Building Materials II

Lecture 6

Storing of Timber

Storing of timber is usually done on a **particular storage godown** in the site. Now this storage place should **be well ventilated. Outdoor spaces such as garages or sheds are ideal. It should be very large a warehouse kind of a place. Anywhere you store your timber it needs to be dry and clean.** If there is any ambient moisture present in the atmosphere or the ground it will affect the timber. The storage place should have **good circulation of air** and this timber should not be in any point of time should be subjected to moisture, because the moisture will ruin the timber. **You should never store your timber in a brand new building.** Usually what we do is when we are constructing a building, we order for timber. And we bring the timber. Now when the timber arrives on site, we should never store the timber in the building, in the newly being constructed building or around the building. But we should always store timber in the particular appointed storage place in the site. Why we should not do this? Why we should not store the timber inside the newly constructed building or a building that is being constructed is, because new buildings have too much moisture built up in them. From all the appliances, technical equipments and general building materials such as plaster and concrete. Now this moisture will affect the timber. So This moisture increases the ambient moisture within the building. Now **timber should always be transported to and from building sites from a conveniently located proper timber storage area, with good ventilation and a dry and clean climate.**

Now one you are storing a timber, how you **position your timber**. This positioning of timber should **always be stored on a flat surface** as flat as possible. Even if the timber is little bit tilted then the weight from the timber on top will affect the timber on the bottom, and it will defect the timber. Now this **surface should be solid** so as to ensure that the timber does not sink into it. If the surface is neither flat nor solid , you risk your timber warping. **Store your timber on palettes instead of directly on the floor or your storage facility. This avoids warping , plus gives your timber extra protection against any moisture building up on the floor space. The length of the timber being stored, is no longer than the pallets you are storing it on, otherwise once again warping might occur.** Warping is basically when the timber gets bent, because of the above, we don't follow the above mentioned storage practices the timber might get bent and warped.

Now **when you are storing your timber you should store your timber in stacks**. These timber stacks should be protected by covers or timber covers. When you are storing your timber in stacks, this stacks should be covered, so as to protect from the atmospheric condition. So even if you feel your timber **storage facility is absolutely ideal that's clean, dry and well ventilated**,

you will still need to store your timber in underneath the protective cover. **Doing this will make sure that your timber is adequately protected from outside elements as well as help the timber to uphold its natural moisture content.**

Now what is the **choosing criteria for this timber cover**?:- To provide adequate protection from sunlight, direct and indirect, this means it will need to be able to reflect the heat and the sun's rays**. Covers should also be water proof, even if being stored inside, since moisture droplets will still build up indoors.** No matter how insignificant you might think this point is, **even the smallest amount of moisture can affect the quality of timber**. So your **covers most definitely need to protect timber from internal condensation as well.**

Stacking of Timber on Site

The practice of stacking on timber is very important under the storage of timber. Now how do we stack timber?:- **Store the timber in stacks upon well treated and even surfaced beams., sleepers or brick pillars.** So as to avoid the ground level by atleast 150mm. **Store members of different length and material separately. Materials of equal length are piled together in layers with wooden batters called crossers separating one layer from another.** Now we will see stacking of timber on site. **Stacking is one of the most important practice under the storage of timber**. Now we will see how we should stack timber? Store the timbers in stacks upon well treated and even surfaced beam sleepers or brick pillars so as to be above the ground level by atleast 150mm. Now you see this image on top for reference. In this image the timber stacks are raised from the ground by it should be minimum of 150mm. This raise can be done on wooden sleepers or brick pillars. And the top surface or the platform on which it should be raised should be flat. **And timbers of different lengths are stacked separately.** Why we should do this is because, if we are stacking up timbers of different lengths, then if a smaller length timber is stuck between 2 bigger length timber, the weight of the bigger length timber might affect the smaller length , the weight that come from above and it may lead to defects such as warping , or cupping or even breaking. Also for counting purposes it is very important to stack timber of different lengths separately. Also when you need for example when you need one meter timber immediately on site, you can take the one meter timber and go to the site instead of searching for the one meter timber if it is a mixed up stack. **Materials of equal length are piled together in layers with wooden batters called crossers, separating one layer from another. So these small dark pieces that you see those are called crossers. These are done such that there is a gap between 2 timber pieces such that there is proper circulation of air, when there is proper ventilation throughout the timber piece. If crossers are not available, smaller section of available structural timber can also be used instead of the crossers**. So **providing this gap is very important, because if there is no proper ventilation given throughout the timber stack , then the timber might get defected,** they might cupped or

warped or bent. **Provide an air space of about 25mm between adjacent members**. So this 25mm is provided by crossers. Place the longer pieces in bottom layer and shorter pieces in the top layer, but keep one end of the stack in true vertical alignment. Basically you see this point means like you see the longer pieces are at the bottom and the shorter and the shortest pieces on top. And this edge of the timber stack is one vertical alignment though the other edge has a staggered alignment. So one edge should be, should have a vertical alignment. And why they say the longer piece should be at the bottom, is again like I said before , if the shorter pieces are at the bottom ,and the longer pieces on top there might be problem with the balance or the weight of the longer pieces might affect the shorter pieces at the bottom. **Suitable width and height of a stack is recommended to be at least about 1.5m -2.0m**. It is not recommended for the height of the stack to go beyond 2.0m. **Distance between adjacent stacks is recommended to be atleast 450mm.** This minimum 450mm should be there for a person to go between the stacks in case he wants to load or unload or take any of the timber pieces. **Protect the stacks on top of the stacks to prevent distortion or warping of the timber in the stack. If it is required to store the timber about a year or more then coat the ends of all members with coal tar , aluminum leaf paints, micro crystalline wax, or such protective paint to prevent end cracking in the material.** Basically if we are going to stack the timber for a year the ends of the stacks , the ends of the timber piece which is the most vulnerable part of the timber, from which maximum amount of moisture can be lost , should be covered with a protective coat such as coal tar or aluminum leaf paints such that the moisture is maintained inside the timber piece.

Defects in Timber

Now we will see **defects in timber**.

What are the different types of defects ? There are many defects in timber we will generally classify in two types- defects caused due to internal factors and defects caused due to external factors. Now Internal factors are those factors that happen in the atmosphere which affects the growth of the tree and Because of the defects during the growth of the tree, the timber that we get out of the wood from the tree, is also defected. Due to factors affecting the growing tissue or the tree or other natural forces can also be considered under internal factors.

Now **defects due to external factors**. These external factors can be further classified as due to conversion. While conversion there are certain defects caused in timber and the second is decay or disease caused by fungi or insects can also form defects in timber. Usually fungi causes decay in timber, while insects cause disease in timber. And finally due to improper seasoning also there are defects found in timber.

Now lets see what are the **defects caused in timber due to internal factors**: - First is **chemical stain**. Chemical stain is caused when during the growth of the tree, if there was any chemical

gases or any atmospheric factors that affected the tree or any chemical gases present in the atmosphere that affected the tree, that will leave a stain on the growing wood that causes chemical stain.

Next **is knots:** - These are the bases of branches of or limbs which are broken or cut off from the tree. The portion from which the branch is removed receives nourishment from the stem for a pretty long time. And it ultimately results in formation of dark hard rings which are known as knots. As continuity of wood fibres are broken by knots, they form a source of weakness.

Shakes: - shakes are formed when there is a big temperature difference between the various seasons and the timber bark dries off it cracks. There are various different types of shakes. We will be looking into it later.

Rind Galls:- The rind means bark and the gall indicates abnormal growth. Hence the peculiar curved swelling found on the body of tree are known as rind gall. They develop at points from where branches are improperly cut off or removed. They are rarely found in the tree and the timber is in this part very weak and not durable.

Twisted Fibres:- These are known as wandering hearts and caused by twisting of young trees by fast blowing winds. The timber with twisted fibres is unsuitable for soil.

Burls: - They are particularly formed when a tree receives shock or injury in its young age. Due to its injury the growth of tree is completely upset. And irregular projections appear on the body of timber.

Upsets: - These indicate wood fibers which are injured by crushing or compression. The upsets are mainly due to improper felling of tree and exposure of tree in its young age to fast blowing winds.

Now we saw the different defects in timber due to external factors, now we will look into a little more detail into the **different types of shakes**. Shakes are also external factors. First **heart shake**. As you see this image, this image shows you a typical heart shake. These heart shakes are cracks occurring in the centre cross section of the tree and they extend from pith to sap wood in direction of medullary rays. Now these cracks occur due to shrinkage of interior part of tree which is approaching maturity. The heart shake divides the tree cross section into 2 or 4 parts.

Next commonly found shake is the **star shake**. As you can see from the image this shape looks like a star because of its layout. These are cracks which extend from the bark towards the sap wood. These are usually confined up to the plane of sap wood. These are wider on the outside ends and narrower on the inside ends. They are usually formed due to extreme heat or severe

frost during the growth of the tree. So because of this very big large temperature difference, in one season there is a lot of moisture, in one season it is very dry. Because of this more moisture or less moisture, there is cracks formed on the bark of the tree, it gives way to star shake.

The next type of shape is **cup shake**. Appears as curved split which partly or wholly separates annual rings from one another. It is caused due to excessive frost action on sap present in the tree especially when the tree is young. So what happens is while the tree is growing when it is young if there is extensive frost forming on the top of the tree and then a layer of the tree annual ring forms on top of it there is a gap between those two rays, this forms the cup shake. Cup shake can happens several times during the growth of the tree as well . So you see in the image here. The shake is in the form of a 'C' and it cups one annual ring.

Next type of shake is **ring shake**. The ring shake is the same as cup shake , but when the cup shake covers the entire ring , they are known as ring shakes. So here you can see the difference between cup shake and ring shake. The cup shake is the smaller version of ring shake. This is also you see three cup shakes here. But in ring shake what happens is several cup shakes join together and from a ring shake. In ring shake the whole annual ring is separated from its adjoining ring. So this image you can see a ring shake where the centre portion of the tree is acting as a separate entity from the outer part of the tree.

Last type of shake we will see is radial shake; - These are similar to star shakes and occur in the felled timber when it is exposed to the sun during seasoning. Now radial shakes are generally irregular, fine, numerous. Many splits appear in this radial shake. You see this image the image shows a radial shake.

Now we will see the defects in timber that are caused due to external factors: - the first external factor is due to conversion. During the process of converting timber to the commercial form, these following defects occur. Chip mark- Chip marks is marks or signs placed by chips on the finished surface of timber. While sawing the timber, chips fell of or some chips are peeled of the surface of timber planks or boards, then it forms a defect and that defect is called a chip mark.

Thorn grain:- This type of defect is caused when a small depression is formed by falling of a tool or so on the timber plank.

Diagonal grain:- Due to improper sawing of timber when the grain is not maintained it becomes wavery or diagonal it forms a defect.

And finally Wane:- wane is a defect denoted by the presence of original rounded surface of the manufactured piece of timber. When you see in conversion first the raw saw is done after using the raw saw you see the ends are still curved. If it is still not properly sawed off and there

is a certain portion of the curved bark still left in the timber plank, then that defect is called as wane. You see in this image, this portion is a wane still a little bit of the curved portion is left in the final timber piece. This is only a small portion while in this image a larger portion of the curved part of the tree.

Now we will see defects in timber due to decay and diseases:- Decay and diseases are caused by two main things fungus and insects**. Fungus causes decay in timber, while insects cause diseases in timber**. First we will see what the fungus does to timber.

Brown Rot: - The term rot is used to **indicate decay or disease of timber**. The fungi of certain type remove cellulose from wood and hence wood assumes the brown colour.

Blue stain: - The sap of wood is stained to bluish colour by the action of certain type of fungi. This bluish colour is present when you cut the timber cross section wise and the bluish colour is present throughout the rays.

Dry Rot: - Dry Rot is also caused by a certain type of fungus. We will be looking into the type of Dry Rot and what it is caused by later.

White Rot: - It is just opposite of brown Rot. In this certain type of fungi attack lining of wood and wood assumes the appearance of a white mass consisting of cellulose compounds.

Wet Rot: - Wet Rot happens due to in the difference of temperature of the seasons and because of that moisture that is trapped inside the timber which attracts fungus.

Heart Rot: - This is found when branch has come out of the tree. In such case the heart wood is exposed to attack of atmospheric agents. Ultimately the tree becomes weak and it gives hollow sound when struck with hand.

Now we will look into dry rot and wet rot in more detail:-

Dry rot:- Some type of fungi feed on wood and during feeding they attack on wood and convert it into dry powder form. This is known as dry rot. Where does dry rot happen?:-**Dry rot happens in places where there is no free circulation of air, such as improperly ventilated basements, rooms, etc, and damp situation like kitchen toilets. The unseasoned sap wood are easily attacked by dry rot. The favored condition of growth of fungus causing dry rot are absence of sunlight, dampness, presence of sap, stagnant air and warmth**. The **dry rot may be prevented by using well seasoned timber free from** sap. When a part of a tree is seriously affected by dry rot, The damaged portion may be completely removed and remaining unaffected portion should be painted with a preservative. Now **a fungi can only exists in the following conditions. There are only four main factors, if all the factors are present only then the fungi can survive.**

First is air for the respiration. Second is moisture or sap that is their food. And third is suitable temperature. Finally the food supply that is the wood.

Now **Wet Rot**;- This is **a Decomposition of sap and fibres of the living tree set up by access of water through wounds in the bark. The alternate wet and dry conditions favour the development of wet** rot. Now if unseasoned or improperly seasoned, timber are exposed to rain and wind, they become easily liable for attack of wet rot. To prevent wet rot, **well seasoned timber should be used for external work or for underground work and it should be covered by tar or paint for protection against moisture.**

Now we will see the **diseases caused by insects**:- So what are **the disease-causing insects**? First Beetles, **boarers and termites.**

What does **beetles** do?:- beetles for **pin holes of sizes about 2mm in** wood. **Tunnel formation is done in sap wood by larva of beetle, conversion of timber into flour like powder.** They eat the timber and convert it into a flour like powder and they do not disturb the outer shell of the wood or cover.

What do boarers do?:- Boarers are usually **found in salty water** . They **form tunnels or boars inside the wood. Diameter size of holes are as high as 25mm and 60mm respectively. Wood loses its colour and strength because of these activities of woods.**

Termites :- Termites are the **most commonly found diseases** causing insect in India. **They live in colony are fast eating the wood from core of the cross section. They make tunnels in different directions not disturbing the outer shell or cover.** So from outside we will not know at all the termites are eating up the wood from the inside. Thus the timber is losing its strength. The timber may look sound until it completely fails. Few good timbers like teak, Sal, etc., can resist the action of termites.

Now we will see what are the defects in timber caused due to improper seasoning:-Improper seasoning, what happens in **improper seasoning is one portion of the timber piece lose moisture faster than the another portion. So because of this ununiform drying or ununiform seasoning lots of defects happen such as twisting, cupping, boaring and spring.** As you can see in this images, **twisting** happens because **the core has cross section wise** there is improper seasoning**. Cupping** happens **when the edges of the timber piece loose moisture sooner than the core**. **Boaring** happens **when the ends of the timber piece. Boaring happens when there is difference in the rate of losing moisture between the ends of the timber piece and the central portion of the timber piece.** And springing also the same case.

Other defects that are caused due to improper seasoning are **checks, cracks and splits.** Now what are checks? A **check is a crack which separates fibre of wood from one end to the other.**

Split- when check extends from one end to the other it is known as a split. And honeycomb. Honeycombing is a form due to stressed developed during drying. Various radial and circular cracks develop in the interior portion of timber, which resembles with honeycomb texture.

Now we will see **how to preserve timber under various decays and defects**. First why do we need to preserve timber? What is the need for preserving timber? By preserving timber, **the preserved timber is resistant to decay and diseases. It automatically increases its life, the life span increases and becomes more durable.**

Now what do we need to preserve timber from ?:- We have to preserve timber from first, **fungi which causes decay. Second insects which causes diseases? And third weathering or the atmospheric factors.** Now when we say preserving timber, we usually looking at preserving timber from the external factors alone. Because internal factors or the issues that happen during the growth of the tree we do not have any control over. **We can only preserve the timber from the external factors such as conversion, defects due to seasoning and defects due to decay and diseases.**

Now how do we preserve timber?:- Now there are **two ways to preserving timber**. **One is create a physical protection and the second is chemical protection. Physical protection is where there is a barrier is created.** If this is a timber piece, **preservative coating is provided on the timber and it creates a physical barrier so where the external forces cannot affect the timber. The second is chemical protection where the wood itself is made poisonous**. So the wood for example if we give a certain type of chemical protection on the timber, the timber becomes toxic to the fungi and the insects. So those insects will not attack timber and it will be preserved.

Now did you know that **hardwood is more resistant to decay than softwood**? Because **hard wood is more dense and also there is less, certain hardwood don't attract fungi and insects.**