rod x 3 rods	=	Rs. 30.00
		Total	=	**Rs. 6490.00**
Cost of relocating layout	=	Rs. 10 / hour x 8 hours x 4 men	=	Rs. 320.00
Total input cost	=	Rs. 6490.00 + Rs.320	=	Rs. 6810.00

Total input cost in charging to proposed method	=	Rs. 6810.00
Saving of cost per Cabinet	=	Rs. 526.75
Number of cabinets to recover input cost	=	13 cabinets.
Time taken recovering input cost	=	13 cabinets x 32 man hrs / 4 men.
	=	104 hours
Time taken for recovering input cost (8 hours/day)	=	13 days.



DRAWINGS

TOP VIEW

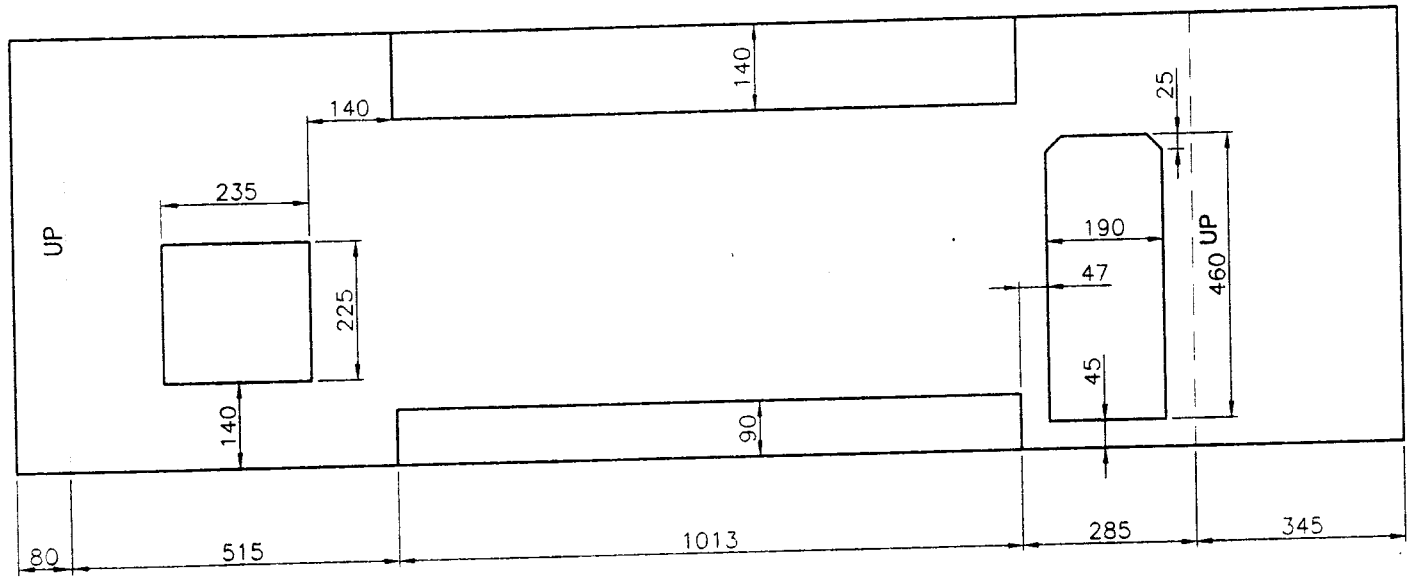


All dimensions in mm

GEDEE WEILER, PVT. LTD.,		
PROPOSED CABINET		
MAT : MILD STEEL	QTY : 1	DRG.NO:
SCALE 1 : 10		

2240x700

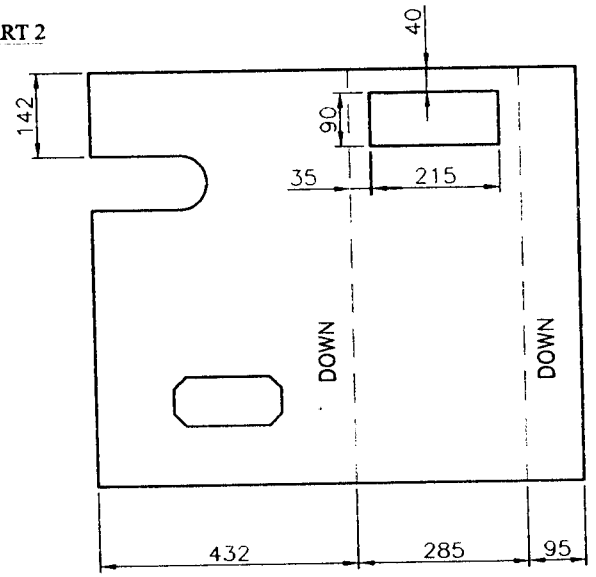
PART 1



All dimensions in mm

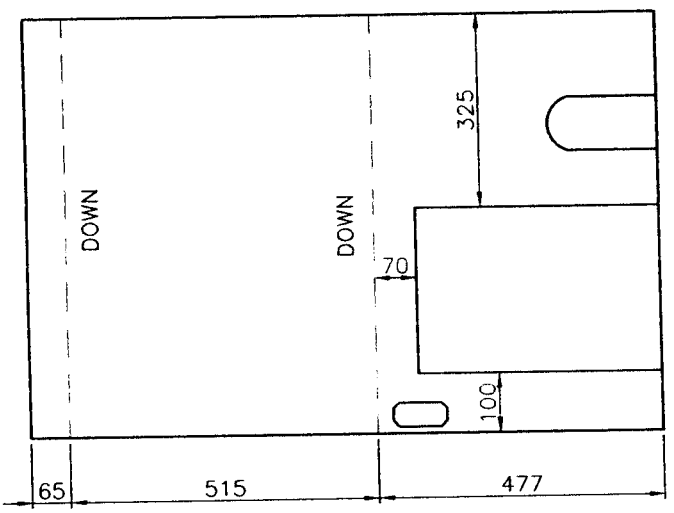
GEDEE WEILER PVT. LTD.,		
BACK SHEET		
MAT : M.S SHEET	QTY : 1	DRG.NO:
SCALE 1 : 10		

PART 2



780x700

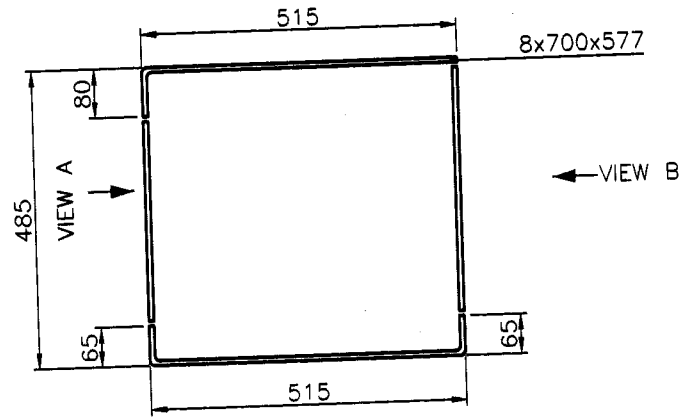
PART 3

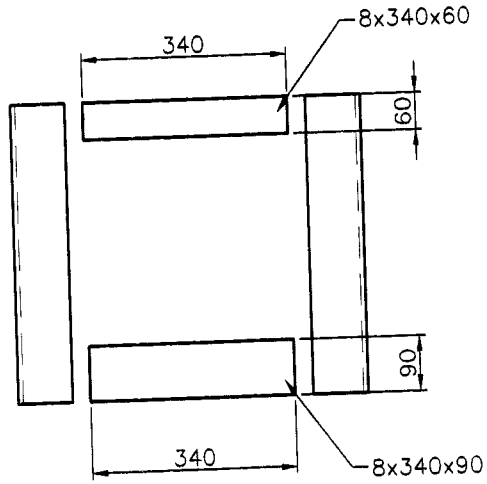


1018x700

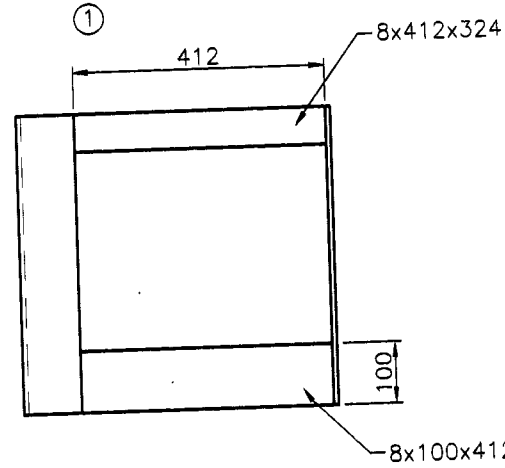
All dimensions in mm

GEDEE WEILER PVT. LTD.,		
H. S. B. SHEET, T.S.B.SHEET		
MAT : M.S SHEET	QTY : 1	DRG.NO:
SCALE 1 : 10		





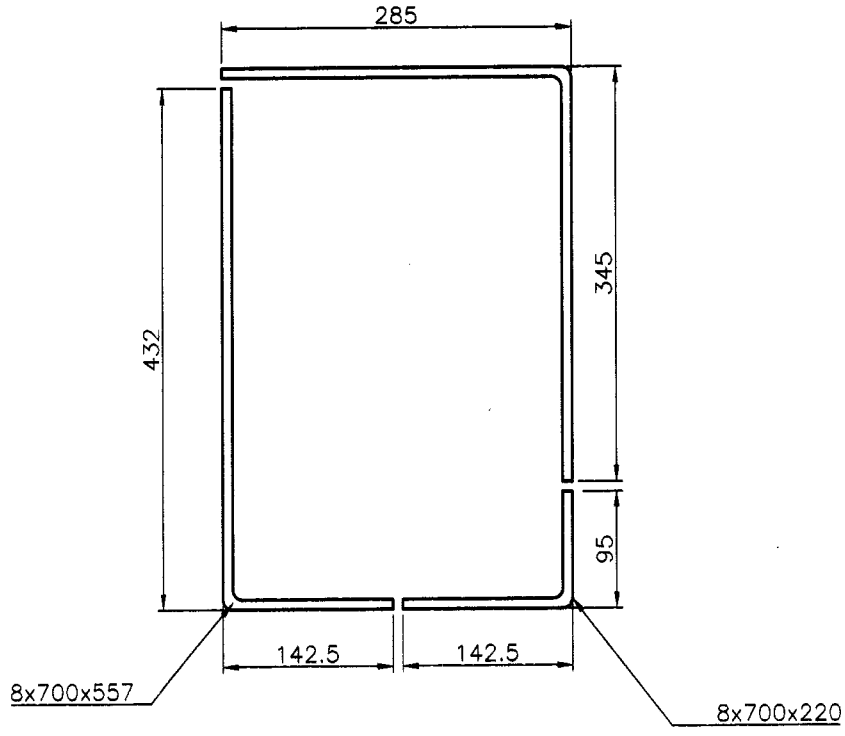
VIEW A



VIEW B

All dimensions in mm

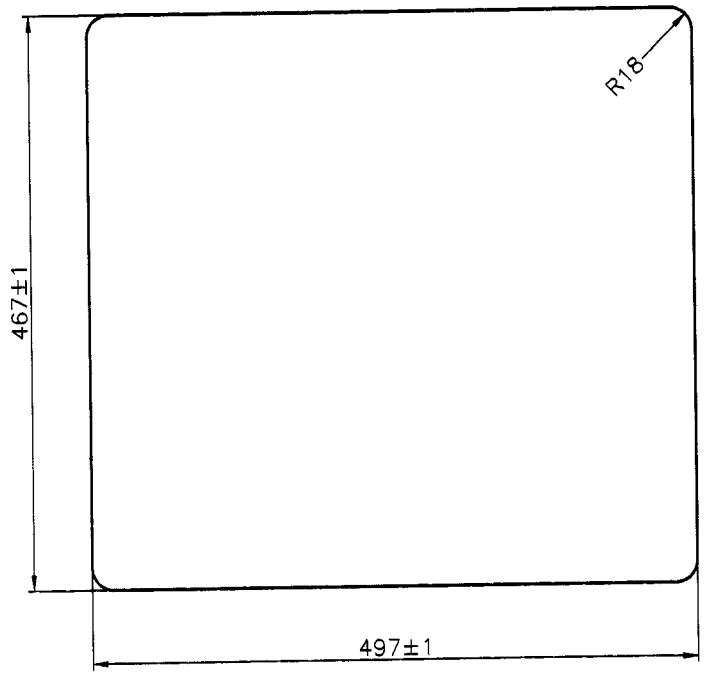
GEDEE WEILER PVT. LTD.,		
HEAD STOCK SIDE BOX		
MAT : MILD STEEL	QTY : 1	DRG.NO:
SCALE 1 : 10		



All dimensions in mm

GEDEE WEILER PVT. LTD.,		
TAIL STOCK SIDE BOX		
MAT : M.S. SHEET	QTY : 1	DRG.NO:
SCALE 1 : 5		

TOP PLATE

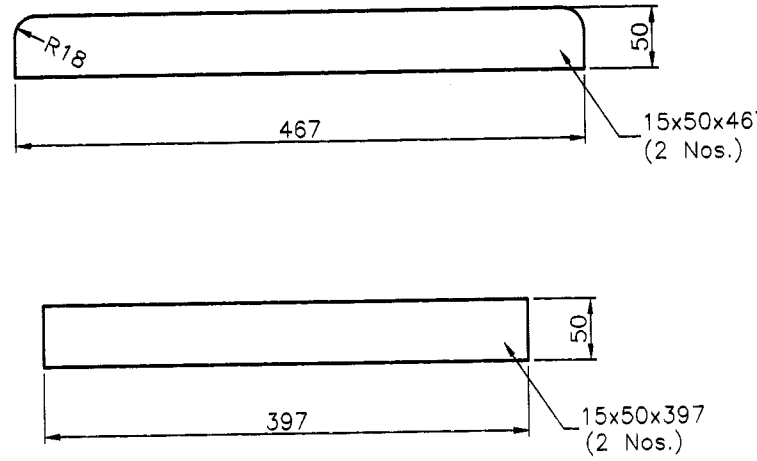


16X467X497

INSIDE STIFFNER

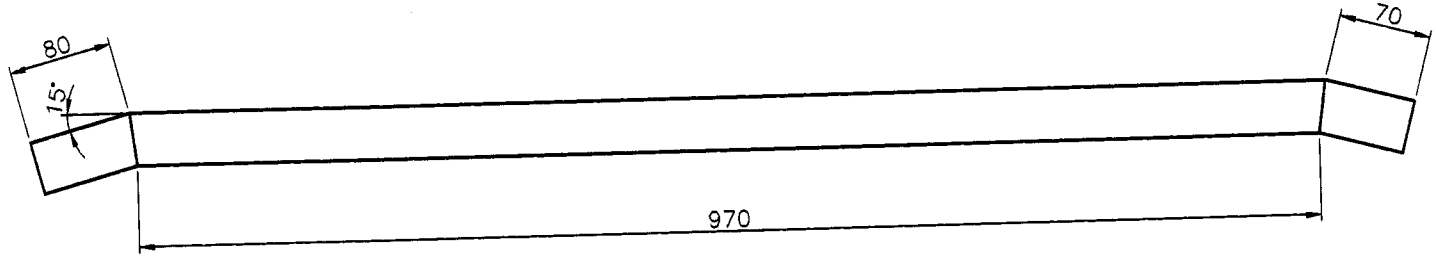
15x50x495 - 2 Nos.

BOTTOM STRIP

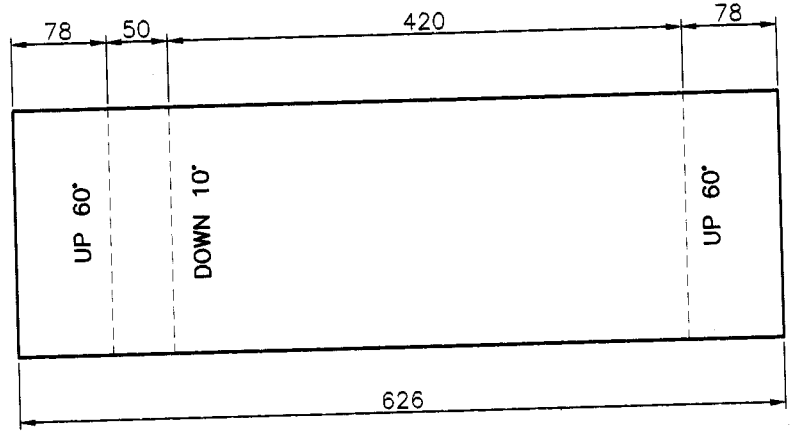


All dimensions in mm

GEDEE WEILER PVT. LTD.,		
HEAD STOCK SIDE BOX STIFFNERS		
MAT : M.S	QTY : 1	DRG.NO:
SCALE 1 : 5		

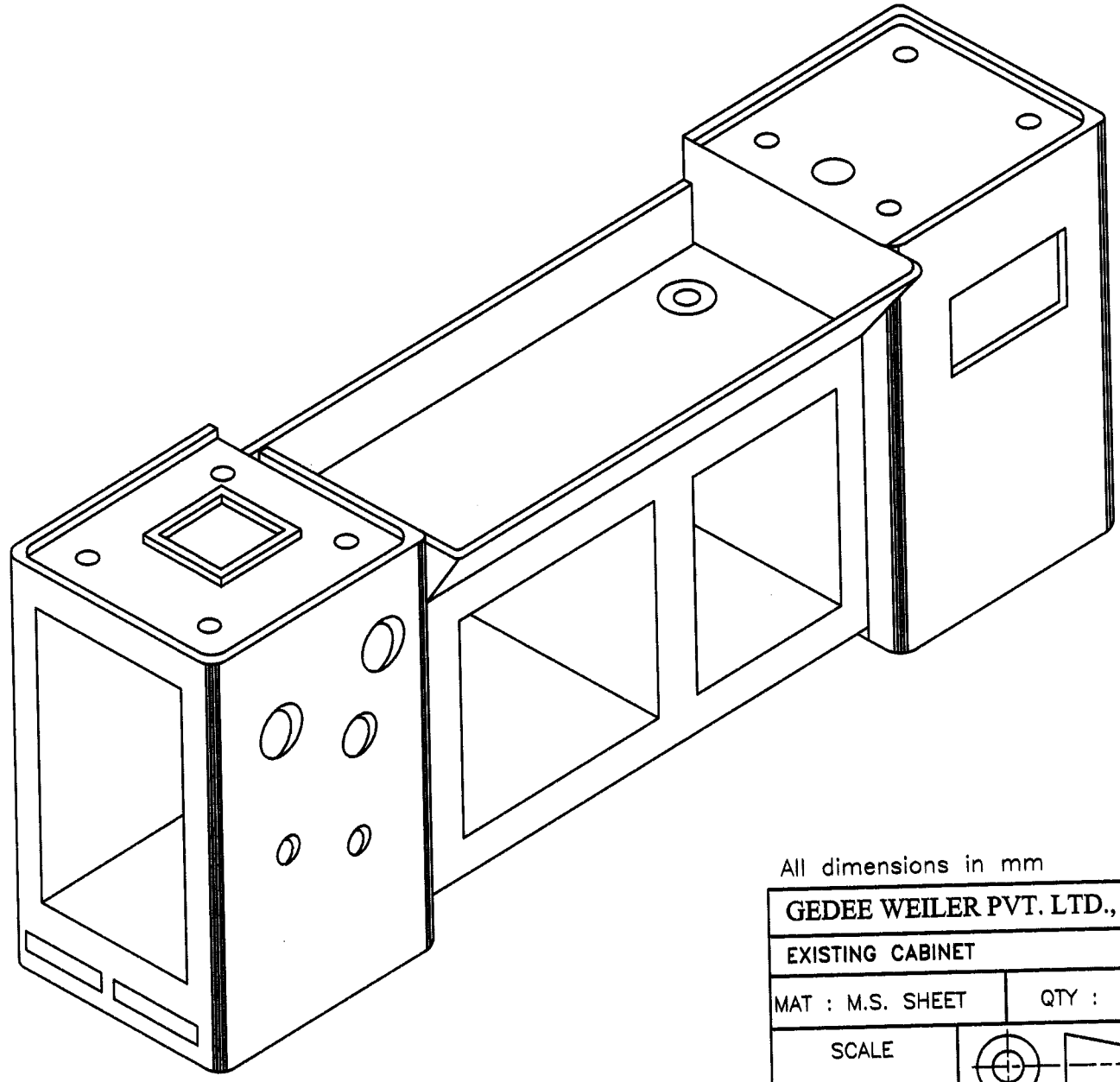


Ø43x2 thick x1120



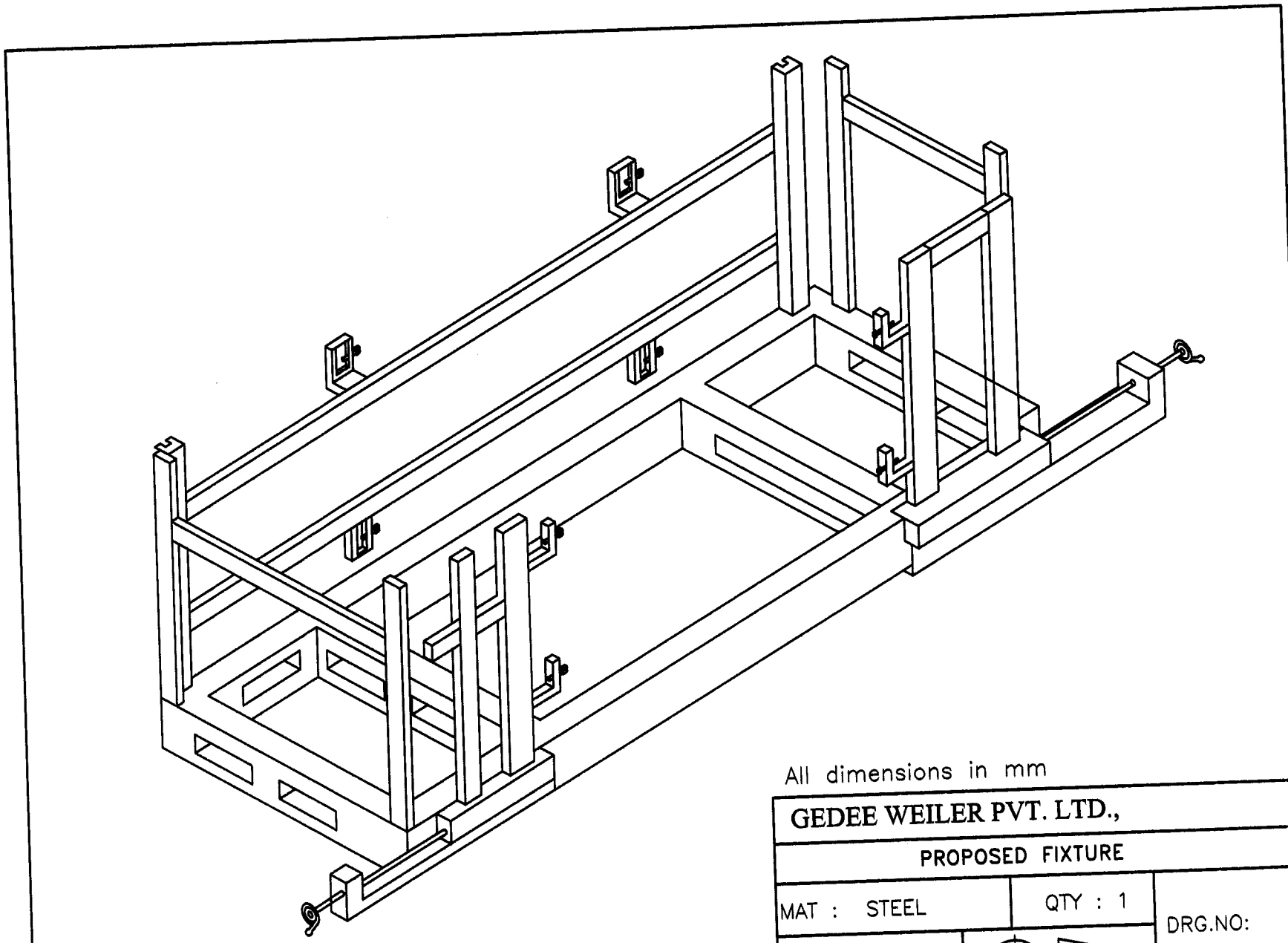
All dimensions in mm

GEDEE WEILER PVT. LTD.,		
WIRE PIPE, COOLANT TOP TRAY		
MAT : MILD STEEL	QTY : 1	DRG.NO:
SCALE 1 : 5		



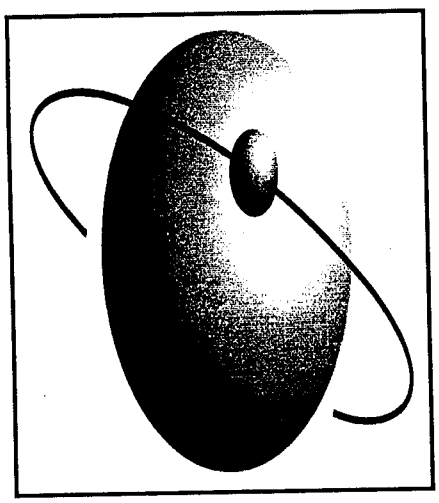
All dimensions in mm

GEDEE WEILER PVT. LTD.,		
EXISTING CABINET		
MAT : M.S. SHEET	QTY :	DRG.NO:
SCALE		



All dimensions in mm

GEDEE WEILER PVT. LTD.,		
PROPOSED FIXTURE		
MAT : STEEL	QTY : 1	DRG.NO:
SCALE		



CONCLUSION

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Thus the study of the existing procedure of fabrication of LZ-350 was conducted, following the systematic work-study procedure. Then, the procedure was analysed and an optimised procedure was arrived-at. Then new procedure of fabrication has following

benefits:

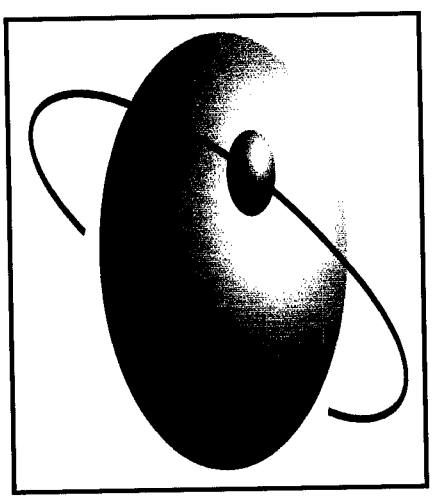
* Reduction of time of fabrication from 44 hours to 32 hours, if fabricated by one worker. In our case, their are four workers which implies reduction from 8 hours to 5 ½.hours.

The layout of the fabrication shop was recorded and analysed systematically and new layout was developed. The new layout has the following benefit

* Reduction of material movement from 437m to 158m.

Existing material handling was improved to reduce the fatigue of workers.:

The developed system has been installed in the fabrication shop.



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   - Donaldson, Lelain, Goold