Architectural Conservation and Historic Preservation
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Lecture 21
Causes of Decay in Cultural Property

Welcome to our next lecture. So far, we have been; especially in the last week, we have been discussing about world heritage site and the different criteria with different examples and the management and significance these are the things. So, once we have decided or discuss about the significance values and the management issue.

Now we are shifting to entirely a different aspect because once we establish the significance or values of any heritage sites; may be world heritage or any other site, we also have to see that while we doing that we have to also understand; what is the status of preservation of that particular heritage property and depending on that and depending on the significance and value, one should decide that what should be done to that heritage structures, we also have discussed the various approaches; what can be done.

So, these various divergent approaches conservation while on one hand, it is very related to the significance of value is also related to what is the status of reservation, what how the property is and for these it. So, we are starting with that aspect is very important to understand that what is the state the property is in short, we call is investigation and diagnosis because like a doctor sees a patient before prescribing any medicine or any operation surgery whatever it is one has to find out that in what state the patient is.

So, that diagnosis is very important if we do not diagnosis the building and we do not understand; what are the; not only what is being seen, but what is the root causes of those problems, we cannot really understand, what should be done. So, today we are starting with that series where we are seeing the causes of decay in cultural property, once we sort of summarize the video causes of decay of cultural property, we will go to the various measures that how these decays can be rectified or what are the steps or measures which can be taken.

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So, starting with the causes of decay of cultural property, lesser to this this example, you have seen Rani ki Vav and this is also Sun Temple, Konarak both are world heritage site, but if you look into the detail of Rani ki Vav, the various sculptures which are the rallies and the Vav, you can see the how beautifully they have been preserved. I mean all the details and everything is very evident where as if you look into Konarak, the really if you can see that that many of these things have been sort of a damage.

Now, we have to understand that why this happened one of course, is that Rani ki Vav, it was under silt for a very very long time, it actually attributed to a good preservation of that now it is exposed to the weather where is Konarak temple, on one hand, it collapsed many of the structure, it has been (Refer Time: 03:32) has been done; that means, many of the broken parts have been shifted back to the fixed to the to the temple, but also one must understand that the context particular context the material of which the Konarak temple is built the context is very in the close proximate to the sea side the salinity all this thing contribute to the status which are which this structure are in an the various details.

You can see very clearly that this are the two details of the two faces and you can see that how these are one is in a very good state of preservation and another is not so good in state, but also one must understand that though they are in a different state of preservation, but that not is not detouring, any one of them being prescribed or inscribed

as a world heritage site, but one has to be careful one has to take proper measure so that at least that is not further detouriator.

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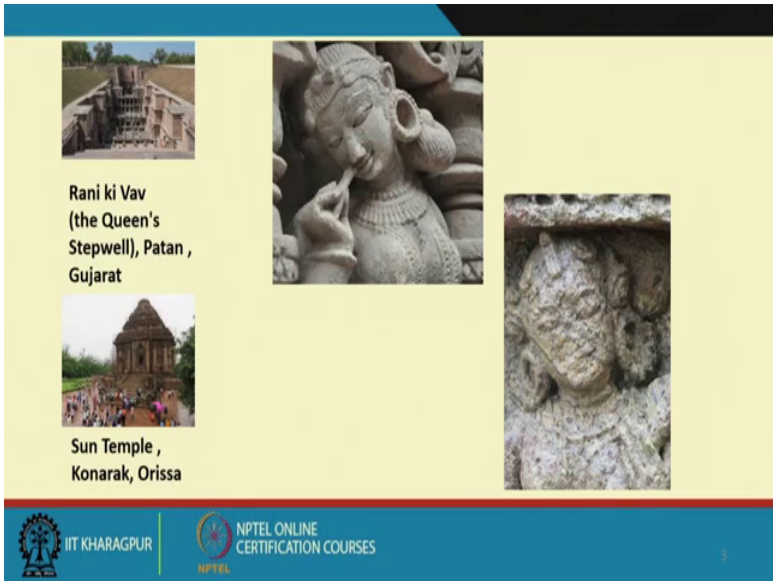

So, going to this to cases that this all the case are important because of the climate condition because of the material which is the surrounding condition there is a combined effect of lot of factors which describe to that state of preservation.

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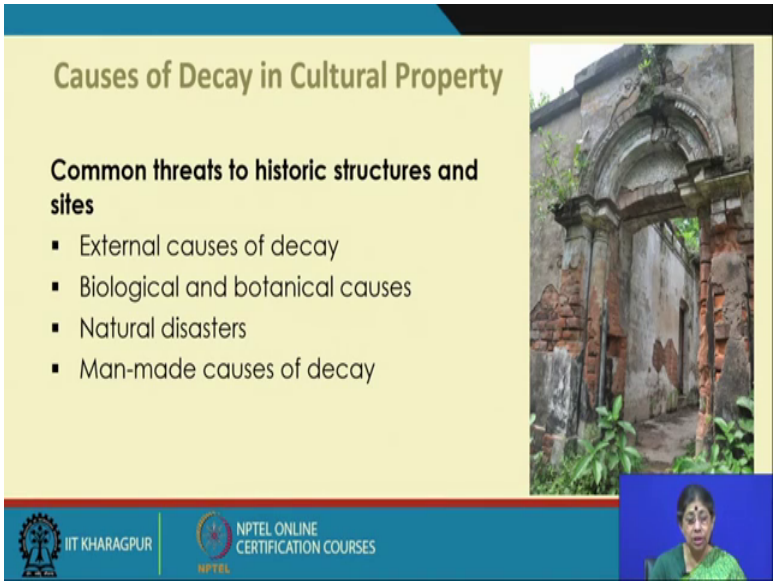

So, let us see the; what are the common threats to the historic structures and the sites. So, we will take one by one is the external causes of decay that what are their various factor

which cause the decay you can see there is a historic structure will close in West Bengal is a old mansion old sort of a masonry structure. It was a residential structure which is no longer in use. So, you can see that there is a lot of dilapidation and decay which has happen that their out goes of tree vegetation that the have come out the bricks have lost their pointing the beautiful details of which is there partly, they are gone this still can be sort of a preserve, but I am what I am saying that combined effects lot of factors, it can be negligence, it can be the environmental factor it can be the various pollution factors all this.

So, the external causes of decay are one is there as we can see that there is also biological and botanical causes because some times in especially in these climate the Bengal where we are talking about this example because of heavy rain fall and the high humidity these also encourage lot of growth of this trees and so the biological botanical and there is also the natural disasters, flood, fire, tsunami, earth quake, all of these things are also detrimental and can be the threats to the historic structures and in addition to the natural and the natural disaster there also the man made causes of decay. So, we will also see that; what are these causes?

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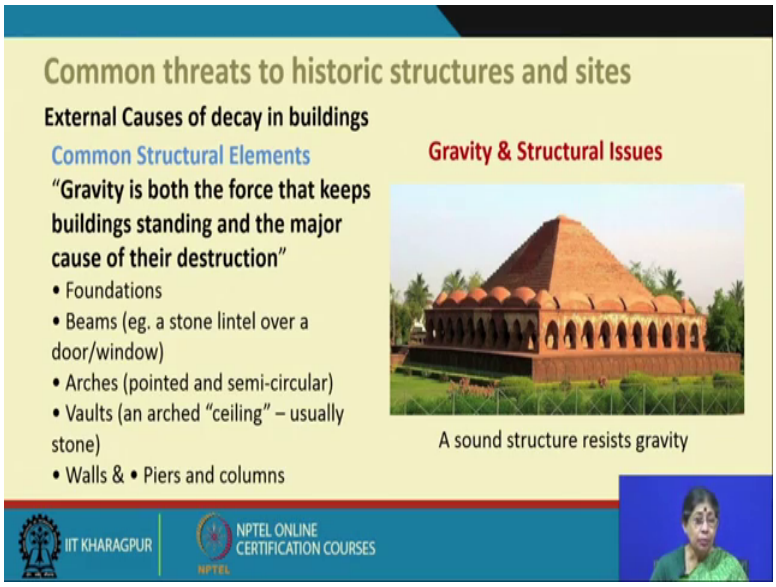

So, that we can be careful now let us talk about the one by one. So, external cause of decay; let us see the common structure problem one is the gravity and the structural

issues. Now how the gravity gravity is both the force that keeps the building standing and the major cause of their destruction.

So, if there is any issue regarding that then the building is likely or structure is likely to collapse for example, if you see this structure, this is Rasmancha Terracotta temple is a I protected site in Vishnapur and west Bengal and this is huge structure is a very unique very distinct architectural structural system. This is entirely terracotta. It is still standing because it is a very sound structural system, which actually resists the gravity. So, there is as such there are in minor issues, which has been rectified taken care of by ASI, but as such there is not problem. So, when we talk about this gravity and related structural issue let us see that preliminary we can sort out divide that into various aspect.

So, one is the foundation there can be due to the foundation. Problems the beams example a stone lintel over a door and window that can sort of a cause a problem or the arches the pointed flat arche or semi circular arche that also due to the either the faulty design or due to some later intervention this also can cause a problem the vaults an arched ceiling usually a stone in the material also you can see that this can happen the walls and piers and columns.

These are the basic components of a structure, if you can we have to analyse one by one and see that what are the problem because if there is a problem in one or may be more than one, then there can be a serious structural issue and the building can be sort of a collapse.

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For example, in this one as you can see that this is a small and this is the functionally both are same off course of a different scale this also Rasmancha which is in Bengal Rasmancha basically it is a structure which is outside the main temple where during basic basically Krishna and Radha during the Raj festival and some other festival the date is brought out in this structures and they are the festival is celebrated around them.

So, the date he comes out I think it is a beautiful concept also these Rasmancha that where the date he comes out to the community and that is apart from that also there are in Bengal and lot of design innovation has been happening around this Rasmancha, the one you can see that is the Vishnupura talked about which is very distinctive architectural style, but the in this case, which is a small village in West Midnapur where you can see the Rasmancha is there which is distinctive style because it is an influence of the colonial architecture which has found Portuguese architecture Turesson other thing, but it is as you can see that there is the severe problem which has happen the cracks are on the made the crown of the arches the cracks have develop and there lot of vegetative growth also there.

So, definitely that there is problem of the low distribution and a and if is not taken care of very soon the entire structure will collapse.

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we also do various other very well known example the leaning tower of Pisa which ts story from all over the world actually this Leaningness of the Pisa is a problem and we will take that in case detail later on, but that leaning tower it is not designed that way, but it happen because of problem what is that problem, we will talk later on.

But definitely is the some of the structural issue and gravity problem and we also have other examples of various places the leaning temple, the Huma temple near Sambalpur and Orrisa you can see that is also the leaning is called the leaning temple of Sambalpur or Orrisa here also because of some gravity and structural issues because of that that sort of a; this inclination has happen and we will see that if it is not taken care of properly there, there is a chance probability that this structures will collapse leaning tower will collapse because already some distoration measures has been taken up and adopted and that is a very interesting case which probablier to that.

So, now, when we talking about that is not always there is a issue with the design of the structure there may be, but sometimes they may be due to external cause like may be the ground movement happen which is beneath the foundation something has happen which cause by the clay shrinkage or the land slip or vibration of subsidence settlement heave sway and so on, there can be various factors which can change the ground water condition or the condition of the surrounding area or the ground beneath the foundation which also can cause these type of problem.

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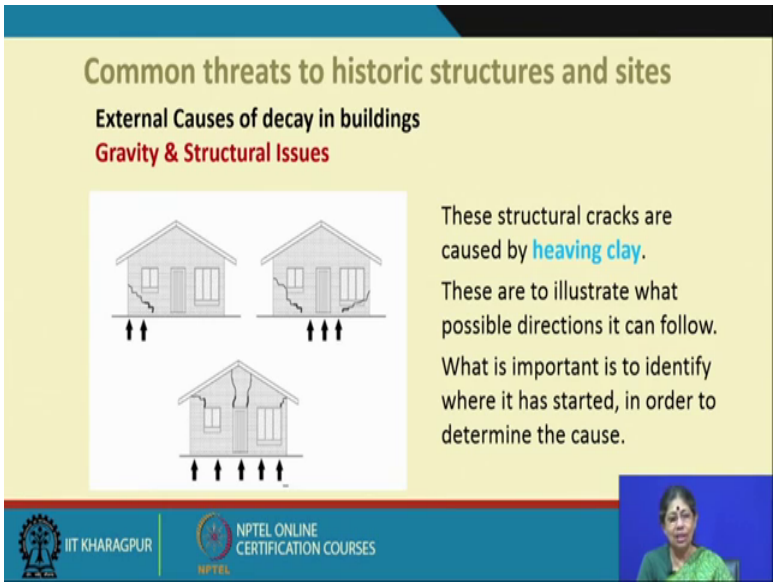

So, it is the and which is affected the gravity and stability of the structure these channel as we say that I mean when there is such issue, they will be manifested in various sort of what we say the indication there are various symptoms where it will reflected.

So, the crack in structure any structure historic building this are actually a very good indication to understand that how where is the issue this is the first step as you can see that that in this small structure I mean depending on from where the problem is the type of the structure the pattern and behaviour of the cracks which has developed our this a first indication to understand the symptoms, what is happening and of course, it has to be led with the further investigation and as you can see that if the cracks are like the corner of the windows and the top it is actually this problem is happening throughout the structure.

So, no one can understand which location and where actually this is happening. so now, these in these case the structural cracks are caused by the heaving clay the clay has sort out heat and is giving an upward thrust and that is really causing a problem sometimes, it is on the one side sometimes it is along the structure so these the cracks. So, these are to illustrate this cases which see that these are to illustrate what possible directions it can follow.

So, from the cracks the direction the pattern also one can understand or can sort of a focus on which are the areas where. What is to be looked, what is also important is to

identify where it has started in order to determine the cause this is one problem that the location of the crack and the pattern of the crack and also mention the behaviour of the crack. Now, what is behaviour of the crack there we all building where there will cracks is there, there is no such building there would not be any crack now the crack has such is not an issue the issue is whether it is a live crack because after any structure is constructed or over the years, it will like to settle and in that process some sort of this cracks are manifestation of some sort of a problem.

Now when the crack is dead crack; that means, not continuing any further then is not much of a great issue, but when the crack is a live crack that is continuing then this something has to be very concerned about that what is the reason the that means.

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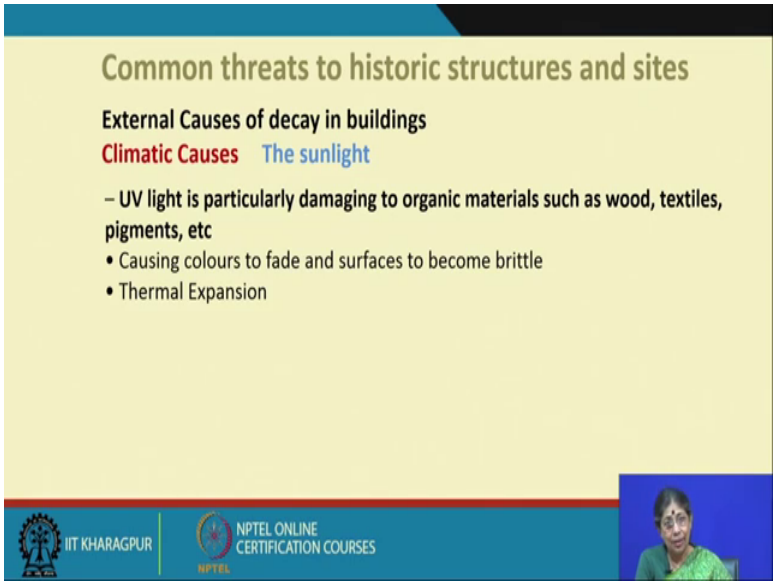

There is some problem so; that means, we have to monitor the crack and these crack will talk about that that monitoring of the crack, there are various way probably, we will see some of the ways how the monitoring of the cracks and understanding, but before going to that we also have to understand the cracks do not happen only because of the heaving or the foundation problem, the cracks and structure can also happen due to the sun light.

So, one of the climatic causes we have to understand is the sun light the u v light is particularly damaging to organic materials such as wood textiles pigments and other things of sun ray and also it cause sometimes colours to fade services to become brittle and another important thing is the thermal expansion the expansion of contraction

seasonal and the Durenal over a time of the day and that also will happen if any structure, but how. How does it happen how different parts different component of a structure sort of act behaves is a very important to understand and due to that something problem like example in this case as you can see.

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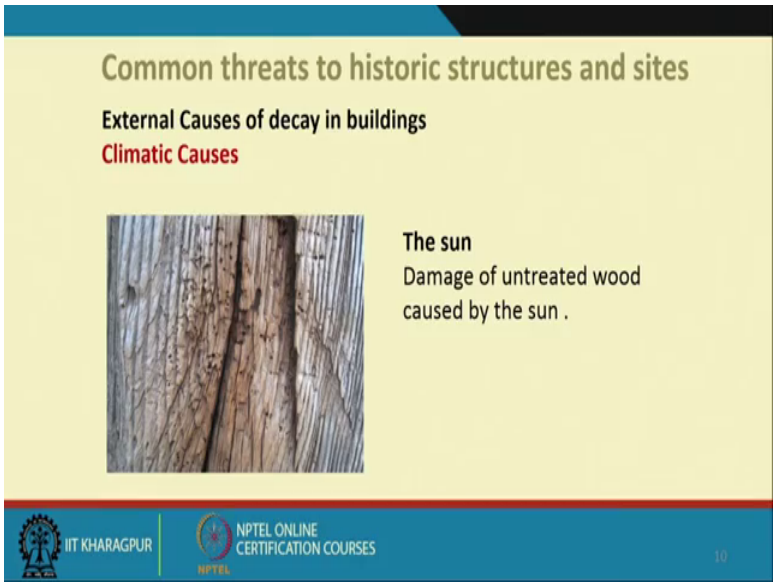

Due to the sunlight the damage has been taken place in the untreated wood, which is caused by the sun because the wood is not in the very good stated, it was untreated. So, the sun light can also cause the problem. Now these are the various sort of a manifestation which the climatic reason can happen.

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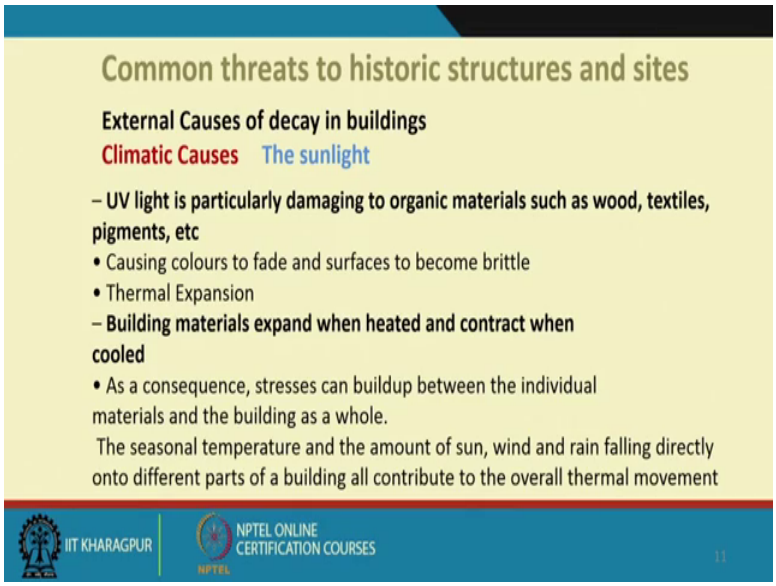

Now, as I said that due to the sunlight this thermal expansion and other things can happen, but another thing is that that I was talking about the contraction and expansion the building materials expanded when in heated and contract when cooled. So, there is a great temperature difference and if the building fabric is not able to sort of absorb it, suddenly happens at very fast ray and it does not happen to other parts of the structure. Then the cracks this cracks is a manifestation of the stretch the stress structure of the fabric is going through.

So, what happen is that when the building material expand when heated and contract when cooled and as a consequence we say the stresses can build up between the individual materials and the building as a whole. See, it also depends on what are the materials which actually making up the building of the structure now the seasonal temperature and the amount of sun wind and rain. So, it is not only sun in isolation, but the amount of the sun the wind and the rain falling directly on to different parts of the building all contribute to the overall thermal movement.

So, this thermal movement and how the different components of its structure sort of behaves due to this contraction and expansion of a temperature difference is a very important element or aspect which has to be understood when before we sort of study structure.

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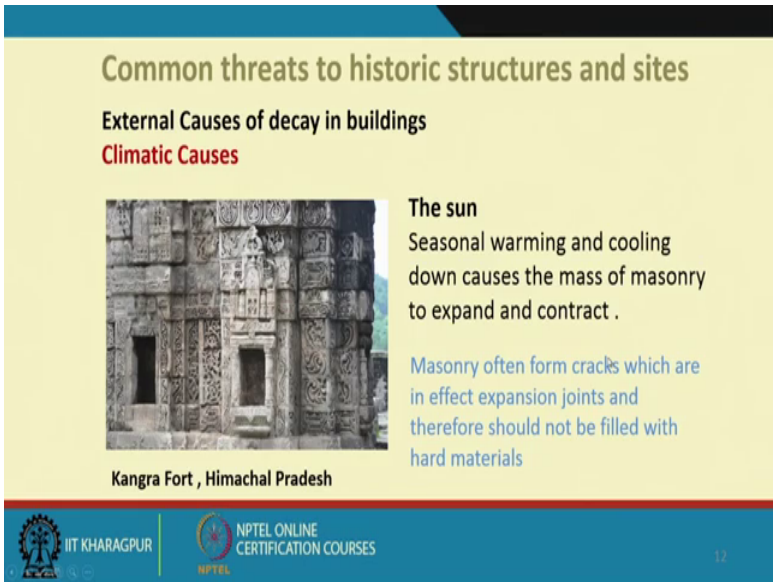

Now as I say that the seasonal warming and cooling cause down the mass of the masonry to expand and contract cooling down and the heating up that that actually cause is the expansion of the extraction, let us see these example because as I say the crack is not only due to the foundation problem it can be happening due to that the temperature difference this is Kangra fort and Himachal Pradesh and as you can see that there is this part in the Kangra Fort that this part where some sort of a crack has develop and these crack is nothing to do with the foundation or the structure failure this type of cracks generally is happening because the masonry often cracks which are in effect expansion joints so. By doing that crack the building fabric is sort of trying to sort of absorb these expansion contraction.

So, these in effect of expansion joints and there should not be filled with hard materials. So, example for example, if there is a crack not looking good; one decide to fill it out with specially a very hard material like cement or something within what happen that the normal expansion and contraction which was happening it will not happen. So, if it you do not give that chance that flexibility to the building fabric then what happens that stress will affect actually the other part of the material and which can be more severe than going into the smaller crack? So, the smaller cracks are sometime one has to understand what is the reason something which may be just because of the climatic causes and the sun light this again.

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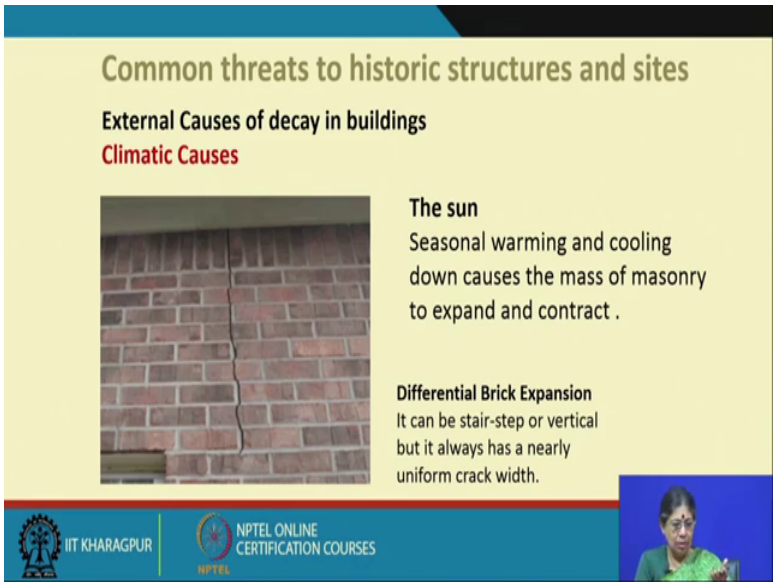

The example of a break wall; where we see the differential brick expansion it can be stair step or vertical, but it always has a nearly uniform crack width. So, these sort of a thumb rule to understand the crack what is the pattern of the crack the location of the crack and other things.

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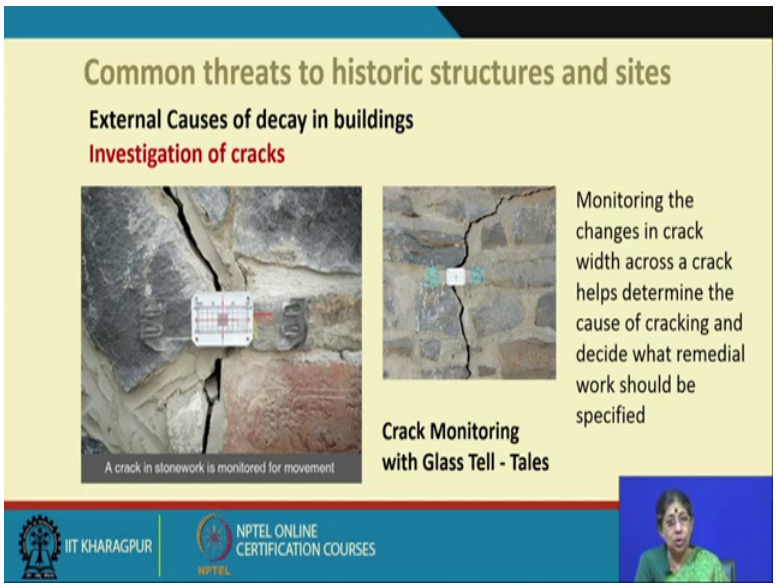

As I say that the crack has to be monitor one has to understand, whether it is night crack or day crack, this is what we say is monitoring of the crack through a glass tell tales where it also this type of little improved version of glass tell tale is shows that whether

the crack, the movement is happening in the horizontal direction or the vertical direction and quite precisely because there are the measurement which are there. So, one can fix that and over and it has to be done for a longer period because one has to also understand this seasonal variation not only the Duranel variation, but in the winter time in the summer time how that building is expanding.

So, if it is pa follows a. Regular pattern we can understand that it is due to a and that it is due to a just that expansion contraction if there is something more if there is a different types of a operation then there we can say if some added reason for that crack to become light crack, but with this light crack day crack whether it happening in the regular pattern because of the seasonal fluctuation or not or whether there is something there is a other type of things happening.

So, that monitoring of a crack over a long period of time is very essential and the glass tell tales different types are there which also the strain gauges are there which also shows much more accurately which direction the crack is happening. So, these are very good examples to monitor the crack. So, before taking a decision that oh the building has cracks we fill it up we do something it very say a one has to monitor and it takes some times some patience .

So, as I say the monitoring the changes in crack with across a crack, helps determining the cause of cracking. And decide what remedial work should be specified if it is a date crack and if it is happening one can simply fill up the crack with grouting and go for the consolidation we have discussed that and then, but if it is not there it still happening it is as light crack and this pattern of the crack when it is recorded on the ground show some erratic behaviour we must understand that it show something very different reason for that.

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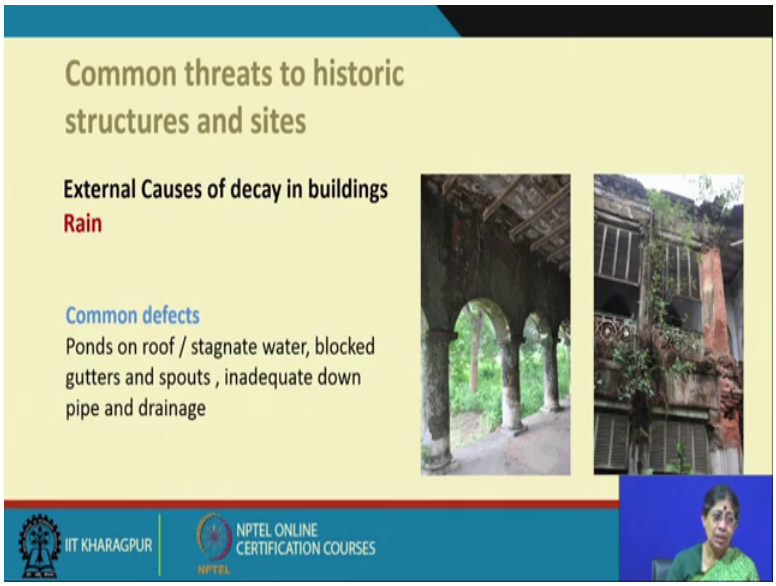

Now after this sun this, we have discuss some of the aspect of the sun when it happens, it also the external causes of decay is may be also due to the rain and rain also, it happens striking then rain is seepage the rain water sort of a; there is a log water logged area.

So, the rain water and cause a havoc sometimes and you can see, but one must understand this is again a the waters as such the water is happening the it is striking the wall and other things that as such not very sort of alarming issue as such a general what is important is that the stagnant water if the water is accumulous in the place that actually is a very severe issue and that can I mean sort of like in these structure this is this again from West Midnapur area in the small area this is a this was a school of a sort of a catholic school and this is now very abundant almost.

So, you can see that how the water seepage because of the negligence or due to deterioration or the roofing material the water seepage is has been happening the it is not only causing problem to the structure, but it is also causing seepage of the rain water and also deterioration of the wood and trust members of the wood and beams and thereafter in these particular case there is a; it is a old mansion which is now again abundant; you can see that water which is has to suppose to go from the roof to ground the down water pipe that is been blocked because of the growth of the trees and that is causing the stoppage of the water the flow of the water and that accumulated water is actually creating more problems.

So, it is not only one issue there is a several issues reasons combine which can cause, but rain in specifically some of the areas where there is a heavy rain fall it can cause a lot of problem and has to be very seriously taken and the maintenance the generally the common defects which happen due to the rain water is the ponds on roofs as I say the stagnated water.

The blocked gutters and spouts if the water flows out then there is not much a problem and it does not take much sort of finance or something heavy machinery just a regular maintenance before the monsoon comes the cleaning the gutter cleaning the drain water pipe all this things are very important measure because otherwise leaves accumulate there the it is blocked due to some reasons if they are cleaned then the water is log to flow and then it actually does not cause must problem.

So, this blocked pipe blocked drainage system the stagnated water on the roof these actually can cause very very severe problem to the building fabric as I say; the faulty disposal of the rain water is the most frequent cause of deterioration in ancient masonry this the disposal of rain water that there is a smooth disposal of rain water regular disposal of rain water.

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So, that that maintenance are taken properly this is a very very important aspect of any specially the masonry structure and other. Now the rain water washing against the surface of a structure will gradually wear it away now when we are talking about

masonry structure mortar and porous masonry structure like the break and certain type of stone which a porous. So, mortar and porous masonry are particularly vulnerable to this type of a structures the problem due to the rain now rain water penetration into the individual materials of the structure causes more damage through salt crystallization and through the continual wetting and drying period and the action of the frost and the ice.

So, these are the problem due to rain due to the salt crystallisation continual wetting and drying and the action of frost of ice this has to be taken up independently and because them has some associated problem and that we will cover in our next lecture.

Thank you.