

**Structure, Form, and Architecture: The Synergy**  
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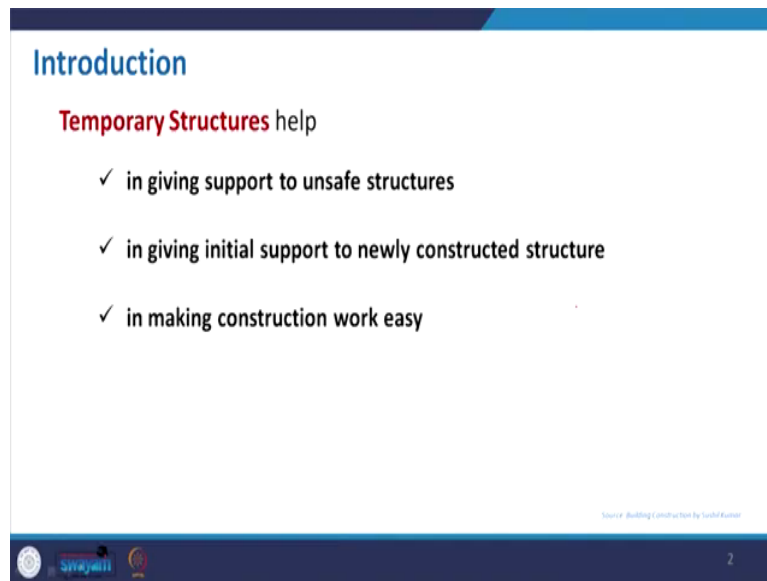
**Lecture – 20**  
**Temporary Structures**

Hello everyone, welcome back to online course on Structure Form and Architecture: The Synergy. Today we are at lecture number 20. So, this is all about the Temporary Structures; previously like in previous lectures we have discussed about the composite structure, then the tensile structure and also we discussed about the load bearing structures. Now, we move to a different kind of you know structural term that is temporary. So, basically as the name suggest, in this lecture we will be discussing about the structure which is just made for a small duration, is just to you know or not for like for you know staying for a longer duration or permanent.

And we should also know the requirement of different structural system to make those temporary structures and also the need of temporary structures to support our you know some buildings or you not to give a form. So, let us start with this particular lecture which is temporary structures. So, basically if you see the a need of temporary structures, so it helps in giving support to unsafe structures. So, many a times if a building is too old and over the period, there will be some deterioration on structure. So, the building is considered to be very unsafe, this is one.

Sometimes maybe due to some faulty construction or maybe the material used was not of the required you know property, then also your structure will become weak. So, for that we need to support it with some temporary arrangement. So, temporary structure helps in giving support to the unsafe building.

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The slide is titled "Introduction" in blue text. Below the title, the text "Temporary Structures help" is written in red. There are three bullet points, each starting with a checkmark: "in giving support to unsafe structures", "in giving initial support to newly constructed structure", and "in making construction work easy". At the bottom right of the slide, there is a small text "Source: Building Construction by Sushil Kumar". The slide also features a dark blue footer with logos on the left and the number "2" on the right.

Second it giving initial support to newly constructed structures. So, here it is basically referred to the form work; when we make the construction with concrete, so when you mix up the cement, sand, stone chip, water and we prepare the concrete, it will be you know very semi liquid form and will not really able to you know take the load. So, for that we have to make the formwork or shuttering work that will give the initial form of the structure, and then we pour concrete on top of it and we wait till the setting time.

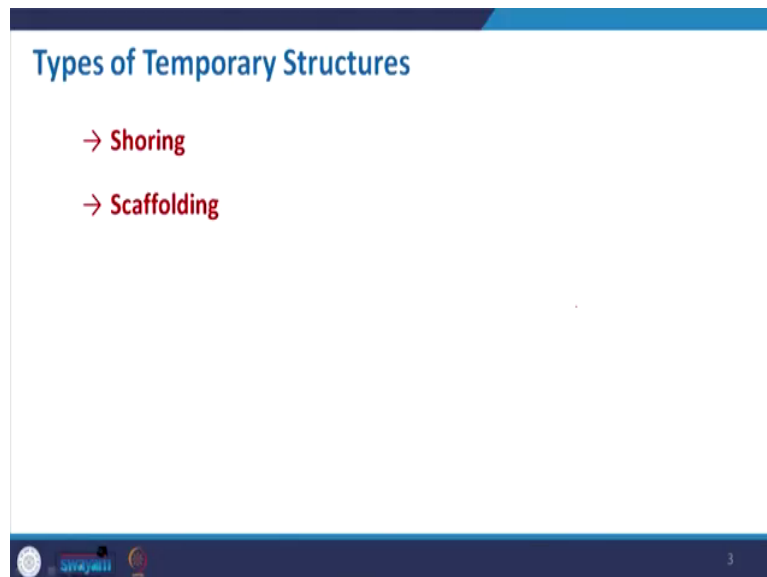
So, depending on the position, depending on the material; it may take to from 7 days, 14 days or maybe 28 days to be you know followed after curing of concrete. So, in order to make this column, slab, etcetera; so we also need to make some you know temporary construction with the material can be of wood, plywood, it may be of steel, depending on the scale of the

project, depending on the available resources with the developer or the construction partner. So, that will also help in to give support to the newly construction you know structural part.

Also in making construction work easy; so this is something not really giving support to the structure, but it is giving you the framework. Many a times when we see at high rise building, so always the question comes in the mind; how like a person like paint at the you know at the height of the 30th floor or something like that, or some repair work to be done, how to make it at that from external wall. So, we have seen such kind of arrangement, like they made they can make it with the bamboo or maybe the steel you know component to just make some platform and then they work it.

So, due to that particular requirement, we also need such kind of temporary arrangement; technically we call it scaffolding.

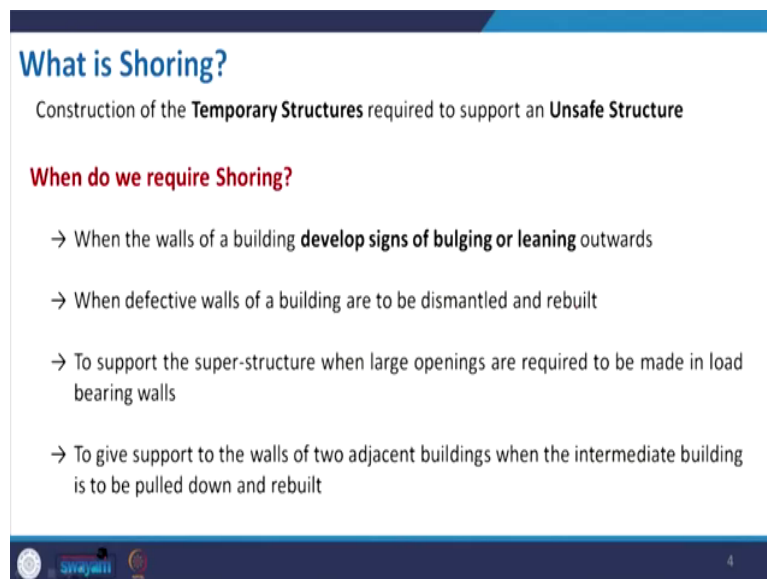
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So, if I broadly classify the temporary structures, so we will have two category; one is shoring, the other one is scaffolding. So, we have to understand each of these term very carefully and like we should know different type of shoring and scaffolding and we can make some difference, what are the purpose. Where shoring is basically used to support your building, either it is unsafe or maybe to give initial strength to the building under construction.

And the scaffolding is basically will help to make the construction work. Like laying the bricks, making plaster, making some repair work or maybe some paint. So, different type of scaffolding; depending on the height of the building, height of the structure, the scaffolding arrangement will vary, the material used will vary. So, in this lecture we will cover those issues.

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**What is Shoring?**

Construction of the **Temporary Structures** required to support an **Unsafe Structure**

**When do we require Shoring?**

- When the walls of a building **develop signs of bulging or leaning** outwards
- When defective walls of a building are to be dismantled and rebuilt
- To support the super-structure when large openings are required to be made in load bearing walls
- To give support to the walls of two adjacent buildings when the intermediate building is to be pulled down and rebuilt

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So, what exactly the shoring as already I mentioned; the construction of temporary structure required to support the unsafe structure. So, what exactly; so we make a structural arrangement ok, which is not permanent for some duration maybe, until the building is returned to the safe position or like maybe dismantle and a new construction. So, in order to like support those unsafe buildings, shoring is required and that is basically a temporary structures.

So, when we require it; when walls of a building develop sign of bulging and leaning outwards, ok. So, what exactly it means; suppose if we see a building is basically the structure is too old or may be due to faulty construction, so or due to unequal settlement underground. So, building will have a tendency to tilt the outer side, or maybe a part of the building is showing a leaning towards something like it will fall; so then a support to be given, like we have seen like in the compressive structure thing, the flying buttresses. So, basically it is supporting the wall and anchor it to the ground.

So, something some kind of arrangement to be done to you know, support this kind of things. So, this shoring is one of the you know structure that can be used to solve this purpose. Now, the next point is the when your wall is a defective wall; suppose it got very much damp and very much porous and it is no longer be taking any kind of load, rather it will give some discomfort to the environment and we have to dismantle it.

But in order to dismantle it, we have to give the initial support to the slab or connecting structure, so that we can easily remove the part which is already damaged and then we reconstruct and then make our structure safe again, until that part is rebuilt, so we can use the shoring. The other one is support the superstructure when large opening are required to be cut in a load bearing wall. So, what exactly does mean; like suppose if you are if you have a load bearing wall and as we discussed in the, you know load bearing structure lecture.

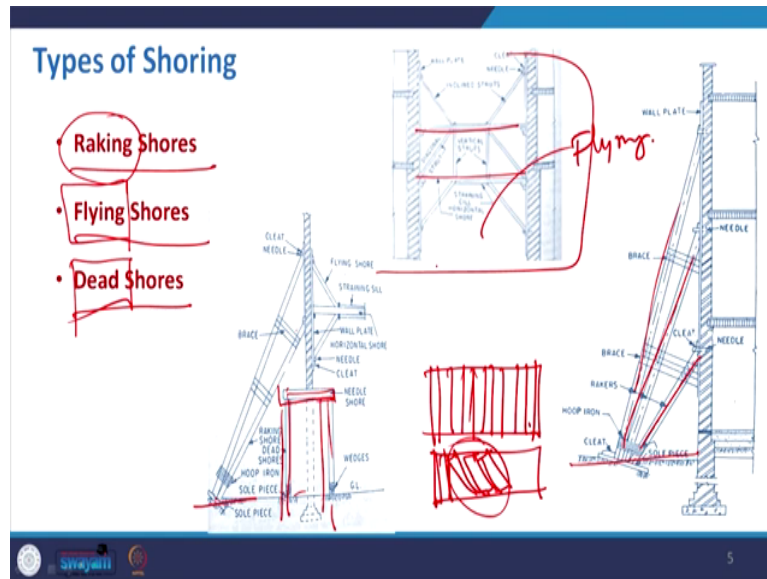
So, preliminary all the load transferred from the slab through the wall to the foundation; so this particular wall is taking the maximum load. Now, the it should have the thickness to bear the load of the upper story. Now, say for example you have to make the openings, so we cannot

simply cut one opening on to that particular wall, and for that you have to initially support the slab, ok; which initially the wall was taking the load, so we have to give another support.

Till that opening is made and the framework; like the door frame or the opening frame being installed properly, till that time we have to support it, so this is also a application of shoring to that. Now, also it gives support to the walls of two adjacent building; when say we have a series of building and what you need to do, they are very close to each other and we have to dismantle the building in between these two.

So, if we have say three buildings and you have to dismantle this particular building, so in that case during that dismantle process and all; they may impact, keep some impact and this you know two buildings you know surrounding that the middle one may fall towards each other. So, for that sometimes we have to make the structure stable ok, we have to give some temporary support; so that can be also done to shoring.

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And depending on the position and the purposes, shoring is further divided in three parts. So, one is your raking shores, then flying shores and dead shores. So, in this case like though the names are very peculiar, but if we just try to understand by taking the meaning of that; so we can probably can understand it in a better way. So, raking means, sometimes you know we always keep our books in the book shelves, and if you notice it, like in a book shelf when you put it; so when you have full number of books, like enough number of books, you can make it in this particular parallel position.

But most often if you take one book, so other will try to you know lean on the other book and make stable position. So, this is basically the rak. So, considering this kind of incline stacking or raking, so the raking shore is related to that. So, in a building when we see the temporary structure is placed in a inclined form to support the building, so then this type of temporary structure is called raking shore. When it is flying, so fly means it relates to something in here.

So, when a shoring arrangement is made such a way that there is no component touching the ground, we call it flying. And then dead shore is basically, dead means; we can just relate it to the soil. And here dead shore means; whenever you have to you know make some changes for the you know underground structures or something to you know enhance the capacity of the foundation or you know rebuild the foundation, for that those kind of thing we use the dead shore. In this case it is a combination of your raking shores and the other props.

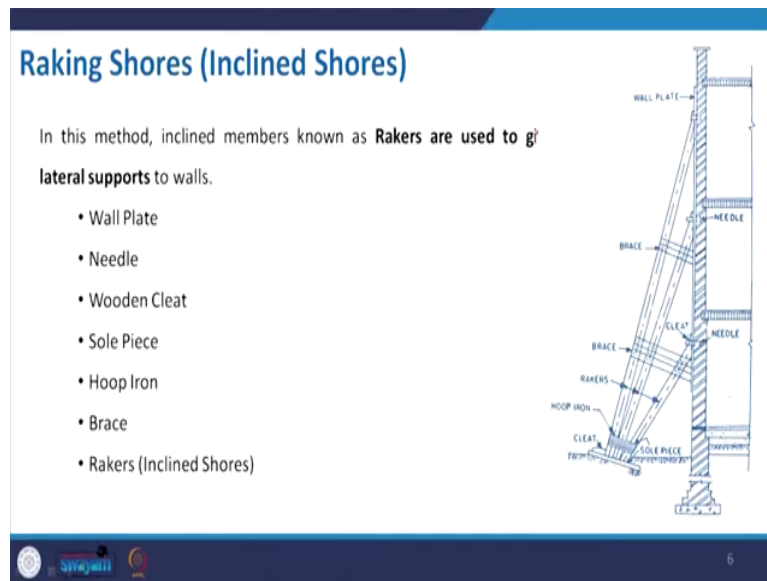
So, in this picture, now based on my deliberation you can easily guess; that in this position like, this is the shoring arrangement giving the support with some members, this members can be made of wood, can be steel. Or sometimes if the span is too large, then we can go for the truss; because truss and space frame this kind of you know arrangement will make it possible to even support two buildings away from each other. So, there is no connection to the ground. So, this is leading to your flying shore.

In this case if you can see that this particular wall being supported with some you know members and they are inclined members. So, like you just compare it with the way we put the books in the, you know our shelf and raks. So, this is basically the raking shore. And here if you see that the, what happen the replacement of the foundation. So, you can see the drawing, the foundation shown in dotted lines.

So, the upper structure is you know, we support it with the raking as well as in order to replace it; so also there is another arrangement with vertical and horizontal member, so that it will give support as a temporary foundation. And then once it is made, so gradually will remove the structure and make our structure safe again with that rebuilt. Come to the raking shore, already I mentioned that it is also referred as the inclined shore.



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Now what are the things normally here; so it is basically the inclined members known as rakers are used to give lateral support to the wall. So, in this case the support is given like this. So, must be this wall is having a tendency and showing a sign to lean towards the site, and this will basically support this to make it in original position. So, what are the other things required to make this kind of arrangement?

So, first of all, we need to have a wall plate and in this if you see carefully in this drawing; so after this walls you have some wall plate, ok. It may be made of steel, it may be made of wood that depends on you know; the severity of the structure, height of the structure, availability of the resources. Then the needle, needle will help to you know connect it your rakers to the wall. So, we will make some penetration and we just give some support, some attachment

with the wall. So, needle is used to stitch. So, here also the purpose is the stitching this wall plate and rakers to the wall.

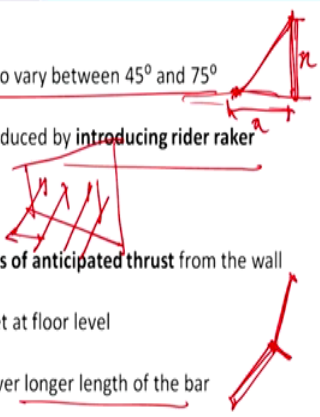
Then wooden cleat is also used where you have to give the support ok, to make it you know very tight. So, cleat is normally being used most of the cases for your wooden you know, joint or something. Now, sole piece is where we use at the bottom, where we actually you know tie up all the rakers. The hoop iron is basically where you can make those you know rakers tied up. The brace or bracing is something where you know with the higher span, you have to give some you know tight situation, ok. So, you have to give some tie bar to you know connect all the rakers together. So, this is the bracing.

So, when we discuss the bracing earlier, so in order to support the lateral load, we use a diagonal. So, here it is something where we used a some you know perpendicular to the inclination, we use this ok. And the rakers are the main components. So, like that we can support it the raking shore.

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### Raking Shores (Inclined Shores)

- Rakers are to be inclined in the ground at  $45^\circ$ . Also vary between  $45^\circ$  and  $75^\circ$
- For tall buildings, the length of the raker can be reduced by introducing rider raker
- Rakers should be properly braced at intervals
- The size of the rakers is to be decided on the basis of anticipated thrust from the wall
- The centre line of a raker and the wall should meet at floor level
- Shoring may be spaced at 3 to 4.5m spacing to cover longer length of the bar
- The sole plate should be properly embedded into the ground on an inclination and should be of proper section and size



The diagram illustrates a raking shore system. It shows a vertical wall on the left. A raker is shown as a diagonal member extending from the wall to the ground. A rider raker is shown as a horizontal member connecting two rakers. The diagram also shows a cross-section of a raker with a sole plate at the bottom. Red lines and arrows highlight key features and dimensions.

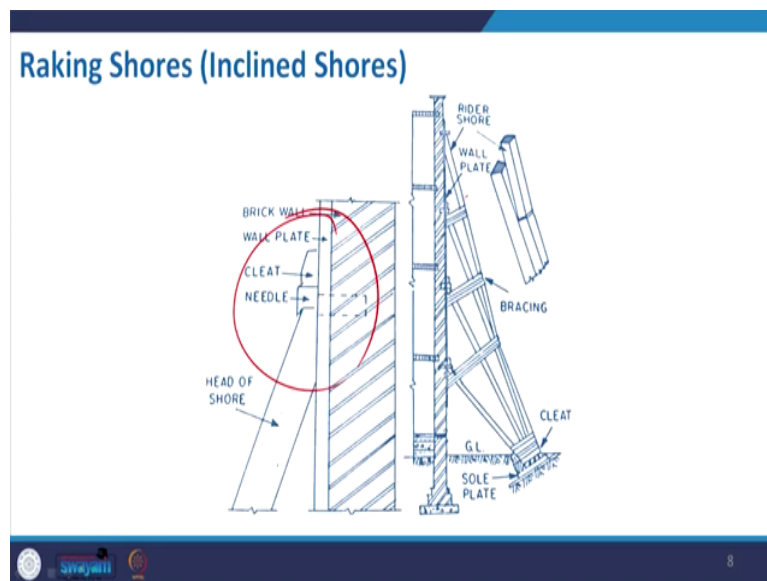
Now, come to the inclination. So, it is always better to have a inclination of 45 degree; that means, the height of the building and you know the point like it will make the 45 degree angle. So, this length and this height of the building will be equal; but most of the case if the building is too high, we cannot have this much horizontal space, because this maybe a road or this maybe some space, we cannot go beyond the boundary. So, then you may change it.

So, basically it can have a range of 45 degree to 75 degree. So, in this case, it is something like where you can imagine that this portion maybe at 45; but the others are not, because it is if it to be 45 degree, then this will go up to this level or something. So, then in that case we can introduce the rider raker. So, rider raker is basically when you need to change it. So, sometimes you can just use a bracing and change the raker you know inclination at certain point, so that you can also manage the horizontal space.

Raker should be properly braced at intervals to give the you know stability to the shoring; then size of the rakers will be determined based on the you know anticipated thrust. That is already I mentioned that, how much the load of the wall, the leaning, the overall condition based on that it will be decided. Now, shoring may be spaced at 3 to 4.5 meter spacing to cover longer length of the bar. So, that means, it is something like I have shown that in cross section.

So, in a wall, so you should have multiple such rakers to support it, right. So, this spacing can be of 10 feet or like 3 meter to 4.5 meter spacing. The sole plate should be properly embedded into the ground. So, in this case if you see this is really the, you know the sole plate is embedded to the ground to give that particular support; whatever the thrust coming, so that will transfer to the sole plate to the ground. So, this is also very important aspect.

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Now, the rider shores as I was trying to draw; here it will be very clear that how it changes the inclination, so that it can manage it will. And this is a bigger picture how the needle and cleat will help to tie your rakers through the wall plate to the wall.

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So, this is what we try to discuss and here you can see that how complicated it looks like; but definitely it is made of steel and in this position they use some coupler, will have some pictures afterwards as well to support it.

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This is another one where you can see that how like in this place it is only the iron, like your steel tube being used and here it is instead of that, the you know the thrust being used to support it, with your horizontal member and inclined shores and this is another one where it is also supporting a wall.

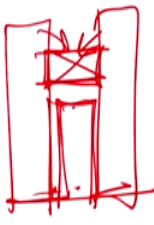
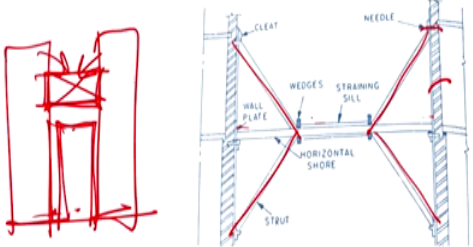
So, sometimes for some heritage you know structure where you do not really want to rebuild with the new material, then also we can give this kind of shoring to make it stable.

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### Flying Shores

- It is a system of providing **temporary supports to the party walls of the two buildings** where the intermediate building is to be pulled down and rebuilt.
- All types of arrangements of **supporting the unsafe structure in which the shores do not reach the ground** come under this category

- Wall Plate ✓
- Needle ✓
- Wedges ✓
- Sole Piece ✓
- Strut ✓
- Horizontal Shores ✓



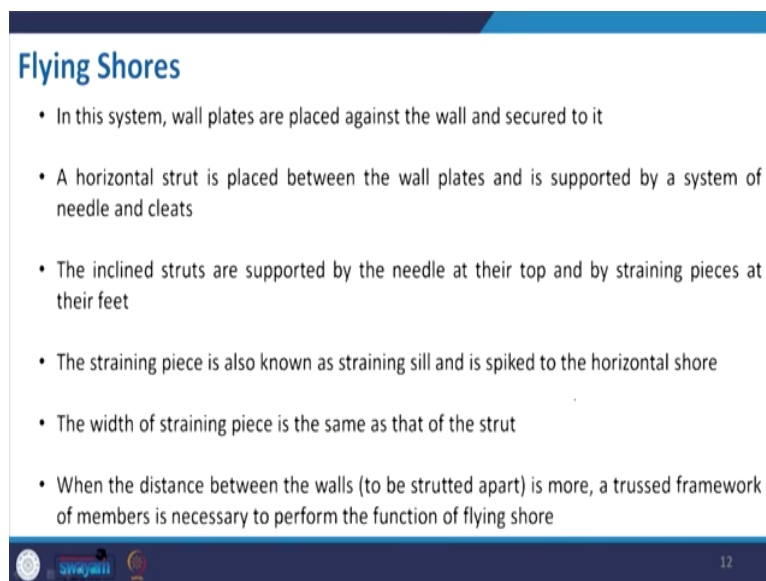
The diagram illustrates a flying shore system. It shows two vertical walls (party walls) of buildings. A horizontal member, labeled 'HORIZONTAL SHORE', connects the two walls. This horizontal member is supported by two inclined members, labeled 'STRUT'. The struts are connected to the walls by 'WEDGES' and 'WALL PLATE'. A 'CLEAT' is shown at the top of the left wall, and a 'NEEDLE' is shown at the top of the right wall. A 'STRAINING SILL' is also indicated. The entire system is shown in a hand-drawn red sketch on the left and a more detailed technical drawing on the right.

Now come to the flying shore, as the name suggests that there will be no connection of any members to the ground; that means, suppose there are two buildings and the tendency they will try to lean towards each of them or maybe something like you have to dismantle the part of the building here in between. So, we have to give initial support and then what you can do; you can just use your shoring at the top ok, in a you know elevated or flying mode.

So, in this case you call this as flying shore. And depending on the structure you know thrust and the span, the shore will be of single flying shore or double flying shore; like this, this is a single flying shore. So, how it is made? So, horizontal members are being given and wall plate is the same, the cleat and needle will be same as the previous one; along with that you have some you know inclined members.

So, they are actually making the, you know composition in such a manner that it will hold the load. So, like it is something you can just imagine; like where you know two particular walls are coming towards you and you just put your hand and put the pressure to keep them separated. So, something like that is there. So, wall plate, needle, wedges, sole piece, strut, horizontal shores they are the members of this. So, in this case if you see, the arrangement is of single shore.

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**Flying Shores**

- In this system, wall plates are placed against the wall and secured to it
- A horizontal strut is placed between the wall plates and is supported by a system of needle and cleats
- The inclined struts are supported by the needle at their top and by straining pieces at their feet
- The straining piece is also known as straining sill and is spiked to the horizontal shore
- The width of straining piece is the same as that of the strut
- When the distance between the walls (to be strutted apart) is more, a trussed framework of members is necessary to perform the function of flying shore

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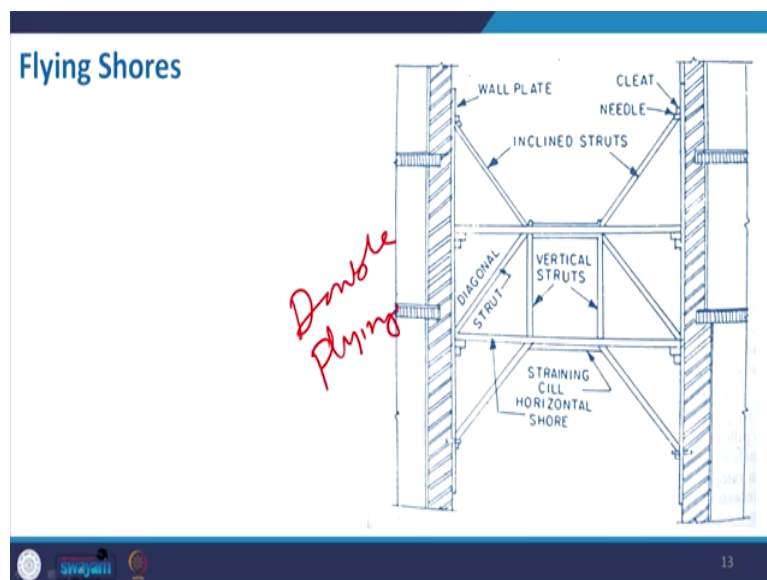
Now, in this system wall plates are placed against the wall and secured to it; horizontal strut is placed between wall plates and it is supported by a system of needle and cleats; then inclined strut are supported by the needle at the top and by straining piece at their feet. So, here if you see that, this is basically your horizontal strut and this inclined strut now they are at the top,



they are fixed with the needle and here it is with the straining sill. So, they are actually you know giving support in that manner.

Now, the width of the straining piece is same of the strut. So, it some specification and it may vary based on the material to be used for that. Now, when the distance between two walls are too much; then probably the struts or single strut will not help, then probably we have to go for the truss or space frame.

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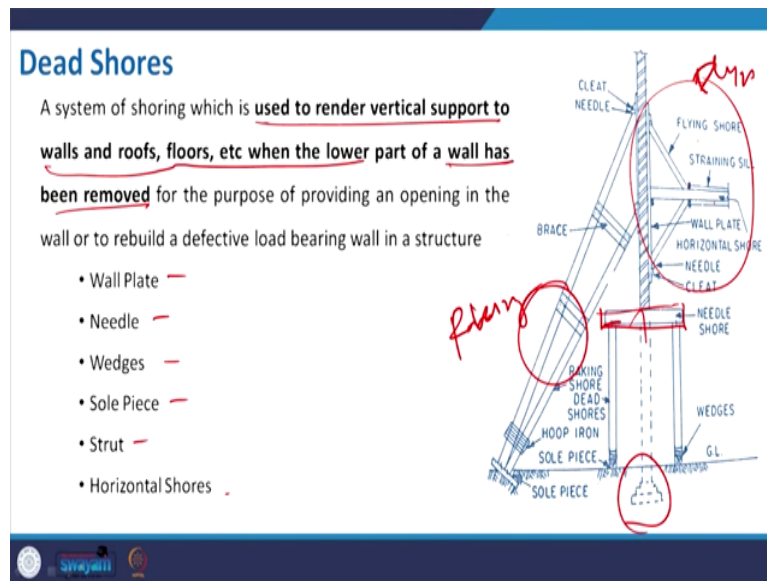
So, this is something where you need to give more support. So, that is why instead of a single flying shore, so here it is basically your double flying shore use, ok.

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So, let us see this picture and you can see that, though this building looks like good; but this building having a very poor condition. So, in this site the raking shores is used, because they have some space; but this is somewhat like we cannot have it some other utility maybe, so for that they are making some kind of arrangement like this. And that was also cross sections, we have to create such multiple you know such flying shore; like in a multiple numbers depending on some spacing, so that it will give the support to the deteriorated or the damaged building or the unsafe structure.

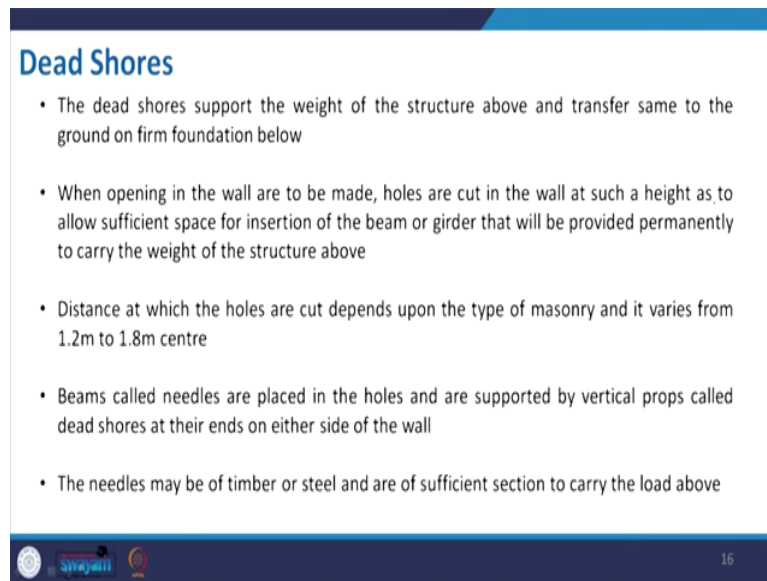
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Coming to the dead shore. So, dead shore, it is basically used to render vertical support to the walls roof floors, ok. When basically the wall has to be removed or maybe some foundation to be you know extended; so this is something the extended picture, so where it is a combination of all.

So, this is something where you can see that flying shore is there, this is the raking shore is there. So, flying and raking both are there; along with that they are giving some horizontal support or temporary support as a foundation, before we just really you know make correction to those you know structure. So, this is also very useful shoring or temporary structure; the materials or the parts of the shore is almost same, as because we are using multiple combination to that.

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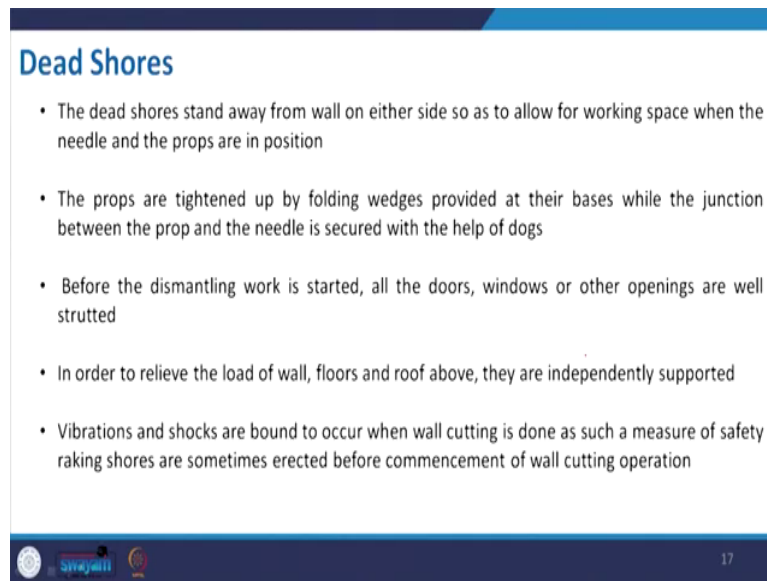
**Dead Shores**

- The dead shores support the weight of the structure above and transfer same to the ground on firm foundation below
- When opening in the wall are to be made, holes are cut in the wall at such a height as, to allow sufficient space for insertion of the beam or girder that will be provided permanently to carry the weight of the structure above
- Distance at which the holes are cut depends upon the type of masonry and it varies from 1.2m to 1.8m centre
- Beams called needles are placed in the holes and are supported by vertical props called dead shores at their ends on either side of the wall
- The needles may be of timber or steel and are of sufficient section to carry the load above

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So, dead shore support the weight of the structure above and that is why it is also required to support all the components separately, so that it will not really be heavy on the structure. The beams called needles are placed into the hole and supported with the vertical you know props. So, vertical props; if you see in this, these are the vertical props that will support the structure, ok. The here we can also use the timber or else we can use the steel tube or sometimes if it is heavy, again the truss.

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**Dead Shores**

- The dead shores stand away from wall on either side so as to allow for working space when the needle and the props are in position
- The props are tightened up by folding wedges provided at their bases while the junction between the prop and the needle is secured with the help of dogs
- Before the dismantling work is started, all the doors, windows or other openings are well strutted
- In order to relieve the load of wall, floors and roof above, they are independently supported
- Vibrations and shocks are bound to occur when wall cutting is done as such a measure of safety raking shores are sometimes erected before commencement of wall cutting operation

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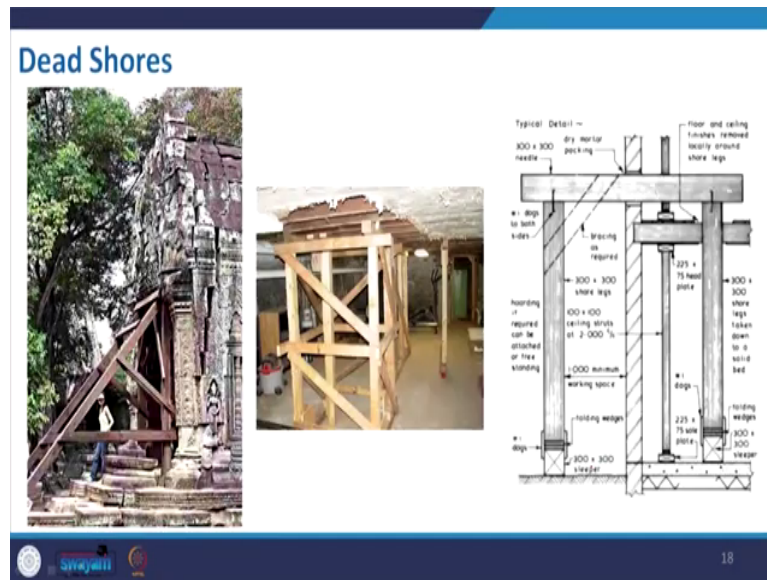
So, in this case also, there are other parts like the dead shore stand away from the wall ok; either side so as to allow working space. So, because when you repair your structure, so you need some space where the you know; the workers can work comfortably, so that the spacing of those vertical props to be placed, so that there will be enough gap to work with.

Then the props are tightened by the folding wedges provided at their base and they are connected to each other; then before the dismantling work started, all doors windows and other openings are well strutted. And another important thing in this is very vital that is the vibration. So, during the works, so when you go for the re working or rebuilding; there will be lots vibration.

So, during that, that will impact the temporary structure. So, we have to take care of that and properly we have to tied all those you know component together, so that it can also resist

those vibration during the reconstruction or cutting any portion of the bearing wall or something.

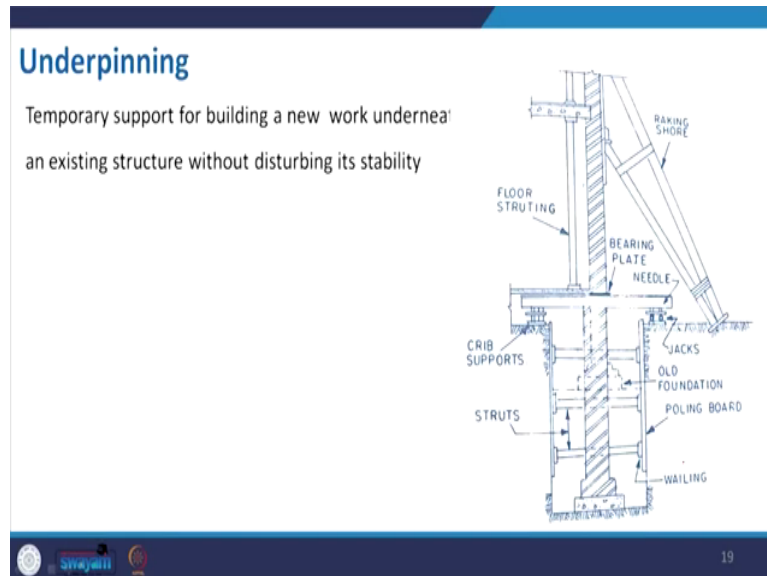
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So, here if you can see that, this is a picture where will like a temple is already you know very you know serious condition, so how this is being supported. So, this is basically the rakers, they provided and inside that they also put something. So, here it is nothing related to the rebuild, but to support the heritage. Here if you can see that, it is being provided with the timber baton to just repair this particular you know basement structure. So, here if you can see how that can be made; so with the you know wooden baton being used and then in order to you know support it, so we have to increase the base, so the head plate being used to support it.

So, the slab to be supported, so some larger base to be provided at the top, at the bottom; so that it will not sleep during vibration or any such you know work. So, this is all about the dead shore.

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Now come to the underpinning; here basically the underpinning is the new work ok, underneath an existing structure, underneath the existing structure without disturbing the stability. So, in this case basically it is all referred to the reconstruction of the wall. So, if you see in this image; the previous position of your foundation, the footing is at this level and now the new one is extended to this.

So, for that the whole superstructure to be supported with the props, with the raking shores, with the you know horizontal and vertical you know support; so this props being used to

support the slab and all. So, basically whenever we do any alternation and give support to the superstructure; so this particular arrangement is called your underpinning.

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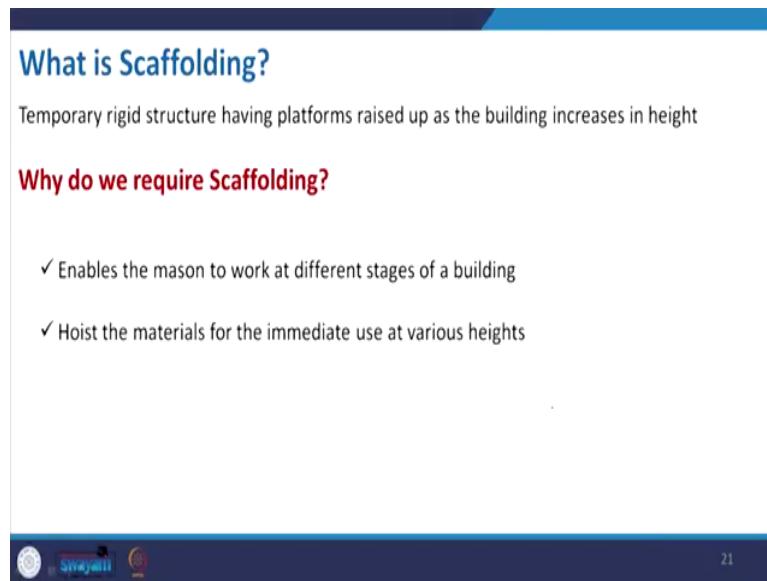


So, here you can see such kind of thing where it is being supported initially, ok. So, the building; so that they can do some repair work. So, in this case maybe you can use simple like the iron or the steel section or sometimes we also go for the hydraulic section to like take the pressure of this.

And then strengthening the foundation can take place or sometimes you know like you just try to create the basement afterwards the building is built; then also this binder underpinning can be used, will be useful to make the construction easy.



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**What is Scaffolding?**

Temporary rigid structure having platforms raised up as the building increases in height

**Why do we require Scaffolding?**

- ✓ Enables the mason to work at different stages of a building
- ✓ Hoist the materials for the immediate use at various heights

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Now come to the second part that is the scaffolding. So, in this section this is not nothing to related to give support to the structure. So, temporary rigid structure having platform raised up to the building increase in height ok and here the scaffolding like say how it will help us, so it enables the mason to work in different stages of the building.

So, first like we lay the brick and then the plaster, then the paint; so all these stages like how the work processes and this scaffolding will keep on you know increasing the height of the building. So, whenever you increase your height of the building, the construction is in progress; so from one first floor to second floor, it will also take the different shape and size as per the construction.

And then also not only the different work, but it will also help to you know carry the material and you know to transport the material. So, sometimes at the very huge height, you use some

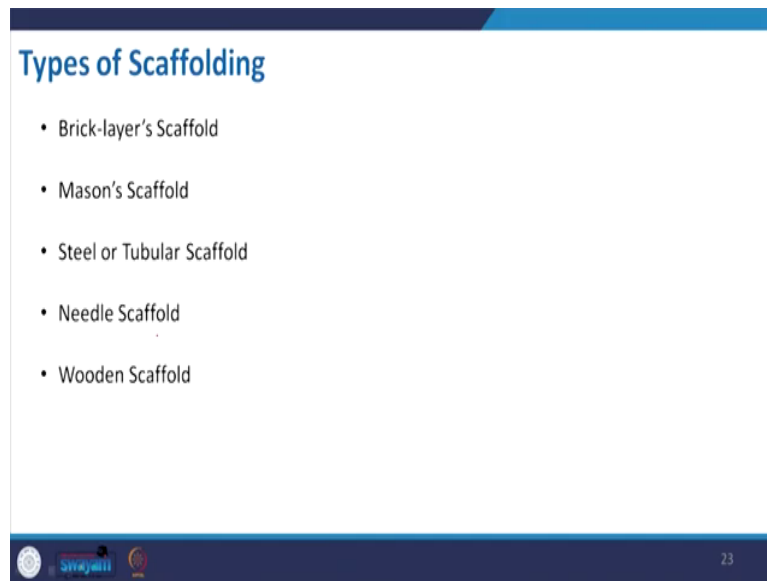
temporary structure; while like manually people can bring those materials or maybe with some certain lift or maybe with some other means, we just transport the materials.

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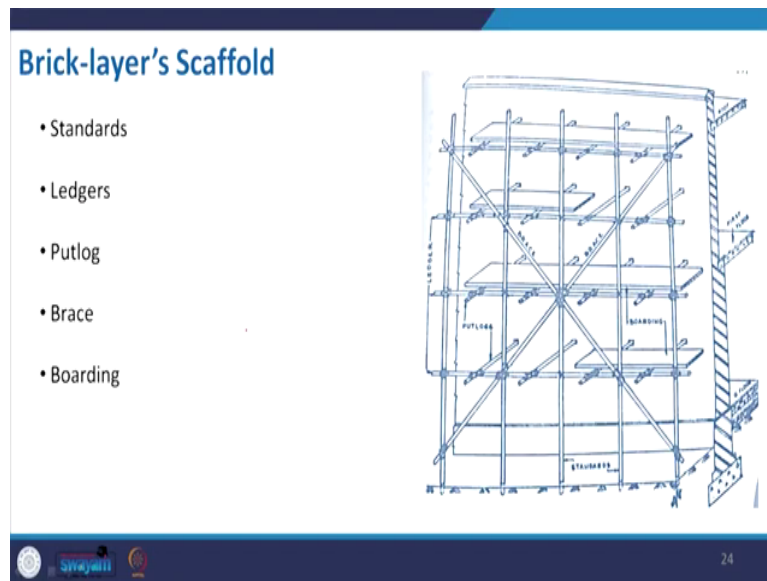
So, here this is something what we can see that, this is your some sculpture from the Rio De Janerio. So, in this case if you see that for the repair work and all, how efficiently this particular system being made. So, this is basically the scaffolding and here the steel is used and there are different platform on the staircase to get access to the top level. And for any construction, newly construction it is to be the same and even for the repair work. So, this is very well designed and that to be designed this temporary structure and this is again under the scaffolding.

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So, if you go to the type of scaffolding. So, here it is the like divided mostly in the brick layer scaffold, masons scaffold, steel or tubular scaffold, needle scaffold and wooden scaffold. So, what exactly this will try to understand that, with some schematic cross section.

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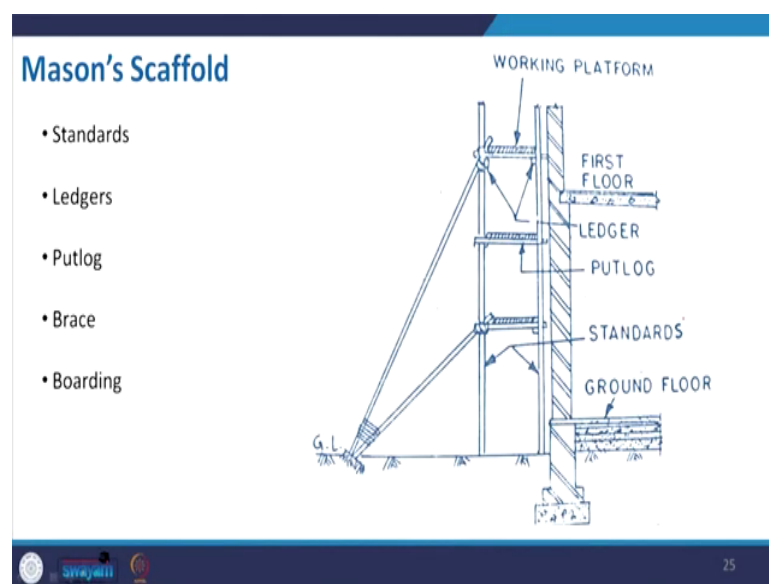


So, brick layer scaffold is a very simple one. So, where like basically what you need to do; when the wall is constructed, so we use some you know standard and ledger. So, what are the standard and what are the ledgers? So, standard are basically your vertical members of this particular framework and ledger are the horizontal. So, they are tied up and along with that to give support to the wall.

So, you can see that many times like during construction we put some hole ok, we just need some brick portion; so that it can give support, so this all you know members which are connecting this frame, this you know ledger and your standard to the wall with a putlog. And if the structure is too high, then probably due to the wind load, the lateral load; it is not safe only to connect it with the wall, so we just use the bracing. So, give more stability and whenever we want to work something, we also use some platform or the boarding.

So, this is also required where one can do the plastering or some kind of you know alternation to those brick work and all. So, this is designed and the gap between these two will be determined based on the you know acceptance of the gap, so that one can really you know climb on each layer. And this is very much you know familiar in most of the cases, and I guess that the all of you have seen this kind of arrangements. So, this is the bricklayer. So, like the brick work, and the putlog is the main work.

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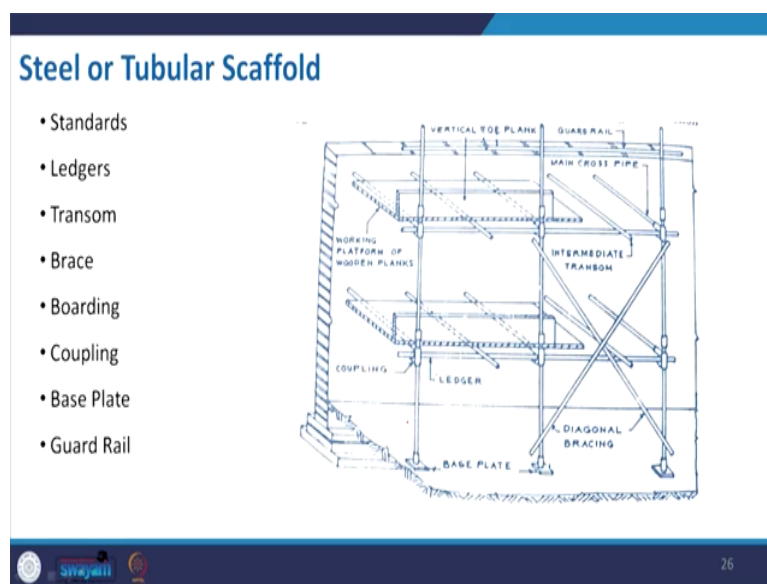


Now sometimes if it is something like your brick wall is not being used to use a putlog; then you make your scaffold separate, stand alone. So, in this case what you do? So, in this case we use instead of a single there is no connection to the wall like the previous the putlog. So, here we have the standard and then in this case putlog is not connected to the wall, right and then we use some inclined you know rakers to support it, ok.

So, there is no connection with the wall and then we use the same boarding and all. So, this is something different from the previous one; previous one we have connection to the wall, so the small punctures made to the wall and we connect this framework. Here it is stand alone, separated with the inclined member. It is only possible when you have sufficient space ok, available from the building.

Suppose it is just next to your you know some road, important road where like people are moving or something like that, we cannot really use this kind of rakers. So, then we have to move for something else.

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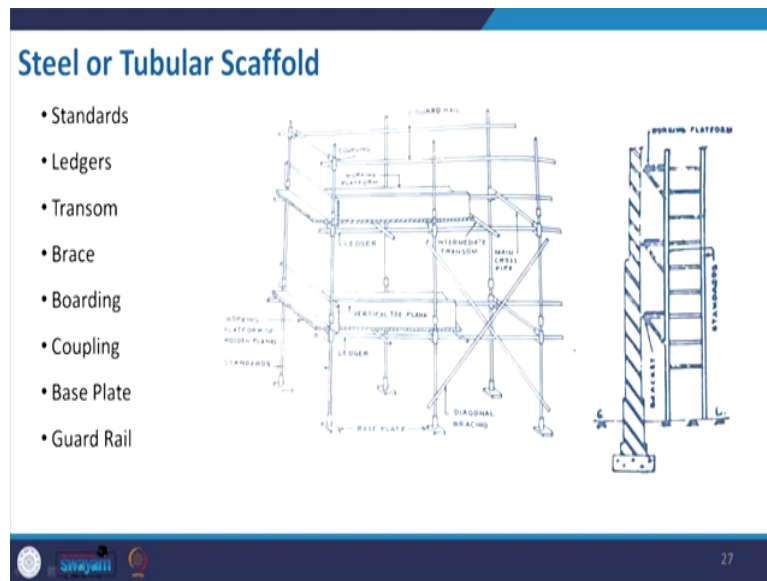
So, in this case it is the steel and tubular scaffold. So, earlier it was something maybe of made of bamboo or something. So, here the thing is something different; the only difference is that,

that instead of those you know tying up the knot. So, if you see these are fixed with the knot; suppose some rope is being used to tie those ledger and standard.

So, in this case the coupler being used, so they are having different you know joints and then with that you have the mechanism to tie it up as per the requirement. The advantage of steel and tubular scaffold is that, you can reuse for multiple time. When you use your bamboo or something so, it is restricted to some height and then you have to tie it up and it will not that much you know reusable.

After certain use you have to dismantle at; but there it is available with standard, you can adjust the height and then the rest of the things is pretty same. So, here also you have the coupling; what I mentioned, the base plate, so that you can put your you know tubular section on a particular place. So, that it will not sleep during the work and all and the bracing is the same what we used earlier.

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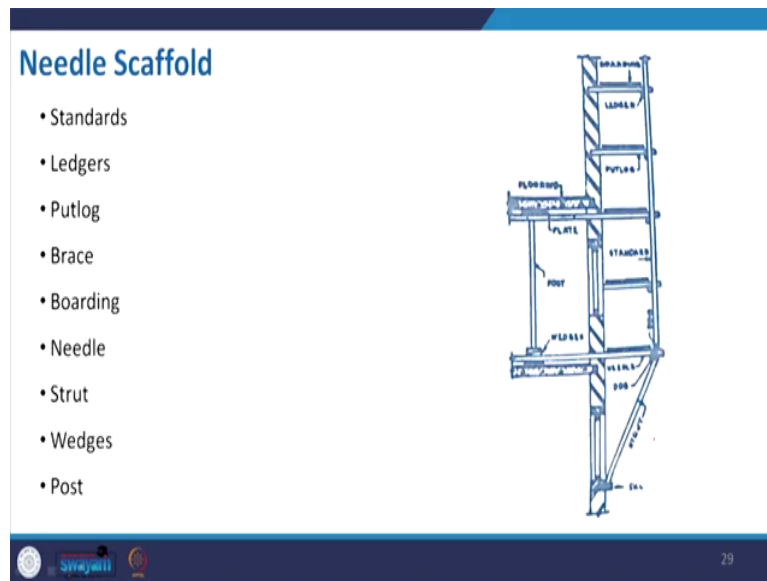


Now, in this case the steel and tubular scaffold; this is another type, this type is where also you use this particular support to the wall, ok. So, this is one; but in this case it is again a frame. So, instead of one, so we use two kind of set up and make it like a stage ok, a platform. And if you see from the side the section is something like that; so where there is no connection to make to the wall.

So, it is similar to the second category that we discussed in this. So, now, it is made with the steel and tubular scaffold; the you know maximum number of components are the same in this case. So, it is again the same example in detail.



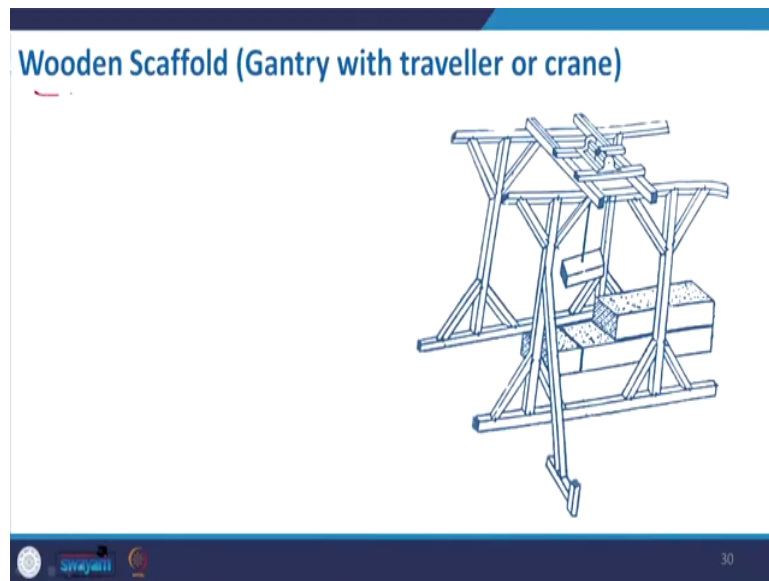
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Now the needles scaffold is something else where like you cannot really access to the ground, because of the busy road or something and then something to be done at the top. So, stating something like making something from the ground, unnecessary we are investing cost and complexity; so somewhere like we can use big needles to put that needles inside your structure, give the support with the props. And then like with inclination you can fix it with the sill level and then you make your scaffolding for repairing the upper structure. So, it has no connection with the ground.

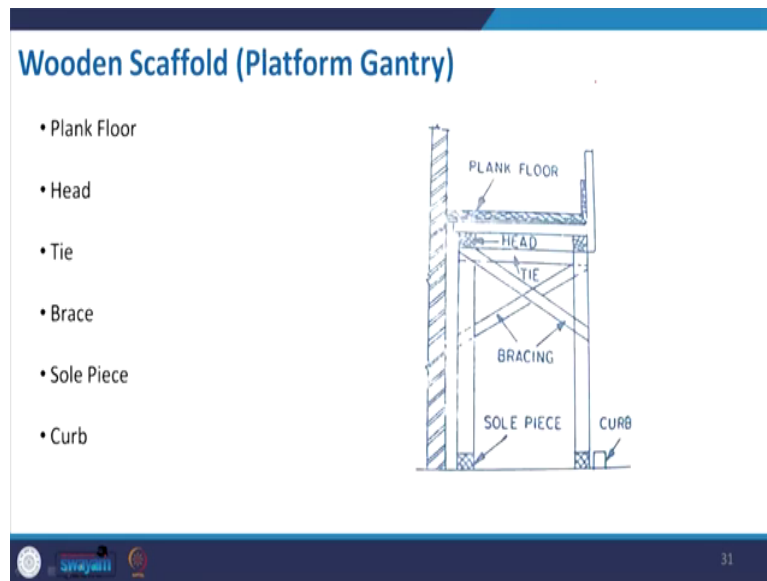
So, this is something different from the others; other few other categories that we discussed, they always have a connection with the ground; but here it is not. The purpose is that you have to make some correction at the top, not at the ground level; and at the same time there is no such provision to make the structure from the ground or it will hamper the daily life.

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Like that also you can have the wooden scaffold or gantry. So, here it is basically not only using will helpful for you know making the work as well as that it will also carry the material; to transfer the material this traveller or crane that can be also used. This is normally you know the wooden baton being used.

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Now, the wooden scaffold is something also we call it platform gantry. So, where something again similar to the needle one, where you have to repair something at the upper portion and you cannot disturb the you know the parts, so may be somebody can you know easily go through this particular space. So, we elevate it, we create the platform and we create the space in between; so that can be used for the regular activity and proper care to be done with making the platform, the plank floor, the head all these things and it is self supported with your structure.

So, this is also helpful for a you know purpose where you have some, you know busy road or something and you have your building just next to the road; then this kind of platform gantry will help you.

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So, now, it is basically where in you know end of this lecture and will try to see the different kind of arrangement. So, in this case if you see, this is basically a local arrangement how the construction being done and the platform and you can see that how it is being supported. So, this putlog; how this is connected to the wall, and so as true with this. So, suppose you can see all those you know punches in that, so that you know in the later stage you can you know use the putlog to increase the height of the scaffold and it is a made of the bamboo and you can see the height, so that one can easily reach it.

Now, compared to that here it is something with made of steel, those section is made on the platform. And again you this is something very important; when you go for the construction work, definitely for the high rise building, so safety to be maintained. So, for that you have to

have some guardrail. So, that you know during the construction, there will be no such casualty happen. So, this is another type of scaffolding here.

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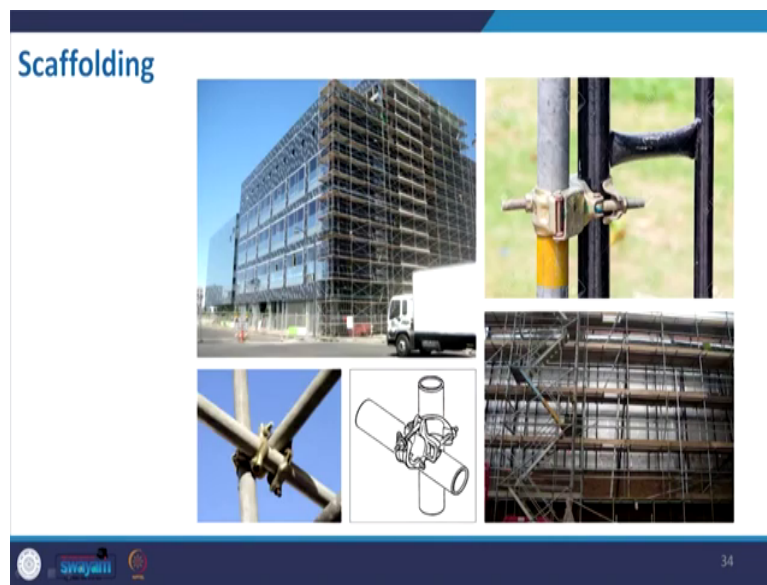


And like this is something where like is a very huge one. So, this is also made of your bamboo and you can easily see those you know bracing. So, one of the building that I have shown that, where structural bracing is used to give the lateral support; but now also for the temporary structure, the concept is same because of the huge vertical structure. So, there will be some wind from different direction. So, that may collapse.

So, for that also the structural arrangement we have to put some bracing. And you can see that due to that you know huge height and different platform and also it is not straight. So, in compared to that, if you use your steel members, so then it will be more stable. So, here you can see how this is being made. So, how the structure is formed, so how this being carried

with a pulley and then how the knot is being made to you know make connection with the standard and ledger. So, this is standard and this is ledger and this is probably the putlog at attaching to the wall. So, this is how this is made.

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And now this is basically in place of the bamboo; how you can use the steel to make it more clean, more safe and most importantly those can be reused. So, these are the couplers that we I was talking about. So, how they are fixing it different you know horizontal and vertical members with the tube, and all and the whole structure can be made of the steel.

So, mostly for the high rise structure or maybe something good developer construction company and all; they use this kind of props, because this is available with the standard height, so that there will be no adjustment; for the other case the bamboo based on something like we have to adjust it.

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So, these are the another example, there are few props to be made like this. So, scaffolding is basically very helpful to you know carry out the work.

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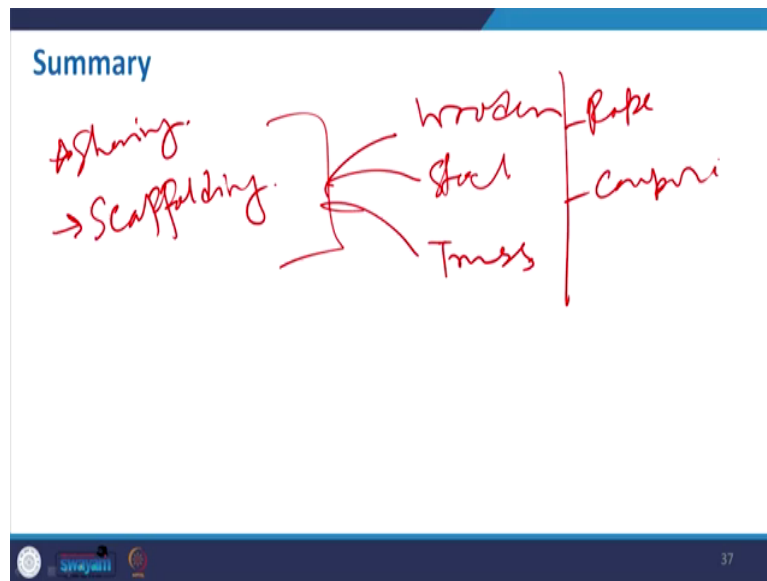


And this is something like for a huge structures. So, the complexity and the making those structure is very crucial. And this is the first step where you just start your structure, making and then give a final look. So, making this temporary structure is also very important and you should also know this kind of arrangement, what are the available thing.

Apart from that also during the foundations, trenches and all; we also use this kind of you know temporary structure to support, to you know stop the erosion of the soil or the falling the soil on the trenches. So, we also create this kind of you know separation. So, this trenches this shoring being used.



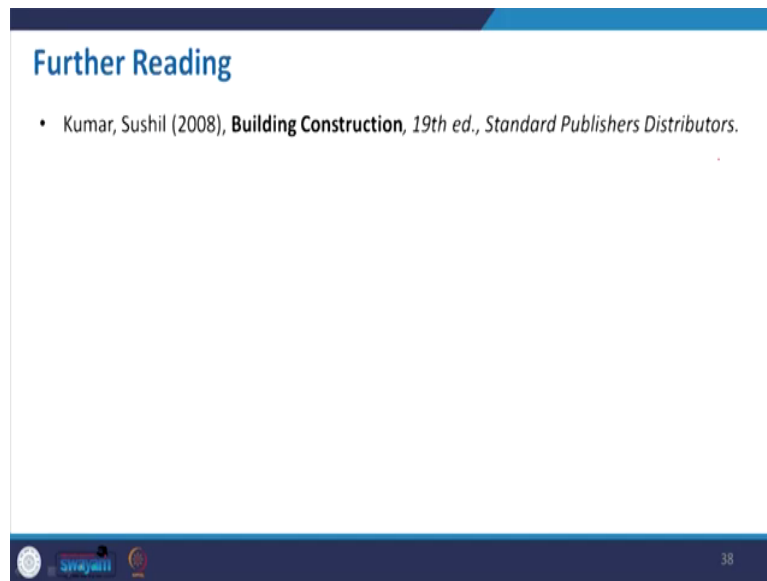
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So, with that, like now in this case what we have learnt that, the shoring is one where it is giving the temporary support to the unsafe structure; the other is the scaffolding. Scaffolding is just not to support the structure, it is to ease off the work of the construction and any kind of finish work like paint, plaster and something. And in both the cases, it may be or made of wooden, it may be made of steel or sometimes it of made of real truss like in state of a single tube or something like that.

And the you know tying up it may be with the rope, or it may be with some coupler. So, depending on the structure, depending on the scale of the construction and all available resources will decide upon that.

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So, with this we conclude here. And for further reading, you can go through this building construction book by Sushil Kumar. There are many books; you can refer anyone, where you can get this kind of stuff.

So, with that I conclude here and then we will be again discussing in next lecture the frame structure. And again I thank you all for taking part in this course and till we go for the next lecture, with this bye for my side.

Thank you.