Work System Design
Dr. Inderdeep Singh
Department of Mechanical and Industrial Engineering
Indian Institute of Technology – Roorkee

Lecture - 22
Flow Process Charts: Examples

Namaskar friends, welcome to session 22 in discussion for week 5 in our course on work system design. So we have started our discussion in week 4 on method study which is one of the most important techniques for developing a better method for performing the job or the task. Prior to that we have 2 weeks of discussion on productivity. Basically our target is to improve the productivity by changing or by varying or by altering the way we are doing our work.

And method study helps us to achieve that target. So our target primarily is to examine the way we are doing our work and then try to find out what can be the better method of doing the same job and how that can be done, that can be done by using the graphical tools that we are studying now. If you remember we have already seen 2 important graphical aids or graphical tools that can be used to examine the work or the current method of doing the work.

And these 2 are the operation process chart which is also called as the outline process chart and the flow process chart. If you remember in outline or operation process chart basically we use 2 types of process chart symbols again coming on to the process chart symbols all of you know all the learners know by now that we have 5 different process chart symbols depicting operation, transportation, inspection, delay and storage.

Now operation process chart majorly uses the operation and the inspection symbols and it gives us a bird's eye view of the current method of doing the job. Major focus is on the sequence of operations and the assembly that takes place in order to complete the product. In flow process chart we have seen that it is much more detailed as compared to the operation process chart and we use all 5 symbols which I have just now highlighted.

All the process chart symbols are used in case of the flow process chart. In the previous session we have taken a case study in which the material was being inspected and marked. So we have seen that if we change the inspection station and the marking station and we change

the lay out we are able to save lot of effort in terms of material handling. The distance travelled by the material on the shop floor considerably, significantly, substantially reduced by changing the layout.

So the changed layout or the improved layout or the optimized layout helped us to save money in terms of the labour hours, the money in terms of the effort required to move the material on the shop floor and overall lead to a more effective, efficient and productive method of doing the work. So what we have done there, we have changed the layout.

We have shifted 2 important work stations that is the marking station and the inspection station to a different location wherein we were able to reduce the movement of the material. So flow process chart we have seen in the last section or in the last session advantages that what are the advantages of the flow process chart. So today as you can see flow process chart we are going to take certain examples.

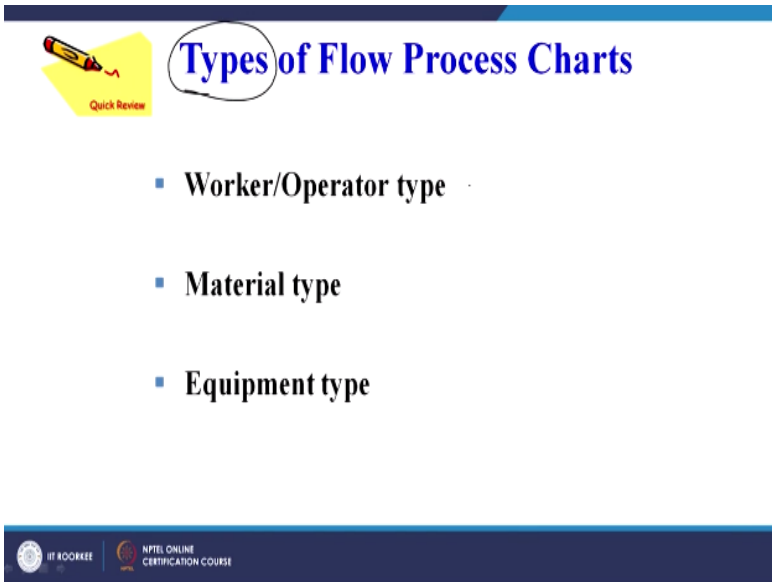
And try to further improve or further substantiate our understanding related to this concept of flow process charts. So we have also understood operation process chart with the help of examples. We will try to understand flow process chart also with the help of examples. Because it is a practical approach, it is less theoretical, more practical, majorly there are 5 symbols that we have to use.

If we know that the symbol stands for what process or for which activity we can analyze an activity as I have taken an example in the previous session also we talked about a person is going to a bank to issue a draft, so this is one situation or one kind of work which is being done in the banking sector. So as a method study analyst I can approach the bank. I can see that how the work is being done.

And I can suggest changes which can help the bank to improve the productivity of it is employees. So it has got a universal approach, so we can apply the concepts of method study at different we say locations and in different domains and in different applications. So the basic concept or the theory is simple, but the applications are plenty and we can just try to use the concept and try to examine the work.

And then using creativity propose different alternatives of doing the same job and then finally establish the method which we have found out to be more efficient, effective and productive. So previous case we have already seen, today again we will try to focus on examples and try to further reinforce our understanding related to the flow process charts. This is just the revision that we have already done.

(Refer Slide Time: 06:04)



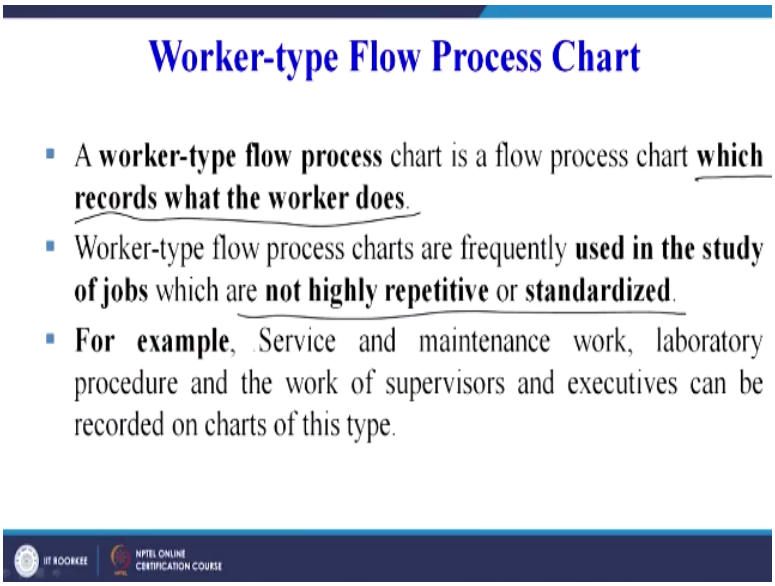
What are the various types of flow process chart? first one is the worker or the operator type, second is the material type and third is the equipment type. So we have 3 types of flow process charts and we will try to see whatever the time permits regarding the examples of these 3 types of flow process charts that is worker or operator type, machine type, material type.

Now one of the foremost important is the worker type flow process chart. Now let us see how we can construct or what are the salient features of a worker type of flow process chart. Now worker type of flow process chart is the flow process chart. What it will depict, which records what the worker does. Worker type flow process charts are frequently used in the study of jobs which are not highly repetitive or standardized.

So a person is doing a particular task so our focus will be on those types of jobs which are not particularly repetitive. So maybe we can see this is slightly a grey definition or slightly a grey area we have to identify that where we want to analyze the work whether the flow process chart will be applicable in such scenario or not. So there is a thin line that divides that where we have to use the flow process chart.

Then when we are it is a highly repetitive type of work we may like to go for the micromotion study, the person is doing the same task again and again, we would like to observe the motions of his limbs, the motions of his body parts and try to optimize so that the overall result leads to a benefits not only for the worker, but also for the organization.

(Refer Slide Time: 07:55)

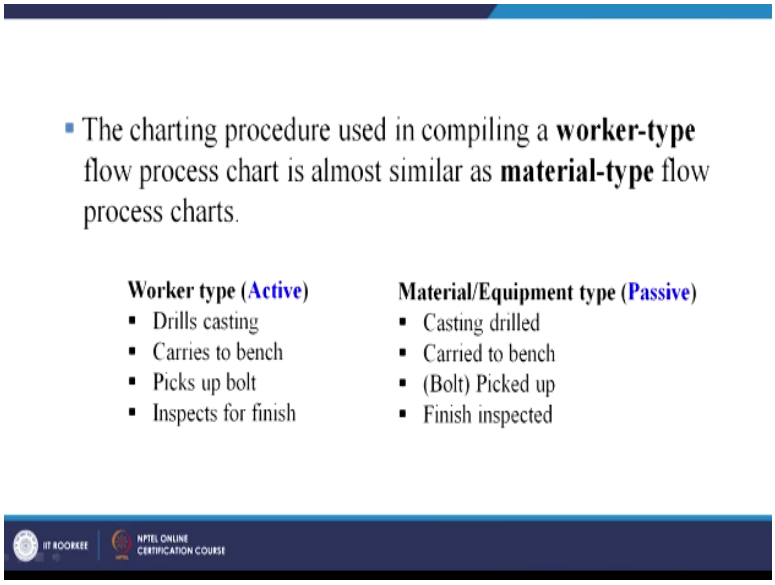


So service and maintenance work are the key areas. Laboratory procedure and the work of supervisor and executives can be recorded on charts of this type. So we will try to understand this with the help of application areas with the help of examples, but maybe supervisors, executives and then the work being done in the laboratory all those can be analyzed, examined using the flow process chart.

Now in laboratory we do different types of experiment so the work is not too repetitive. We may be doing may be one particular sequence of operation for one type of experiments and then we may like to change the sequence of operations for other type of experiment so maybe when the work is not very repetitive in nature we can focus our attention on or we can rely on flow process charts to examine the way we are doing the work.

Now charting procedure also, we know last time we have taken an example.

(Refer Slide Time: 08:57)



So charting procedure used in compiling a worker-type flow process chart is almost similar as material type flow process chart. So as I have already told the process chart symbols remains the same. In one case we seeing how the material is moving inside the shop floor or in the organization. If you remember the previous session, we have taken an example in which there was a material being unloaded from a truck and then it was being transported inside the shop floor.

It was going to the various section receiving and then inspection and then marking and all those maybe operations were being conducted, inspections were being conducted on the material so we are focusing on the material that how the material is moving inside the shop floor. Similarly, we can focus on the men or the worker that how the worker is moving, what is the movement of the worker in the shop floor.

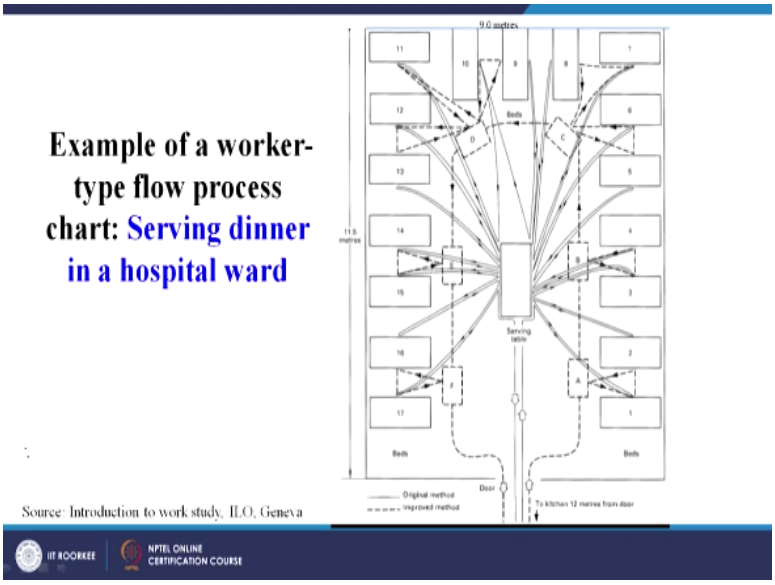
So we can focus either on worker or on material. In the previous session our target was a material type of flow process chart which we have seen in the previous session. So only difference that we usually see is slightly how write the details about the activity being done. In case of worker type we use active voice so we can see when we have to talk about the worker we will see drills casting so this one operation being done by the worker.

Carries to the bench may be transportation, picks up bolt, inspects for finish then when it is material type then we will write in the passive form that is casting drilled, carried to bench, what is carried to bench, the casting is carried to bench. Now that casting is actually the

material then picked up, what is picked up, the bolt is picked up, what is bolt, bolt is a material then finish inspected. Now what is inspected, the material is inspect.

But who is inspecting, a person is inspecting which is inspects the casting or inspects the part to who is doing it, worker is doing it. So only this is the maybe slight adjustment in the way we depict our activity when it is a material we will use the passive form when it is a worker we will use the active form, examples I think makes it very, very clear.

(Refer Slide Time: 11:18)



So friends let us take an example of a worker type of flow process chart. So first thing that we have to remember is that it is a worker type of flow process chart. So our target will be on the operator or the worker or the ward boy who is performing the job or the task or the work in this case. Now what is the work that he is performing. He is serving dinner in a hospital ward. So our target here is a worker.

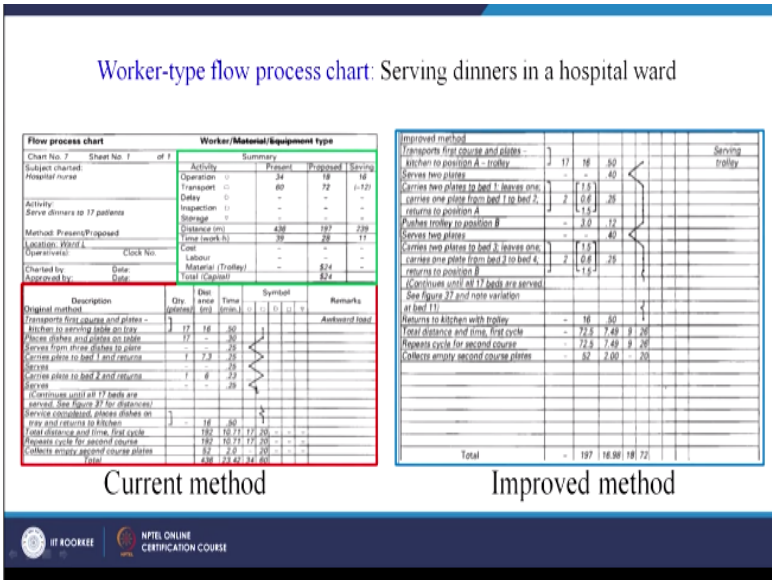
So it is operator or a worker type of chart which type flow process chart and then the work that we want to analyze is serving dinner in a hospital ward. Now you can see in a hospital ward there will be number of beds. So you can see this is bed number #1, so in this manner the numbers are increasing 7, then it is 8, 9, 10 and then 11 and then finally 17. So he has to serve dinner to these 17 patients who are on the beds in the hospital.

And we assume that each bed is occupied that we have people on each and every bed. So what can be the common approach. Normally what a worker will do. So he carries a serving table, you can see here, this is to kitchen 12 meters from door, so your kitchen is in this

direction, so he brings the trolley or he brings the service table, this is the service table and from here he moves like this and then again comes back like this.

So this is the original method is depicted by the solid line and the improved method is depicted by the dotted line. So here you see we have a dotted line also. So in the current method he takes the food serving table here and one by one moves to the bed and serves the food there and when he serves the food if we can go to the flow process chart here you can see.

(Refer Slide Time: 13:30)



Serves from 3 dishes to the plate, places dishes and plates on the table so he takes the plates as well as the dishes and then he goes to the bed and serves the 3 dishes on the table so number of operations are more, but in the improved method maybe you can just imagine that he has taken all food for 17 people in a serving table at the center of the ward.

From there he is moving to one particular bed, he is putting the plate there, he is putting the dishes there, which are the operations and then he is putting all the food one by one into these dishes or all the food items one by one into the dish and maybe chapatti and rice in the plate, so that is the way he is performing his task in the current method, but we want to improve this method.

So how this can be improved, there can be number of alternative so one of the alternatives is that he follows this dotted line as you can see here and this is first position that is the trolley he stops at A and from A he serves 1 and 2 and then from A he moves to B in this direction

and from B he serves the bed number 3 and bed number 4, and then moves forward and finishes his job at this position and goes back.

So this is another method of serving the patients on 17 different bed. So this improved method requires a trolley in which he will carry the food because in first case the ward boy or the worker is taking the food to the serving table and from there he is serving the 17 different bed and here he is carrying one trolley which he is moving to bed by bed 1, 2, 3, 4, 5 and then coming back to the 17th number and going out.

So it requires additional investment of a food trolley which the person or the worker can carry so that is one additional thing and then the other thing can be that the plates can be redesigned in such a way that he can pack the food in the kitchen only all the items are put in a plate and the plate only is taken out and it is served to the patient instead of putting the food items individually into the dishes and the plate.

So there can be improvement in the equipment which can help to reduce the effort of the worker and more importantly save time of the worker in the ward or on the working area. So we can see what are the saving. I think all of you have understood that initially the food is placed centrally and served to individual beds, in second case there is a trolley which is moving from bed to bed and then serving each and every patient on the bed and coming back from the door.

Now what are the savings we can see, there are different types of savings. This is the current method; this is the improved method. So in current method the operations are 34, but when we see that he is serving the plate only with all the items, so number of operations will certainly come down, so it is 18. So number of operations reduced, transportation as clear from the diagram from 60, it has come down to 72.

The distance travelled you can see earlier it was 436 meters, now it has reduced to 197 meters similarly the time which was 39 earlier now it is 28, only addition is the material trolley which is required for the improved method. So you can see that lot of savings are there in terms of time, in terms of man hours that we are spending, in terms of the number of operations that we do.

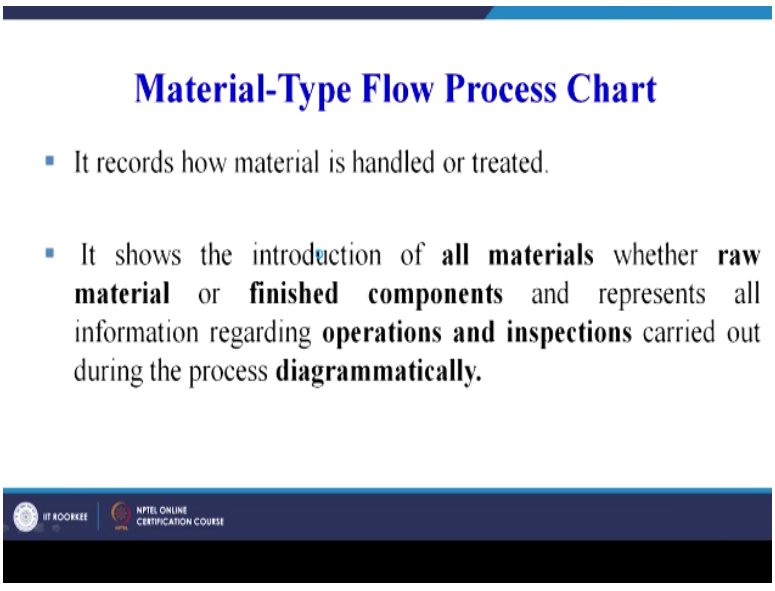
So we can say that just by using our creative skills, just by using our common sense we are able to find out a better method of serving the patients in the hospital ward or serving dinner to the patients in the hospital ward. So here our focus was the worker because the worker was taking the food to the various patients on the beds. So I think this has made the things absolutely clear that the problems are not maybe there was no problem with the current method.

But by improvising on the way we are doing the job in the current way we are able to improvise, there is always a scope of improvement like the total quality management says continuous improvement. So we can focus on the current way of doing the work and there is always a scope of improvement and here also we can see that it has led to considerable savings.

So this is one example of a flow process chart, within flow process chart it is depicting a worker or operator type of flow process chart and here you can see what is the information that we have put. We have put quantity of plates, distance, time and as I have already told all the symbols remain same as we have seen in outline process chart or operation process chart.

Operation is there transportation, delay, inspection and storage. So symbols remain same but 3 additional things we are recording here the time in minutes, distance in meters and the quantity of plates. Now material type flow process chart, it records how the material is handled or treated.

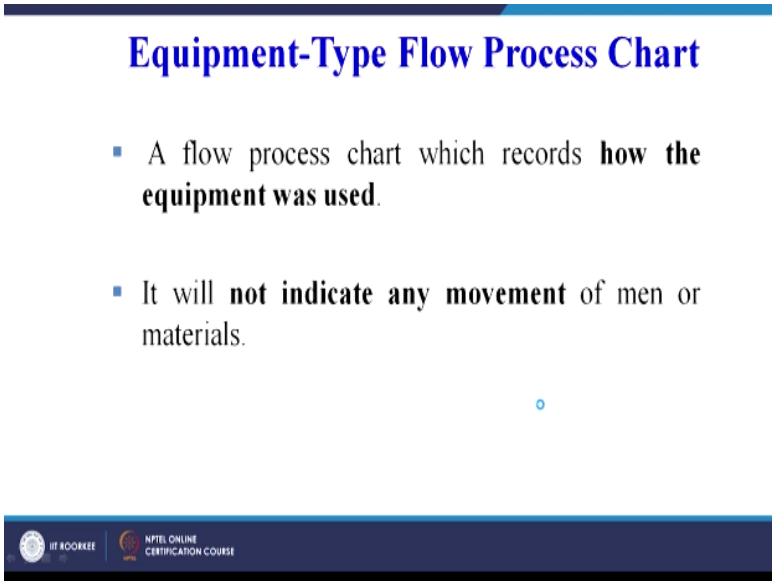
(Refer Slide Time: 19:23)



It shows the introduction of all materials whether raw material or finished components and represents all the information regarding operations and inspections carried out during the process diagrammatically. So it is also we can say one form of flow process chart and in this case we will try to understand it with the help of a case study but if you remember in our previous session we have taken one case study which was related to material type of flow process chart.

So are not going to take a specific example of a material type of flow process chart again today, but we will try to see one case study in which we will try to draw both the man type or operator type of flow process chart and a material type of flow process chart. So here we will see our focus primarily will be on the movement of the material on the shop floor or in the office.

(Refer Slide Time: 20:29)



Similarly, the equipment types a flow process chart which record how the equipment was used can also be drawn, it will not indicate any movement of men or material. So equipment type of flow process chart usually maybe can be drawn if we want to focus on how the equipment is being used or if there is a scope of improvement in the way the equipment is being operated. So for equipment also we can develop a flow process chart.

So for equipment maybe suppose it is kind of a gantry robot which is moving from one place to other in the shop floor so it is one equipment for that we can see that what is the flow pattern for this equipment. It can be drawn and it can be seen that how the path can be

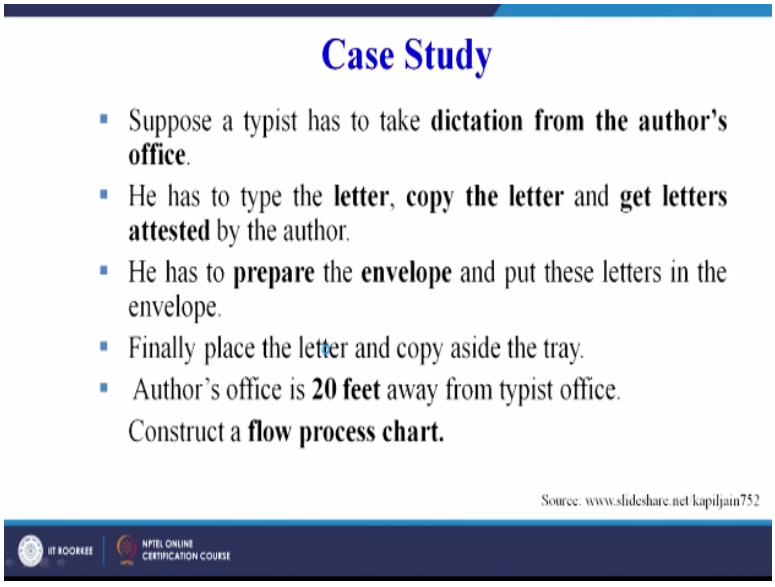
optimized for this equipment. How the distance the equipment is travelling to satisfy the various constraint.

How the distance can be minimized, how the battery life of this equipment will be improved if we are able to optimize the path the equipment is travelling. So all those types of charts or jobs can also be put into flow process chart. Let us take now one case study. Now our case study is a simple case study. Normally you will see that I take examples which are related to our day to day life so that we can understand the concept.

And once the concept is clear to us we can apply it in tougher problems, tougher means there is no problem which is tough, but maybe which is related more to our works fair. I take problems which are similar to all of us maybe somebody is from chemical engineering and doing this course on work system design he can apply the same concept in chemical engineering applications.

If somebody is from production and industrial engineering background he can use the same concept in solving problems related to shop floor. If somebody is from mechanical engineering he can use the same concept for solving the problem in one of the application areas of mechanical engineering. Concept remains the same, the applications may be different.

(Refer Slide Time: 22:38)



So let us take this simple example of our day-to-day life. Now suppose the typist has to take dictation from the author's office or from the boss's office. So there is an author who has to

give dictation to a typist. He has to type the letter, copy the letter and get letters attested by the author or signed by the author. So first thing is a typist has to take dictation from the author or from the boss then he has to make copies of that dictation.

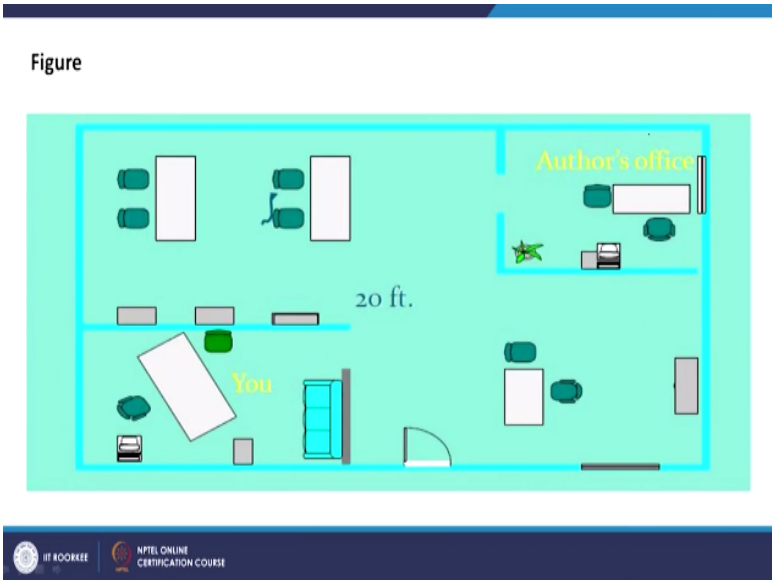
Maybe he has to type that letter then he has to get it signed by the author or the boss. He has to prepare the envelop and put these letters in the envelope finally place the letter and copy aside the tray. Author's office is 20 feet away from the typist office. Construct a flow process chart. The distance between the two offices, the office of the typist and the office of the boss is given 20 feet away, one condition.

Then the sequence of operations is also given. The activities that have to be completed in order to complete this project are also given. What we have to do, we have to construct a flow process chart. In today's session we are taking the examples of flow process chart. So what are the 3 types of flow process charts. Operator or worker type of flow process chart, material type of flow process chart and equipment type of flow process chart.

So in this case if you see there is some content which has to be put on paper, which has to be typed as a letter. So that we can say is a material, so we can make a material type of flow process chart focussing on the content which has to be put in the form of a letter into the envelope and has to be sent out or we can take the typist as our subject. Typist is a worker.

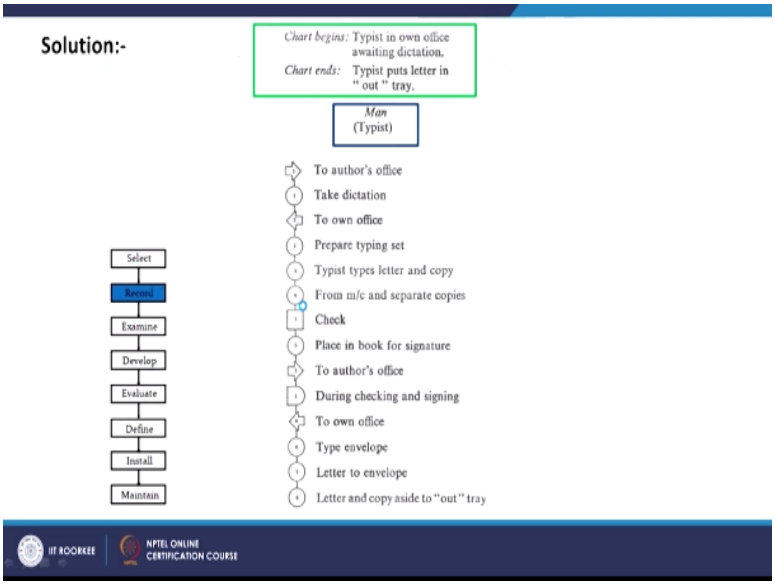
So we can make a worker or operator type of flow process chart here by focusing on the worker or the typist and we can make a material type of flow process chart by focusing on the contents of the letter that have to be sent out. So we can make 2 types of flow process charts here and that to both of them we will try to understand.

(Refer Slide Time: 25:04)



Now this is the figure, where here this is the author's office, this is the typist and the distance already is specified is 20 feet, already it is mentioned, 20 feet. Now this typist has to go to the author's office take the dictation there then come back to the office do the typing, make the copies, put the letter into the envelop and put it on a side tray for further dispatch. So we can make a flow process chart here.

(Refer Slide Time: 25:36)



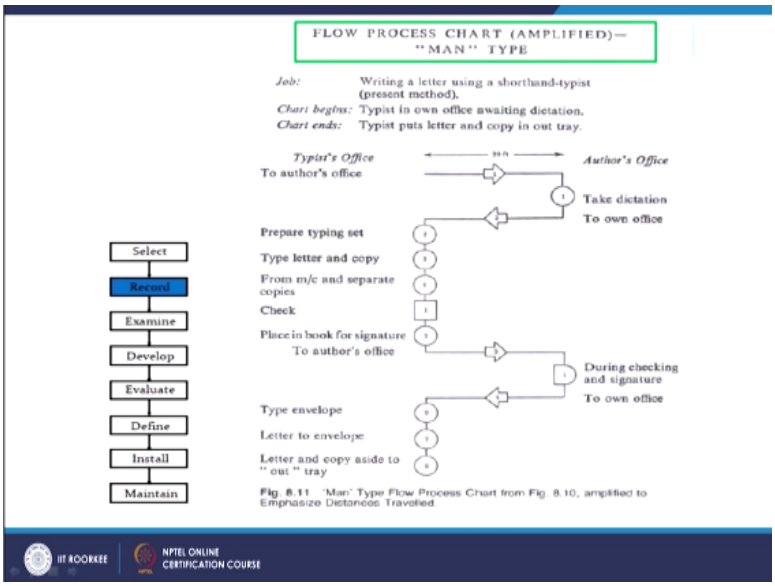
You can see the chart begins, typist in own office awaiting dictation, chart and typist put the letter in the out tray. Out tray means that it is ready for dispatch. Now the first condition is or the base condition is, the zero level is that the typist is in his own office awaiting for dictation. So we have to start the flow process chart by assuming that the typist is in his or her own office.

So first thing is the typist will move from his office or her office to the boss's office or to the author's office, there take dictation which is you can say is an operation then go back to own office which is again a transportation symbol, prepare the typing set, typist types the letter and copy from machine and separate copies maybe first he types the letter then make copies on a machine that is a photo copying machine.

Then inspect whether the things are okay or not, place in the book for signature because he has to get the things attested by the author, then again after everything is ready go back to the author's office during checking and signing now the author is checking and signing so in that case our worker is waiting or our typist is waiting for the final signature after it is signed comes back to the own office, a transportation symbol is there.

Type the envelope, the letter is put into the envelop and letter and copy aside to the out tray for the further dispatch. So here our focus area is the typist. And what type of chart we have made here. We have made operator or a man type of flow process chart. And in next case we can also make a chart which is a material type of flow process chart.

(Refer Slide Time: 27:41)



The previous one you can see is the operator or the man type of flow process chart and the next one is that is the material type of flow process chart that we will see, but this is the another way of representing the typist or a man type. Here again this is man type another representation that we have seen already are typist type of flow process chart. So here we can see it is showing because the distance was also mentioned 20 feet.

So typist's office is here, author's office is here, so to the author's office 20 feet typist goes to the author's office takes dictation there comes back again 20 feet and then prepare the typing set type the letter from machine and separate the copies and makes the copy, he checks himself place in the file for signature again goes for signature and then there is a delay he is waiting for the author to check and sign the document or the letter.

Again comes back then he prepares the envelop, letter to the envelop and then it is in the out tray for final dispatch. Same way but the distance part is represented in a different way here. Then we can make what type, man type or operator type already we have drawn. Now we can focus on the material. Now what is the material? Material can be the contents of the letter, so which is clearly mentioned here, contents of the letter.

Now what is for the material, the material is with the author, so what is wait arrival of typist, so material is already available with the author so the material is waiting for the typist to come and take dictation, taken down in shorthand. Now the material is taken down by the typist in shorthand in shorthand book. Then the material moves to the typist office. Typist prepares to type. Typed in the letter form. The material is getting typed in the letter form.

Typist separates the copies, it is checked by the typist, placed in book for signature. So when we are focusing on the operator we say places, the copies in the book for signature, but here we are focusing on the material. So the material is getting placed in the book for signature. So you can check we have seen in today's session only active and passive forms.

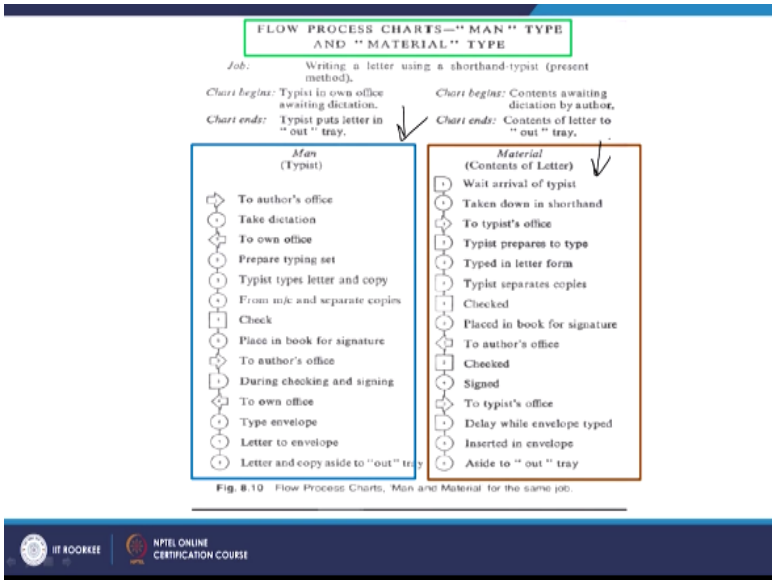
So the material is getting placed in the book for signature then the material goes again to the author's office where it is inspected, that is check then it is signed. Then it goes to the typist's office, delay, why it is delay because our letter or the material is ready but the envelop has to be typed so delay while the envelop is getting typed. Then the material or the letter is getting inserted into the envelop and then it goes to the out tray.

So we have seen maybe here as per my understanding the material type is not that clear but if you remember in the previous session the example of material type of flow process chart that we have taken was very, very clear, absolutely clear, crystal clear. Here also the contents of the letter are taken as the material and this is just to explain that how a material type of flow

process chart can be constructed and how an operator or a machine type of flow process chart can be constructed.

Today we have not taken any example for a machine or equipment type of flow process chart, but we have easily understood an operator or a man type of flow process chart one and we have also seen a material type of flow process chart. Now these are the 2 charts placed simultaneously. This is the man type and this is the material type.

(Refer Slide Time: 31:42)



So you can just once again go through these things and you will be able to differentiate the active and passive things that we have discussed today. With this I conclude today's session. In next session we will take forward our discussion related to the various graphical tools that we use to conduct the method study. Thank you.