

PROCESS CHART















PROCESS CHART

- ⦿ A chart may be a diagram, a picture or a graph which gives an overall view of the situation, say a process. a process chart records graphically or diagrammatically in sequence the operations connected with a process.
- ⦿ All the details about the existing method/ process are recorded and represent in chart. This is done by directly observing the work.
- ⦿ Symbols are used to represent the activities like operation, inspection, transport, storage and delay.

PROCESS CHART SYMBOLS

- ◉ The recording of the facts about the job or operation in a process chart is done by using **standard symbols**.

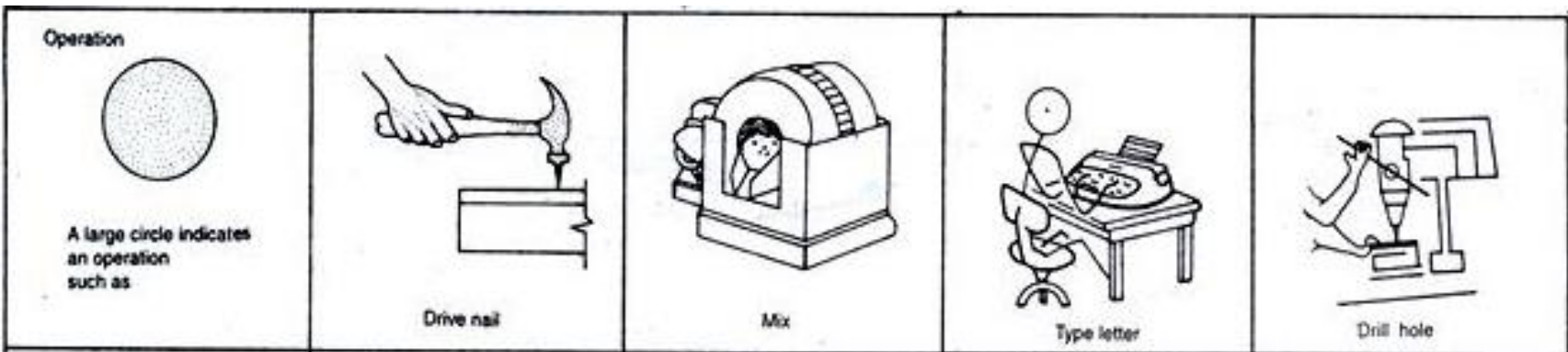
Process Chart Symbols

Sym	Name	Action		Examples
	Operation	Adds Value		Saw, Cut, Paint, Solder, Package
	Transport	Moves Some Distance		Convey, Fork Truck, OTR Truck
	Inspect	Check For Defects		Visual Inspect, Dimension Inspect
	Delay	Temporary Delay/Hold		WIP Hold, Queue
	Storage	Formal Warehousing		Warehouse or Tracked Storage Location
	Handle	Transfer Or Sort		Re-Package, Transfer To Conveyor
	Decide	Make A Decision		Approve/Deny Purchase

PROCESS CHART SYMBOLS

1. Operation

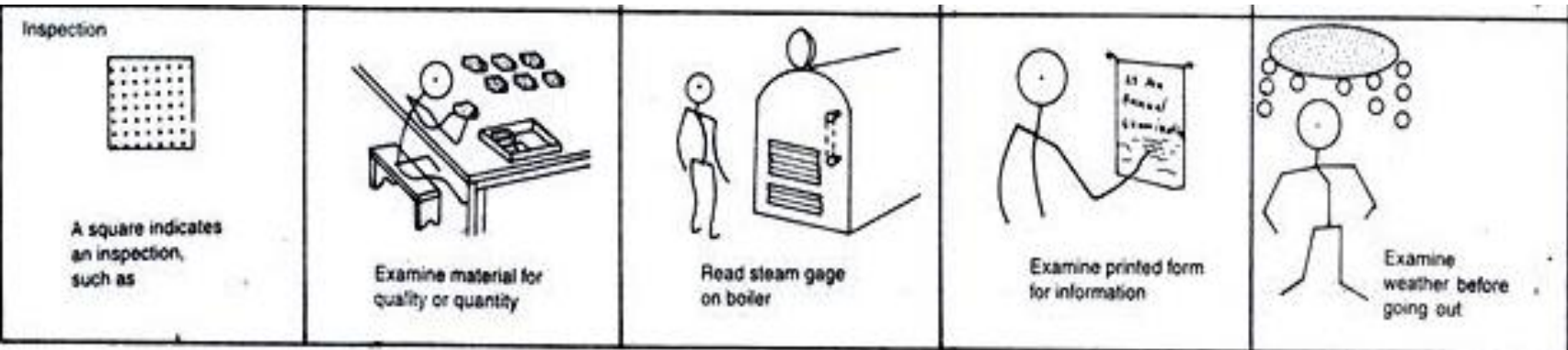
- ◉ A large circle indicates operation.
- ◉ An operation takes place when there is a change in physical or chemical characteristics of an object. An assembly or disassembly is also an operation.
- ◉ When information is given or received or when planning or calculating takes place it is also called operation.
- ◉ **Example:** Reducing the diameter of an object in a lathe. Hardening the surface of an object by heat treatment.



PROCESS CHART SYMBOLS

2. Inspection

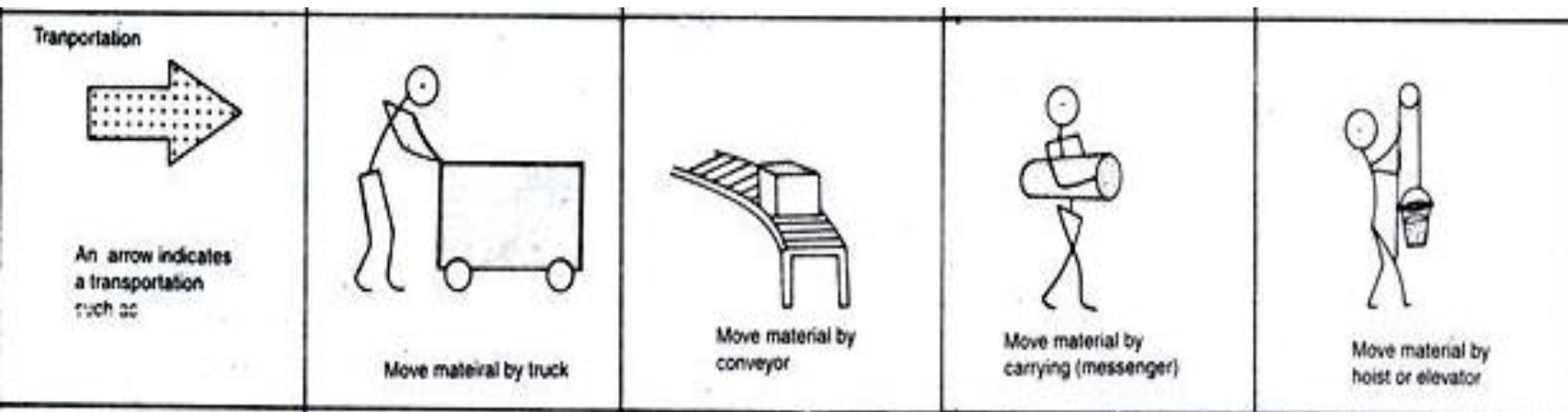
- A square indicates inspection. Inspection is checking an object for its quality, quantity or identifications.
- **Example:** Checking the diameter of a rod. Counting the number of products produced. of an object by heat treatment.



PROCESS CHART SYMBOLS

3. Transport

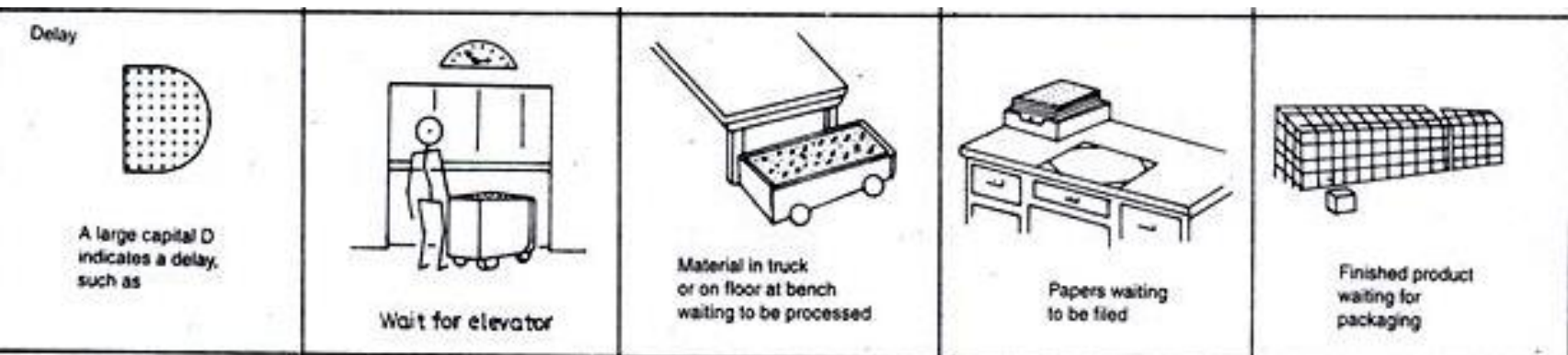
- An arrow indicates transport. This refers to the movement of an object or operator or equipment from one place to another. When the movement takes place during an operation, it is not called transport.
- **Example:** Moving the material by a trolley Operator going to the stores to get some tool.



PROCESS CHART SYMBOLS

4. Delay or temporary storage

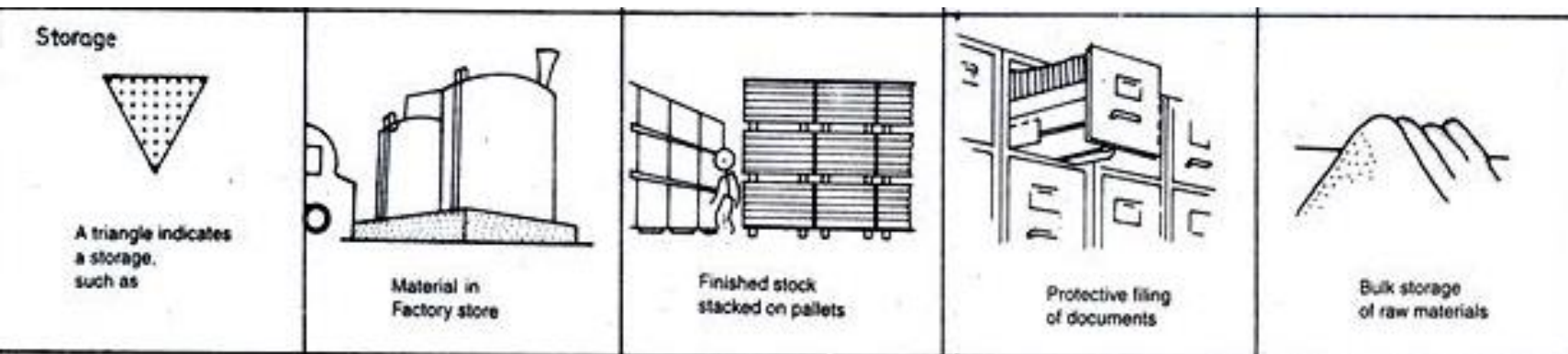
- A large capital letter D indicates delay. This is also called as temporary storage. Delay occurs when an object or operator is waiting for the next activity.
- **Example:** An operator waiting to get a tool in the stores. Work pieces stocked near the machine before the next operation.



PROCESS CHART SYMBOLS

5. Permanent storage

- An equilateral triangle standing on its vertex represents storage. Storage takes place when an object is stored and protected against unauthorized removal.
- **Example:** Raw material in the store room.



OPERATION PROCESS / OUTLINE PROCESS CHART

- ◉ An outline process chart is a process chart giving an over-all picture by recording in sequence only the main operations and inspections.
- ◉ An operation process chart is a graphic representation of the sequence of all operations and inspections taking place in a process.
- ◉ It gives a bird's eye view of the overall activities.
- ◉ Entry points of all material, the sequence of all operations and inspection associated with the process are noted in the chart.

THE CONVENTIONS / PROCEDURE FOLLOWED IN PREPARING THE CHART

1. Write title at the top of the chart.
2. Begin the chart from the right hand side top corner.
3. Represent the main component at the right extreme.
4. Represent the sequence of operations and inspections by their symbols. Connect them by vertical flow lines.
5. Record the brief description of the activity to the right side of the symbols.

THE CONVENTIONS / PROCEDURE FOLLOWED IN PREPARING THE CHART

6. Note down the time for each activity to the left of the symbol.
7. Number all operations in one serial order. Start from the right hand top (from number 1).
8. Similarly number all inspections in another serial order (starting from 1).
9. Continue numbering, till the entry of the second component.
10. Show the entry of purchased parts by horizontal lines.

OPERATION
 PROCESS /
 OUTLINE
 PROCESS CHART:
 EXAMPLE :
**MANUFACTURE
 OF ELECTRIC
 MOTOR**

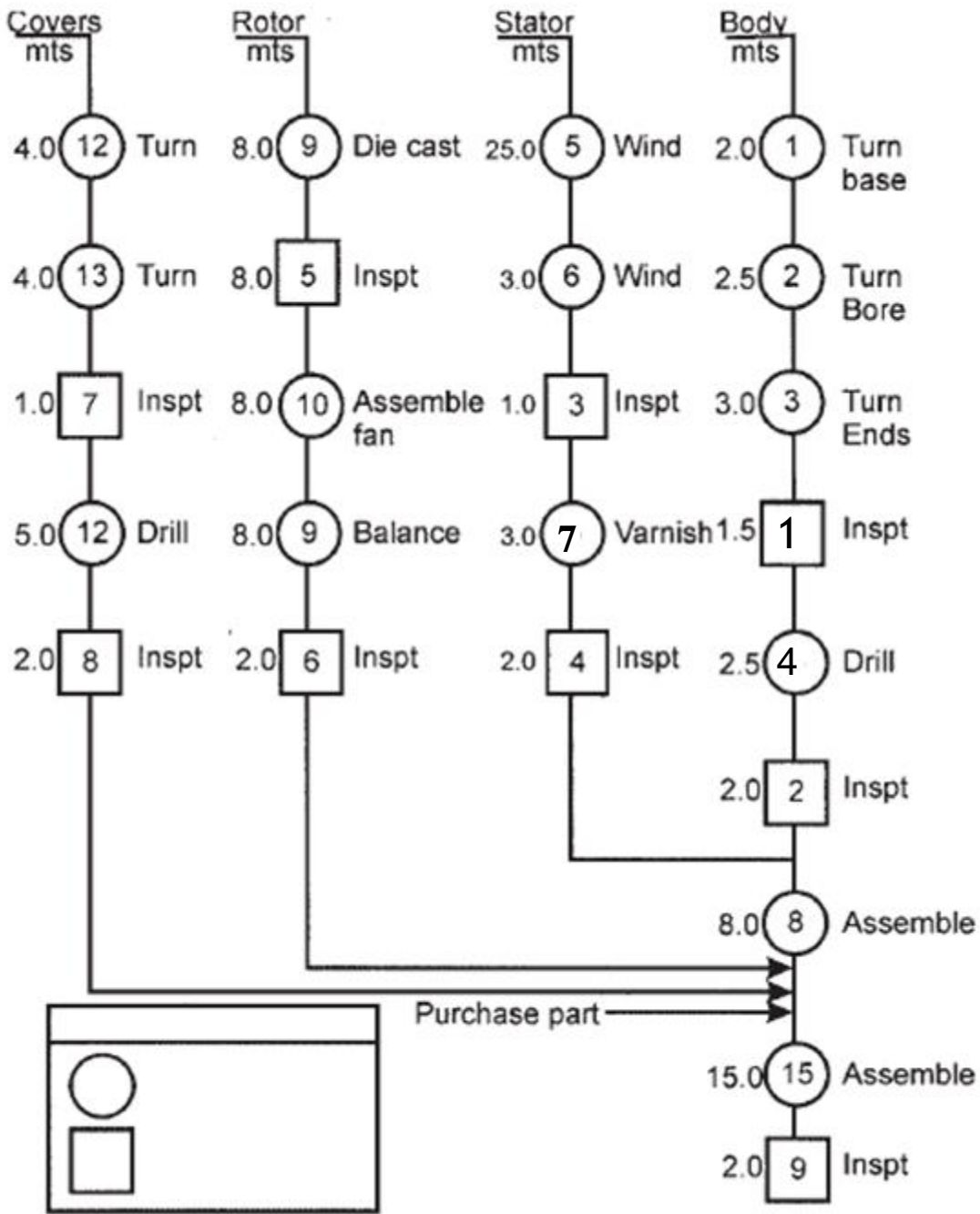
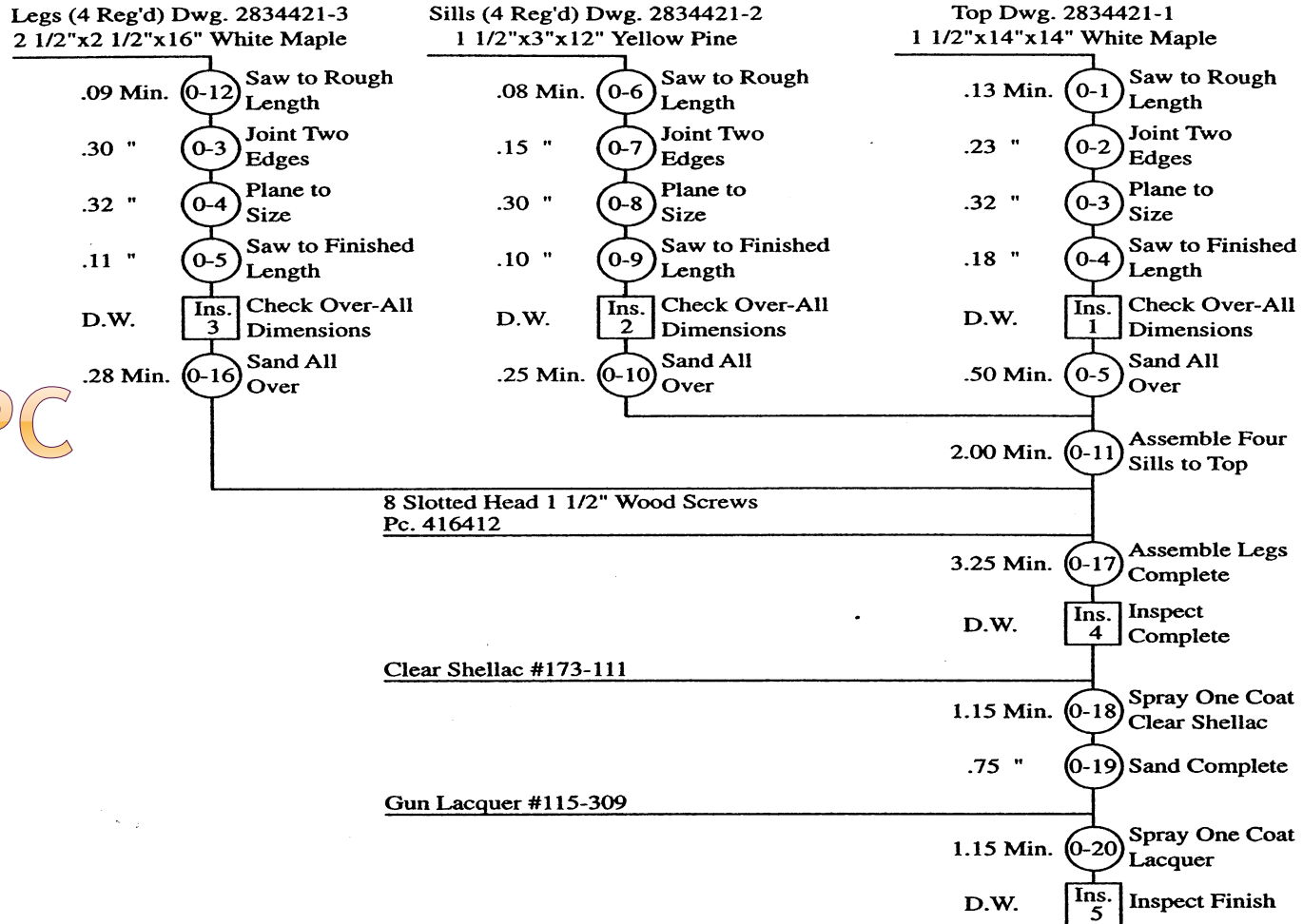


Fig. 1.2: Operation process chart

Operation Process Chart
 Manufacturing Type 2834421 Telephone Stands--Present Method
 Part 2834421 Dwg. No. SK2834421
 Charted By B.W.N. 4-12-

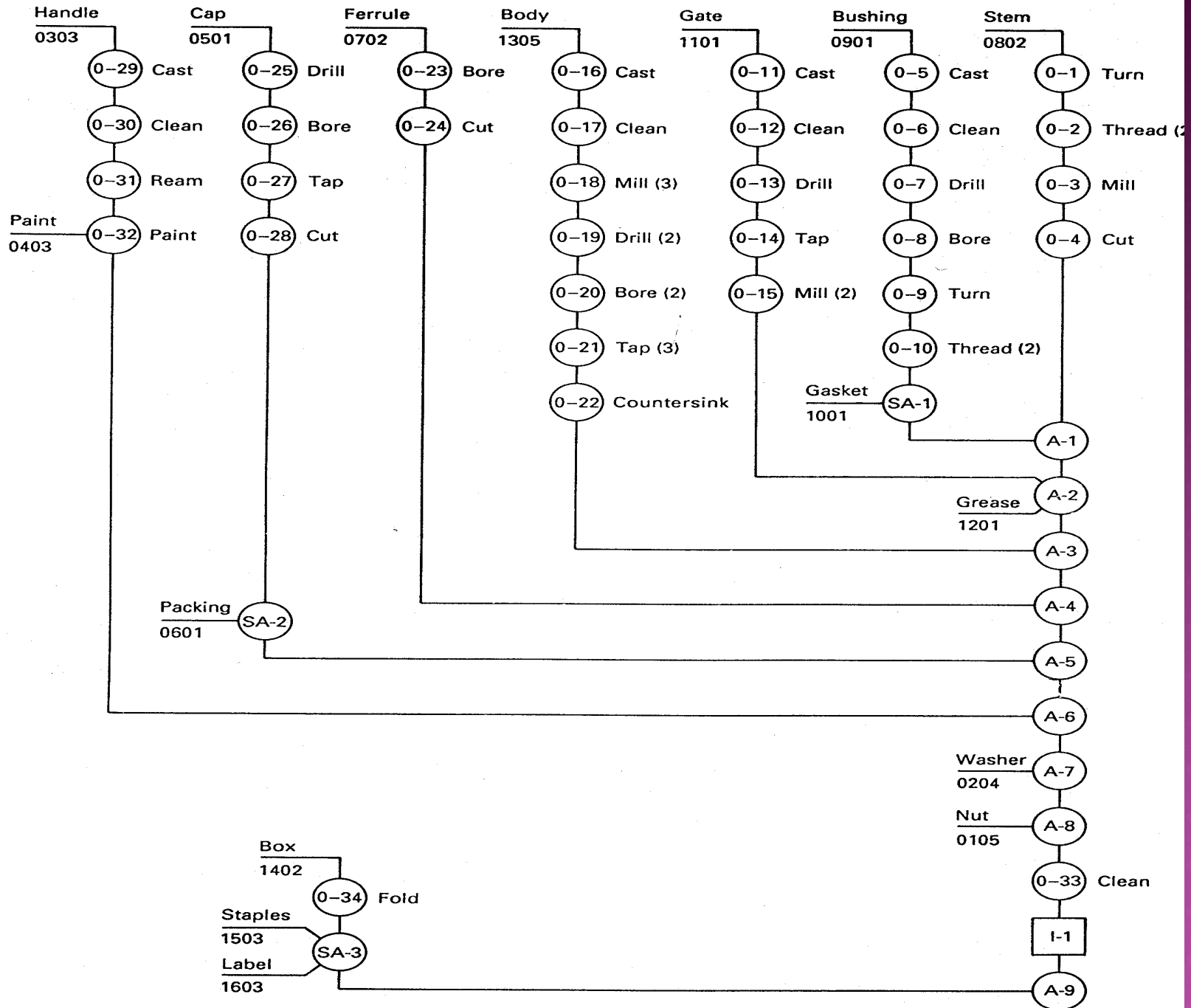


Summary:

Event	Number	Time
Operations	20	17.58 minutes
Inspections	5	Day work

Figure 2-8 | Operation process chart illustrating manufacture of telephone stands.

EX:
OPC



FLOW PROCESS CHART

- ⦿ A flow process chart is a graphical representation of the sequence of all the activities (operation, inspection, transport, delay and storage) taking place in a process.
- ⦿ It is the detail version of outline process chart recording all the event.
- ⦿ Process chart symbols are used here to represent the activities.

GENERAL GUIDELINES FOR MAKING A FLOW PROCESS CHART

1. The details must be obtained by direct observation—charts must not be based on memory.
2. All the facts must be correctly recorded.
3. No assumptions should be made.
4. Make it easy for future reference.
5. All charts must have the following details:
 - (a) *Name of the product, material or equipment that is observed.*
 - (b) *Starting point and ending point.*
 - (c) *The location where the activities take place.*
 - (d) *The chart reference number, sheet number and number of total sheets.*
 - (e) *Key to the symbols used must be stated.*

OBJECTIVES OF FLOW PROCESS CHARTS

- ◉ Set out sequence of flow of events occurring in the process.
- ◉ To study the event in a systematic way.
 - To improve the layout.
 - To improve material handling.
 - To reduce delays.
 - To eliminate, combine or rearrange the events in a systematic way.
- ◉ To compare between two or more alternative methods.
- ◉ To select operations for detailed study.

TYPE OF FLOW PROCESS CHARTS

1. *Man/ Worker type flow process chart.*

This flow process chart records what the worker does.

2. *Material type flow process chart.*

This flow process chart records how the material is handled or treated.

3. *Equipment type flow process chart*

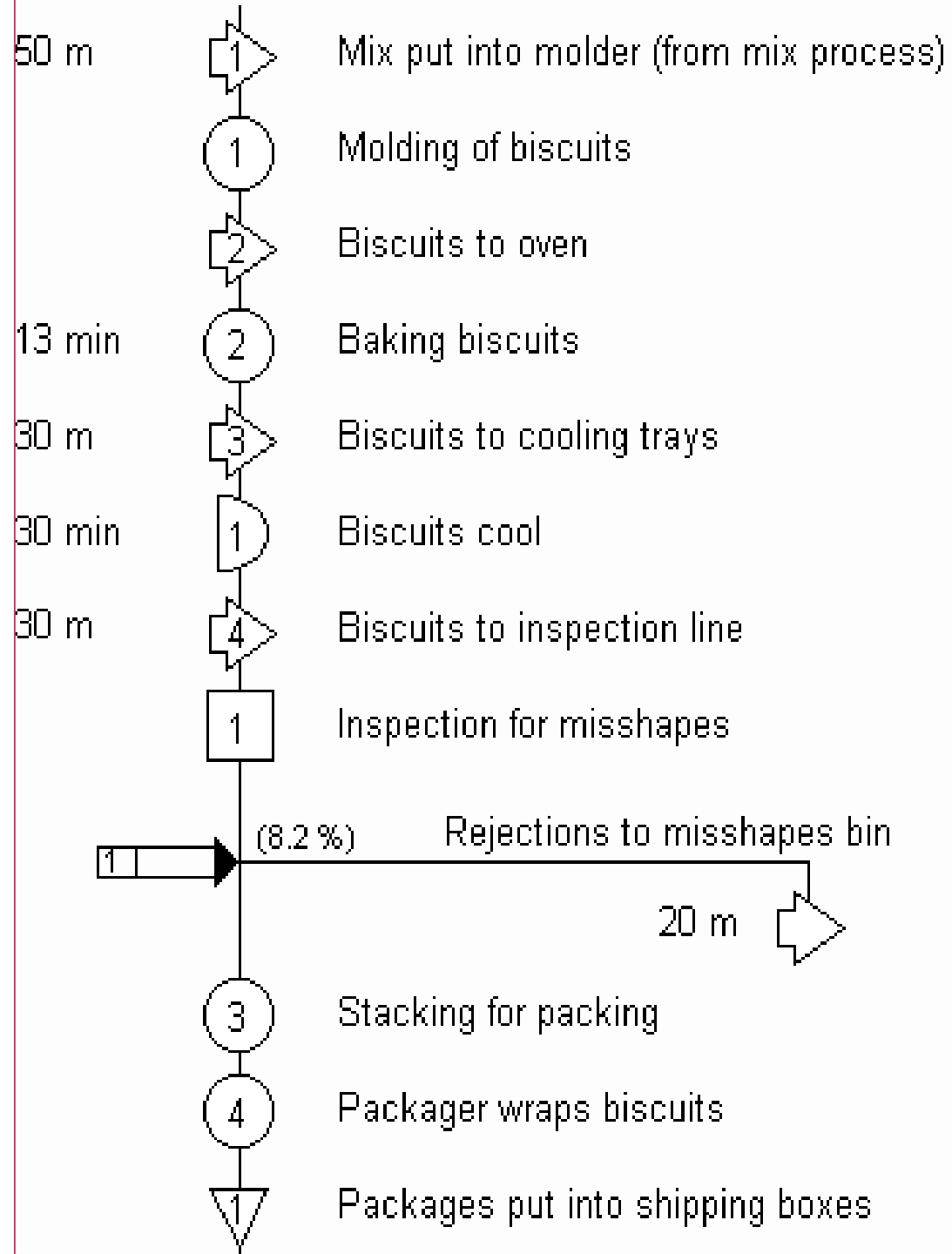
This flow process chart records how the equipment or machine is used.

Machine/ Equipment Flow Process Chart:

Flow Process Chart Job : Requisition of petty cash	Analyst ABC	Page 1 of 2	Operation	Movement	Inspection	Delay	Storage	Distance
Details of method								
Requisition made out by department head			●	⇒	□	D	▽	10 m
Put in "pick-up" flag			○	⇒	□		▽	
To accounting department			○	■	□	D	▽	5 m
Account and signature verified			○	⇒	■	D	▽	
Amount approved by treasurer			●	⇒	□	D	▽	
Amount counted by cashier			●	⇒	□	D	▽	
Amount recorded by bookkeeper			●	⇒	□	D	▽	
Petty cash sealed in envelope			●	⇒	□	D	▽	
Petty cash carried to department			○	■	□	D	▽	
Petty cash checked against requisition			○	⇒	■	D	▽	
Receipt signed			●	⇒	□	D	▽	
Petty cash stored in a box			○	⇒	□	D	▼	
			○	⇒	□	D	▽	
			○	⇒	□	D	▽	
			○	⇒	□	D	▽	
			○	⇒	□	D	▽	

	Summary	Distance
Operations	6	
Inspections	2	
Transport	2	15 m
Delays	1	
Total	11	

Machine/ Equipment Flow Process Chart:



TWO-HANDED PROCESS CHART (OR) RIGHT HAND, LEFT HAND CHART

- It is the process chart in which the activities of two hands of the operator are recorded.
- Motions of both hands of worker are Right hand-Left hand chart recorded independently.
- It shows whether the two hands of the operator are idle or moving in relation to one another, in a timescale.
- It is generally used for repetitive operations.

TWO-HANDED PROCESS CHART (OR) RIGHT HAND, LEFT HAND CHART

- ◉ **Operation:** Represents the activities grasp, position, use, release etc. of a tool, component or material.
- ◉ **Transport:** Represents the movement of the hand or limb to or from the work or a tool or material.
- ◉ **Delay:** Refers to the time when the hand or limb is idle.
- ◉ **Storage (Hold):** The term 'hold' is used here instead of storage. This refers to the time when the work is held by hand.
- ◉ The activity '**inspection**' by hand is considered as an operation. Hence, the symbol for inspection is not used in this chart.
- ◉ Two-handed process chart can be used for assembly, machining and clerical jobs.

GENERAL GUIDELINES FOR PREPARING THE **TWO-HANDED PROCESS CHART**

1. Provide all information about the job in the chart.
2. Study the operation cycle a few times before starting to record.
3. Record one hand at a time.
4. First record the activities of the hand which starts the work first.
5. Do not combine the different activities like operations, transport etc.

EX: TWO-HANDED PROCESS CHART

Job : Assembly of washer and nut to a bolt		Assembly Bolt Washer Nut			
Chart begins : Both hands free before assembly		Date :			
Chart ends : Both hands free after assembly		Operator :			
Chart : Existing method/Proposed method		Chart No :			
Operator :					
Left hand		Right hand			
Sl. No.	Description of the activities	Symbols	Sl. No.	Description of the activities	Symbols
1.	To the bolt tray		1.	To the washer tray	
2.	Picks up one bolt		2.	Picks up one washer	
3.	Returns to original position		3.	Returns to the initial position	
4.	Holding the bolt		4.	Assembles washer over bolt	
5.	Idle		5.	To the nut tray	
6.	Idle		6.	Picks up one nut	
7.	Idle		7.	Returns to initial position	
8.	Idle		8.	Assemble nut to the bolt	
9.	To the assembly tray		9.	Idle	
10.	Puts the bolt in the tray		10.	Idle	
11.	Returns to the original position		11.	Idle	

Fig. 1.4: Two-handed process chart

CHARTS USING A TIME SCALE

- Multiple Activity Chart
- Simo Chart
- P.M.T.S. Chart

Multiple Activity Chart Or Man-machine Chart

- ⦿ A man-machine/ Multiple Activity Chart chart is a chart in which the activities of more than one worker or machine are recorded.
- ⦿ Activities are recorded on a common time scale to show the inter-relationship.
- ⦿ It is used when a worker operates a number of machines at a time. It is also used when a number of workers jointly do a job.
- ⦿ The chart shows the idle time of the worker or machine during the process.

Multiple Activity Chart Or Man-machine Chart

- ◉ Work load is evenly distributed among the workers or machines by this the idle time of worker or machine is reduced. Multiple activity chart is very useful in planning team work in production or maintenance.

- ◉ Only two symbols are used in man-machine/ Multiple Activity Chart :



Working



Idle

- ◉ Types of Multiple Activity Chart :

- Man – Machine Chart
- Man – Multimachine Chart
- Multi – Man Chart
- Multi – Man machine Chart

PURPOSE OF MULTIPLE ACTIVITY CHART

- To detect the idle time on machine and workers
- To optimize work distribution between workers and machines.
- To decide no. of workers in a group.
- To balance the work team
- To examine the activities.
- It is used for recording the complex movements of material or men.
- Used to find out the most economical route.

APPLICATION OF MULTIPLE ACTIVITY CHART

- ⦿ Plant repair & maintenance.
- ⦿ Job construction.
- ⦿ Planning team work.
- ⦿ It is used to check whether the work station is correctly located.

SIMO CHART

- Only one recording technique of micromotion study will be described here briefly, namely the ***Simultaneous Motion Cycle Chart (SIMO Chart)***,
- A simo chart is a chart, often based on film analysis, used to record simultaneously on a common time scale the therbligs or groups of therbligs performed by different parts of the body of one or more workers.
- The simo chart is the micromotion form of the man type flow process chart. Because simo charts are used primarily for operations of short duration, often performed with extreme rapidity, it is generally necessary to compile them from films made of the operation which can be stopped at any point or projected in slow motion.

SIMO CHART

- It will be seen from the chart illustrated in figure that the movements are recorded against time measured in "winks" (1 wink = 1/2000 minute).
- These are recorded by a "wink counter" placed in such a position that it can be seen rotating during the filming.
- Some simo charts are drawn up listing the fingers used, wrist, lower and upper arms.

FIGURE 52. A SIMO CHART¹

SIMO CHART

DRAWING No. AND NAME: 27 Bottle Dropper

FILM No. A — 6 — CC

Top

CHART No. 42

OPERATION: Assemble

SHEET No. 1 of 1

OP. No. DT 27 A

CHARTED BY: A. B.

OPERATOR: L. Jones — 345

DATE: 25. 10. 54.

WINK COUNTER READING	LEFT HAND DESCRIPTION	THERBLIG	TIME	TIME IN 2000/min.	TIME	THERBLIG	RIGHT HAND DESCRIPTION
120	Finished part to tray	TL	8	0			
130	To bakelite caps	TE	16	20	20	TE UD	To rubber tops
140	Bakelite cap	G	8		10	G	Rubber tops
150	To work area	TL	4		12	TL	To work area
160	For assembling	P	2	40			
170	For R.H. to grasp top	H	18		8	P	To bakelite
180	For R.H. to pull rubber top	P	2	60	6	U	
190					2	RL	Rubber tops
					4	TE	To top of rubber
					2	G	Top of rubber
					8	U	Pull rubber through