Safety in Construction
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Lecture-04
Cost of Injury Vs Investment in Safety

Yes, good morning, so this is the second lecture on safety in construction. So, today's lecture will be primarily on cost of injuries and so, one is that is complete set of costs related to injury. Other side you have all costs related to safety, we will discuss these 2 in today's class and how a safety budget is planned, so that will be the end of this today's class.

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So, accident cost, accidents always cost a construction organization a great deal that everyone knows. Because there is lot of other issues are disturbed, in terms of productivity, in terms of helping the injured worker get his medical facilities and so on. And in a way a lot of chaos happens as a result there is lot of slow progress in construction sites. So, lot of things happen and accidents always have a great amount of cost to any construction organization.

So, according to Hinze, a researcher in safety, he said if the true cost of injuries is well defined, the management can very clearly plan for an informed decision on safety. In a way, if I know that I have to shell out this much portion on cost on safety, then I can think of any safety measure or something to curtail this cost on injury, so that is what is a background meaning behind. So,

keeping workers safe in any construction sites always come with an expense, several people have commented on**.**

If you want to have safe workers, you may have to give them proper PPE or you may have to give them a safety net and so on, if they are working at heights. You may have to safeguard them in so many ways then accordingly you have to pay or you may have to spend on something. So, safety always comes with some expense and worker safety cost has some amount of an expense.

Now when you look at the worker safety, compared to the human suffering and the pain, loss of a worker or something, so should we really think of profit of project or should we think of spending money on safety for the worker? So, that is the biggest question to any employer, but many of the contractors have told even though there is some amount of expenses goes in terms of safety, still there is a positive impact on this spending on safety budget.

Because, if there is no accident, workers keep on working, they also have a contented feeling that sites are very safe. So, there is no injury, then there is no money spent on injury cost or something. So, some contractors at least 70% of the contractors have said safety practices have a positive impact in the stand on safety.

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So, now let us discuss about the true cost of injuries. So, true cost as you have seen in other cost issues it has 2 components predominantly, one is direct cost and the other one is indirect cost. Indirect cost sometimes you can include claims, sometimes you can exclude claims, there are different groups of working out on the indirect cost. So, what do you mean by direct and what do you mean by indirect?

So, direct cost is nothing but any visible cost, which is often referred as an insurable cost, some workers say, so this workers compensation is primarily taken up as a direct cost. And some researchers have said whatever cost you can quantify with the reasonable amount of accuracy, it will not be too deviating from the actual expenses. But if you can calculate to some extent an accurate value, then those costs are all can be calculated as a direct cost.

For example, ambulance services, medical and ancillary treatment, medication, hospitalization, disability benefits and lost wages of injured workers, these all comes under direct cost. Let us see that indirect cost, so all the other costs that are not recovered through insurance coverage, they can all be classified as an indirect cost or those costs which cannot be quantified that easily with reasonable accuracy.

Or it is very difficult for you to go and take out each and every item and then calculate the cost, then it is primarily called as an indirect cost, we will see in detail with examples. Most of the indirect costs can be categorized as being related to the cost of lost productivity, damaged materials, equipments, added administrative efforts and so on. So, now what about the health and safety program implementations?

That also has some amount of costs towards safety, will that be calculated as one of the cost parameters? That is still a question mark I have put, because the spending on safety is never treated as a cost these days, it is treated as an investment on safety that we will come back at the end of this class. Then there is something called hidden cost of injury, what do you mean by hidden cost is where there is no historical record kept, which implies the pain and suffering of the worker.

The loss of a career of the worker because he lost an arm or a leg and he is no longer able to continue his earlier work, his career is totally shattered. So, these all can come under hidden cost of injury and you would not be able to calculate or quantify this hidden cost.

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And there is another group of people who have classified as financial cost and social cost. So, financial cost is your direct and indirect cost what we have seen, to some extent all those can come under financial cost. Social cost is any cost that can result in utilization of national resources. So, what do you mean by national resources? For example, if you involve any government sector people for calculating or for any associated costs, then it primarily comes under social cost.

For example, productive years of the injured worker, government support towards medical expenses and hospitalizations, some government also extends support for all these injured workers in terms of medical expenses, maybe the employer may pay 50%, the 50% of these expenses will be taken care of by the government, this happens in many countries. So, the government also has some component on the cost of injuries.

The government regulatory authority, for example a major accident happened and there is so much of chaos because of some incident that happened in a particular locality, then the government may also extend the support in terms of administrative personnel or authority for

inspection, investigation and other scenario, so that cost will be part of your social cost. The next one is court, maybe it can come in terms of the reason behind the accident or claims behind the accident, something related to that. So, the people involved in the court and the proceedings, they all can become part of the social cost.

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Now in the same note, you can also classify the true cost of injuries in terms of fixed cost, variable cost and disturbance cost**.** Fixed cost, so which cannot vary with the absence of the workers, if the workers had a minor injury, they may be absent for a few weeks of time, if they had a major or a permanent disablement, they maybe absent for a few months of time. So, that will not affect the cost then it is primarily called fixed costs.

For example, administrative costs, communication cost and so on, they all can come under fixed cost. The next is variable cost, so this variable cost varies with the absence of workers. So, the period of absence of the workers will be dependent on the cost then those all will come under the variable cost. For example, if you want to keep a replacement worker or a substitute worker in the absence of an injured worker.

Then the salary to that worker will be dependent on how much time he is replacing the injured worker or overtime extra work to compensate the productivity loss. So, when the injured worker has recovered and joins the work these extra expenses will start coming down, so those expenses

can be categorized as variable cost. The next one is disturbance cost, so disturbance cost depends on the nature of the accident maybe there is a lot of major accidents happened because of one incident.

Then that can create loss of reputation maybe failed project progress in the same project or lot of fines you may have to go through or maybe trials in the court, you may have to spent so much on that, mental disturbances as you may lose reputation and no projects in future, so it can all shatter. So, these are all primarily can come under the disturbance cost.

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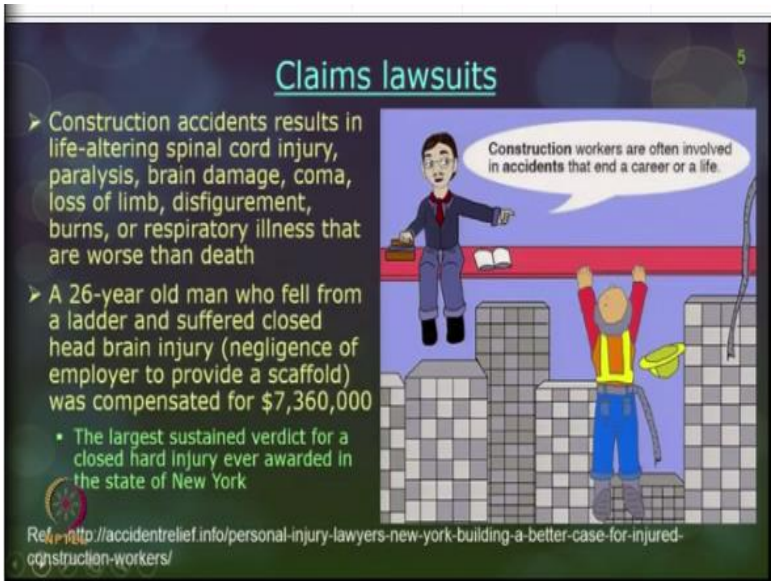

Then let us look at the claim lawsuits. So, there are so many lawsuits which primarily favor the workers, because workers are the one who gets injured and they are the one who does not want to get injured. But unfortunately, or fortunately even though the standards or procedures are made by the top management, the low level management on workers, they are the one who gets injured.

So, construction accidents, it can result in totally a life shattering death or it can be from life altering ways of your routine life in terms of spinal cord injury, paralysis, brain damage or loss of limb, disfigurement, burns and which are even worse than the death. So, if you look at the lawsuits in one report, it was reported a 26-year man who fell from a ladder and suffered a head

brain injury and because the employer had failed to provide him a scaffold and the other PPE supports.

So, he was compensated almost like 7360000 dollars, which is like a highest compensation recorded in the state of New York. So, your cost of injuries as a result of accident may collapse you in terms of you cannot even think of project profit margins.

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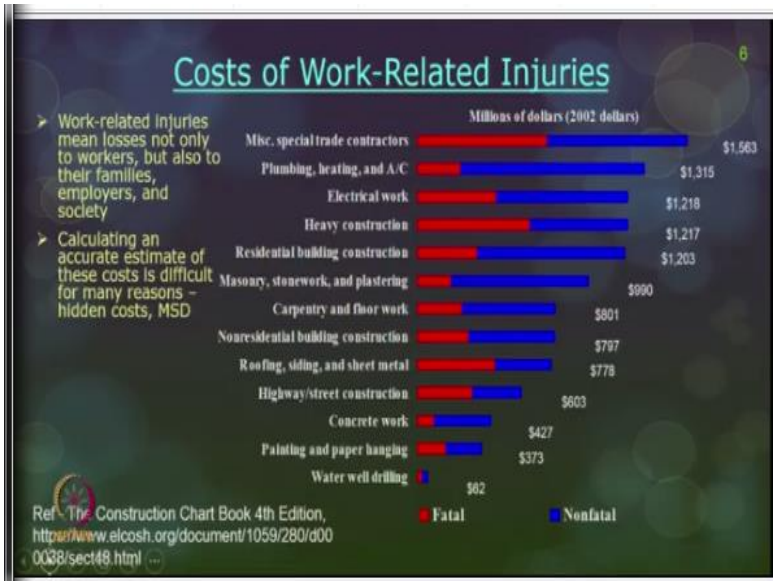

Now let us look at the cost related injuries in terms of different sectors in terms of different major accidents, minor accidents and so on. So, work related injuries mean losses not only to workers, but also to their families, employees and society that we have seen earlier. And calculating an accurate estimate is always very difficult, because of several reasons. A few reasons are hidden costs, which we have seen few slides earlier which is very difficult to quantify and estimate.

The other one is musculoskeletal disorders, as I told which is these health issues cannot happen immediately on spot, some health issues may happen after prolonged exposures, 2 years, 3 years or 5 years and so on. So, to which particular contractor under whom they were working, under what circumstances it is very difficult to estimate and then take the claims off. So, that is where it is very difficult to have a reasonable estimate on injuries.

If you look at these fatal and non fatal, if you see fatal claims on injuries even less compared to the non fatal because compared to one fatality, you may have at least like 100 or something like that on major injuries. Because last class we have seen on the number of ratios between your fatality to major accidents to minor accidents to near misses. So, it varies in 100s times or it can multiply in 10s time. So, with maybe one fatality has happened, you may have at least 20 or 30 major injuries, so as a result the claims are really high.

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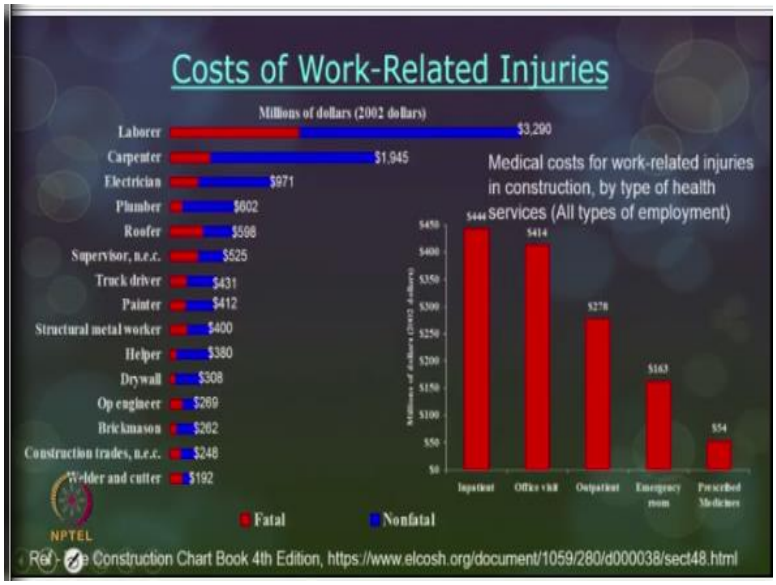

Now based on the different levels of skilled and unskilled workers, if you see the unskilled workers are the one who has a larger amount of fatality and the non fatal injuries compared to other sectors. Because the skilled workers they know how to behave safely in the construction site. Unskilled workers as we have seen, why construction industry is risky? Most of the points that we have discussed on subcontracting, migrant, seasonal workers and so on.

All these attributes go very well jelling with the unskilled part of your most of the labors, that is where the fatality and the non fatal injuries compensation is very, very high. So, now if you look at the medical facilities, and how much was spent? So, this was also a data taken from all types of employment in the construction chart book. So, if you see here, so this shows, inpatient expenses, office visits, then outpatient expenses, emergency rooms and one the medicine and prescribe medicines and they leave the hospital if you see. So, the inpatient claims are too high and people have spent so much on inpatient claims.

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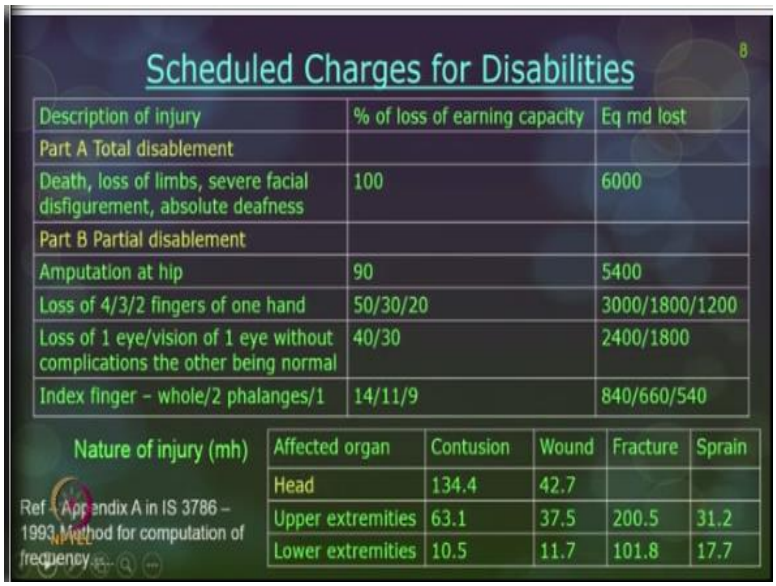

Scheduled Charges for Disabilities

Description of injury	% of loss of earning capacity	Eq md lost
Part A Total disablement		
Death, loss of limbs, severe facial disfigurement, absolute deafness	100	6000
Part B Partial disablement		
Amputation at hip	90	5400
Loss of 4/3/2 fingers of one hand	50/30/20	3000/1800/1200
Loss of 1 eye/vision of 1 eye without complications the other being normal	40/30	2400/1800
Index finger – whole/2 phalanges/1	14/11/9	840/660/540

Nature of injury (mh)

Affected organ	Contusion	Wound	Fracture	Sprain
Head	134.4	42.7		
Upper extremities	63.1	37.5	200.5	31.2
Lower extremities	10.5	11.7	101.8	17.7

Ref - Appendix A in IS 3786 – 1993 Method for computation of frequency

Now, how the different injuries are classified and how are they compensated? Some hint is given, various references are there to show the hints. And one reference I have picked as IS code IS 3786, which talks about method for computation of frequency and severity indexes in construction projects. So, now this is based on a physical injury or I would say major injury, suppose if you are losing an organ in your body.

Suppose if it is an ill health or something like that**,** like a minor injury, then there is also an equivalent calculating proportion. And approximately it all comes nearly to the same as given in the IS code. So, the nature of injury is here given as contusion, wounds, fracture, sprain and these values are given in terms of man hours**.** For example, head contusion 134.4-manhours or 42.7-manhours if it is a wound, upper extremities, upper part of the body and lower part of the body, so accordingly you have values here.

So, major injury, this is how the mandays loss or given as a guideline. For minor injury you get a different set of a guidelines, but every injury is actually compensated.

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So, now let us look at different other sources South African Department of Labour. They have actually had a statement on the different classifications and the compensation paid. First aid treatment is South African Rand 1000, and the medical consultation or treatment 3500 South African rand and lost time accidents or major injuries 30,000, cost per fatality is 1.5 lakhs. So, this is what is the compensation paid.

So, overall if you see fatality is paid little high, is actually paid little high, then comes a major, then comes minor on the first aid treatment. But the final total cost on claims on fatality or lost time or minor injuries and first aid, total it comes approximately to the same value. Because the number of first table will be too many in compared to the medical consultation, that will be too high in compared to last name.

So, based on the frequency numbers obviously you will have all the components equal to the same total values. If you see the percentage of material handling, slips, trips and falls being struck by or colliding with an object, accidents involving tools, fall from heights. So, material handling ranks number one of total claims because there are so many claims and you pay so much on the material handling.

Slips, trips and falls, fall second**,** next in the number of claims, so like that you have the other one. Fall from heights it ranks high in the frequency, but if you see in the percentage of total

claims, it is not that high and compared to the material handling, maybe because of the musculoskeletal disorders which comes along with the material handling. So, material handling is little ranking high in the percentage of total claims. Then sprains and strains, again it is the musculoskeletal portion which I am talking about, that is actually taking up more claims. Then cuts or punctures 19%, fracture 11%, contusions 9%, eye injuries are ranking as 5%.

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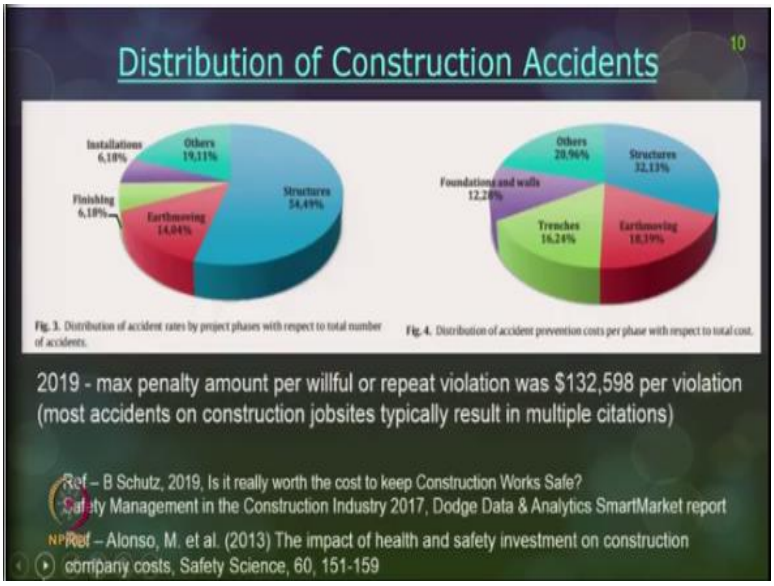

Then here let us see the different cost, so far, we have seen in terms of fatality, major, minor and so on. So, this is an index on what is the accident prevention cost and what is the accident rates. So, the first pie chart is on accident rates by project phrases and the second pie chart is primarily on accident prevention cost. So, structures, so more lot of money has spent on the prevention cost for any structure collapse or something.

And if you see the accident rates, structures are ranking high. So, there is a logical reason also for the connection, so because structures accidents are too high. So, there is also a large amount of money spent on serious investigation on safety precautions in controlling the number of accidents related to structures. The next is earthmoving here also you will see lot of safety policies and procedures are all taken up.

And earthmoving is actually having so much of cost compared to the other cost. Again, so accordingly you have the distribution. So, every company can have a pattern on accident rates

and they can shell out on the prevention cost. And so, these are the other costs, so accident prevention, it can come under safety or some people also bring it under cost, so we have discussed that also.

Now the next major portion on cost related to injury in a construction site comes under penalty. So, in 2019 the maximum penalty amount per willful or a repeat violation was remarked as 132,598 dollars per violation on the construction sites. And if you see in construction sites many of these fines or penalty are paid because of multiple citations or an which comes under willful or repeat violations. So, this is also another cost which the company spends in terms of an accident prevention.

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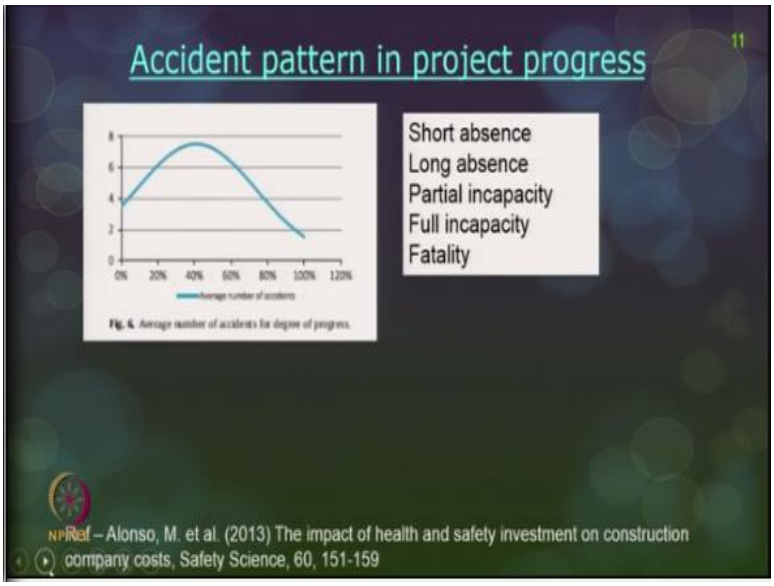

So, if you look at the categories of different claims. So, fatality, full incapacity in the sense completely who are disabled, you will not be able to work even though you are alive, you will not be able to have a job opportunity after the accident. Partial incapacity maybe you will have restrictions in your job earning capacity, you may not be able to do the work which you are doing it earlier.

Long absence, maybe you are away from the work for 5 months or 3 to 4 months or 5 months and then you can come back to work, but you will not have an incapacity. And the next is classified as short absence, maybe for a few weeks you maybe away from your job site, and then

you will come back to the work and you will continue with your same work. So, these are the different classifications when it comes to calculating your injuries or claims and so on.

If you see the pattern of accident over the project progress, so when the project is peaking up to 50% to 70%, you will see there is lot of accidents happening in a construction site and after then the accidents are reducing. So, initially when the project is picking up its gear, again you do not see so many accidents. So, obviously there is a wave pattern of accidents which is seen in many of the construction projects.

So, this can be related to a schedule pressure on most of the project, because the completion pressure starts coming in after maybe close to 40, 50% that progress has to happen. And we have to finish the remaining part of your construction project. And this pressure starts triggering out speedy work and obviously the workers are the one who are getting injured.

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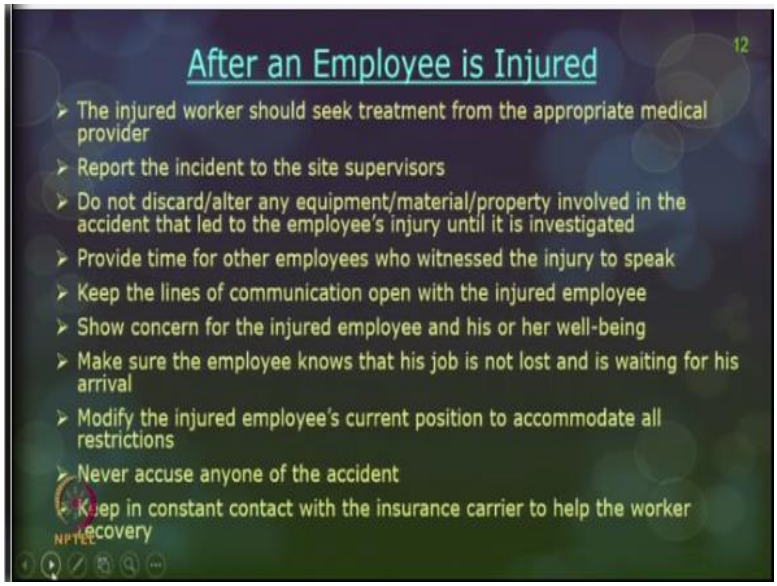

Now, after an employee is injured, so what are the precautions and how he should be taken care of? So, the first thing is without any investigation or anything on who did and what and so on, the injured worker should be given a proper treatment from an appropriate medical provider. So, it can be a nearest hospital maybe a first aid treatment, it can be an in-house hospital facility, wherever you it is a complete best treatment, the injured worker should get the first treatment.

Then next is report the incident or the accident to the site supervisors, the site supervisors who are available there should be aware of what has happened? Who got injured? What happened? And he should be immediately informed. And before any investigation or something has happened, do not discard, do not alter the position, do not change the equipment because of which the accident happened or material, property whatever which is related to the accident, do not try to even discard or alter or change the position or do something.

And which led to the employee's injury unless it is investigated and the case is closed. And provide time for other employees who witness the injury to speak as to what happened, who was at fault and so on. So, do not try to consolidate the injury to the crew who were there and so on. And keep the lines of communication open with the injured employee. First of all, the injured employee should be able to speak frankly on what happened on the day of injury, and what was the real incident and how it can be improved and so on.

So, that has to be there and also the workers recovery also should be monitored at each and every point of time. Show concern on the injured employee and his or her well being, so that is another issue, so a little positive note on recover and come back to work will make an employee become better rather than saying what did you do on that day and why this happened and so on.

Rather than interrogating and investigating, it is better to have a concern on humanitarian means of concern to the injured employee. Modify the injured employee's current position to accommodate all restrictions. So, based on the nature of injury and the medical advice given by the doctors, so accordingly the injured worker has to be given a different job position rather than taking away from the job site.

And never accuse anyone of the incident then that is a real first point of what after an incident has happened. So, obviously when you start investigating on the accident or the incident, it will obviously be pointing out to some men. It can be a group of employees or it can be an equipment which was at fault, whatever. But equipment will not create an accident on it is own, when the equipment is at fault the employee who is working close by should have reported it or he should not be operating a defective equipment.

So, whatever it is, it obviously corners down to one particular or a group of workers. So, instead of that, we should always be in a positive note on seeing to that the same accident does not happen again. Keep in constant contact with the insurance carrier to help the worker recovery with peace of mind on the cost of injury, hospital fees and so on. So, now we have talked about the worker who is injured has to come back to work, and he has to be given the job. Now we have to discuss about what are the different types of job facilities and what happens once the worker is back to the job.

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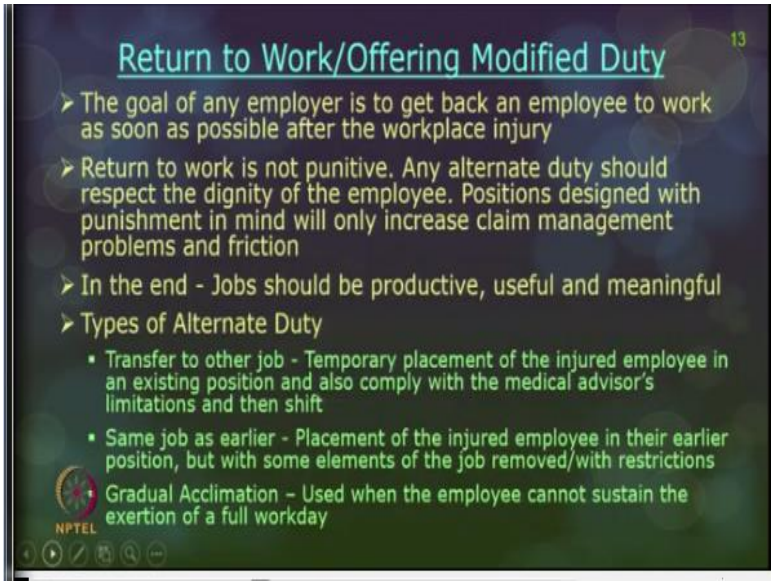

So, the goal of any employer is to bring back the employee to work as early as possible, because keeping the worker away from the job site. Actually, you may have to, it is like too much of a cost, you have to bring a new replacement worker, he has to be trained, the next day itself he cannot start his productive work, he has to be given a proper training and space for him to get adjusted with the crew and so on.

So, this takes some point of time and when he picks up the productivity, most of the time the injured worker itself may be ready to come back to work. Goal of an employer is not to just send away the worker who got injured, because there is a fault on the injured worker, because he created a loss of reputation to the company. So, that should not be the real goal of an employer then that will not work out.

So, return to work is not punitive. So, because the worker has done something and he has got injured. So, it should not be treated in a punishment mode on so putting the worker back on the same job and making him do whatever the work he has done earlier. So, an alternate duty should be given in to respect the work he has done in the last 5, 10 years or something or the sincerity he has shown into the job in the last few years or his education level.

So, everything has to be taken into account in maintaining the dignity of the worker. And positions designed should not be in terms of punishment in mind, what will happen is it will only increase the friction between the employer and employee, and it will also increase the claim management problems. So, until then, at least the employer should be in a positive mode towards the workers.

In the end, so if the punishment mode happens, then the negative energy starts creating and you will not be able to get a productive job, your best job and a peaceful job in future. So, the employer should always think in mind the job should be productive, useful and meaningful at any point of time in the end of the day. So, types of alternate duty, so number 1, transfer to other job suppose based on the permanent disablement or temporary disablement, you can shift the worker to another job.

But the temporary placement of the injured employee in an existing position and also complying with the medical advisors' limitations. And accordingly, you can keep them temporarily and get all the work transferred to another replacement worker and then this worker can be shifted, so that sort of an arrangement is also possible. The same job as earlier you can also keep the worker in the same job, but you can also remove some segments of the job which the worker cannot do.

Or we can also put some restrictions on to the worker that he need not do some segments of the job, so that he still able to finish his job properly. So, placement of the injured employee in the earlier position, but with some elements of the job removed or with restrictions. Then gradual acclimation, so once the worker is injured and he is in the stage of recovery, you cannot give him an 100% productive job to happen**.**

So, you may take him for 30% productivity, and after 2 weeks, you may expect him for 50% productivity, so slow gradual acclimation of the worker absorbed into the site that you may have to think of. So, this is another pattern of putting the employee back to work and you should also keep in mind the employee is not exerted on the full day workload until he is recovered.

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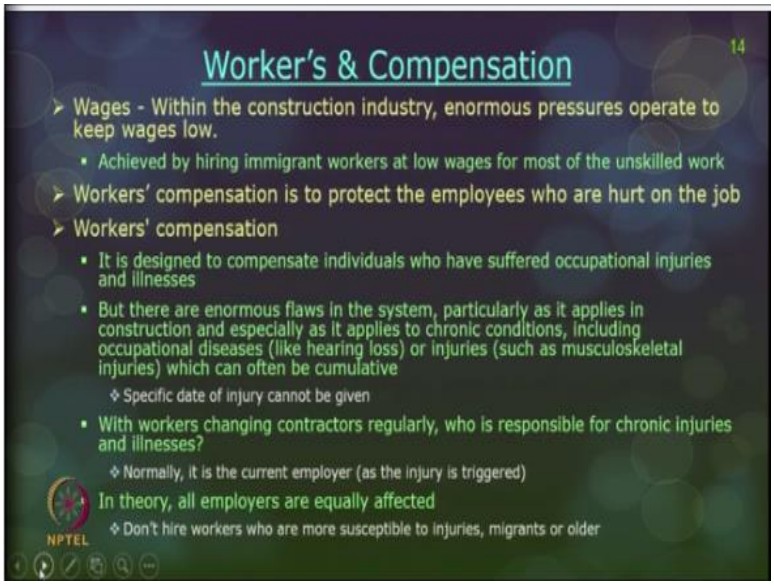

So, far we have talked about cost of injury, different patterns wherein how the compensations are, how the claims are done and so on. And we have also saw the workers medical facilities and how they are back to the job, what sort of jobs the workers should be posted and so on. So, most of the insures, claims and so on always target about compensation. So, what do you mean by compensation?

And this workers compensation when we discussed about direct cost, there are some researchers who said this workers compensation directly contribute to the direct cost. So, now what do you mean by this workers compensation and why it is required? Even today in many of the construction sites, the wages for any construction worker in the construction industry is always kept as low as possible, because there is a pressure from other fraternity.

So, to keep the wage as low as possible, that happens even now. And this is also possible and this is achieved in many construction sites by hiring immigrant workers at low wages for most of the

unskilled workers. So, primarily they can be seasonal workers, they can be immigrants, so who will be very ready to do for whatever low wage the employer is willing to give and hence the workers compensation came in.

So, this workers compensation is to protect the employees who are hurt when they are on the job site. Now what do you mean by workers compensation? So, it is an amount which is given to compensate any individual who have suffered occupational injury or an illness. So, it can be an injury on accident or it can be even a health issue also. But there are a lot of flaws in the system, because some compensation measures are very difficult to calculate.

For example, this applies to occupational diseases like hearing loss. Hearing loss will not happen immediately. So, it takes a lot of time when you are on site and when you are hearing lot of noise in the construction site, which is above the permissible limit, which your excavator or your drilling machines or drilling hammers can pile hammers can easily give cross beyond that normal permissible limit or injuries, the famous example is a musculoskeletal injury.

So, it cannot be actually assigned or specific date of injury you cannot assign to, and hence compensation claims are very difficult to be given to these workers. Because for to pay a compensation the specific date and time of injury should be given and when that cannot be given for certain aspects of your compensation of the injuries. With the workers changing contractors regularly especially for all these issues I said on hearing loss or musculoskeletal disorders and so on, who will be responsible for these chronic injuries and illnesses?

For the slow injuries to be visible, who will be responsible? And normally what happens, the trend is it will be the current employer. Because the injury who has shown visible impact our effect only with the current employer, and most often the current employer will be responsible for all these compensations and for all the injury related compensation. So, in theory all employers are equally affected as a result of shifting jobs of these workers and subcontracting way of culture in the construction industry.

So, now what the employers should take a precaution is, do not hire workers who are more susceptible to injuries, who are like absent minded every time, who runs here and there and do their work without taking care of safety precautions, and keep in mind not to take recruit migrants or even an old worker. So, these are all the different, different precautions one can keep in mind in order to avoid all these compensations and claims.

So, now these migrants should be avoided for in order to have a zero-accident site, but which is actually the ironical statement that in many of the construction sites, you see migrant workers only available for low wages and as an unskilled worker.

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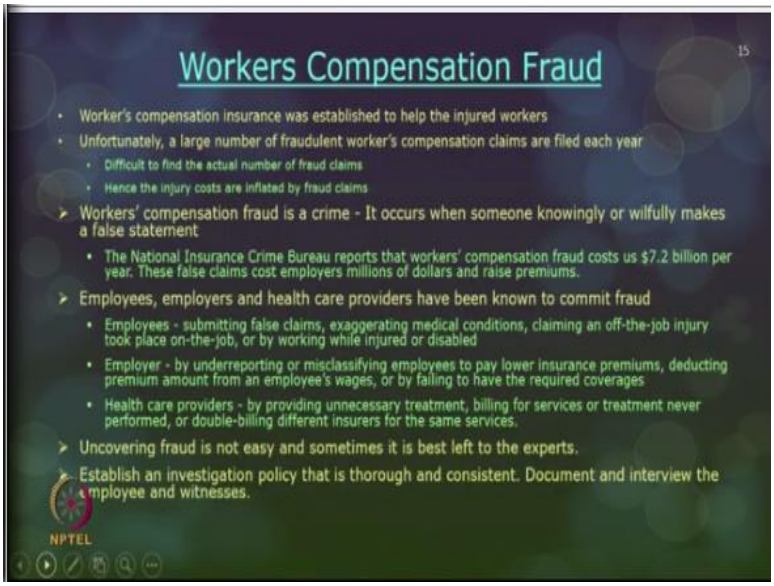

Workers' compensation fraud, now the unfortunate incident is workers compensation came just for helping a worker in order to get their injury or illnesses recovered with some support from the employer. Now there is an equal amount of fraud cases also, which also comes in along with this compensation. So, what do you mean by workers compensation fraud? So, workers compensation insurance was established to help the injured workers.

But unfortunately, a large number of fraudulent claims are also filed every year and it is very difficult to find the actual number of such fraud claims. But if you can really investigate, there are some techniques to investigate, then you can identify the false claims. But still you will not be able to really go to the nth level of accurate fraudulent claims to be discarded from the sites.

And what happens here is, the injury cost of your company's reputation also goes because of maybe you have genuine five injuries. And there were 2 or 3 false claims, and your high injury cost shows inclusive of the false claims which will definitely hurt the company's reputation. So, workers compensation fraud is also treated as a crime, why? Because you did not get hurt or maybe you did not get because of someone but you wanted to get the compensation and hence you have twisted the story and claimed and filed a wrong claim.

So, unknowingly or knowingly, you have actually made a false statement which is against the court of law, that is actually treated as a claim. And the National Insurance Crime Bureau has reported workers compensation fraud cost, almost like 7.2 billion dollars per year. So, these false claims can make the employers to raise more premiums and so on, which is not in the good sign for the growth of any construction industry.

Now if you see here who all commits fraud? There are 3 different people in this group on claims, and all the three different peoples commit frauds at their levels. Number one employees or the workers, they can submit false claims because they do not have enough money to maybe to get rid their injury, which is not done in the construction site and hence they may show false claims.

Exaggerate the medical conditions, maybe the condition of the medical treatment is not that high, but they can exaggerate just to create sympathy and get more leave for their recovery. Or claiming and off the job injury that took place as if it was on the job which is what we say in a within the site premises if an injury happens, then only the workers are eligible for a compensation. Suppose if the injury has happened outside the site premises, but they do not have enough money to get cured.

Then obviously they claim as if it has happened within the site premises or by working while injured or disabled. From an employer's perspective, by under reporting an injury or misclassifying the employees to pay low insurance premiums, so based on their education, cadre and their experience and the skill trade set, the premiums are paid accordingly. So, what happens

is, this can make them pay very high on premiums, so they can misclassify the employers or the workers.

So, that they can keep their wages low and they can pay their premiums also low, and deduct some portion of the amount from their salary to pay all these premiums or by failing to have the required coverages. If a worker is eligible for a specific amount of a coverage and these employers can curtail that and show a less coverage as well. From the health care providers, they can also provide unnecessary treatment, which is not necessary and they can bill for all these unnecessary expenses.

And billing for services or treatment which they have never performed and double billing different insurers, so that at the same time for the same services and they can get 2 different claims. So, these are the different frauds from three different parties who are involved. So, uncovering fraud is not that easy, and these people who will raise the false claims, they know how to hide their mistakes. So, it is not that easy to identify but there are certain ways to identify all these flaws claims. Now let us see what are the ways to do?

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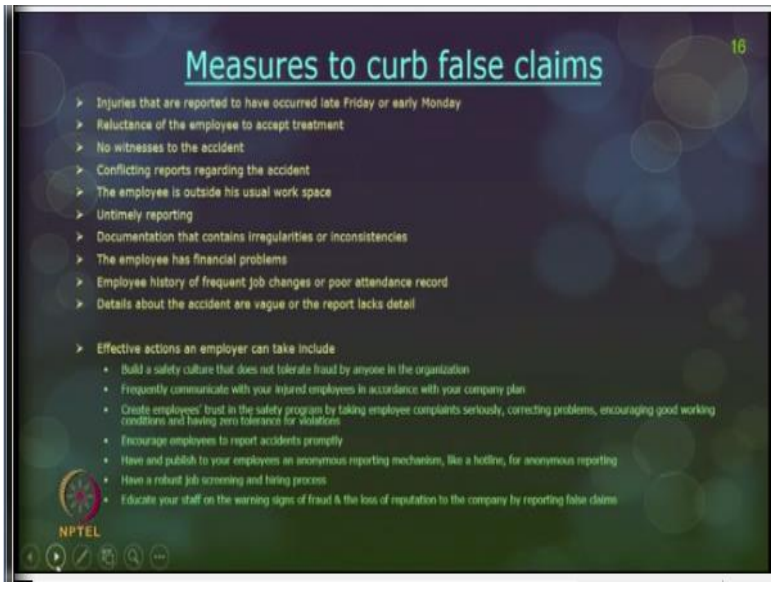

Measures to curb these false claims, so injuries that are reported that to have occurred late on Friday, so that they could not have they could not report it on the site. Or early on the Monday just when the work starts when some worker is reporting on an injury, then there can be a

suspicion on their reporting. Reluctance of the employee to accept treatment, so if the company has a provision to have an in-house hospital facility.

But the workers are very reluctant to take those services and they want to get treated outside but they wanted only the reimbursements, then there is a suspicion that the worker has not had an injury at all. And when there are no witnesses at all to the accident or to the incident scene, and only the worker alone says that there was an accident and he got hurt, then you can think of it as a suspicious case.

Conflicting reports on the accident, people who were nearby the work coworkers can give a different report compared to the injured worker who claims to have an injury, then you can think of it as a suspicious case. The employee is outside his usual workspace and does something, so that one's also a suspicion. Untimely reporting, again it can be linked with late Friday or early Monday and says that immediately after the work starts, he is claiming, so then you can have a suspicion.

Documentation that shows irregularities or inconsistencies or the worker has very serious financial problems, then you can really think of there is a suspicion behind. An employee history of frequent job changes or poor attendance record and so on, then you can really think of it as a false claim. Details about the accident are vague or the report lacks details, these are the different ways to you can have a vigilance on that this can be a case of a false claims.

And instead of highlighting all the red flags or red tapes, so we can also think of positive side on promoting these false on in curtailing these false claims. So, you can have a robust screening process and hiring process, you can educate all your workers as to what is the impact of all these false claims. And you can also tell how much it affects the reputation of the employer.

So, that the worker will know their mistakes and then will not do a false claim. And build a safety culture, so that does not tolerate a fraud, so you can come out lot of safety schemes like incentives and so on. So, a worker who does not get injured and who is very safe in the construction sites will be rewarded. So, this can help them to curtail all the false claims or you

can pay them adequate salary, so that they are not thinking of all these false claims to meet their medical expenses. So, these are the different ways of doing it.

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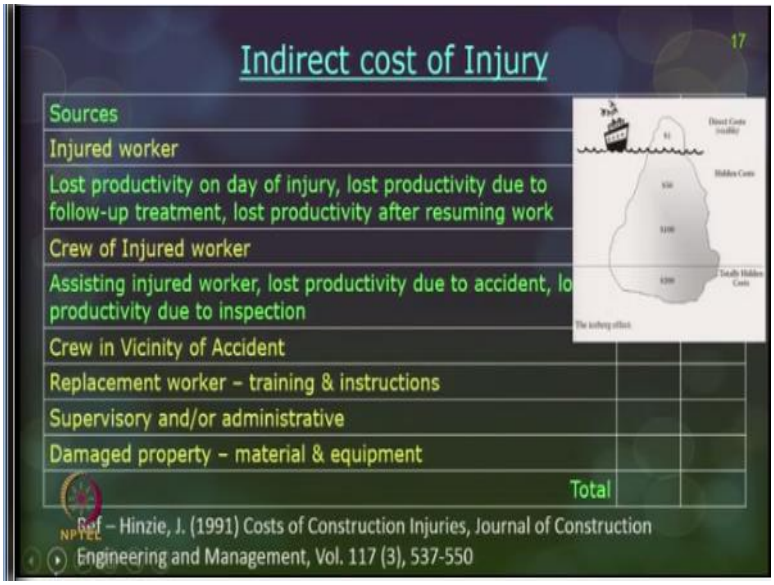

So, now let us discuss about indirect cost. So, last few slides we have talked about direct cost, now we will see about indirect cost. So, indirect cost, I have to give an example first then I think it is easy for you to understand what are the different items on indirect cost. Let us assume there is a very large construction site and there are lot of crews who are working in the construction site.

And everybody is busy working, suddenly some accident has happened, it can be a major accident or it can be fatality let us not discuss about that, but some accident has happened. Now what will happen? Immediately when the accident has happened the workers, the injured worker needs a first aid treatment. So, all the coworkers who are closely sitting or working along with this injured worker will be in chaos in order to get the first aid treatment to this worker.

And also, will be going for a hospital help lines or emergency ambulance services or they may be reporting to their site supervisors. So, they will be busy doing moving around here and there in order to report in the incident or the scene of the particular accident**.** Now this news will immediately spread like a fire to the neighboring gang of workers and they will also rush to the spot to see, to understand what has happened.

And simultaneously your administration people or your site supervisors they will also return to the scene in order to investigate and see and understand what has happened in the accident. Now what happens here is, immediately the productivity of the particular site is just goes stand still**.** And this is an immediate impact you will see and so then the injured worker would be taken in the mean time to your first aid or to your neighboring hospital facility and that will be going on.

So, along with the injured worker few of his friends who are called the coworkers they will also accompany him and go with the hospital services. And they will be and the worker will get the first aid treatment regular treatment, then follow-up treatments all will go through. And for every follow-up and so on the coworker sometimes they may also accompany the worker, so this happens**.**

Now this news starts spreading along the entire construction site and people maybe gossiping about the accident now and then. And this will be prevailing for at least for few hours based on the type of accident that has happened. Now if you look at the entire picture what I have shown you right now maybe you could have imagined along with me. Now what happens is, the injured worker has stopped there is a lot of lost productivity on the day of injury until he recovers and then comes back to work.

Obviously, the productivity is totally lost and somebody has to be compensating or replacing him or for his lost productivity. There is an extra money spent on to the injured worker apart from his direct medical facilities and so on which will come under direct cost**.** Now the hospital facilities and the coworkers also accompanied him and so on, all this lost productivity also will have gone, productivity of them also you cannot expect.

Now the crew of that particular injured worker and his site, everybody would have stopped work suddenly the reason productivity loss and halt. And even after 2, 3 hours also then only the worker start their work. But even then, they will not have a high productivity as it was before the accident. So, the productivity will be very slow on the particular day till the scene is away from the worker's mind**.**

Suppose if it was like a dramatic accident then this news on what has happened and so on will be narrated by the group of workers discussion among the workers will keep happening and so on. And this nausea feeling on this accident will be spreading all around the construction site at least for few days**.** Now what about the administrative personnel and so on they have to have an investigation.

So, whenever they are questioning and interrogating the workers and the injured worker and their co workers obviously there is a halt of productivity and the pictures starts coming in to the co-workers. And obviously there is a disturbance at now and then on every point of time. Now if you see is it very easy to calculate all these costs? It is not at all easy and that is where all this cost comes under an indirect cost on safety.

And this is also narrated equally with an iceberg effect which we have shown in the last class also. So, only the visible portion of the iceberg is a direct cost and all other hidden ice below the water level is primarily termed as an indirect cost**.** If you see few lists I have brought it out here but you can imagine, is it possible to note down each and every point of the scene, it is very, very difficult to note down.

Injured worker lost productivity on the day of injury, the lost productivity due to follow up treatments, lost productivity after resuming work. After resuming the work also he may have restrictions in the work, so who will bear all those lost productivity? There is no mechanism to retrieve and to measure then crew of the injured worker primarily in terms of assisting the injured worker. Lost productivity due to the accident due to inspections and follow up treatments also they may accompany.

So, all these there is no mechanism on how much is a lost productivity. Then crew in the vicinity of the whole accident as I told you at least for few hours the entire site comes to a standstill in terms of work progress, you will not have way to measure all those. Replacement worker, again if he has to be given a PPE, proper training, instructions on how to handle the construction work progress.

Then, supervise the administrative personnel in preparing a scene report and investigation mechanism that also lot of money, effort, time is all done. And every time the workers, the all the fellow workers are all disturbed because of that. Damaged property, maybe the accident happened and some equipment or material is damaged, you may have to bear the loss. So, this if you see it is like too much of portion goes in terms of indirect cost on safety.

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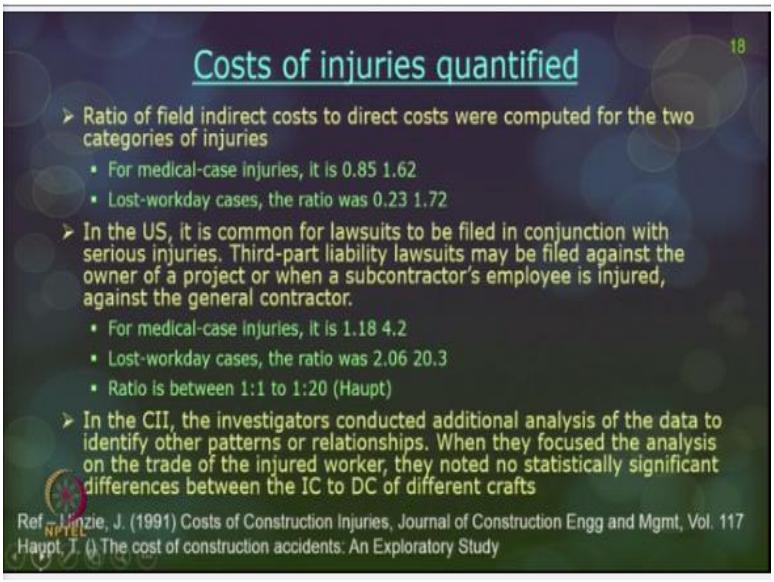

So, now as I told you it is very difficult to calculate an indirect cost. So, some researchers have also taken effort in calculating indirect cost through some form of a direct cost itself**.** Because direct cost I told you it can be measured with terms of accuracy. So, when the direct cost is measured in terms of accuracy, so there is a mechanism of calculating the indirect cost with some relationship with the direct cost.

So, now how is an indirect cost calculated? So, now if you see here, researchers have taken up so many formulas are there. So, some researchers say for medical case injuries, it is 0.85, for lost workday cases, it is 0.23 and so on. And the same in the lost goods are filed in the sense when your claims are also included then the ratio is really altered. So, your direct cost is calculated with accuracy, indirect cost will be this direct cost multiplied with the ratio value.

And to get your indirect cost, total cost of injury will be sum of direct cost and indirect cost. It is very easy to calculate**.** So, recently a researcher Theo Haupt, he mentioned this ratio between direct cost and indirect cost it varies very much from 1:1 to 1:20, based on different, different situations, different, different injury places and scenarios, an injury types, impact and so on.

So, several researchers have brought in 2 different ratios and if you see all the range of these direct cost, indirect ratios fall between 1:1 to 1:20. So, in CII, the investigators conducted additional analysis of the data and they wanted to see how is the pattern and is it possible to derive a formula out of the ratios.

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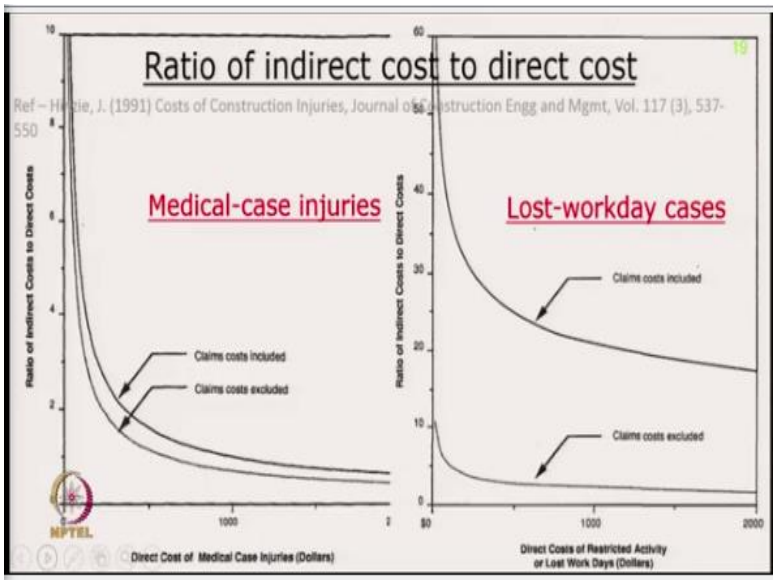

If you see, so this is a medical case which is a minor accident and this is a major accident on lost workday cases. And if you see here, this claims cost included or excluded when the cost is included obviously you have a little higher value. But if you see in the claims, cost included you will have a higher portion in terms of lost workday cases. So, in CII, the researchers have doll upped a model which can actually talk about which can be a fair and accurate estimate by giving an equation.

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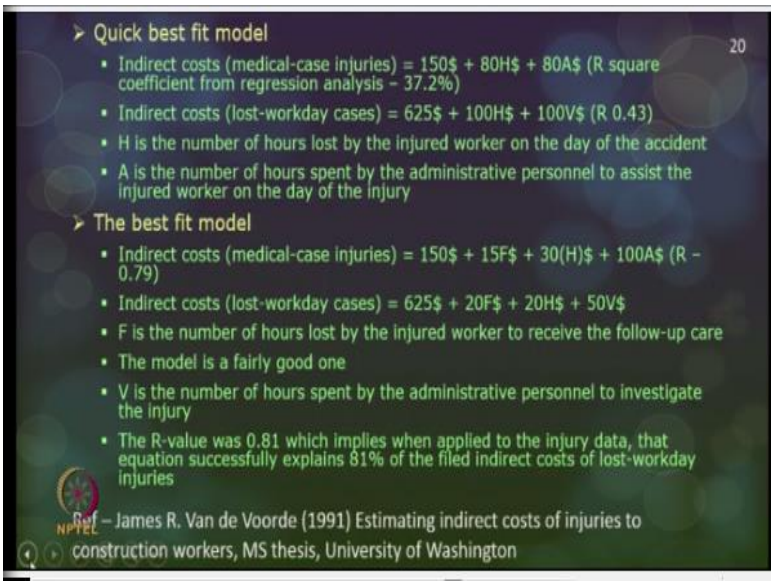

So, this equation is there are 2 ways of this equation, one is a quick fit model and other one is a best fit model. In the quick fit model, there is few variables involved and in the best fit model additional variables were also taken into account and we will discuss both the parts. So, in the quick best fit model indirect cost, medical case injuries 150 dollars + 80H dollars + 80A dollars, here the R square coefficient from the regression analysis gave value as 37.2%.

And indirect cost for the lost workday cases 625 dollars + 100 H dollars + 100V dollars and here the R square coefficient value is 43%. And where H is the number of hours lost by the injured worker on the day of the accident. And A is the number of hours spent by the administrative personnel to assist the injured worker on day of injury, and V is again the administrative personnel hours only.

Now the best fit model, so in the best fit model you have something on the follow-up care. also, so data on follow-up care also, so the equation will be slightly altered. Indirect cost, medical case injuries 150 dollars + 15F dollars + 30H dollars + 100A dollars and here the R square is a 0.79 which implies 79% accuracy. For lost workday cases 625 dollars + 20F dollars + 20H dollars +50V dollars, here also the R square value is something around 81%.

So, which implies the equation successfully explains 81% of the filed indirect cost, filled indirect cost of lost workday injuries. So, these 2 models were considered as a best fit model. So, far we

have talked about the different cost proportions on injuries whether it is minor, major, fatality and what are the claims and where the claims are high and low and so on.

And we also talked about how to calculate direct cost and how to calculate the indirect cost indirectly, so that also we have discussed. Now the next set is planning for safety, as I told you earlier some companies still treat the expenses spent on safety as a cost of safety only, but planning for safety is never to be considered as an expenditure.

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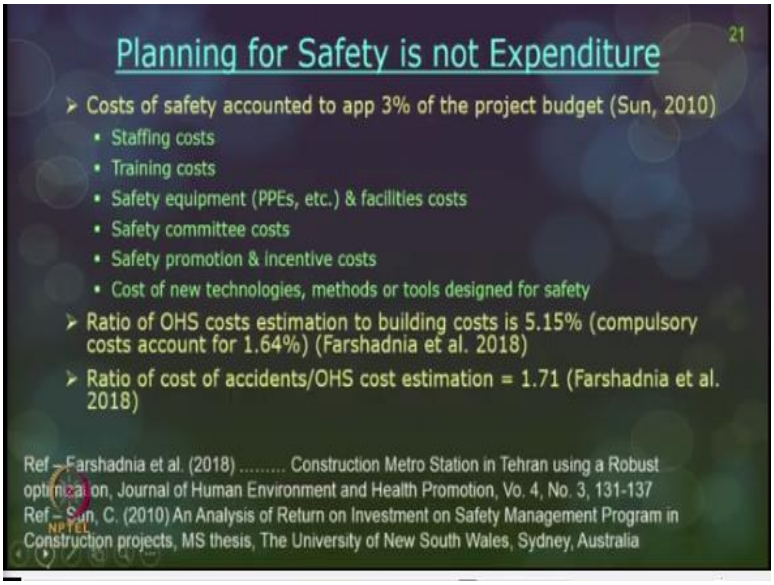

Because when you are training the workers the safety norms get imbibed into the workers mind, and the worker try to behave safely. And when these workers are maybe kept in the same company or even if they move to other companies, they have the safety conscience and the training in their mind. So, you will see some amount of benefits in the long run, so safety is never treated as an expenditure and it is treated as an investment on safety which is like a positive notation on safety.

Let us now discuss what is this safety cost and how much is the cost? For the cost of safety accounted to 3% of the project budget, some researchers have worked out. And they say it is 2, 3% of the total project budget. So, what are the major cost involved there, first one is staffing cost, staffing cost implies your site supervisor, safety superintendent and so on, who are project

safety director and so on, who are specially appointed in order to see or be vigilant on safe measures in the construction site.

The next is training cost, training cost is to workers, site supervisors, foreman and other people in the construction site. In order to know how to handle hazards, how to prevent hazards and so on, so they all primarily come under training cost. The next is safety equipments, safety equipment predominantly is PPE and other facilities can include your safety nets, guard rails and so on which primarily protects the environment and the protects the workers.

The next costs are safety committee cost which are not compulsory but they are voluntary cost. Safety committee cost, so there can be a committee for investigation and other purposes, they all can come under safety committee. Safety promotion and incentives maybe your posters, your banners whatever you put in the safety in the sites. And the incentives to encourage the workers who be safe in the construction sites can also come under incentive cost.

Cost of new technologies, methods, tools, software whatever you want in order to plan for safety and also in order to your budget for safety can also come under your safety cost, so these are the different items under safety cost. Now researchers have also said the ratio of occupational health and safety cost estimation in proportionate to your building, total building cost, it comes to 5.15%.

So, if you look at only the compulsory cost your staffing, training and PPEs and facilities, it comes to only 1.64%**.** Suppose if your total project cost has come to 1 lakh, so only 1% of the 1 lakh is what you spent on safety budget. So, which is not too high and value but the ratio of cost of accidents to the OHS cost estimation. So, primarily it is cost of accidents to your safety budget cost that is actually 1.71 value.

So, you can always understand, do you want to spend negatively on injuries, accidents and then pay for compensation or you want to spend the project money in terms of positive side on promoting safety and for preventing accidents in construction sites.

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Now if you look at safety cost, there are so many groups given here, direct cost on safety, direct cost on no safety and indirect cost on safety**.** Some researchers have classified all as safety cost just like your cost of injury, (()) (58:05) in safety comes a part of that.

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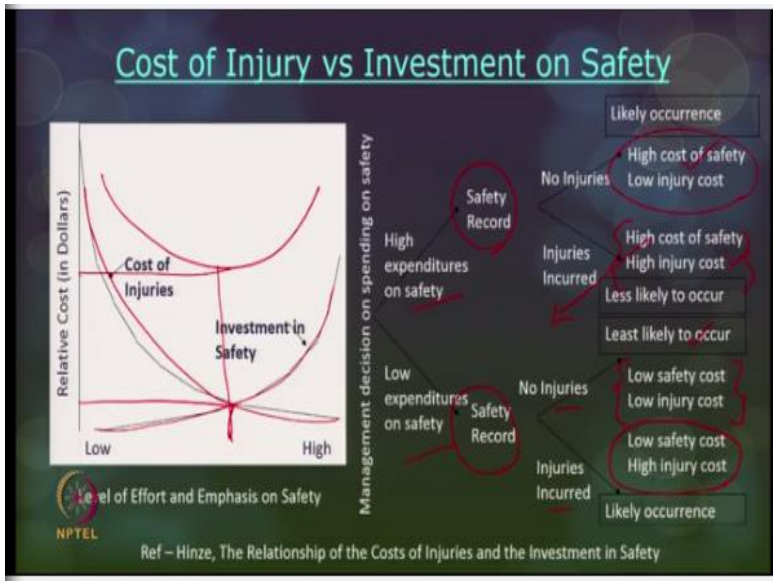

So, direct cost of safety, so cost of injury versus investment on safety, so let us see how the trend is? So, if you spend too much on your safety then obviously your cost of injuries can come down as seen in this picture. So, actually the investment on safety is very low, you are spending too much on cost of injuries. The minute you try to spend on safety budget, on improving your safety budget, your cost of injuries are coming down.

So, this is level of effort and emphasis on safety and this is a relative cost of safety measures. At the same time, you cannot spend too much on safety also because you need to have an adequate profit margin as well. So, the optimum value of expenses on safety is this value wherein you are having low cost on safety and this is on injuries. So, you will get a total cost of safety, so that value will become somewhere striking here and that is an optimum level of budget on safety.

Now this is a decision tree on expenses on safety. So, management decision on spending of safety, high expenses on safety, low expenses on safety. You are also having a safety record on both the sides**.** Here you will still have 2 scenarios no injuries and injuries occurred the most likely occurrences when you do less expense on safety you may have low safety cost but a high injury cost.

And when you are spending too high on safety you may have high cost on safety but you may have low injury cost. So, what happens, the less likely occurrences are when you are having high expenses on safety still you are having a high cost of safety and high injury cost. And when you are spending too less on a safety still you are having a low safety and a low injury cost. Now let us discuss about this scenario when you are spending too much high on safety budget on different programs and implementation, PPEs and standards.

Still why should you incur on the high injury cost? Which implies your safety programs had not reach the workers or maybe there is a flaw in your safety program itself. Or maybe your safety program should have been designed properly for your projects and for your workers then the safety measures would have been reached the workers and the site then you would not have had a high injury cost in the construction site.

And what about this, low safety cost and low injury cost this is purely a matter of luck and this may not happen every point of time**.**

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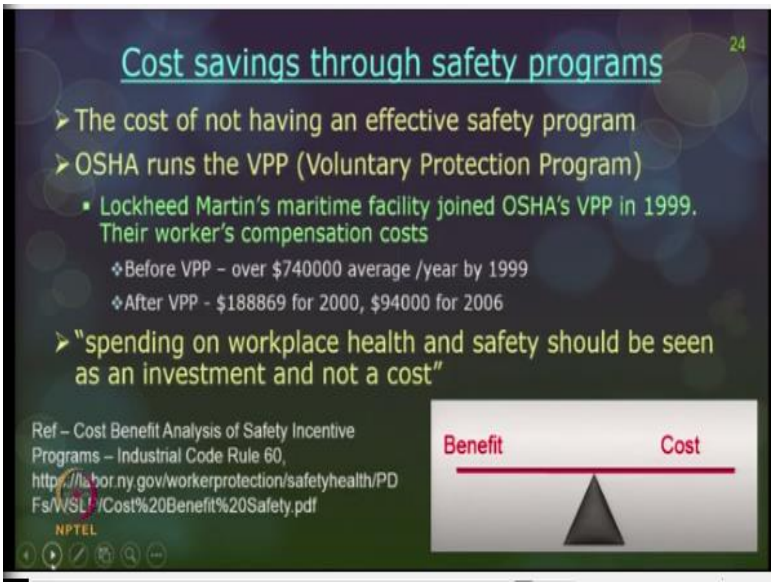

So, what is a cost savings through safety programs? As I told you one of the savings, I would say is the training a worker gets in one project in under one contractor. It is actually like a savings because it is stored in the mind of the workers and whenever he moves from one project to another project or whenever he moves from one site to another site, the training also is carried along with the worker and he tries to behave safe.

So, there is a benefit of the training which is important to the worker, this is actually given by OSHA there is a record given by OSHA. There is a voluntary protection program and Lockheed Martin's maritime facility joined the OSHA's VPP program in 1999. And there is actually a difference of records, scene say. So, 1999 they were almost like dollars 740000 average was spent every year on the claims and so on, workers compensation cost.

And after the voluntary protection program in 2000 itself there was a sudden decline to 188000 dollars and in 20006 there was still a gradual decline of 94000 dollars. So, you will see a gradual decline when you are emphasizing on safety the cost of injury is can actually come down. So, in the wrap up I would just say that, spending on workplace health and safety should be seen as an investment and never as a cost.

The minute you see it as a cost then obviously you will not be willing to spend on safety and obviously you are going to have high cost on injuries. And the other issue is better to spent on a

positive note on safety rather than pain, suffering an accident and claims all negative side on the cost of injuries but the ironical statement this also I would have discussed earlier is and injury may or may not happen but whatever the budget you plan for safety obviously will be happening.

Because when you plan for PPEs or when you plan for training programs on safety. So, those all when you plan obviously you are going to spend that money on safety. But injuries may or may not happen and primarily to the workers who wants to be safe in the construction sites. That is a main reason why the employers are very hesitant in spending on safety because they always have that thinking that it is the worker who has to be safe in the construction site. So, with this I am stopping here. Thank You.