Chemical Process Safety
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Lecture – 49 Accident Investigation Procedure – II

Now welcome to this Accident Investigation Procedure module. In the previous module we had gone through about the accident and related facts about accident, various outcomes of accident, accident causation theories and accident investigation protocol. So had we had studied earlier that the accident investigation protocol has the six step and then the previous module we have studied first two steps of this accident investigation protocol. Now, let us have a look about the third step.

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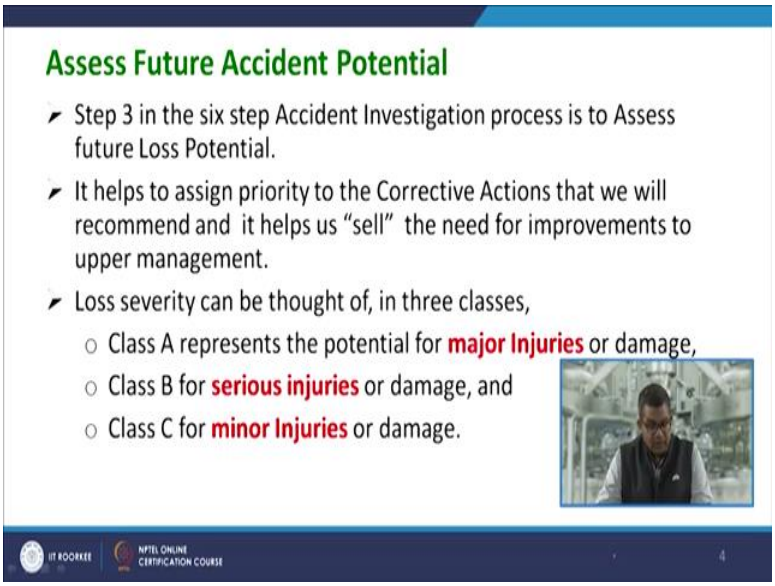

Now this third step involves the assess the future accident potential. Now in this particular step, this particular process involves the assessment of the future loss potential now it helps to assign priorities of corrective action that we may recommend or we will recommend and it helps us to sell the need of any improvement and it gives the suggestive majors for those improvements to the upper management. Now loss severity can be thought of in three different classes. Class A, class B & class C. The class A represents the potential for major injuries or damage, the class B for the serious injuries or damage and class C for the minor injuries or damage.

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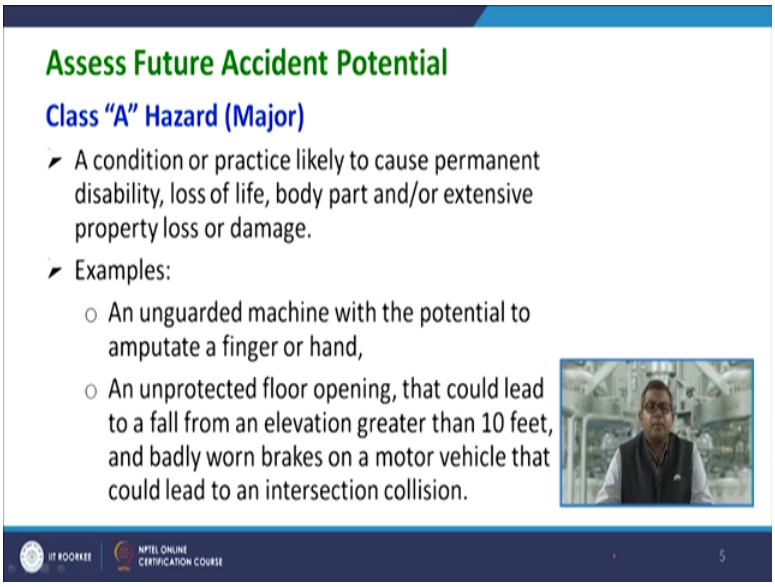

So, let us have a look about a class A hazard that is major. Condition or practice likely to cause the permanent disability, loss of life that is fertility loss of body part or extensive property loss or damage. Let us have an example that an unguarded machine with the potential to amputate a finger or hand. And unprotected floor opening that could lead to a fall from an elevation greater than 10 feet or a and badly worn brakes on motor vehicle that could lead to an intersection collision.

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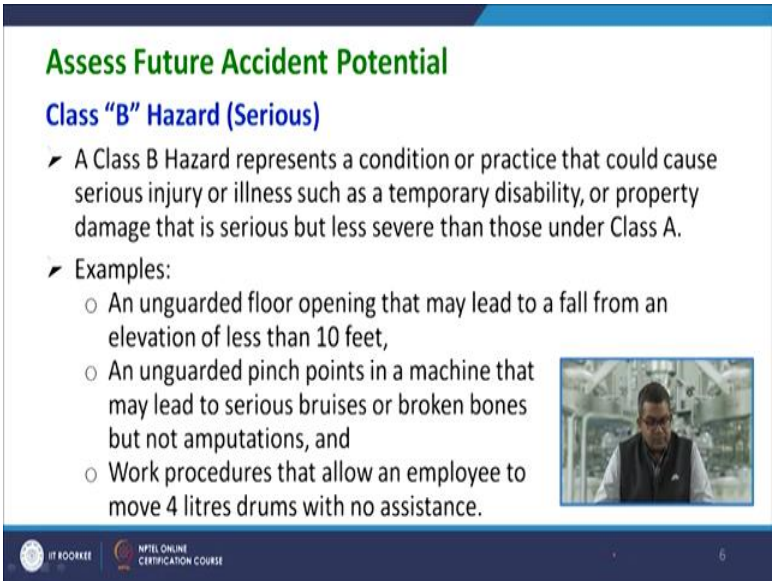

Now, let us have a look about the class B hazard that is serious. The class B hazard represents a condition or practice that could cause serious injury or illness such as a temporary disability

or a property damage that is serious but less severe than those under we have club under the class A the example is the unguarded floor opening that might may lead to a fall from an elevation of less than say 10 feet. And unguarded pinch points in a machine that may lead to a serious problem or broken bones but not amputation and the work protocols that allow an employee to move 4 litres drum without any assistance.

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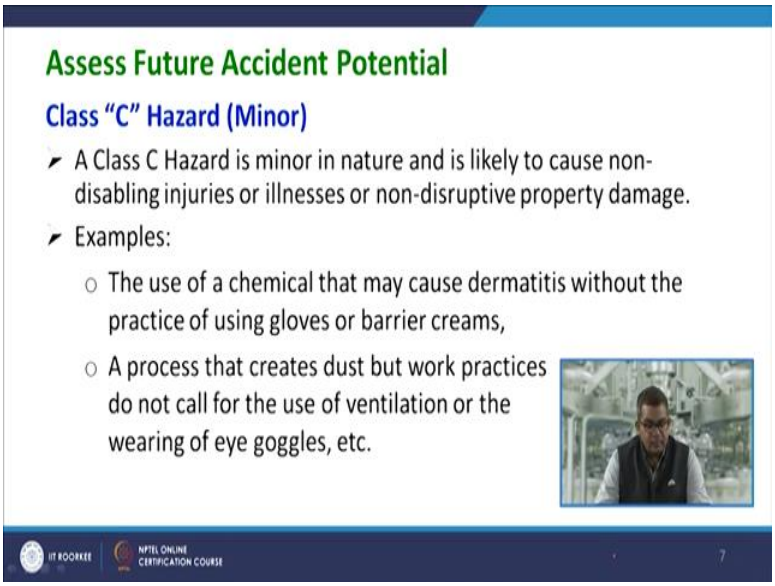

Let us have a look about the class C hazard those are cub under the head of the minor one. A class C hazard is minor in nature and is likely to cause non disabling injuries or illness or not non-destructive property damage. For example the use of a chemical that may cause dermatitis without the practice of using gloves or barrier creams, a process that creates dust but worker practices do not call for the use of any kind of ventilation or the wearing of any eye goggles etc.

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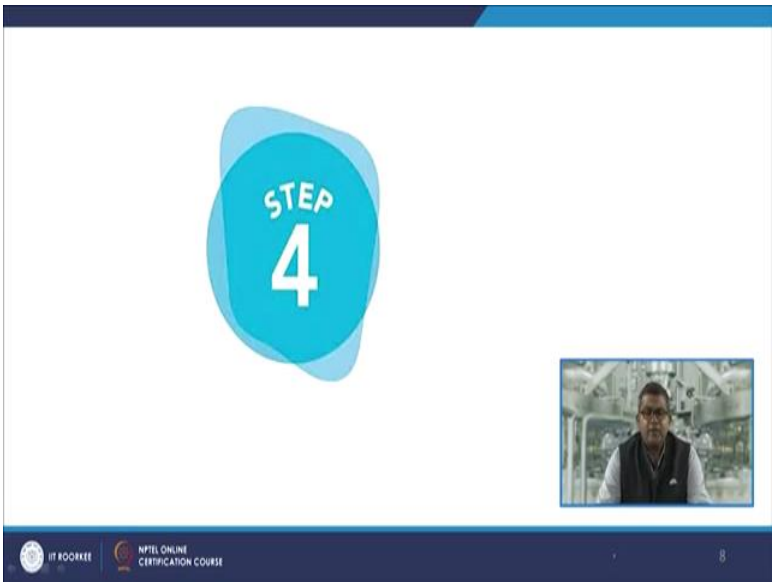

Let us have a look about the step no 4.

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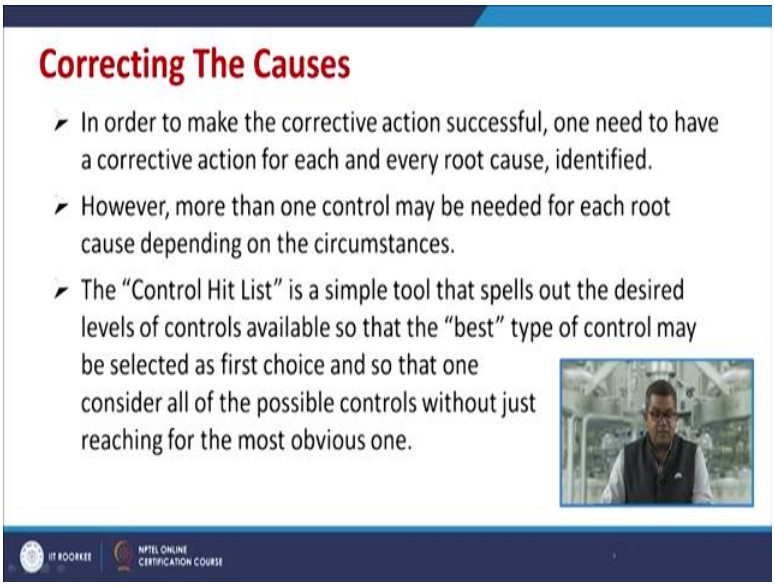

Now this system 4 involves the correcting the causes. Now in order to make the corrective action successful one need to have a corrective action for each and every root causes which we have identified, however more than one control may be needed for each root cause depending on the circumstances. Now the control hit list is the simple tool that is spells out the desired level of controls available so that the best type of control may be selected as first choice and so that one consider all the possible controls without just reaching for the most obvious one.

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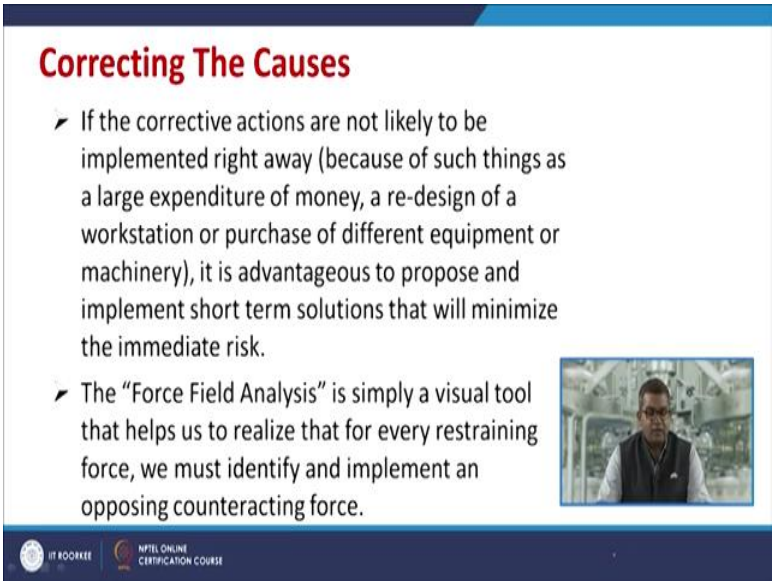

Now if the corrective actions are not likely to be implemented right away because maybe of the variety reason, because of such things as a large expenditure of money or may require redesign of a workstation or a workplace or purchase of different equipment or machinery. Now it is advantageous to propose and implement the short-term solution that will minimise the immediate risk. So the force field analysis being carried out, now this force field analysis is simply a visual tool that helps us to realise that for every restraining force we must identify and implement an opposing counter acting force.

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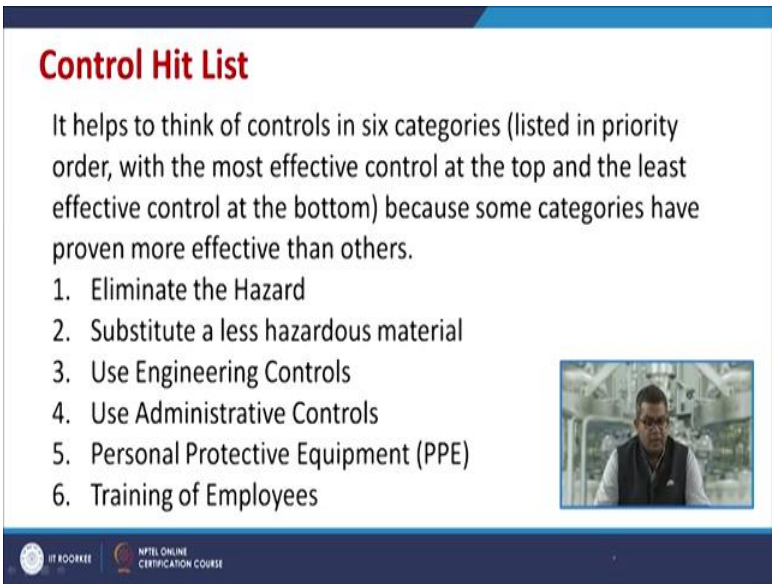

So, let us have a look about the control hit list. Now it helps to think of control in 6 different categories, now they are listed in priority order with the most effective control at the top and the least effective control at the bottom, so this maybe because some categories have proven more effective than others so these are the like elimination of hazard this is the most effective control.

But you cannot eliminate all hazard at workplace so you can minimise those hazards. Now minimization may be achieved by the substitution of a less hazardous material. Number 3 may be use of proper engineering controls, you may use the administrative control sometimes there is an administrator may be included like controlled zones adopting the protocol of the control Zones.

So that the common people are those the people those who are not required that work place they may be cordoned off to go into the controlled zone, so these are the some of the example of use of administrative control. Then the use of personal protective equipments PPE and then the training of the employees.

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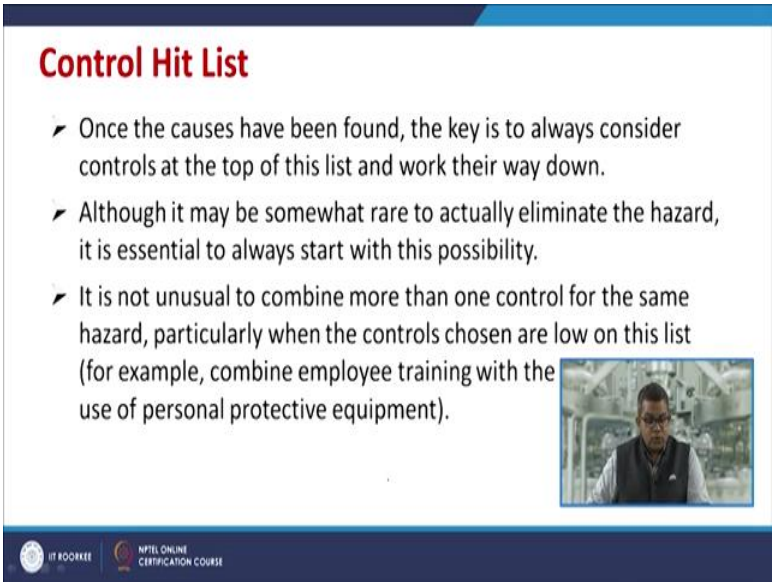

So once the causes have been found the keys to always consider the controls at the top of the list and work their way down. So sometimes it may be somewhat rare to actually eliminate the hazard now it is essential to always start with this particular possibility so if you recall in the industrial hygiene chapter we have discussed the four basic protocols like substitution, attenuation, isolation etc. Now it is not unusual to combine more than one control for the

same hazard particularly when the controls chosen are low on this particular list like combine employee training with the use of personal protective equipment etc.

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Now, let us have a look about the fifth step.

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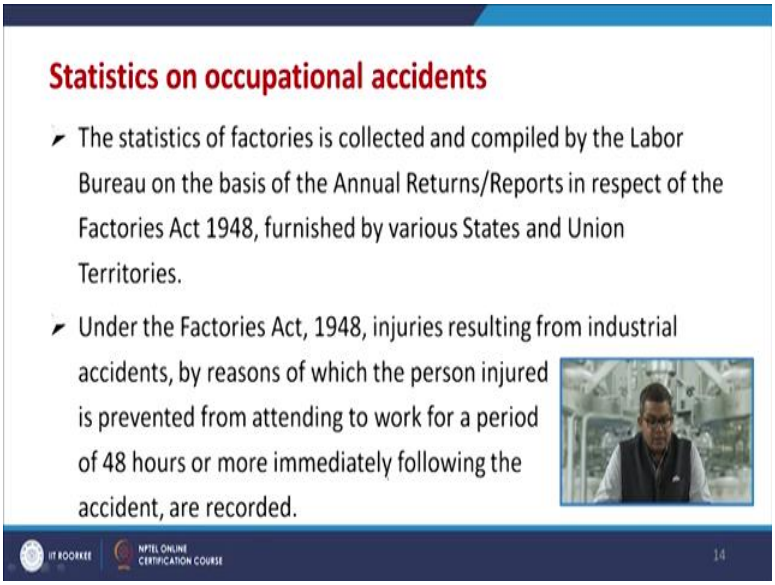

That is their statistics on occupational accident now the statistics of factories or Industries is collected they are compiled by the Labour Department on the basis of annual returns reports with respect to the factories act 1948 and their furnished by the state and union territories.

Now this is very important that is the under the factories act 1948 injury is resulting from any industrial establishment under the head of industrial accident by reason for of which the person injured is prevented from attending to work for a period of let us say 48 hours or more immediately following the accident they are recorded. So it gives a proper data so that it in future then you are analysing those accidents may be used as a future reference.

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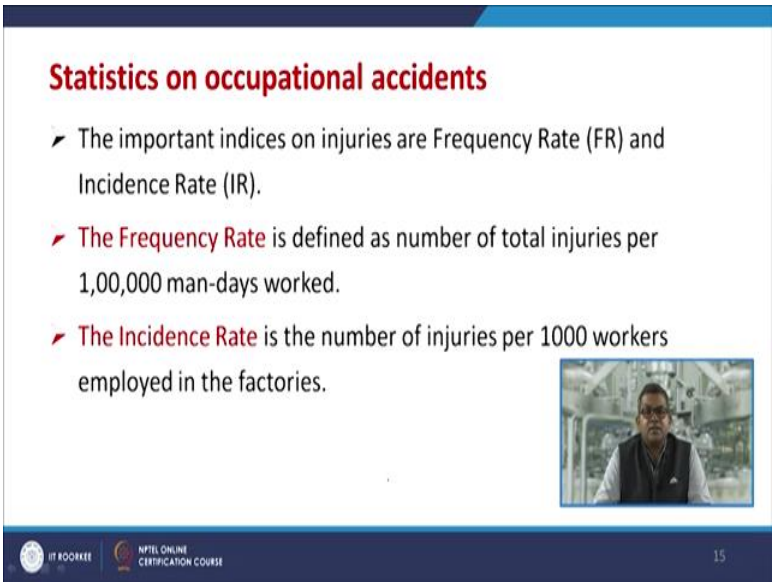

Now, the important indices on injuries are frequency rate that is FR and incidence rate that is IR now the frequency rate is defined as number of Total injuries per 100000 man-days worked. This one and the incidence rate is the number of injuries per 1000 worker employed in those factories or establishments.

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Then there is a report of a data and recommendations so all accidents to employees however, maybe minor should be recorded that is very important. Now this is a requirement under the social security legislation so all near misses incidents and accident they should be reported, no matter how slight they may appear. So fatal accidents this may include the fatal accident, accidents causing the major injuries, notifiable accidents and dangerous occurrence, reportable accident and dangerous occurrence and some written records.

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So the company usually encourages employee to report all accident no matter how minor and sometimes they fail the reason is that if the accidents are reported in a proper manner then the

chances of paying compensation in terms of economy may be on the higher side so accidents that involve very minor injuries like small cuts non extensive process etc. and would not normally require any action on behalf of the company like the breaking of a drinking glass etc.

So they do not have to be reported all the employee could report them if they want so the quality of accident sampling is essential. Now on the other hand the accidents that involve for or could have involved more severe injuries and they may required investigation and action from the company must be dutifully reported.

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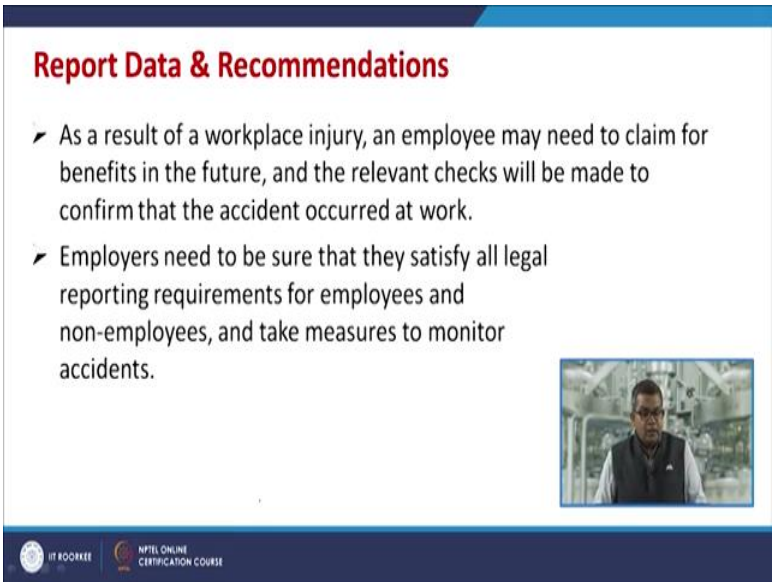

So as a result of a workplace injury and Employee need to claim for benefits in future and the relevant checks will be made to confirm that the accident occurred at workplace. Now, the employer need to be sure that they satisfy all legal reporting requirements for the employees and non employees and take the measure to monitor those accident, so that is crucial as far as the employer perspective is concerned.

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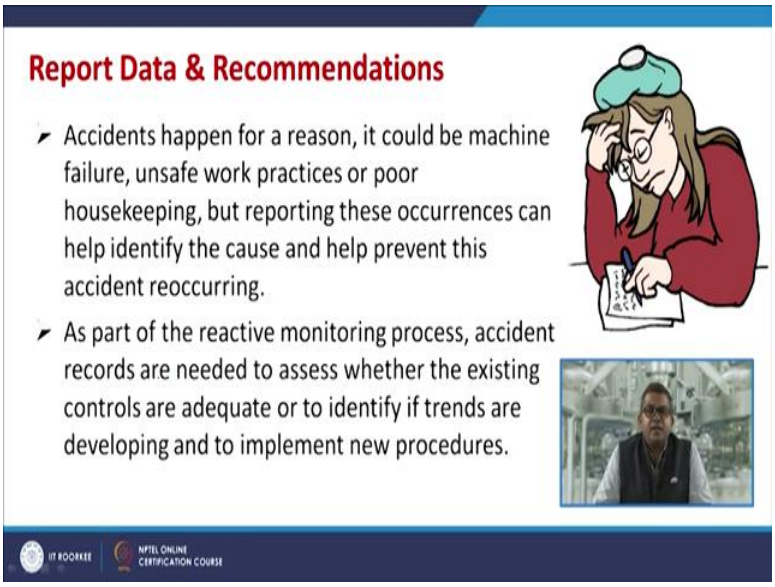

Now accidents happened for a reason it could be machine failure, unsafe work practice or poor housekeeping but reporting this occurrences can help identifying the cause and help prevent the this accident reoccurring. So as a part of the reactive monitoring process accident records are needed to assess whether the existing controls are adequate or they need to identify trends are developing then sometimes it may give a very vital information it is just like that if the rise in temperature is recorded in any reactor then it may be serious thing. So it helps us to identify if there any kind of trend is developing and to implement any kind of new procedure.

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Now, the record may also be produced for the health and safety executive to the parents or the guardians or in course of civil proceeding if a claim is brought following incident. Now reporting and recording procedures they vary from organisation to organisation as the procedures are a different, usually in most effective way of reporting incident accident is through a specific reporting form. So the design of that particular form is important.

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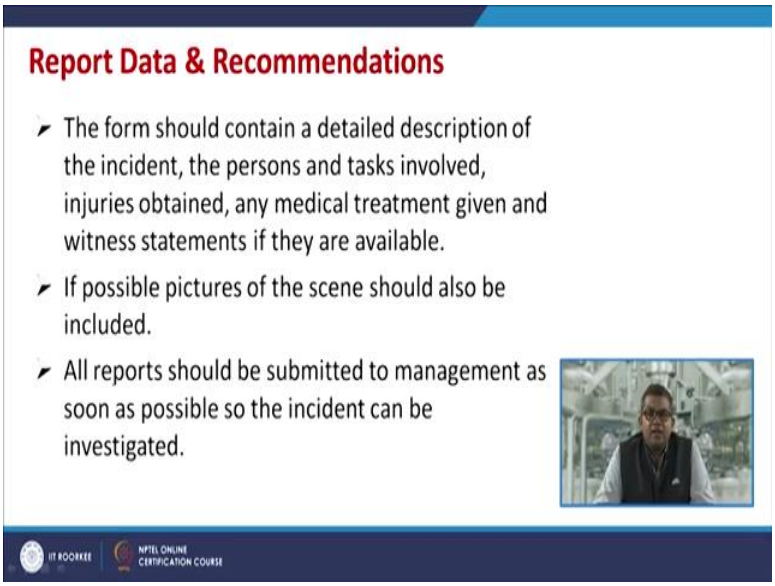

Now the form should contain a detailed description of incident the person and a task involved injuries obtain any kind of medical treatment is given to them and witness statement if they are available sometimes people are better reluctant to give any kind of witness statement. Now, if possible picture of the scene there should be included if the investigation team is able to get any kind of picture then they should be included. So all report should be submitted to the management as soon as possible so the accident incident can be investigated.

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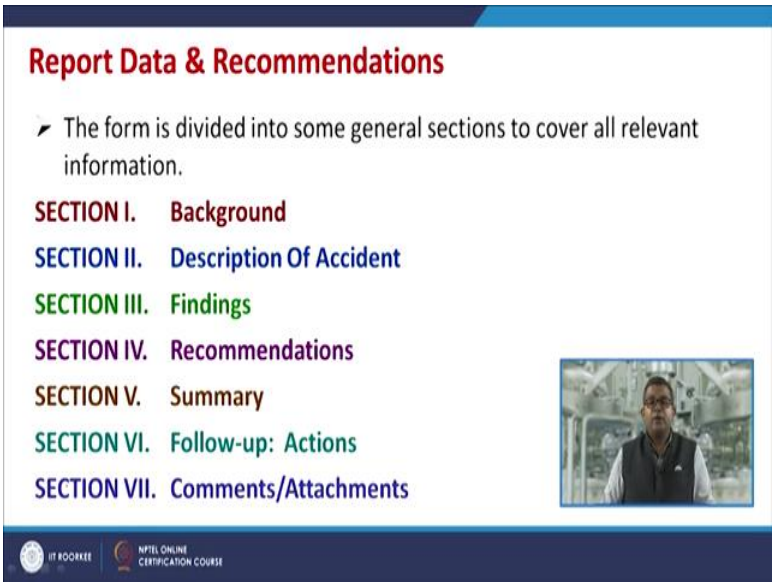

Now, let us have a look about the basic feature of the form now the usually the form is divided into some of the general sections to cover all relevant information. Now these sections may include the section 1 may be the background, section two the description of detailed description of the accident, the section 3 may be the finding of investigating team.

The Section 4 is the recommendations been suggested by the investigation team, section fifth will be the summary and section sixth may the follow up the actions and section 7 may include the comment and various kind of attachments may be used for the reference of this particular report. Now, the important thing is that need to documents document the facts only.

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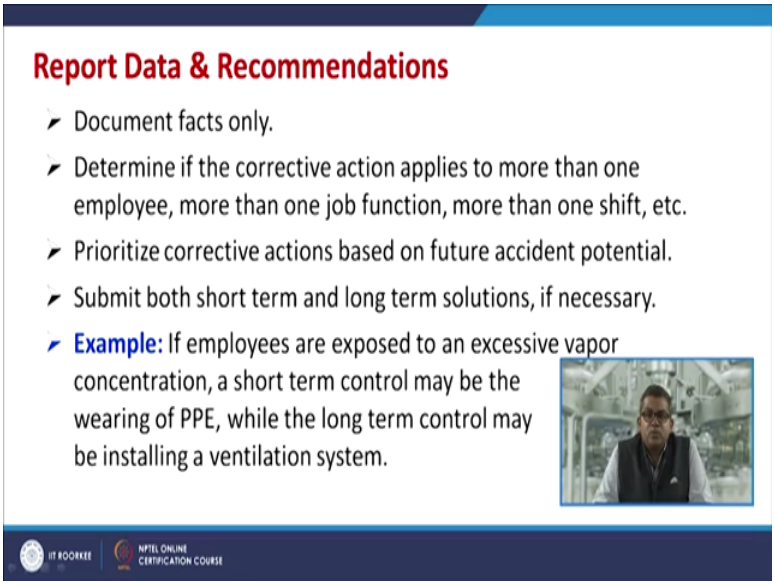

Now determine if the corrective action applies to more than one employee, more than one job function or more than one shift, etc. Then the priorities the corrective action based on future accident potential you may submit the both short term and long term solution if required. Let us have an example like. If employees are exposed to excessive paper concentration a short-term control maybe the wearing the personal protective equipment while the long-term control maybe the by the installing ventilation system.

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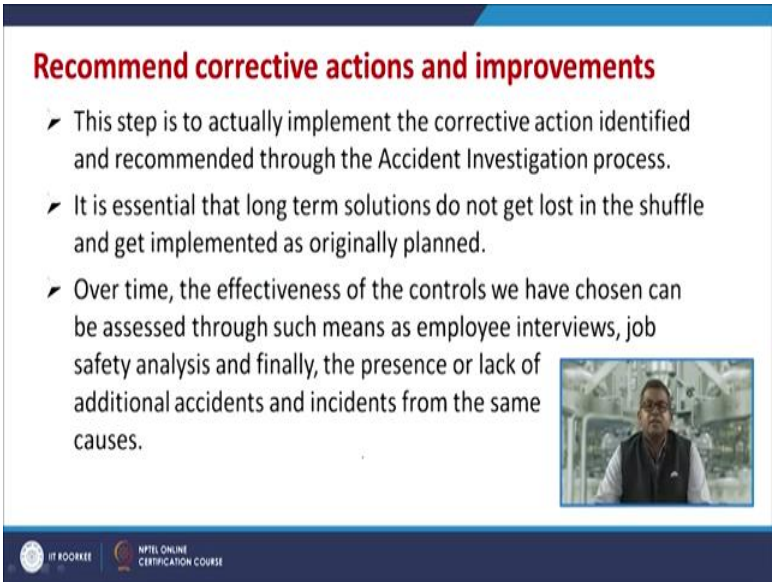

Now, let us have a look about the sixth step that is the last step that is recommend corrective action and improvement. Now this step is actually implement the corrective action identified and recommended through the accident investigation process. Now it is essential that long term solution do not get lost in shuffle and get implemented as originally plant. So over time the effectiveness of the controls we are chosen can be assessed through such means such as employee interviews, job, safety analysis and finally the presence of lack of additional accidents and incidents from the same cause.

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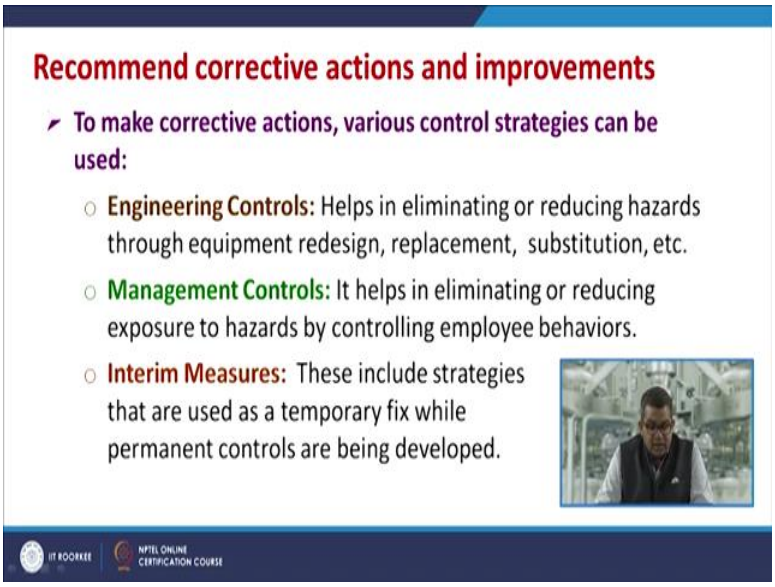

Now to make the corrective action various control strategies can be used, one is the engineering control this helps in eliminating or reducing hazard through equipment redesign and replacement, substitution, attenuation, isolation etc. Then the Management control it helps in eliminating or reducing exposure to hazard by controlling employee behaviour the third one is the interim measures. These include the strategies that are used as a temporary fix while permanent controls are being developed.

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Now various improvements should be made to policies programs plans processes and procedures in order to have proper and better investigation and less accidents. Now it can be

done within one or more of the following elements that does safety management system like managerial commitment, employee involvement, hazard proper hazard identification control, proper training and education, then incident and accidental analysis by adopting the proper system evaluation protocol, then by fixing the accountability etc.

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Now the making a system improvement might include some of the following things like including the safety in a mission statement because you may find that in several good organisation there is a mission statement and there is a vision statement so the safety may include in the mission statement. Now improving safety policy so that it clearly establishes the responsibility and accountability.

The changing a training plan to include using checklist because checklist is a very vital source of finding the problems within the system. Revising the purchasing policy to include safety consideration as well as the cost so you may one example is that sometimes you may give allowances to the raw material contamination because sometimes the contaminants may create a future problem in further reaction.

So you may revise because sometimes the account section may say that you should compromise with 5 percent 6 percent purity of that particular component so you may revise the purchasing policy. Now the changing the safety inspection process to include all supervisors and employees.

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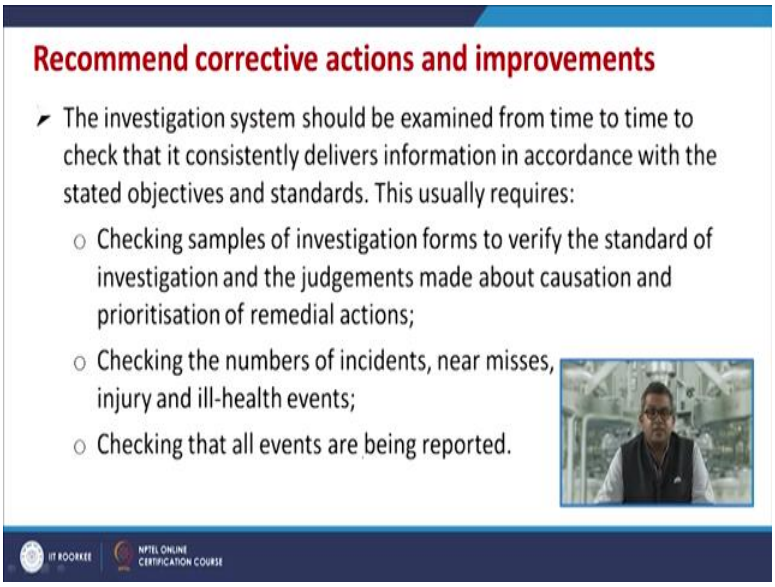

Now the investigation system should be examined from time to time to check that is that it consistently delivers information in accordance with the stated objectives and standards. Now the usually requires that checking samples of investigation forms to verify the standards of Investigation and the judgement made about the causation and the prioritization of remedial actions, sometimes checking the number of incident near misses, injury or all ill health events now checking that all events are being reported that is very important.

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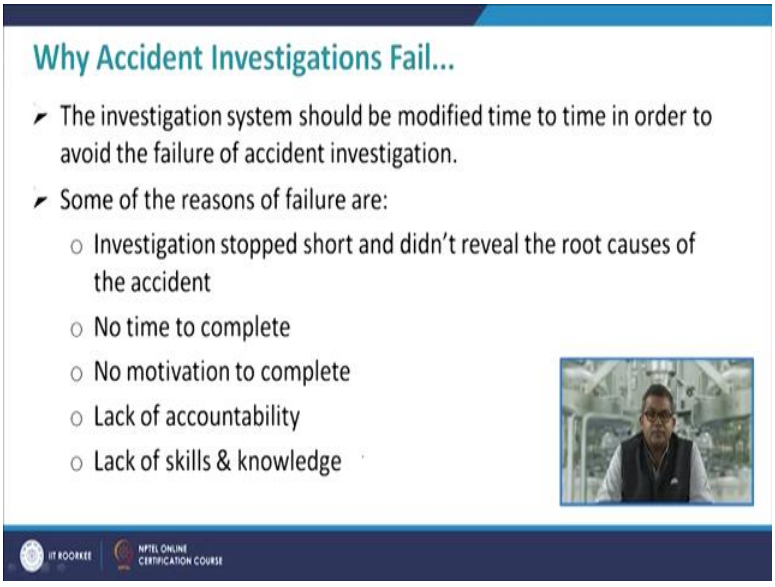

Now sometimes these accidents investigation fails so why this accident investigation fail? the investigation system should be modified time to time in order to avoid the failure of accident

investigation and some of the other reason of the failures maybe like investigation is stopped, short and did not reveal the root cause of accident. /there was no time to complete the accident investigation, there was no motivation towards the completeness of that particular accident investigation, there was a lack of accountability, lack of skill and knowledge so all these factors they are involved to the failure of accident investigation.

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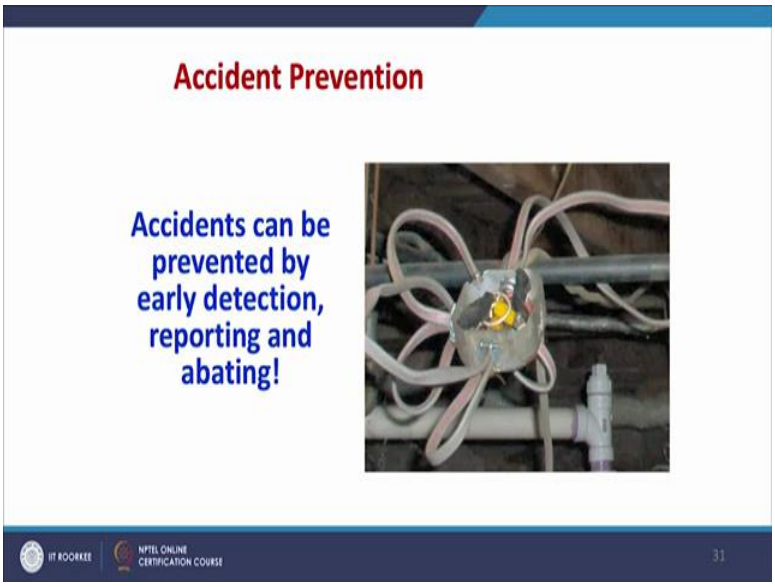

Now, let us have a look about the accident prevention now accident can be prevented by early detection, reporting and awaiting, so let us have a look about the various steps involved.

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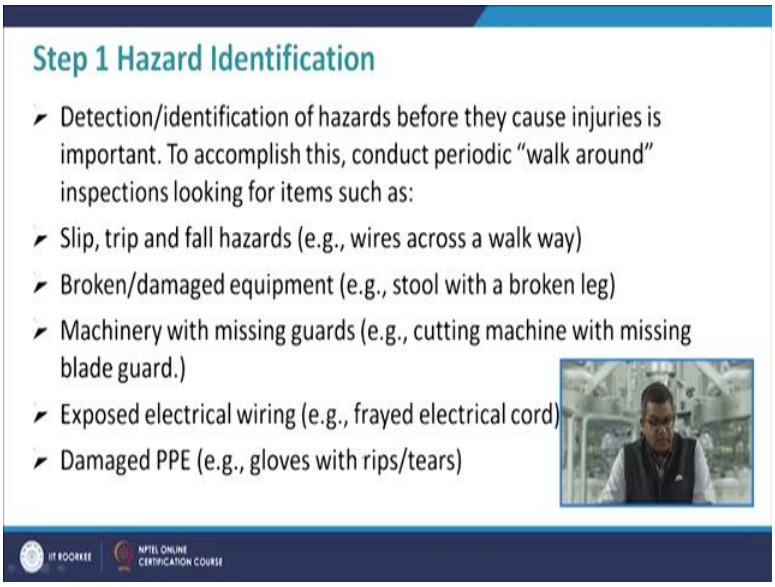

Like hazard identification, detection, identification of hazard before they cause injuries is important now to accomplish this conduct the periodic walk around inspection looking for items may be such that like slip, trip and fall hazards maybe across may be wire across umm a walkway, sometimes you may observe the broken damage equipments for example, stool with broken leg.

Sometimes you may observe the machinery with the missing guard like cutting machine with the missing frayed guard. Sometimes you may experience the exposed electrical wiring may be frayed electrical cord sometimes you may experience that there is a damage of personal protective equipments like gloves with rips or tears etc. so this may create a problem.

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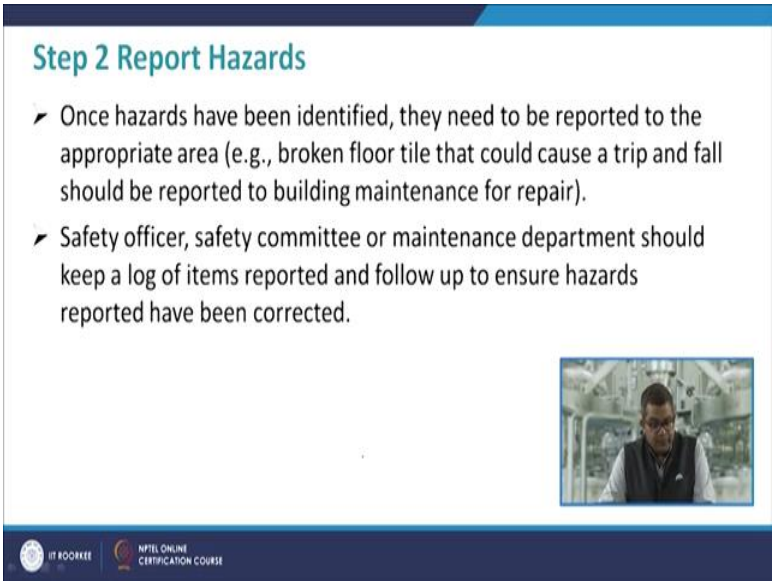

Second is the step is the report hazard so once a hazard have been identified they need to be reported to the appropriate area that is that for example, the broken floor tiles that could cause a trip and fall that should be reported to the maintenance section for repairing. The safety officer, safety committee or maintenance department should keep a log of those item reported and follow-up to ensure the hazard reported have been corrected so this is again important issue.

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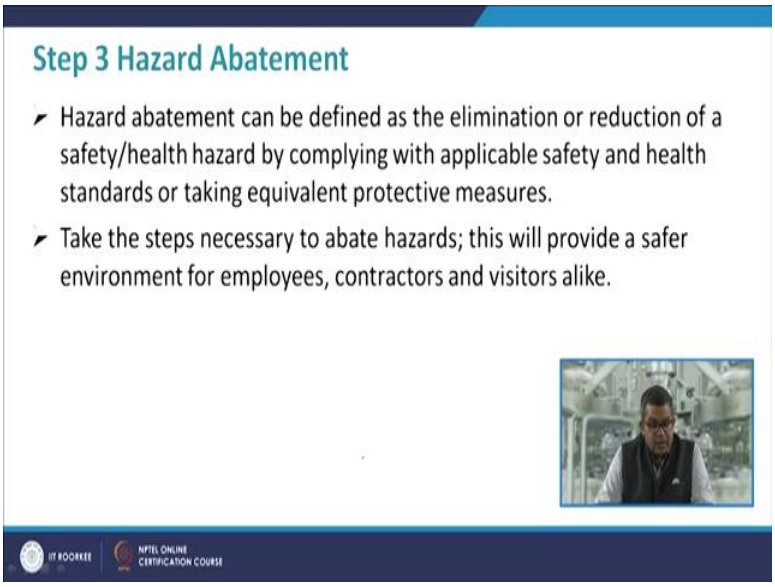

Then third one is that the hazard abatement. The hazard abatement can be defined as the elimination or reduction of a safety hazard by complying with applicable safety and health standards or taking accumulate protective measures so take the steps necessary to abate hazard now this will provide a safer environment for employees, contractor, visitors etc.

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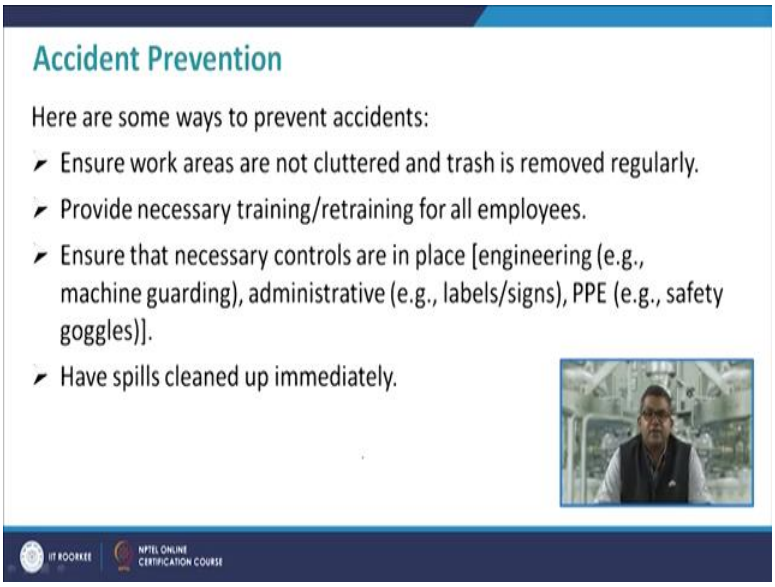

Now, here are some ways to prevent the accidents one is to ensure the work areas they are not cluttered and trashes removed regularly because this lead to the good housekeeping. Now provide the necessary training, retraining of all employees. Now ensure that necessary controls they are in place like a machine guarding etc. administrative controls they are well in

place like label sign, play cards etc. The personal protective gears they are in place like safety goggles, mask, etc. Now have spills cleanup immediately that is a very good housekeeping practice.

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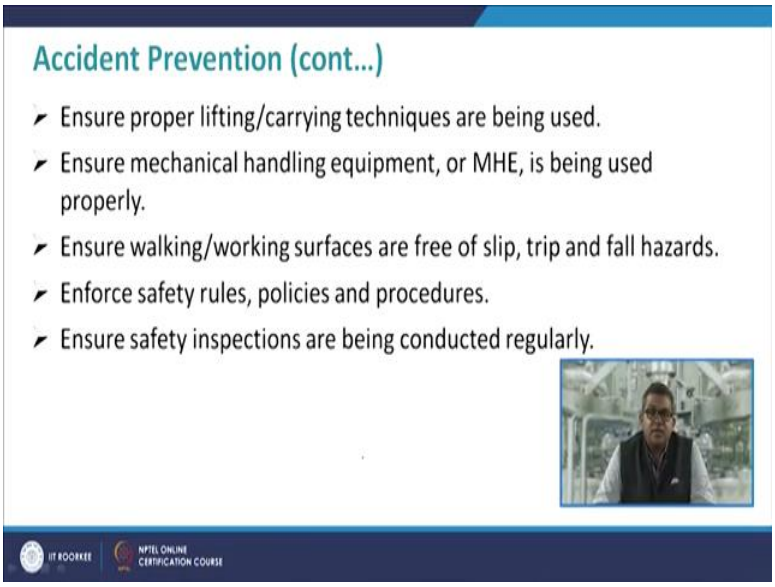

Ensure proper lifting carrying techniques they are being used. One must ensure that mechanical handling equipment is being used properly one may ensure that walking working surfaces they are they all are free of slip trip and fall hazard. One must ensure that the safety rules policies and procedures they are well implemented, you may ensure that that safety inspection they are being conducted regularly.

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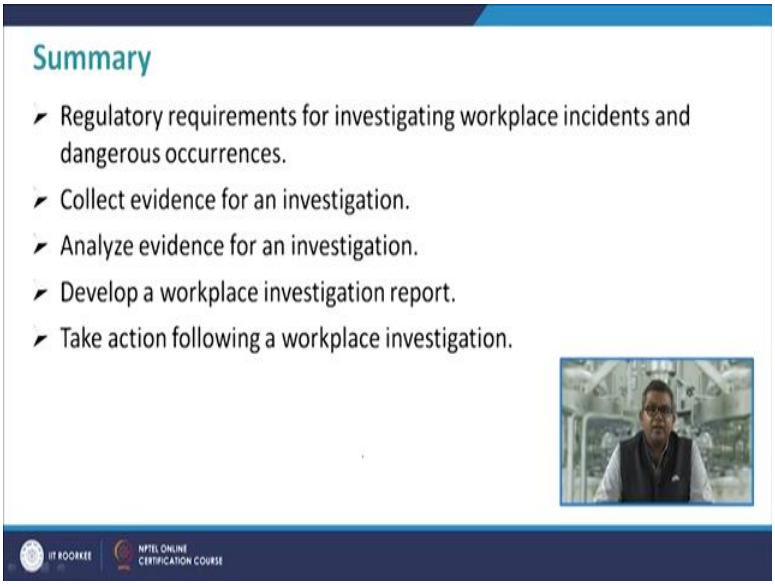

So, in summary you may say that the regulatory requirement for investigating workplace incident and dangerous occurrence. You must collect all evidences for an investigation, analyse all evidences for an investigation. You must develop a workplace investigation report, a proper workplace investigation report, a detailed workplaces specification workplace investigation report.

Now you take the action following a workplace investigation report. So, in this particular chapter we have discussed about the accident investigation protocol. What are the different key factors? What are the different theories involve and how we can present the report? How we can go for the follow up action etc.?

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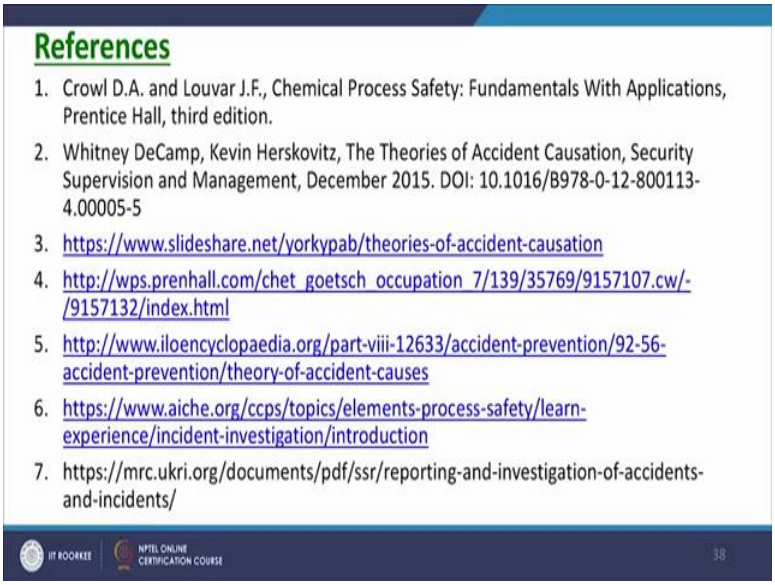

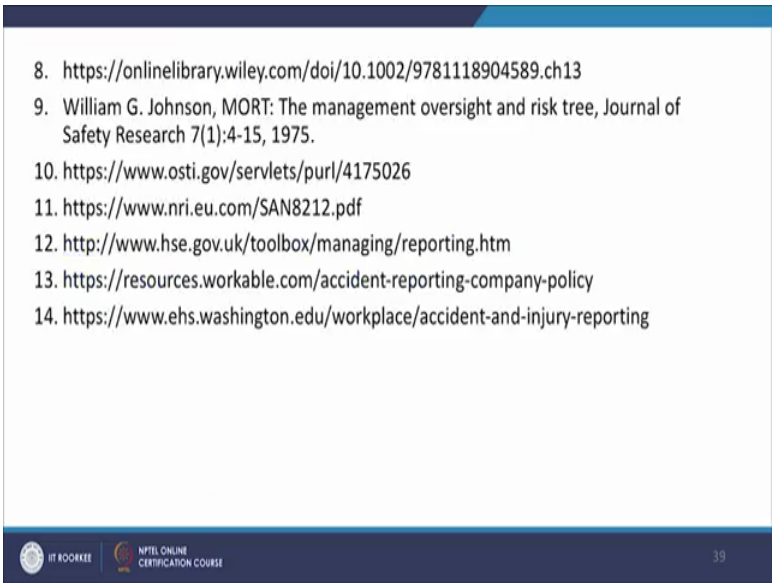

Now, if you wish to have for the reading then we have a listed a large number of references for your convenience. You can go through all those references, thank you!