

A Report of
WORK-TERM I

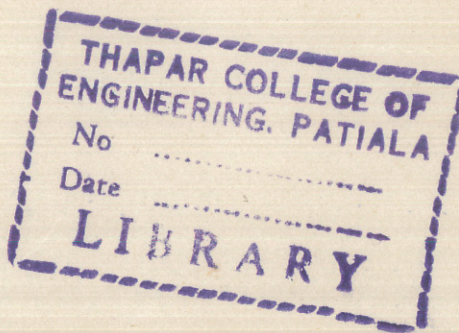
(Feb. 91 to July 91)

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THE INDIAN SUGAR & GEN. ENGG. CORPN.



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Submitted by :
SUDHIR GUPTA
167/88, B.E. IIIrd yr. (IND.)

ACKNOWLEDGEMENT

I express my sincere thanks to Dr. R. C. Bahl (Head, Mech. & Industrial Engg. Deptt) for giving me an opportunity to have my WORK-TERM I in ISGEC. I am highly grateful to Mr. J. S. Tikka for his keen efforts in arranging my training. I express my sense of gratitude to Mr. P. L. Bali, Mr. R. Garg & Mr. T. P. Singh for their kind guidance during my training.

I am thankful to Dr. S. M. Haider (Manager, Training & Development), Mr. S. Gulati (Engineer), Mr. S. N. Mishra (Engineer) and all the concerned persons of ISGEC for their kind cooperation and guidance.

I. I. E. T., PATIALA

(SUDHIR GUPTA)

PREFACE

Training is a device for increasing Trainee's effectiveness. It also increases his practical experience towards difficult fields. A six-month training is a part of five year industrial Engg. Degree of T.I.E.T. Patiala.

I had the privilege of receiving my training in one of the heavy Engineering Industries of our country i.e. Indian Sugar And Gen. Engg. Corporation, Yamuna Nagar.

In the very starting period of my training from 26th Feb. I did a weak orientation of whole factory Then I did a project on Method study of all fitting operation of Boiler Shop as a previous step for time study. Second part was a project on Man-Power utilisation in foundry shop and third was on the layout of container shop.

T.I.E.T.
PATIALA.

(SUDHIR GUPTA)

ABSTRACTS

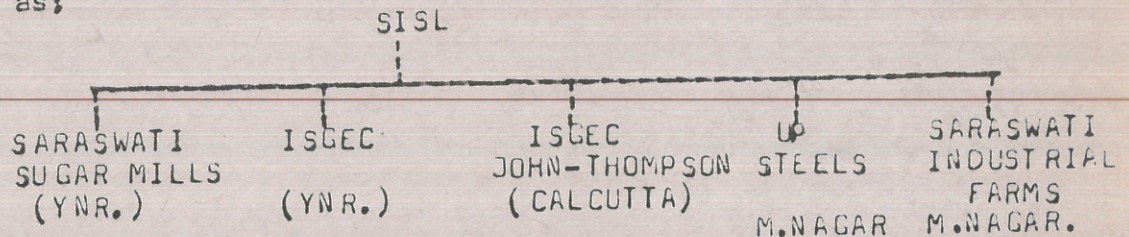
1. ORIENTATION REPORT.
2. METHOD STUDY REPORT
3. MAN-POWER REPORT
4. PLANT LAYOUT REPORT

CHAPTER-I

ORIENTATION REPORT

INTRODUCTION TO THE ORGANISATION:

Indian Sugar and General Engineering Corp. (ISGEC) is the flagship company of Saraswati Industrial Syndicate Ltd. The syndicate was established on Jan. 13, 1933, with two sugar Mills of four hundred tonnes per day cane crushing capacity at Yamuna Nagar and Neoli. . . A subsidiary in the name of 'THE INDIAN SUGAR AND GENERAL ENGINEERING CORPORATION' was incorporated on Jan. 19, 1946. The main objective of subsidiary was Machinery Manufacturing in the year 1962 Saraswati Sugar Mill and ISGEC were amalgamated to form THE SARASWATI INDUSTRIAL SYNDICATE LIMITED. Another subsidiary named ISGEC JOHN THOMPSON LTD. was formed in 1965 for design Engg. and sale of different types of Boilers and pressure-vessels and the same have been amalgamated with 'SISL' July, 1, 1973. The organisational structure of SISL is as:



BRANCH OFFICES: :

DELHI, BOMBAY, MADRAS, CALCUTTA.

CONTD....

SOME MAJOR PRODUCTS OF THE COMPANY

1. PRESSURE VESSELS:

Heat Exchangers, Distillation columns and Towers, Auto Claves, liquified NH_3 & Cl_2 gas containers, galvanising baths, class-I vessels in stainless steel, nickel and other special materials.

2. SUGAR MILL MACHINERY & EQUIPMENTS:

Complete sugar plant, high and medium capacity milling tendems, evaporators, vacuum pans, juice-heaters, cane-unloaders, cane knives, cane/bagasse handling equipments, sulphur burner sets crystalizers, sugar dryers and sugar graders, sugar centrifugals.

3. BOILER AND WATER TREATMENT PLANTS:

Shell Boiler for oil/coal/wood firing, water-tube boiler for oil/gas/coal/bagasse, waste heat recovering boilers, water treatment plants for industrial applications, deaerators.

4. HEAVY MACHINERIES:

Hydraulic presses and machanical presses, plates bending and levelling rolls, welding rotators and mainte manipulators, fume hoods.

5. CEMENT MACHINERIES:

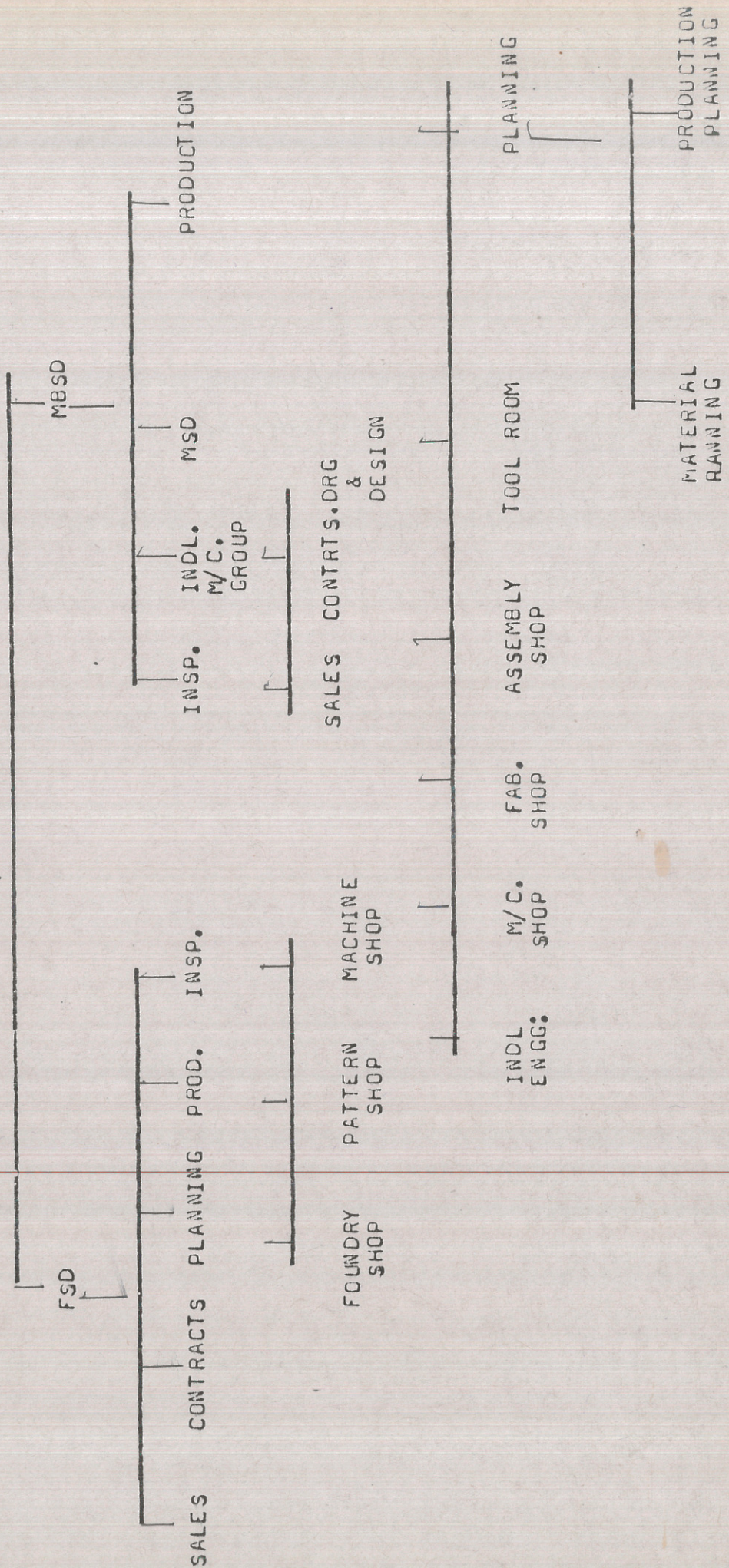
Heavy fabrication of all types of castings.

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ALL ABOUT G.D.

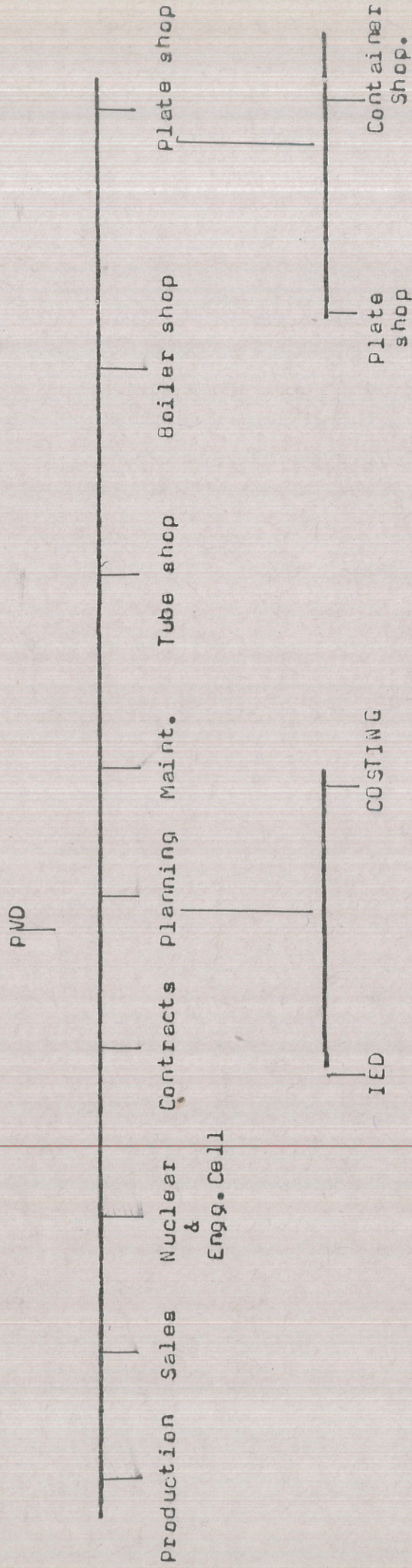
a) ORGANISATIONAL STRUCTURE:

G.D.

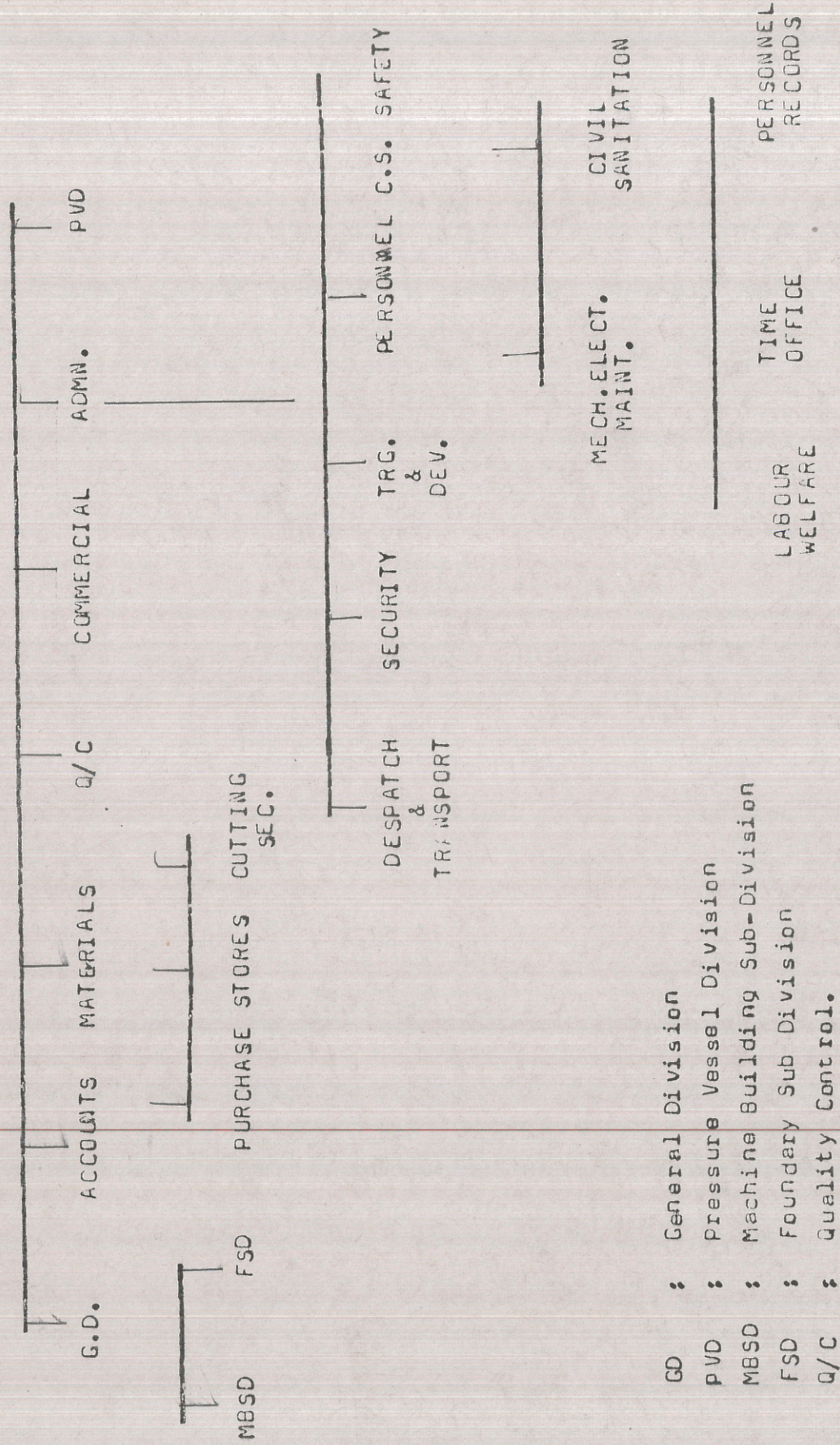


ALL ABOUT PRESSURE VESSEL DIVISION

a) ORGANISATION STRUCTURE



ISGEC(W) HEADED BY WORKS MANAGER



- GD : General Division
- PVD : Pressure Vessel Division
- MBSD : Machine Building Sub-Division
- FSD : Foundary Sub Division
- Q/C : Quality Control.

6.

VARIOUS DEPARTMENTS OF ISGEC

Works of the Company is divided into 2 Divisions:-
Pressure Vessel Division (PVD) and General Division (GD),
General Division is again divided into 2 parts namely:
Machine, Building Sub-Division (MBSB) and Foundary Sub-Division
(FSD).

I. VARIOUS DEPARTMENTS UNDER PVD:

1. PRODUCTION DEPARTMENTS:

There are four shops in this departments namely
Tube shop, Boiler shop, Plate shop, Containers shop.

2. Sales:

3. CONTRACTS

3. PLANNING

5. INDUSTRIAL ENGINEERING & COST CONTROL

6. MAINTENANCE

7. QUALITY CONTROL

8. PVD DRAWING OFFICE

9. NUCLEAR SHELL

II. VARIOUS DEPARTMENTS UNDER G.D.

MBSB:

1. Production Departments:

There are three shops in this department namely M/C.
shop, structure shop and Assembly shop.

cont d...

2. Sales
3. Contracts
4. Planning
5. Industrial Engineering & Cost Analysis
6. Maintenance
7. Inspections
8. Drawing Office

FSD:

1. Production Department : Foundary Shop
2. sales
3. Contracts:
4. Planning
5. Drawing office

There are many other general Departments which are common for both the divisions:

1. Finance and Accounts
2. Material Department: Purchases, Stores, Cutting Section.
3. Commercial Department; Audit Section
4. Administrative Department:
 - a) Security
 - b) Safety
 - c) Training and Development
 - d) Dispatch and Transport
 - e) Gardening & sanitation
 - f) Personnel
 - g) Time Office
 - h) Labour welfare.

FUNCTIONS OF VARIOUS DEPARTMENTS UNDER PVD

DRAWING OFFICE:

To prepare the detailed manufacturing drawing from the design received from clients and get these approved from clients as well as various inspection authorities r fixed by clients. After that, the office issue base drawing alongwith its Bill of materials and cutting diagrams etc. to the production shop (PB,PP,PT) as well as to the inspection departments, planning and industrial Engineering department for the production it also issues the bills of Materials to the concerned store to release the require to material. Preparing details of Raw-material and finished items to be used for products and give to contracts department for procurement.

SALES:

- a) Keeping a track of the forth coming new projects & getting ourselves registered as a supplier of the items filling in our range.
- b) Keeping in touch with the existing plants/projects for their replacement requirements.
- c) Scrutiny of tender documents making estimates and quotations to the parties.
- d) Maintaining follow up, attending technical and commercial discussions and getting the orders.
- e) Sending order acceptance and realising the first advance payment.

contd.....

- f) If there is a change in our scope of work for any existing order, settlement of the corresponding price and deliver implication.

INTERACTIONS:

i) Contracts:

Interactions with contracts Departments continues throughout the pendencies of the contract. Basically it is to keep a track is here is any change in scope of work or whether material has been procured at the same rates of import-duties so that extra claims is required are lodged.

ii) Engineering:

For getting design of various equipments if required at the stage of sending offer.

iii) Quality Control:

Discussion with Q/C Department regarding a specific testing requirements of a particular enquiry.

iv) IE & CC Department:

At times we get fabrication and machining times for some complicated items before submitting our offer, we also receive copies of the cost estimates after the job is completed for our future record and action.

v) Commercial Department:

The sale Dept. needs this department in getting bank guarantees for EMD advance etc. and for getting

solvency certificates from the bankers regarding our financial stability. We also seek their opinion on few occasions about some commercial conditions of the tender enquiries.

vi) IJT:

IJT is getting the pressure parts of their boiler-contract fabricated in PVD. We settle with them pricing policy on yearly basis. Further when the job is nearly under completion and when the actual material cost of components is known, the extra claim is lodged with them and amendments are accordingly received from them, we also quote to them for their requirement of spare tubes.

vii) Purchase (CD):

We occasionally get in touch with this deptt. to ascertain availability of individual items and the prices of these items are not regularly dealt by PVD.

viii) Despatch:

No much interaction is existing with the Despatch section.

ix) Export Deptt:

At the time of submitting our offers, some formalities like furnishing of bid bond and availability of export benefits are to be completed by the Export Deptt.

BOILER SHOP FUNCTION

This shop is fabricating pressure vessels, boilers, heat exchangers, columns, and other chemical equipments, There are mainly four parts of this shop as mentioned below:

- i) Fabrication section
- ii) Welding section
- iii) Press section
- iv) Machinery section.

Dealings:

Like planning, contracts, IE & CC, Q/C Engg. Shell and welding and other stores etc.

TUBE SHOP FUNCTION

Bending the tubes for boilers as per drawing given by contract deptt.

Dealings:

planning deptt., feeds materials for bending and also arranging the tools for the new jobs. Contract Deptt. issues drawings and other informations and requirements of jobs. Q/C deptt. checks the quality of jobs.

CONTRACTS DEPARTMENT FUNCTIONS:

- i) To get orders from different clients and to execute orders received from various clients.
- ii) To help the sales deptt. in making advertisements of products.
- iii) To prepare detailed working drawing and getting these approved from the relevant inspecting authority or the clients themselves.
- iv) To calculate the requirement of raw materials.
- v) Getting the work started at the shop floor & its completion and despatch.

PLANNING DEPARTMENT FUNCTIONS:

- a) Co-ordination of job work with various deptt. and shops.
- b) Arrangement of consumables/toolings.
- c) Inter-division co-ordination.
- d) Sub-contract of various items required for jobs.
- e) Intending and feeding of material to shops.
- f) Preparation of macro and micro programmes reqd. to execute the jobs from time to time.

INDUSTRIAL ENGG. AND COST CONTROL DEPTT:

Industrial Engineering is concerned with the designs, improvement and installation of integrated system, man, materials and equipments.

contd.

The I.E. & C.C. Department has the following objectives:

- i) To establish methods for controlling production costs.
- ii) To develop programmes for reducing these costs.

Specially, the industrial Engg. is applicable to the production deptt.

- iii) To prepare and establish incentives, assessment of man power & machines for different projects, process planning of specific jobs, method improvement and standardisation and to control all time both functions.

- iv) The cost control comply jobwise booking of labour and to prepare men and machine utilisation reports, compilation of booking of raw material, consumables labour and other expenses incurred against each job. To prepare cost-sheets and investigate reasons of variation in actual booking and the estimate, to circulate various reports in connection with various jobs' profit/loss of the division.

Dealings with other deptt: Sales, contacts, planning Quality control, maintenance, engineering, all the shops, tool room stores, A/c. Audit and commercial Department.

FUNCTIONS OF VARIOUS DEPARTMENTS UNDER GD

1. Machine Shop:

- i) to do machine loadings as per priorities, production schedule given by Planning deptt.
- ii) To see that max. utilisation of machine, men and material is done in the shop.
- iii) To co-ordinate all activities to boost incentive schemes and to get the jobs manufactured in prescribed time by Industrial Engg. Deptt.

2. Structure Shop:

- i) The whole shop is divided into different fabrication groups and each group is comprise of fitting, welding and grinding man. Each group is doing the following operations:-
Gas cutting, fitting, welding, grinding.

3. Tool-Room:

- i) To provide tools, measuring and making instruments as well as gauges.
- ii) Design of some special tools.
- iii) Making of gauges, templates etc. for different shops, as per their requirements.
- iv) Making of small critical jobs, which can't be made in shops.
- v) Grinding of cutting tools.

contd....

- vi) Heat treatment of cutting tools and machinery parts and apart from this giving trial of new tools and provide their performance.

4. Material Department:

This department consists of three sub departments;

a) Purchase department.

b) Stores

c) Cutting Section

a) Purchase Department:

i) Timely procurement of all materials to the required specifications.

ii) Location & approval of capable vendors and sub-contractors.

iii) Incorporating complete quality requirements in the purchase orders.

iv) Prompt communication of specification changes to the vendors and sub-contractors.

b) Store Department Functions:

i) Proper receipt, handling and storage of materials in accordance with the relevant instructions.

ii) Proper segregation of materials in stores and their issue with reqd. identification details.

iii) Segregation of rejected materials and their disposal.

contd.....

c) Cutting Section Department functions:

- i) Delivering cut to shape materials to shops and relates work link marking, handling.
- ii) Carriage of gas cylinders to the place of cutting.
- iii) Delivering materials to transport section after cutting.
- iv) Layout and study of drawing before cuttings.
- v) Liason co-ordination with division (plng, Insp. & Drq. Office).

5. FUNCTIONS OF ASSEMBLY SHOP:

Assembly shop is primarily responsible for complete assembling and trials of any machine tool or equipment manufactured by the division. It performs the following types of functions.

- i) The complete work order alongwith the specifications of the job is received from the contracts deptts. and the job to be assembled is discussed with the concerned contract engg.
- ii) Internal Planning: Once the job is discussed and understood a schedule to carryout the assembly is worked out depending upon the inflow of job material from different resources. Allocation of the group of workers and supervisors is made as per the requirement of the job.

The planning also include the different time estimates and job is regularly monitored and evaluated for the time consumed. A chart is maintained in the shop and regular entries about time consumed are filed in.

iii) Receipt of Drawings and components from the deptt. concerned and from the store deptt.

iv) The supervisors assigned to the particular job starts working out his plans. Parallel activities are worked out and would be carried out simultaneously. Each sub-assembly or critical item is offered to the inspection department if it is necessary to do so. Once the job is completed by assembling is handed over to the service and commissioning department. The people also take care of overtime and compensatory leaves.

6. PRODUCTION PLANNING AND CONTROL DEPTT.

i) Production planning & control department of MBSD is concerned with production planning, scheduling and control, material planning control, material follow-up, process planning, method improvement etc.

ii) The department has to interest with design/drawing offices, production shops, inspection, purchases, stores PVD, & FSD planning (Production) and quality control, cutting yard etc.

iii) The deptt. expects that delays at all levels are reduced particularly in purchase deptt. and drawing offices.

7. INDUSTRIAL ENGG. & COST CONTROL:

i) I.E. & C.C. Deptt. of MBSD is concerned with preparation of time-standards, devising and implementing incentive

schemes, methods-improvements, inventory control, job-costing, preparation of revised estimates and cost-sheets.

- ii) This deptt. has to interact with production planning, production shops, accounts, purchases and stores etc.
- iii) The department expects improvement in its Industrial Engg. functions.

8. MAINTENANCE:

It covers electrical and mechanical maintenance in MBSD as well as FSD. Attends any break-down of machines, planning maintenance, production maintenance and spare parts planning, both types of maintenances: preventive maintenance as well as break-down maintenance.

FUNCTIONS OF DEPARTMENTS COMMON TO BOTH THE DIVISIONS

1. PERSONNEL DEPARTMENT FUNCTIONS:

Personnel Management is the planning organising, directing and controlling of procurement, development, compensation, integration and maintenance of people for the purpose of contributing to organisational, individual and social goal.

Personnel Management is concerned not only with managing people, but also with solving the human problems of an organisation intelligently and equitably and in a manner which ensures that employees potential is properly

contd...

developed, that max. satisfaction is derived by them from their work, that the objective of the organisation are achieved and that good human relations are ~~are~~ maintained within the organisation.

Personnel Department of the company is headed by the Personnel Manager. The department under him are:-

- 1) Labour welfare.
- ii) Time Office.

2. SAFETY DEPARTMENT FUNCTIONS:

This department performs the work for the safety of the workers. The safety officer provides education to the workers relating to their jobs on different machines. It also gives general awareness to the workers and also suggests management about safety of workers. The main objective of safety department is to maintain the workers safe by advising them in different ways e.g. by providing Seminars, lectures, etc. and hence also help the production department to increase the production and to have the optimum utilisation of man, material and machines.

3. TRAINING AND DEVELOPMENT DEPTT. FUNCTIONS:

- i) Training deptt. finds out training needs for various cadres namely workers, supervisors and senior executives in different functional areas. Arranges to conduct these programmes either by internal faculty or external faculty.

- 3 ii) Supervisors the training of the students and helps them in carrying out some projects on certain problems coordinates the liason work with various academic institutes.
- iii) Training deptt. has also undertaken the work of arranging the campus interviews for various poly-technic and engg. colleges.
- iv) Apart from, this the department is involved in distributing various articles, case-study, course materiel, another publications for the benefit of the employees. The department has taken initiative to introduce quality circle in the company.

4. COMPUTER CENTRE FUNCTIONS;

- a) The computer Department looks after the data processing needs of five units of SISL Viz- SSM, ISGEC (W), ISGEC(XY), ISGEC(FC), & Head Office with the final objective to provide information to management for control and decision making process.
- b) At present the following processes are computerised:-
- Financial accounting for all the five units.
 - Costing & Budgetary control for all the five units.
 - Payroll for ISGEC(W) & SSM.
 - Cost A/Cing for SSM.
 - Store Accounting for ISGEC(W) & SSM.
 - Over time accounting for ISGEC(W) & SSM.
 - Fixed Assets Accounting for ISGEC(W) & SSM.
 - Resources utilisation & incentives for ISGEC(W).

contd.....

5. ACCOUNT DEPARTMENT FUNCTIONS:

- 1) To circulate management information report.
- 2) To prepare the Balance-Sheets.
- 3) To deal with banks.
- 4) To provide informations to Head office and also for purpose of Income Tax and Tax Audit.
- 5) To maintain books of accounts.
- 6) To give valuation to divisions.
- 7) IJT Billings.
- 8) To circulate cost centre reports & statements.
- 9) To make payments of salaries.
- 10) Incentive wages checking and payments.

6. SECURITY DEPARTMENTS FUNCTIONS:

As the name indicates, the security department do the security work for the workers of the factory. It performs various operations like to control and to have a watch on the assets of the factory. In all the fire risk areas, there are fire-extinguishers. The security department also has a look on the electrical instalment and Gas pipe lines etc. Whenever security department anticipates any risk in any area, it at once aware about it to the management.

The security men at the factory gate don't give permission to any person enter the workshop area without badge or photo-pass. They have also to look over Trade Union activities & other labour movement in nearby industries.

Security department also checks the materials while entering the factory or going out of the factory. Sweepers and gardeners also give informations to the security department about the different matters.

In the last three years, the security department has shown very good performance. It has caught about forty vehicles entering the factory having lesser material than mentioned in the gate pass and warned the management about this for taking further steps and actions.

CHAPTER- II

METHOD- STUDY

SUBJECT : TO DRAW FLOW PROCESS CHARTS FOR VARIOUS FITTING OPERATIONS IN 'BOILER SHOP'

INTRODUCTION:

Method-Study is the systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more effective methods and reducing costs.

The objective of method study are :-

- The improvement of processes and procedures.
- The movement of factory, shop and work place, layout and
- of design of plant and equipment.
- Economy in human effort and the reduction of unnecessary fatigue.
- Improvement of the use of material, machines and manpower.
- The development of a better physical working environment.

The different steps in procedure of method study are :-

- i). Select the work to be studied.
- ii). Record all the relevant facts about the present method by direct observations.
- iii). Examine those facts critically and in ordered sequence, using the technique best suited to purpose.
- iv). Develop the most practical, economic and effective method, having due regard to all contingent circumstances.

contd.....

- v). Define' the new method.
- vi). Install' that method as standard practice.
- vii). Maintain' that standard practice by regular checks.

The most common technique of method study is flow charts.

FLOW PROCESS CHART :

A Flow Process Chart is a process chart setting out the sequence of flow of a product or a procedure by recording all events under review, using the appropriate chart symbols.

Flow Process charts of type :

- i). Man-Type
- ii). Material-type
- iii). Equipment-Type

VARIOUS OPERATIONS OF BOILER SHOP :

Boiler shop mainly deals with pressure vessels, Heat Exchangers, Boilers(Water-Tube) etc. The work starts from initial plate cutting to final finished vessel of varying capacity.

The various operations are :

- i). FSTCH-UP : In this operation, sheet is pressed from both sides in 750 Tonne press. This is a pre-requisite of rolling operation.
- ii). ROLLING : Sheets are rolled in roller to convert it into shell. The most common thickness of sheet is 12 mm.

- iii). L/S WELDING ; The shell belt rolled, welded lengthwise. The most common welding technique used is SAW-WELDING.
- iv). CENTRE LINE MARKING ; The shell belt is centre lined to locate the position of cleats to attached the two or more belts, so that between L/S of two belts, an angle of 45° can be set.
- v). C/S WELDING ; Two shell belts are welded along circumference to make it a big belt. The common welding used is SAW WELDING.

Other operations like D/E preparation (done at 500 tonne press), D/E to shell Assembly, D/E assembly etc.

The details and steps are shown in flow process charts.

PURPOSE OF STUDY ;

The time standards are not fully prepared for all operations in Boiler Shop. Since method study is pre-requisite of time study, this study was conducted. In all the shops, the time standards are prepared for incentive scheme. Incentive scheme starts from rating 75 and ends at 112. Incentive payment is given depending upon time saved. A person can earn maximum of time saved half of the time taken, like a time of 10 hrs. is issued and

contd....

and it is completed in 6 hrs. , Then he will earn of
3 hrs., not of 4 hrs.

THE STUDY WAS CONDUCTED TO PREPARE TIME STUDY SHEETS.
SO NO FLOW OF MATERIAL WAS REQUIRED IN FLOW PROCESS CHART.

FLOW PROCESS CHART

CHAR. NO. _____ SHEET NO. _____
 SUBJECT CHARTERED:
 Cold pressing of D/E's of Containers
 ACTIVITY: Cold Pressing
 METHOD: PRESENT / PROPOSED
 LOCATION: 500 Tonne press (Boiler shop)
 CHARTERED BY: _____ DATE: _____

SUMMARY			
ACTIVITY	PRESENT	PROPOSED	SAVING
OPERATION ○			
TRANSPORT ⇨			
DELAY □			
INSPECTION □			
STORAGE ▽			
Time (min)			

DESCRIPTION	TIME (min)	SYMBOLS					REMARKS
		○	⇨	□	□	▽	
(i) Load plate		●					
(ii) Raise bed and press plate.		●					
(iii) Lower bed halfway down so as to clamp		●					
(iv) clamp the D/E		●					
(v) Lower bed completely so as to unload the D/E		●					
(vi) Raise bed to unload the D/E		●					
(vii) Put D/E on the stack.		●					
(viii) Lower bed to load the plate.		●					

COLD PRESSING OF D/ES OF CONTAINERS

In the present method, as clear from the chart that there is one productive step (No 11) and rest of the steps are just to load or to unload the work-piece on the bed or from the bed (Non-productive). So if by some means, these non-productive steps can be reduced, then the method would become quite easier, simple and less time consuming.

ONE SUCH METHOD, IF POSSIBLE IS:

When the plate is loaded on the bed, it is loaded manually by two persons (Plate is straight here) and when it is unloaded, its shaped is slightly curved. So if plate could be unloaded manually (the way we load it), all the steps from (iv) to (viii) could be eliminated. The weight of the work-piece is same but the only difference is that it is slightly curved.

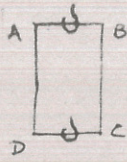
FLOW PROCESS CHART

CHART NO. SHEET NO.		SUMMARY					
SUBJECT CHARTERED:		ACTIVITY	PRESENT	PROPOSED	SAVING		
Cold pressing of D/Es of Containers		OPERATION ○					
ACTIVITY: Cold pressing		TRANSPORT ⇨					
METHOD: PRESENT / PROPOSED		DELAY □					
LOCATION: 500 Tonne Press		INSPECTION □					
CHARTERED BY: _____ DATE: _____		STORAGE ▽					
DESCRIPTION		Time (min)	SYMBOLS				
			○	⇨	□	▽	REMARKS
(i) Raise bed to unload the previous (on stack) D/E & to press the loaded plate (ii) lower Bed halfway so as to clamp D/E (iii) clamp the D/E (iv) lower bed to unload the D/E and to unload the next plate Note In this proposed method, the position of the chain should be such that when bed is lowered the chain to swings in a manner to put the D/E on the stack		● ● ● ●					

~~FETCH UP~~

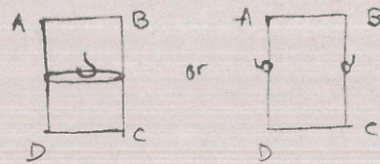
FETCH UP OF PLATES OF CONTAINERS

In fetch-up, clamping is done in a manner as shown.



First AB side is clamped and DC is put in machine. Then plate is put on the floor AB is unclamped, DC is clamped and AB is put in machine. So some time is consumed in extra movements of plate.

If sheet could be clamped in a way as shown:



then without putting the plate on shop-floor, in a single lifting operation, both the sides AB & DC could be folded and time could be saved.

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY				
SUBJECT CHARTERED:		ACTIVITY	PRESENT	PROPOSED	SAVING	
		OPERATION ○				
ACTIVITY:		TRANSPORT ⇨				
		DELAY □				
METHOD PRESENT / PROPOSED		INSPECTION □				
		STORAGE ▽				
LOCATION:		Time (min)				
CHARTERED BY:						
DATE:						
DESCRIPTION	TIME (min)	SYMBOLS				REMARKS
		○	⇨	□	▽	
(xvii) blank is adjusted.						
(xviii) Dies closed and grip the blank						
(xviii) Crane lifts the blank						
(xix) two dies open						
(xx) blank moved downward with crane						
(xxi) Adjusted and loose is repeated with a long bar put into on the lower die.						
(xxii) blank is taken out						
(xxiii) Crane puts the blank on shop floor.						
(xxiv) jaw is taken out						
(xxv) Jib crane moves to other end (banded)						
(xxvi) jaw is fixed with banded end						
(xxvii) crane lifts the blank						
(xxviii) blank is directed to wife put in the wife and same operation as on the first side.						
(xxix) blank is taken out						
(xxx) put a 2nd stack of banded plates, jaw is taken out, crane moves to 1 st blank						

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY					
SUBJECT CHARTERED: Hot-pressing of petals		ACTIVITY	PRESENT	PROPOSED	SAVING		
ACTIVITY: Hot-pressing		OPERATION ○					
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨					
LOCATION: 500 Tonne press.		DELAY ◯					
CHARTERED BY: _____ DATE: _____		INSPECTION ◻					
		STORAGE ▽					
		Time (min)					
DESCRIPTION	TIME (min)	SYMBOLS				REMARKS	
		○	⇨	◯	◻	▽	
(i) Crane awaited to come to move the trolley.							
(ii) Crane comes and clipped to trolley.							
(iii) trolley moves to furnace, shutter opens (4 persons sitting on back of trolley)							
(iv) trolley is directed, adjusted by crane, picks the piece							
(v) picks the piece, moves back and then to the press.							
(vi) blank is put on the bed, trolley moves to original position, crane goes away.							
(vii) pressing operation is done							
(viii) After operation, air pressure is given to remove extra particles							
(ix) wait for crane, may be delay due to some congestion in crane path.							
(x) Crane arrives, holds the piece and put it on the floor.							

HOT-PRESSING OF PETALS

In hot-pressing, crane is used to move the trolley initially and then to take the petal out of die.

Now a problem may occur and it should always be taken into account. The problem is

when crane is awaited, there may be a chance that that some another crane is working in between the crane (that we need) and our job. So a congestion of cranes may occur and a lot of time may be wasted in wait of crane.

Again, when crane goes away after putting the work-piece on die, there may be a congestion between this crane and the place where we need it.

So this factor should always be taken into account.

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY			
SUBJECT CHARTERED: Hot pressing of D/Es of Containers.		ACTIVITY	PRESENT	PROPOSED	SAVING
ACTIVITY: Hot-pressing		OPERATION ○			
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨			
LOCATION: 500 Tonne press		DELAY □			
CHARTERED BY:		INSPECTION □			
DATE:		STORAGE ▽			
		Time (min)			

DESCRIPTION	TIME (min)	SYMBOLS					REMARKS
	○	⇨	□	□	▽		
(i) D/Es are placed in front of furnace and crane is awaited to put the D/Es in furnace.							
(ii) Crane comes, attached to clipper, two persons supporting it from end.							
(iii) moves, picks the D/E one by one puts in furnace.							
(iv) moves back, put the clipper on floor, moves away.							
(v) heating operation is over after 40 mins, crane awaited.							
(vi) Crane comes, attached to clipper, moves to furnace (two persons supporting it).							
(vii) D/E is moved to press, put on the lower die, clipper is taken away still held by crane.							
(viii) D/E is pressed.							
(ix) Crane moves the clipper to D/E picks it and puts it on shop floor.							
(x) clipper is moved to furnace and picks the next D/E.							
<p>Note: problem of congestion of cranes may occur.</p>							

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY				
SUBJECT CHARTERED: Circular Seam set-up.		ACTIVITY	PRESENT	PROPOSED	SAVING	
ACTIVITY: Circular-Seam (LPG Bullets)		OPERATION O				
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨				
LOCATION:		DELAY D				
CHARTERED BY:		INSPECTION □				
DATE:		STORAGE ▽				
		TIME (min)				
DESCRIPTION		TIME (min)	SYMBOLS			REMARKS
		O	⇨	D	□	▽
(i) Attach cleats on both ends of the 1 st shell.						
(ii) Bring 2 nd shell on two rollers by crane and crane disengaged.						
(iii) Attach cleats on one side of the shell.						
(iv) Move 2 nd shell sideways, to provide half of roller for 1 st shell.						
(v) Bring 1 st shell on one and a half roller, still holding it in crane.						
(vi) Move or reolve 2 nd shell so that cleats come in one line.						
(vii) Disconnect crane and tight nut-bolts in two shell.						
(viii) Tack at various pts.						

1. If identical rollers are used and marking of cleats is done already and one shell is placed on $\frac{1}{2}$ roller and II^{nd} held by crane then moving I^{st} (revolving) two marks may be brought in one line and the need of cleats may be avoided. For further correctness four rollers may be used. ^{Each} One is supported on two and any one of them is revolved because the gap between shells is small it can be seen whether marks are in one line or not. This will avoid cleating operation, time, electrodes, man-power, transportation & crane utility.
2. If cleats are necessary, then using three rollers, (one rest on $\frac{1}{2}$ and II^{nd} held by crane) marks may be brought app. in one line and then all the four cleats (two on each) may be done in one position of shells with revolving. To avoid the held up of crane, four rollers may be used.
3. Four rollers may be used, so that for setting no crane is used and once two shells are bolted if we revolve one II^{nd} will revolve automatically.
4. II^{nd} shell could be placed on $\frac{1}{2}$ of rollers when crane was used and then cleats could have been welded while in used method, shell was placed on two rollers, cleats were welded and then moved sideways to $\frac{1}{2}$ rollers.

Few Points about Circ-Seam

1. There were ~~three~~ ^{two} rollers, ~~two of same type and IIIrd of different type~~ & one idler. So ^{a packing} an extra sheet of certain thickness (app) was placed under IIIrd roller to make them of same height. But this was just an approximation. Why three identical rollers were not used?
2. When cleats were attached on IInd shell ^(on one side), why didn't they were attached on both side while it could be done with the same position of shell.
3. Ist shell was found to be a little above to roller. So there may be a ^{chance} of some mis-alignment of either shells or rollers.
4. When cleats were welded, the dimensions of the weld were greater than the requirement (Fillet used: Req^d.)
5. Cleats on the first shell were welded at certain place and then it was brought to final place of assembly. Why cleats were not welded at ^{the place where assembly to be done} final place, by doing so, additional transportation would have been avoided.
6. When cleats were welded on IInd shell it was supported ~~by~~ ^{on} fully rollers and afterward it was shifted sideways to $1\frac{1}{2}$, why crane had not put the shell on $1\frac{1}{2}$ rollers and cleats were welded in that position.
7. In cleats and bolt, there's a little tolerance, so chance may be that if cleats are not in proper line, even then bolt may be fixed in two cleats and bolted.
8. Why props were removed before circ seam because ovality may occur afterwards while shells rest on rollers.

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY			
SUBJECT CHARTERED: Marking of D/E (NO 520 PBD)		ACTIVITY	PRESENT	PROPOSED	SAVING
ACTIVITY: Marking of D/E		OPERATION ○			
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨			
LOCATION		DELAY □			
CHARTERED BY:		INSPECTION □			
DATE: 08/04/91		STORAGE ▽			
		Time (min)			

DESCRIPTION	TIME (min)	SYMBOLS					REMARKS
		○	⇨	□	▽		
(i) Set D/E on ground	10.00					Two persons	
(ii) Adjust the marker at the required height from the base.							
(iii) Mark the D/E along the outside surface of D/E.							
(iv) Punch the D/E	12.00						
	2.00 hrs.						

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY			
SUBJECT CHARTERED: Assembly of D/E (PV-1400)		ACTIVITY	PRESENT	PROPOSED	SAVING
ACTIVITY: Assembly of D/E		OPERATION ○			
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨			
LOCATION		DELAY □			
CHARTERED BY:		INSPECTION □			
DATE: 09/04/91		STORAGE ▽			
DESCRIPTION		Time (min)	SYMBOLS		REMARKS
		○	⇨	□	▽
(i) place all the five petals (except the sixth) in proper position. (ii) check & adjust height of each petal by giving some packing below the supporting rod or reducing ht by gas cutting. (iii) Mark all the dished end for gas cutting. (iv) Remove all the petals so as to perform gas cutting. (v) gas cut all the petals. (vi) separate petals so as to perform grinding. (vii) Perform grinding. (viii) Bring petals back in position. (ix) Tack the petals.					

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY				
SUBJECT CHARTERED:		ACTIVITY	PRESENT	PROPOSED	SAVING	
ACTIVITY:		OPERATION ○				
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨				
LOCATION:		DELAY ◯				
CHARTERED BY:		INSPECTION □				
DATE:		STORAGE ▽				
		Time (min)				
DESCRIPTION	TIME (min)	SYMBOLS				REMARKS
		○	⇨	◯	□	▽
(X) Bring VI th petal closer to assembly						
(xi) flame cut the ^{rod of} sixth to match profile.						
(xii) flame Mark & flame-cut the sixth petal.						
(xiii) Note down the outside dia and adjust it						
(xiv) flame cut the VI th in taper direction						
(xv) tack the sixth petal						

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY				
SUBJECT CHARTERED:		ACTIVITY	PRESENT	PROPOSED	SAVING	
ACTIVITY: C/S Assembly of die to shell		OPERATION ○				
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨				
LOCATION: Container ship		DELAY □				
CHARTERED BY:		INSPECTION □				
DATE:		STORAGE ▼				
		TIME (min)				
DESCRIPTION	TIME (min)	SYMBOLS				REMARKS
		○	⇨	□	▼	
<ol style="list-style-type: none"> 1) Match ID of shell and ID of die, fit and weld reduction pipe and do C/S of both sides 2) Await for inspection. 3) Inspection. 4) Transport to SAW M/c. 5) C/S welding 6) Transport to grinding 7) Grinding. 8) Inspection 9) Transport to X-ray. 10) X-ray testing 11) Repair 12) X-ray testing 13) Transport to SR store in Boilershp 14) Transport to container ship off SR 15) Storage of SR shells 16) Transport for Name plate 17) Name plate 18) Hydrotest 19) Transport to Dry section 20) Dry container 21) Weighing 22) Transport for final stamping 23) Preparation for painting 24) Painting 25) Storage for dispatch 						

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY					
SUBJECT CHARTERED: Reference line marking of boiler shell PBD-519.		ACTIVITY	PRESENT	PROPOSED	SAVING		
ACTIVITY: Reference line marking.		OPERATION \circ					
METHOD: PRESENT / PROPOSED		TRANSPORT \Rightarrow					
LOCATION:		DELAY \square					
CHARTERED BY:		INSPECTION \square					
DATE: 17/04/21		STORAGE ∇					
DESCRIPTION		Time (min)	SYMBOLS				
			\circ	\Rightarrow	\square	∇	REMARKS
1 Draw straight line along diam. (AB)		9.0000					
2 Mark 683mm on both ends of shell and join two points to make it a line (CD)							
3 Extend line on D/E side and then on inner surface							
4 Draw a \perp line along circumference of vessel.							
5 Punch along CD							
6 Note the outer circumference of shell							
7 Mark $\frac{1}{2}$ Circ from line CD on both ends.							
8 Join points to make a line (EF)							
9 Extend EF on D/E side and on inner side							
10 Draw a line \perp along circumference							
Rotate the shell							
11 Half the distance between CD & EF, from CD							

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY				
SUBJECT CHARTERED:		ACTIVITY	PRESENT	PROPOSED	SAVING	
ACTIVITY:		OPERATION ○				
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨				
LOCATION:		DELAY □				
CHARTERED BY:		INSPECTION □				
DATE:		STORAGE ▽				
		Time (min)				
DESCRIPTION		TIME (min)	SYMBOLS			REMARKS
		○	⇨	□	▽	
13 Repeat the same on other end						
14 Rotate the belt						
15 Note the distance of AB from both these marks and check.						
16 Rotate the shell.						
17 join these marks and make it a line						
18 Punch along line (GH)						
19 Complete line along D/E & inner side						
20 Draw a ⊥ line along Arc.						
21 mark suitable marks of $\frac{1}{2}$ Arc from GH on both ends.						
22 join points and extend line on D/E side and on inner side						
23 Draw a ⊥ line along Arc and position the clear.						
		10:00 am				

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY						
SUBJECT CHARTERED: C-Beam for PBD 519		ACTIVITY	PRESENT	PROPOSED	SAVING			
ACTIVITY: C-Beam of boiler shell		OPERATION ○						
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨						
LOCATION:		DELAY ◯						
CHARTERED BY:		INSPECTION □						
DATE: 17/04/91		STORAGE ▽						
DESCRIPTION		Time (min)	SYMBOLS		REMARKS			
(i) place 1 st shell on two rollers (ii) Bring 2 nd shell closer to 1 st (iii) Rotate 1 st and bolt the two (crane holdup the 2 nd) (iv) Weld a piece on inner side (v) Weld a piece on outer side (vi) Support 2 nd shell from the end and tack the two		10:30 am	○	⇨	◯	□	▽	
Note: (i) During whole operation Crane was held up. (ii) There was no support below the C-beam joint.		11:45 am						

FLOW PROCESS CHART

CHART NO	SHEET NO.	SUMMARY			
SUBJECT CHARTERED: D/E to shell assembly PV-1397		ACTIVITY	PRESENT	PROPOSED	SAVING
ACTIVITY: D/E to shell assembly.		OPERATION ○			
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨			
LOCATION:		DELAY □			
CHARTERED BY:		INSPECTION □			
DATE: 17/04/91.		STORAGE ▽			
DESCRIPTION		Time (min)	SYMBOLS		REMARKS
			○	⇨ □ ▽	
(i) Bring D/E to shell by crane		315pm			
(ii) Rotate Belt to align the cleats					
(iii) Direct crane to make cleats in one line					
(iv) Bolt lower cleat.					
(v) Weld two pieces on each ^{both} sides of the bolted cleat.					
(vi) Bring D/E closer to shell from upper side.					
(vii) Bolt left & right cleat.					
(viii) Rotate shell to bring upper cleat down by lowering crane					
(ix) Bolt the fourth cleat.					
<p>Note: when fourth cleat is to be bolted by lowering the crane and rotating the shell, shift may occur. So to eliminate it two pieces are to be welded on each side of the bolted cleats.</p>		4.30pm			

FLOW PROCESS CHART

CHART NO	SHEET NO.	SUMMARY					
SUBJECT CHARTERED: Nozzle to Die in Boiler PBD-521		ACTIVITY	PRESENT	PROPOSED	SAVING		
ACTIVITY: Nozzle to Die assembly. (Two nozzles attached at same time)		OPERATION ○					
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨					
LOCATION:		DELAY ◯					
CHARTERED BY:		INSPECTION □					
DATE: 11/05/21		STORAGE ▽					
DESCRIPTION		Time (min)	SYMBOLS		REMARKS		
			○	⇨	◯	□	▽
1. Weld a bar in two nozzles.		9:45 a.m.					
2. place nozzles in position.							
3. put nut-bolt & packing under bar.							
4. put a straight bar on two nozzles.							
5. Measure ht from both sides.							
6. Adjust height by hammering.							
7. Measure ht.							
8. Adjust height.							
9. Tack nozzles.		10:50 a.m.					

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY				
SUBJECT CHARTERED: Nozzle to shell assem. PBD-521		ACTIVITY	PRESENT	PROPOSED	SAVING	
ACTIVITY: Nozzle to shell assem.		OPERATION ○				
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨				
LOCATION:		DELAY ◯				
CHARTERED BY:		INSPECTION □				
DATE: 11/05/2016		STORAGE ▽				
		TIME (min)				
DESCRIPTION		TIME (min)	SYMBOLS			
		○	⇨	◯	□	▽
						REMARKS
(i) Place nozzle in position						
(ii) Tack nut bolt arrangement.						
(iii) Measure ht. from top of shell						
(iv) level with spirit level.						
(v) put bar on nozzle. measure						
(vi) Adjust ht.						
(vii) Measure ht.						
(viii) Tack nozzle.						

CHAPTER-III

MAN-POWER PLANNING

AIM: To study the % utilisation of existing man-power in foundry shop and then to check the excess or shortage of the same.

INTRODUCTION:

Foundry shop mainly deals with the castings of sugar-machinery cement plant machinery starting from the initial pattern-making to the final finished casting. Foundry has its own machinery division which includes lathes, drilling machines and boring machines.

Some of the main operations of foundry are pattern making, moulding, chipping, grinding, fitting, welding, sand-preparation, cupola work etc. For melting metal three cupolos of dia 30', 42', 48' (for ferrous) and one pit furnace (for non-ferrous).

BRIEF ABOUT EXISTING MAN-POWER:

Foundry shop has following distribution of workers.

<u>Group</u>	<u>No. (shift)</u>
Pattern Makers	7.(A)
Moulders	25(A B) 13 12
Mistry	2(A)
Cupola-man	2(A)
Lab-boy	1(A)
Chippers	3(A B) 2 1

contd...

Markers	1(A)		
Sand-men	2(A	B)	
		1	
Crane-drivers	6 (A B C)		
	3	2	1
Fitter	6 (A B)		
	3	3	
Welder	1 (A)		
Helpers	42 (A B)		
	35	7	
TOTAL NO. OF WORKERS :	99(A B C)		
	76	20	3

No study was conducted in machining division.

METHOD SELECTED TO STUDY THE UTILISATION:

Foundry jobs are varying in nature and dimensions and no specific time standard is issued for any operation. So method of work-sampling was followed.

Work sampling is the technique to check the % occurrence of an event by random observations.

According to the concept if sample size is large and observations are at random. There is quite a high probability that these observations will reflect the real situation plus or minus a certain margin of error.

A work-sampling study was conducted on various groups simultaneously (from 10th to 23th June).

contd...

Random timings were selected for each days observation. These were on an average 20 observations for each person involved. The least time interval between two observations was 10 or multiple of 10 (in mins.) Initially, it was decided that app. 10 days study will be enough. So no. of observations were not calculated initially.

NO. OF OBSERVATIONS: RECORDED

<u>GROUP</u>	<u>NO. OF PERSONS</u>	<u>READING</u>
Pattern-makers	2 persons	432
Moulders	5 "	1225
Sand-man	1	236
Chipper	1	236
Helper	5	1202
Grinder	1	236
Fitter	1	236
Cupola-man	2	471

OBSERVATIONS AND CALCULATIONS:

A tally was prepared for study and % working, % idle and % enforced idle for diff. groups.

In utilisation working (working on job, study drawings, getting instructions and misc. work).

In idle time (Away from work-place, personnel need, sitting idle, going before and coming after shift time, gossiping).

contd....

In enforced idle-time (crane wait, power failure and
Misc. idleness).

GROUP	WORKING			IDLE				ENFORCED IDLE			
	Working	Study dig.	getting ins.	Mis. Away	Gossip	Peron. Idle	Misc.	Crane wait	Power Failure	Misc.	
PATTERN MAKER	50%	6% (62%)	4%	2%	10%	8%	5%	5%	3% (5%)	2%	
MOULDERS	46%	(57%)	10%	1%	3%	6%	10%	6%	2% (9%)	1%	
CHIPPERS	59%	(65%)	6%	6%	5%	6%	7%	3%	2% (1%)	1%	
GRINDERS	49%	(56%)	7%	5%	5%	7%	14%	3%	2% (7%)	2%	
FITTERS	57%	(63%)	6%	8%	5%	4%	8%	4%	2% (8)	2%	
CUPOLA-MAN	38%	(52%)	12%	2%	9%	7%	16%		(6%)		
SAND-MAN	52%	(58%)	6%	8%	4%	6%	14%	4%	3% (6%)	3%	
HELPERS	60%	(65%)	6%	5%	3%	5%	3%	3%	1% (5%)	1%	

CROSS-CHECK FOR ABSOLUTE ACCURACY (CORRESPONDING TO 95%
CONFIDENCE LEVEL)

1) MOULDERS: N=1225 P=57%

$$= \frac{pq}{N} = \frac{57 \times 43}{1225} = 1.3$$

$$A = 2 = 2.6\%$$

2) PATTERN MAKERS: N=472 P=62%

$$= \frac{62 \times 38}{472} = 2,$$

$$A = 2 = 4\%$$

3) SAND-MAN: N=236 P=58%

$$= \frac{58 \times 42}{236} = 3,$$

$$= A=2 = 6\%$$

4) CHIPPER N=236 P=65%

$$= \frac{65 \times 35}{236} = 3.2$$

$$= A=2 = 6.4\%$$

5) GRINDER: N=236 P=56%

$$= \frac{56 \times 42}{236} = 3.1$$

$$= A=2 = 6.2\%$$

6) BELPER: N=202 P=65%

$$= \frac{65 \times 35}{202} = 1.2$$

$$= A=2 = 2.4\%$$

7) FITTER N=236 P=56%

7) FITTER N=236 P=63%

$$= \frac{63 \times 37}{236} = 3.1$$

$$=A=2 \quad =6.2\%$$

8) CUPOLA MAN: N=471 P=52%

$$= \frac{52 \times 48}{471} = 2.4$$

$$=A=2 \quad =4.8\%$$

N = No of observations

P = % occurrence

q = Percentage idle

A = Accuracy

= std. error of proportion.

After checking % working % idle & % enforced idle,
Allowances for various groups were collected.

RELAXATION ALLOWANCES: These were calculated from ILO

1) PATTERN MAKER:

Average force	=	9 (Points)
Posture	=	4
Clothing	±	0
Concentration	=	10
Eye-strain	±	0
Noise	=	3
Temp. & Hum.	=	14
Ventilation	=	2
Fumes	=	0
Dust/Dirt.	=	2
Wet	=	0
		<hr/>
	Total :	45
		<hr/>

So relaxation allowances corresponding to 45 points
are 81%.

RELAXATION ALLOWANCES

GROUP	AV. FORCE	POSTURE	CLOTHING CONC.	EYE STRAIN	NOISE	TEMP. & HUM.	VENT.	FUMES	DUST & DIRT	WET	TOTAL
Moulders	8	8	0	2	6	15	3	4	6	0	60 (30%)
Chippers	15	6	8	2	10	14	2	2	6	0	69 (36%)
Grinder	15	6	8	2	6	14	1	1	8	0	63 (32%)
Fitter	12	6	6	8	5	14	1	1	4	0	60 (30%)
Helper	8	6	5	0	4	14	1	2	6	0	47 (22%)
Sand Man	3	5	0	0	2	15	1	0	6	0	36 (17%)
Cupole-man	5	6	3	2	0	16	3	4	10	0	52 (25%)

CALCULATIONS FOR % UTILISATION AND CORRESPONDING MAN-POWER REQ.

PATTERN MAKERS:

Relaxation allowances = 21%
special allowance = 5%
Total allowance = 26%

Utilised time = 62% idle = 33% enforced = 5%

Enforced idle time % is subtracted from the total allowance percentage, because in that time person rests so relaxation allowances must be reduced by same %.

Further, enforced idle time should be added to utilised time.

So allowances = 26% - 5% = 21%

21% of 62 (utilised time) = 13.02

Total utilisation = 62 + 13.02 = 75.02%

Net Idle = 100 - 75.02 = 24.98%

Hence 24.98% of existing man-power is extra is pattern makers.

MOULDERS:

Utilisation = 57% Idle = 34% enforced = 9%

Relaxation allowances = 30%

Special allowance = 5%

Total allowance = 35%

Net allowance = 35 - 9 = 26%

26% of 57 is 14.82

So utilisation is $57.49 + 14.82 = 80.82\%$

Net Idle = $100 - 80.82 = 19.18\%$

So moulders are 19.18% extra.

CHIPPERS:

Utilisation = 65% idle 29% Enforced 6%

Relaxation allowance = 36%

Special = 5%

Total = 41%

Net allowance = $41 - 6 = 35\%$

35% of 65 = 22.75

So total utilisation = $65 + 6 + 22.79$
= 93.79%

Net idle = $100 - 93.79 = 6.21\%$

Extra chippers are 6.21%

GRINDER:

Utilisation = 56% idle = 37% enforced = 7%

Relaxation allowances = 32%

Special = 5%

Total = 37%

Net = $37 - 7 = 30\%$

30% of 56 = 16.8

Total utilisation = $56 + 16.8 + 7 = 79.8\%$

Net idle = 20.20%

Extra grinders are 20.20%

FITTER:

Utilisation = 63% idle = 29% enforced = 8%

Relaxation allowances = 30%

Special = 5%

Total = 35%

Net = 35-8=27%

27% of 63 = 17.01

Total utilisation = 63+17.01-8 = 88.01%

Net idle = 100-88.01=11.99%

Extra Fitters are 11.99%

CUPOLA MAN:

Utilisation = 50% idle = 44% Enforced = 6%

Relaxation allowances = 25%

Special = 5%

Net allowance = 25+5-6 = 24%

24% of 50 = 12

Total utilisation = 50+12+6 = 68%

Net idle = 100-68 = 32%

Cupla man are 32% extra.

SAND MAN:

Utilisation = 58% idle = 36% Enforced 6%

Relaxation allowances = 17%

special = 5%

Net allowance = 17+5-6=16%

16% of 58 = 9.28

contd...

If on an average in a month, a man has 185 hours
so total man hours in shop = $99 \times 185 = 18315$ hrs.

Extra Hours = $19 \times 185 = 3515$ hrs.

In a month 3515 hrs. are wasted or extra consumed.

In other words, if the existing man-power is 100% utilised, then 3515 man-hrs. in a month can be saved and keeping same man-power, a job can be completed 3515 man hrs. before the existing man-hours. So if a company costs 44 Rs./man hrs. then a saving of $3515 \times 44 = 154660/-$ per month will be saved.

So by close supervision and reducing time for job, shop can save 3515 man hours and 154660 Rs. per month. (if 100% utilisation). Furthermore, if rating is performed in shop, all persons will not be working at standard pace and if time standards times are issued according to std. pace, jobs can complete even lesser time and the required man-power may be even lesser or existing idleness may be more than 19%.

CHAPTER : IV

PLANT - LAYOUT

AIM:

TO STUDY THE PRESENT LAYOUT OF CONTAINER-SHOP IN
PVD TO DRAW A REVISED LAYOUT FOR THE SHOP.

INTRODUCTION ABOUT CONTAINER-SHOP:

Container-shop mainly deals with the manufacturing of liquified gas containers, made under prescribed codes like BS-1500 in which diff. parameters like design pressure (19.9 kg./cm^2) design temp. (65°C). hydraulic test pressure corrosion allowance (1.5mm) are given. These containers are inspected by third party like LLOYDS REGISTER INDUSTRIAL SERVICES. After completion these containers are painted with one coat of Red oxide and 2 coats of suitable finished paint, according to the nature of gas which will be stored e.g. Golden Yellow for chlorine, light green for SO_2 Grey for freon, white for dimethylamene. The weight of the container is 602kgs. for 12mm thick plate shell having a water capacity of 780 kgs. app. The different components of a container are:

Name plate
washers,
Nuts,
Studs,
Cleats,
Valve
Protecting dome,
supporting bosses,

Inspection plugs,
Inspection couplings,
Valves,
Education pipes,
Valve couplings,
Shells,
Dished-end etc.

METHOD STUDY SHEETS WERE PREPARED ABOUT SEVERAL OPERATIONS IN SHOPS:

After noting the method followed and movements traced in shop, new work-stations were determined.

CRITERIA FOR WORK-STATIONS AND LAYOUT:

Work-stations were decided on the basis of line balancing. Where two or more processes could be done at the same place, depending upon the early arrival or delays. But in job type shop, no line balancing was there. So different work-stations for diff. operations were made and area for each work-station was decided depending upon the required (given in drawing).

Then according to scale, on a large card-board, different sections of areas were placed and adjusted to get the least area consumption and least movement of materials.

contd...

FLOW PROCESS CHART

CHART NO.	SHEET NO.	SUMMARY					
SUBJECT CHARTERED:		ACTIVITY	PRESENT	PROPOSED	SAVING		
ACTIVITY: DIE Fabrication		OPERATION ○					
METHOD: PRESENT / PROPOSED		TRANSPORT ⇨					
LOCATION: Container shop		DELAY ◯					
CHARTERED BY:		INSPECTION ◻					
DATE:		STORAGE ▽					
		Time (min)					
DESCRIPTION	TIME (min)	SYMBOLS				REMARKS	
		○	⇨	◯	◻	▽	
4) Transport plate from main store to shop							
1) Material identification in yard.							
2) Cutting in yard.							
3) Transport to Boiler shop.							
4) Cold pressing							
5) Hot pressing.							
6) Transport to container shop.							
7) Machining on Boring M/C							
8) Drilling operation.							
9) Shot Blasting.							
10) Coupling fitting.							
11) Coupling welding.							
12) Inspection							
13) Ready for C/S setup.							

FLOW PROCESS CHART

CHART NO.

SHEET NO.

SUMMARY

SUBJECT CHARTERED:

ACTIVITY

PRESENT

PROPOSED

SAVING

ACTIVITY:

OPERATION ○

TRANSPORT ⇨

METHOD: PRESENT / PROPOSED

DELAY D

LOCATION:

INSPECTION □

CHARTERED BY:

DATE:

STORAGE ▽

Time (min)

DESCRIPTION

TIME (min)

SYMBOLS

○

⇨

D

□

▽

REMARKS

- 25) L/S final welding
- 26) Transport for X-ray.
- 27) X-ray L/S
- 28) Repair
- 29) X-ray L/S.
- 30) shot Blasting from inside
- 31) Remove Runner plate
- 32) Grinding for DIE setup.

PRESENT WORK-STATIONS

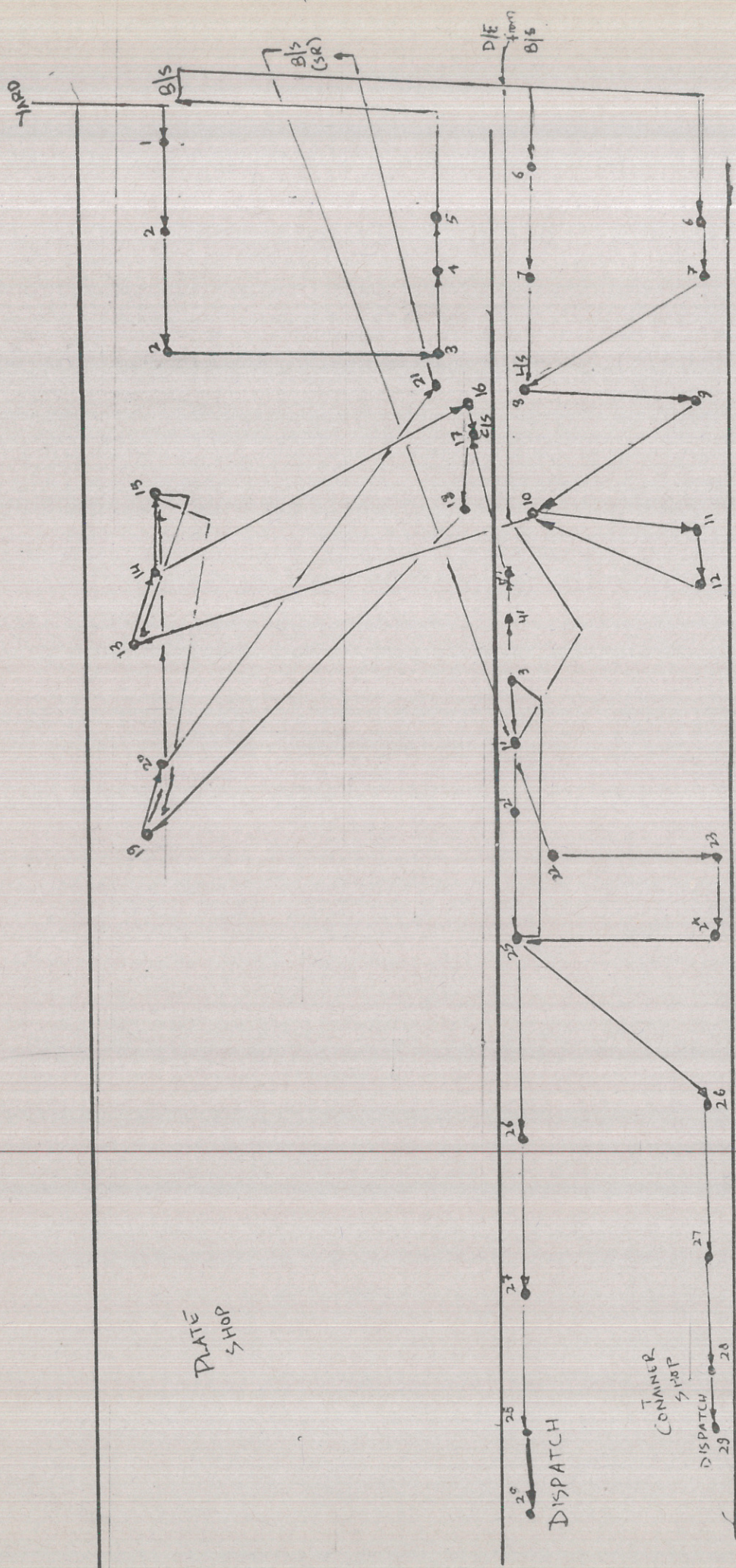
1. Stacking of plates from yard.
2. Spreading and marking.
3. Stacking of marked plates.
4. Gas cutting.
5. Storage of gas cut plates.
6. Storage of rolled shells.
7. Grinding of rolled shells.
8. Long seam set-up.
9. Long seam inspection
10. Long seam welding.
11. Gauging.
12. Storage before Radiography.
13. Storage after Radiography
14. Shot Blasting of shells
15. C/S set-up
16. C/S welding
17. Storage before Radiography
18. Storage after Radiography
19. Storage for stress relieving.
20. Hydro-station
21. Drying
22. Weighing and storage and final stamping
23. Sand-Blasting
24. Painting and storage before dispatch
25. Dispatch.

26. D/E machining.
- 27 Boring
- 28 shot Blasting
- 29 Coupling work and inspection.

PROPOSED WORK-STATIONS

1. stacking of plates from yard.
2. Spreading and marking
3. Stacking of marked plates
4. Gas cutting
5. Stacking of gas-cut plates
6. Storage of rolled shells
7. Grinding of rolled shells
8. Long seam set up
9. Long seam inspection
- 10 Long seam welding
- 11 Gauging after long seam welding
- 12 Grinding after long seam welding
- 13 Storage before Radiography
- 14 storage after radiography
- 15 Repair section
- 16 shot blasting of shell
- 17 C/S set up
- 18 C/S welding
- 19 Storage ~~after~~ before Radiography
- 20 storage after Radiography
- 21 storage for SR shells
- 22 Hydro-station
23. Weighing

24. Drying
- 25 Shot blasting for painting preparation
- 26 Final stamping
- 27 Painting
- 28 Storage before dispatch
- 29 Dispatch
- 30 Machining of D/E
- 31 Boring
- 32 Coupling fittings
- 33 Coupling welding
- 34 Storage and inspection of D/E.



PROPOSED MOVEMENTS OF CONTAINERS

DISTANCE TRAVELLED = 1800 ft ^{per container}

SAVED DISTANCE = 2900 - 1800 = 1100 ft ^{per container}

SPACE SAVED = 4 column of plate shop are fully saved; (4 x 15 ft length)
 2 50 ft width

DISTANCE COMPARISON (TRAVELLED BY ONE CONTAINER IN SHOP)

S.No.	OPERATION	PRESENT DISTANCE (Fts.)	PROPOSED DISTANCE (Fts.)
1.	Marking Identification & Gas cutting.	330	175
2.	Unloading rolled shells	160	20
3.	From Storage to grinding	30	30
4.	From Grinding to Long Seam	60	25
5.	From Long seam to Inspection	15	15
6.	From Inspection to Long Seam	60	55
7.	From Long seam to Gauging	100	30
8.	From Gauging to grinding	80	30
9.	From Grinding to L/S	20	50
10	Radiography Long Seam	50	80
11	Shot Blasting of shells	150	70
12	D/E preparation to Inspection of D/E	110	250
13	C/S set up	180	80
14	C/S welding	15	15

contd...

15.	Radiography	30	100
16	Waiting for SR	240	240
17	Hydro-zone	360	270
18	Weighing	60	20
19	Drying	60	35
20	Shot blasting or sand Blasting.	800	30
21	Final stamping	100	30
22	Storage before dispatch	100	80
23	Dispatch	390	100
----- TOTAL :		2900	1800

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