Safety in Construction
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Lecture-21
Health Issues in Construction

So, today's class will be on health issues in construction. So, previously all these weeks you would have seen a lot of safety issues primarily I was focusing on the fatal 4 falls, electrocution, cave-in, struck by or caught in between.

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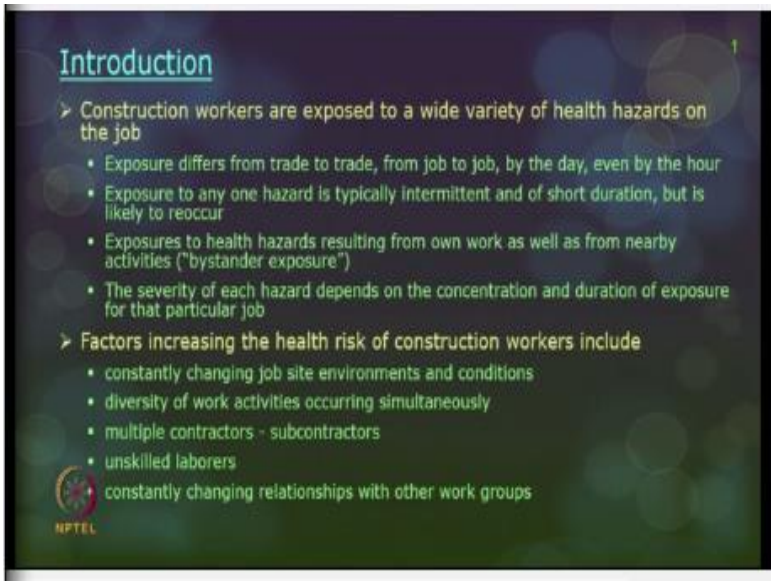

And now we will see on health issues. So, now where are these health hazards coming from and what are the different types of health hazards a worker is exposed to. So, construction workers are always exposed to variety of health hazards and these health hazards are primarily changing from craft to craft. So, in brick masonry you have different sort of a health hazard and in concreting you may have a different sort of a health hazard maybe awkward postures, cement dermatitis, noise or pollution, dust.

So, there can be so many hazards changing from one trade to another trade or from one job to another job. And even in the same day by the change in the timing, you may have different hazards you are actually exposed to. And the exposure to one hazard is not like permanent, it can

be of short duration, it can likely to repeat after some point of time. So, repeatition and all these are also possible.

And most of these exposures, now you should be very careful in listening to this, most of these exposures are not created by some of the activities which the worker is doing. But because the worker is standing in the midst of so many activities which are taking place in a construction site, the worker is actually exposed to different sort of health hazards. It may not be the hazard induced by the activity done by the worker which we call it as a bystander exposure.

In the sense the worker is standing in the site and maybe there is an equipment, a drilling equipment is going on next by close to where the worker is operating something or there may be some vibration activity going on in the site. So, these are all different sort of activities which are going on in the site and as a result the worker may be exposed to noise pollution or dust or something, so that has to be taken care of.

Now, what is the health hazard? Every hazard is not the same, so the severity of a health hazard depends on how much time the worker is exposed to which we call it as a duration of exposure. And what is the health hazard all about and what is the component of the health hazard the worker has by mistakenly consumed or something. And some of these health hazards can be rectified if the workers are wearing a proper PPE.

For example, a proper respirator or a mask can easily prevent the workers from inhaling all the dust or maybe the toxic gases, fumes or vapour present in the construction site. If he wears a proper hearing protection, all these noises induced sounds can be minimized. So, there are some PPEs which can at least minimize the hazard to a worker. Now factors which influence or which promote these health risks in a worker are constantly changing job environments and conditions.

So, what happens is in due course of time, if a worker is picking out some infection or some disease or some hazard, health hazard, they do not even have a clue what from where they picked out and what has happened? And from which contractor he was working under or from which

type of a project he was working under. Because many of these health hazards it takes ages, 2 or 3 years or maybe 5 years or even 10 years down the line who pick up all these infections.

So, diversity of work activities, and all these years if there is no chance that this worker was working on the same job only, he would have changed his job routine from projects to projects because of multiple contractors, subcontractors. So, even he the worker himself would not have done the same activity but he would have picked the infections because of the bystander exposures.

Because he is standing in the midst of so many activities which are going on in site, he would have picked out so many infections. And the other issue is unskilled workers, many of these workers are not even aware of what is the problem or what is the hazard they are going to where in their lifetime if they are not wearing a proper PPE. For example, you should wear a proper safety shoes and even you wear proper gloves, so that the cement and other particles are not getting into your skin and getting in, that is not in contact with your skin and other issues.

So, most of this awareness if the worker is not is really clear off because of their ignorance or because of their education issues. So, what happens is, they pick out all these infections slowly into the construction sites.

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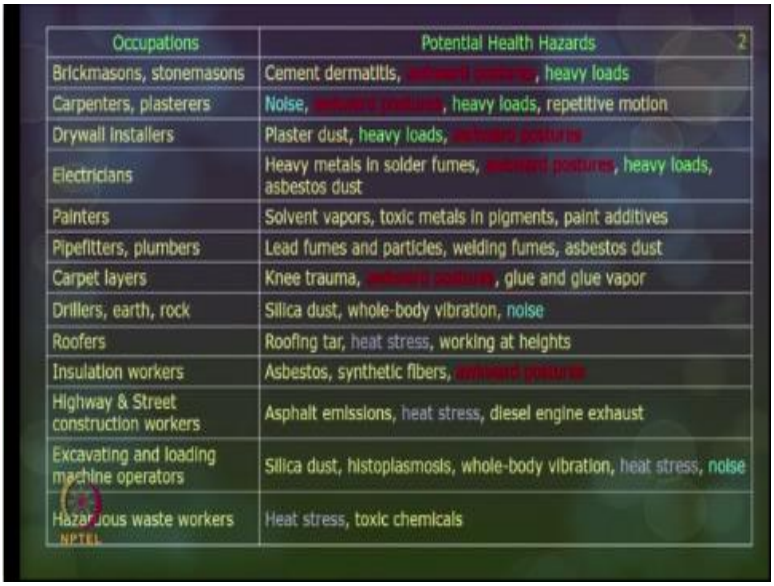

The next is what are the different hazards which are primarily in a construction site? So, I am just going to pick out few of the occupations in the construction site and the potential health hazards. For example, brickmasons, stonemasons, cement dermatitis, awkward postures, heavy loads, carpenters or plasters, noise, awkward postures, heavy loads, repetitive motion. Drywall installers again plaster dust, heavy loads, awkward postures.

Electricians, heavy metals in solar fumes again awkward postures, heavy loads, asbestos dust. Then pipe fitters, plumbers lead fumes and particles, welding fumes again asbestos dust. Carpenters, knee trauma, awkward postures and so on. Drillers, again silica dust, whole body vibration, noise. Then you have highway and street construction workers, asphalt emissions, heat stress, diesel engine exhaust.

Then hazardous waste workers, heat stress, toxic chemicals. Excavating and loading machine operators, silica dust, whole body vibration, heat stress, noise and so on. I have highlighted few of the hazards in some colours to show that there are many health hazards which are there in most of these operations. For example, awkward postures, you find almost in every activity in construction work starting from brickmasons and stonemasons, carpenters, in drywall installers then carpenters, installation workers you find almost everywhere.

If you look at heavy load, handling heavy loads, it is again dead with brickmason, stonemasons, carpenters, drywall installers, then electricians are almost there. Heat stress, most of these works are done primarily in the open environment obviously you may have heat stress. Anyway, our country is not is primarily in the cold region, otherwise cold stress also has to be taken care of. So, most of these are primarily ergonomics related which we will see in the next lecture. So, today's lecture, we will talk about the different types of health hazards.

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So, there are actually 4 types of health hazards which the researchers have broadly classified starting from physical, chemical, biological and ergonomic. So, ergonomics alone is a very vast topic which we will see in the next lecture. So, today's lecture we will primarily discuss about physical, chemical and biological. And also keep in mind not just a single health hazard is seen in any construction work, it is always a combination of all these works.

And ergonomics is the most frequently occurring construction hazard. And if you look at the statistics on injury statistics, many of these injuries are primarily related to ergonomic hazards only**.** In right now, the trend is ergonomic related hazards are actually even number one compared to even the fatal fours in construction sites.

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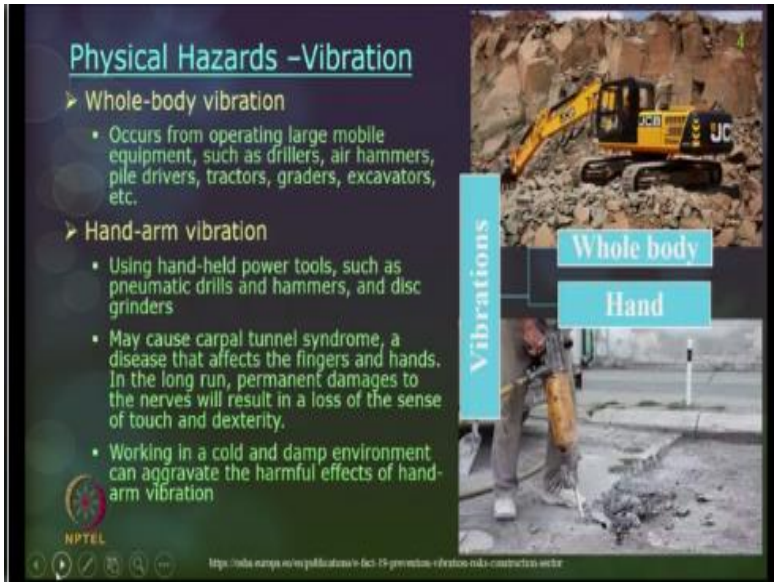

Now physical, so the physical hazards, so primarily you have the whole-body vibration or a hand-arm vibration. Whole-body vibration primarily when you do excavation, loading work and so on, hand-arm vibration primarily when you are vibrating and making the concrete penetrates into the reinforcements, so there you may have the hand-arm vibration. So, whatever it is, the vibration is one of the hazards which is just which is affects the human system primarily the nervous system of any human being.

So, whole body vibration occurs primarily in large mobile equipments. It can be excavators, primarily any type of excavators or drillers or hammers, pile drivers, tractors, graders and so on. Hand-arm vibration using handheld power tools, such as pneumatic drills or hammers and so on. And also, with the vibrators and this can cause carpal tunnel syndrome a disease which affects the fingers and the hands and in the long run it may have even loss of sense and touch in the sense organs.

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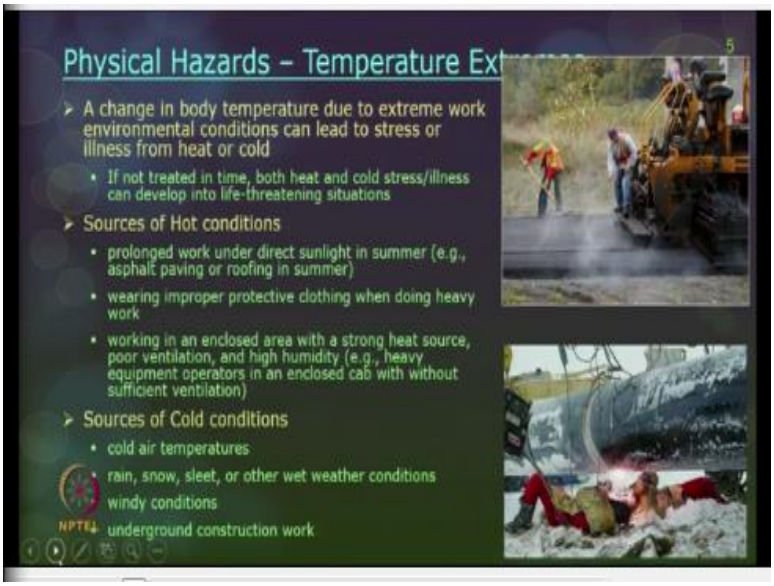

And when you are working in extreme hot or cold temperature it can have severe impacts as well. So, physical hazards are temperature extremes, so the change in body temperature due to extreme weather environment, it can lead to either stress or illness either in from your cold or from your heat environment. And if you do not treat both heat stress or cold stress are generally, they are life threatening situations.

Sources of hot conditions prolonged work under direct sunlight in summer, for example, asphalt paving or roofing in summer wherein improper protective clothes when doing heavy work. Working in an enclosed area for example, where heat is generally produced for example, confined spaces and so on. Or maybe in an enclosed cab where the equipment operators are working without proper ventilation and sufficient respiratory systems there.

Sources of cold conditions, cold air temperatures, rain, snow, etc. can also aggravate windy conditions or underground construction work can also be some of the situations.

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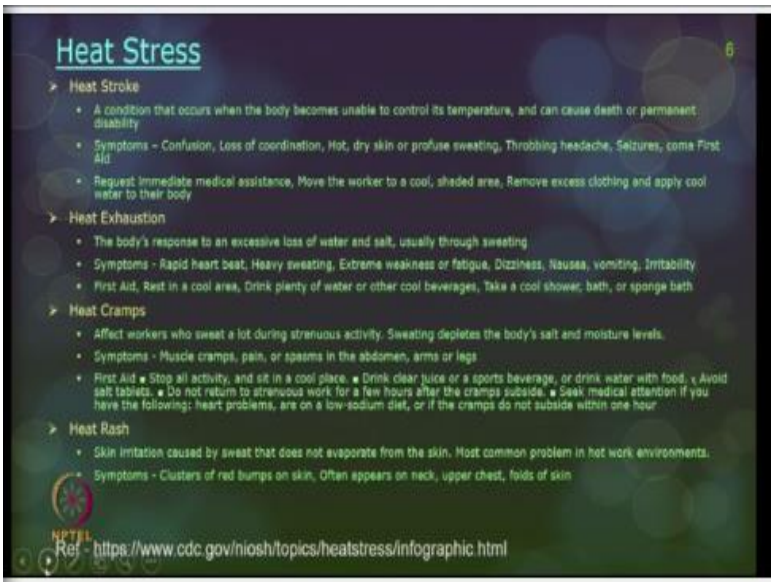

Now let us discuss about heat stress. So, heat stress can result in several different health hazards, starting from heat stroke, heat exhaustion, heat cramps and so on. And there are other types also. So, heatstroke it is a condition in which the body becomes unable to control it is temperature and can cause death or permanent disability. Symptoms can be confusion, loss of coordination, hot, dry skin or profuse sweating, throbbing, headache, seizures and so on.

And primarily you have to go for first aid immediately. And if the worker is not responding, then you may have to go take the worker to a medical physician. Heat exhaustion, the body's response to an excessive loss of water and salt usually through sweating, symptoms can be rapid heartbeat, heavy sweating, extreme weakness or fatigue. Sometimes if it is continuous or prolonged you may have dizziness, nausea, vomiting and so on.

Primarily first aid treatment should be advisable and then make the worker rest in a cool place. Give him lot of water and other cold beverages, so that the temperature is controlled. Heat cramps, when the workers are doing a very heavy strenuous activity, especially in a very hot summer, and the workers can sweat a lot. And this sweating depletes the body salt and moisture level symptoms can be muscle cramps, pain or spasms in the abdomen, arms or legs.

So, first aid and the worker have to stop all the work and rest in a cool place. And again, medical attention is required if the worker is slowly responding. Heat rashes, skin irritation caused by

sweat that does not evaporate from the skin, and it is a most common problem in hot environments sometimes you may also see blisters along with the rashes. Symptoms, clusters of red bumps on the skin which is primarily called and rash or a blister.

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And next is cold stress, again there are so many different varieties here. So, we will be talking about hypothermia, frostbite and immersion or trench foot. Hypothermia, it occurs when the body heat is lost faster than it could be replaced and the normal body temperature drops to less than the normal which is 95 degrees. Moderate to severe symptoms, so when the body temperature starts falling off, symptoms will work will start worsening, shivering will start happening.

And the person may be unable to walk, stand, the pupils became dilated and the piles and breathing becomes slowed and loss of consciousness can also occur. A person can even die if proper medical attention is not given to the worker. First aid has to be given, move the worker to a warm place and then dry place and you have to give him adequate blankets and so on, so that the worker is comfortable and he is recovering from the hypothermia.

Frostbite, it is primarily an injury that is caused by freezing of the skin and the underlying tissues and the lower the temperature the quicker the frostbite occurs. So, it primarily affects your hands and the legs and the amputation may be required in some cases if the damage is very severe.

Symptoms can be reddened skin develops which is grey with white patches, numbness may be there in the affected part and you feel firm or hard.

And the blisters can also be seen in all these places. First aid, do not trap or try to burst out all these blisters, you have to apply water and clean the blisters and not to break the blisters and take care of medical aids. Immersion or trench foot, it is primarily caused by prolonged exposure to wet and cold temperatures, non freezing injury occurs because wet feet loose heat 25 times faster than a dry foot.

So, to prevent this heat loss, the body starts contracting the blood cells to shut down the circulation in the feet. And as a result, the skin tissue begins to die and because of lack of oxygen and nutrients. And in the symptoms can be redness of skin, swelling, numbness and blisters.

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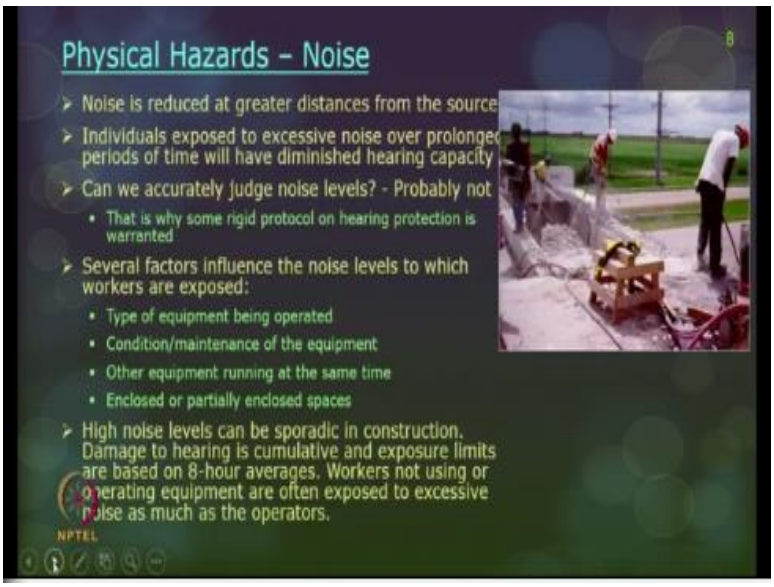

The next physical hazard is noise. So, noise is primarily reduced at a greater distance if you are from the source. But what happens is in construction site even if some other activity is going on and you can be away from but since there are so many activities going on in a site, especially in a very congested site. You do not have enough places to get away from the noise coming out in the construction sites.

And individuals exposed to excessive noise over prolonged periods of time will have diminished hearing capacity. And if you do not treat or if you do not do a proper hearing protection, it may become permanent hearing loss. So, hearing protection wherever required you have to wear a proper hearing protection because judging a noise level whether it is safe or unsafe, or has it exceeded the nominal level and so on, it is very difficult to judge.

So, several factors which influence the noise levels where the workers are exposed can be type of equipment that is operated. Condition or maintenance of the equipment, other equipment running at the same time, sometimes there can be 3 or 4 equipment which are even above the normal permissible level which an ear should hear. And you may be seen so many equipments running alone enclosed or partially enclosed spaces.

So, high noise levels can be sporadic in construction. So, damage to hearing is cumulative but exposure limits are based on primarily 8-hour averages noise levels. Noise levels are generally measured in decibels.

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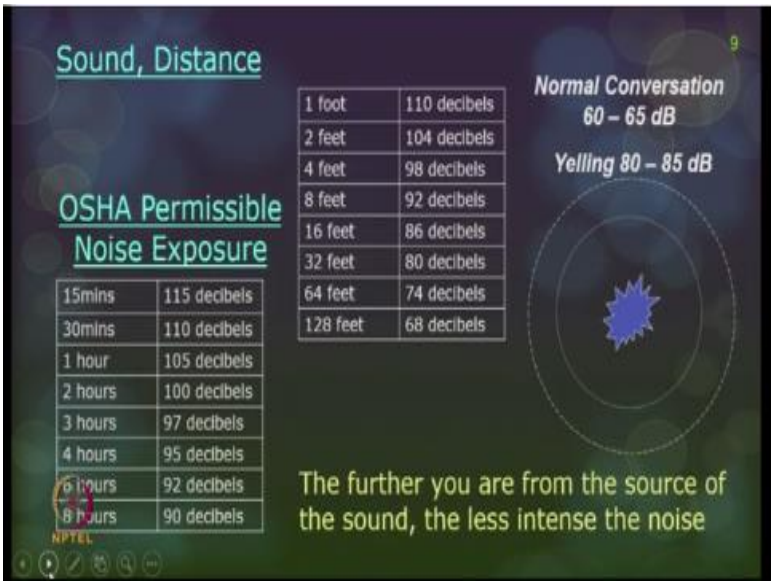

And that chart as given from OSHA we will see here. So, normal conversation is primarily 60 to 65 decibels when you are yelling at someone, when you are shouting at a very high pitch the noise levels is primarily 80 to 85 decibels. And what does OSHA say is the permissible noise

levels exposure, it ranges from 8 hours 90 decibels in the normal, 90 decibels continuously you hear for 8 hours it is normal for your ears, 6 hours 92 decibels.

So, primarily when the noise is impact is too much then the time exposure should also be minimal. 4 hours 95, 3 hours 97, 2 hours 100 and so on, 15 minutes is 115 decibels. And also, the same noise when you are far away from the source the sound actually starts diminishing. So, when you are at 1 foot, you could hear 110 decibels the same sound when you are 2 feet away you will hear 104 decibels, when you are actually 4 feet it is 98 decibels.

And as and when, when you move ahead of to 64 feet actually it is starts diminished to 74 decibels and when it is 128 feet you hear only till 68 decibels. So, there is a proportion of distance and so on, suppose if we have a spacious construction site then you should think of keeping the bystander exposures at least away from the source of sounds.

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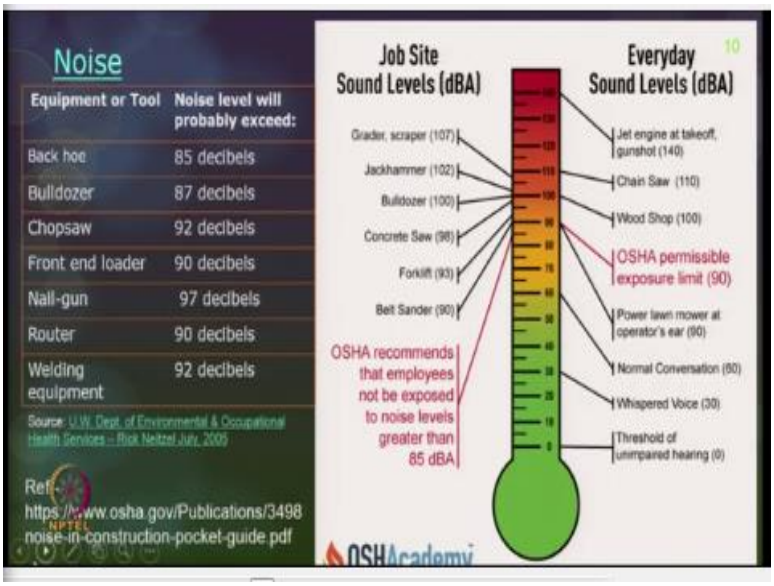

And what are the equipments which is seen in the construction site which has a very high noise levels, which is above the yelling noise**.** Backhoe, generally has 85 decibels, bulldozer 87 decibels, chopsaw 92 decibels, front end loader is 90, nail gun 97, router is 90, welding equipment is 92, grader or scraper is 107, forklift is 93, then chainsaw is 110 and. So, whispered noise is 30 and normal conversation is 60. So, this is how the different noise which is heard or seen in a construction site as measured in decibels.

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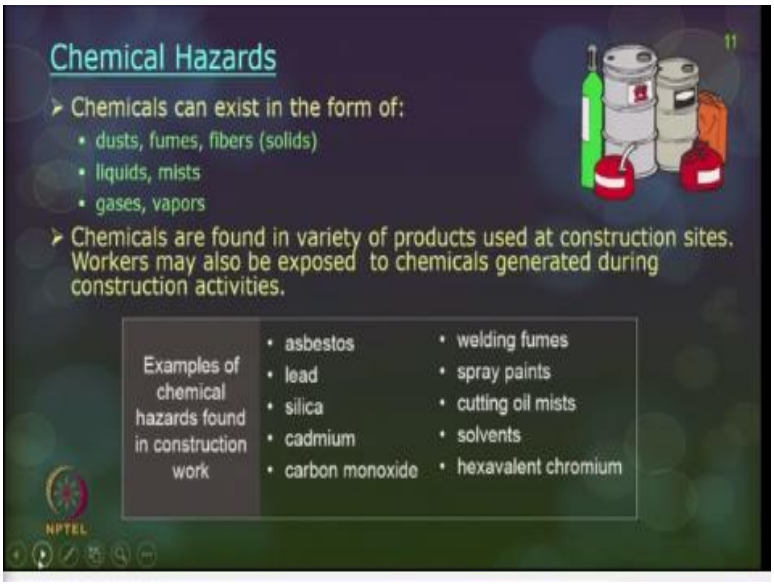

So, now you cannot avoid working in with any of the equipments in construction site even as a bystander exposure or as an operator. The one thing which you can do is at least try to wear a proper hearing protection, so that the noise levels are not impacting your ears. The hearing protection we have discussed earlier along with the PPEs. So, you have ear muffs, ear plugs or canal gaps, there are a lot of varieties of ear protection are coming these days.

And mere cotton will not serve the purpose of the noise protection in your ears. So far we have discussed physical hazards. So, physical hazards starting from your vibration, whole-body vibration and hand-arm vibration. Temperature extremes, heat and cold extremes, then noise may have seen. The next hazard is chemical hazards, chemical hazards can come in different forms, how do you take in the chemicals into your body.

So, it can be in the form of dust or fumes or fibres, it can be in the form of liquids or mist, it can also be in the form of gases or vapours. Chemicals are found in different byproducts used in the construction sites, not just 1 or 2; so many chemicals are used for different, different parts of the construction building. So, workers may be exposed to all these chemicals primarily when they are doing the construction activities.

Examples of chemicals, asbestos, lead, silica, carbon monoxide, cadmium, welding fumes, spray paints, cutting off mess, then solvents, hexavalent chromium and so on.

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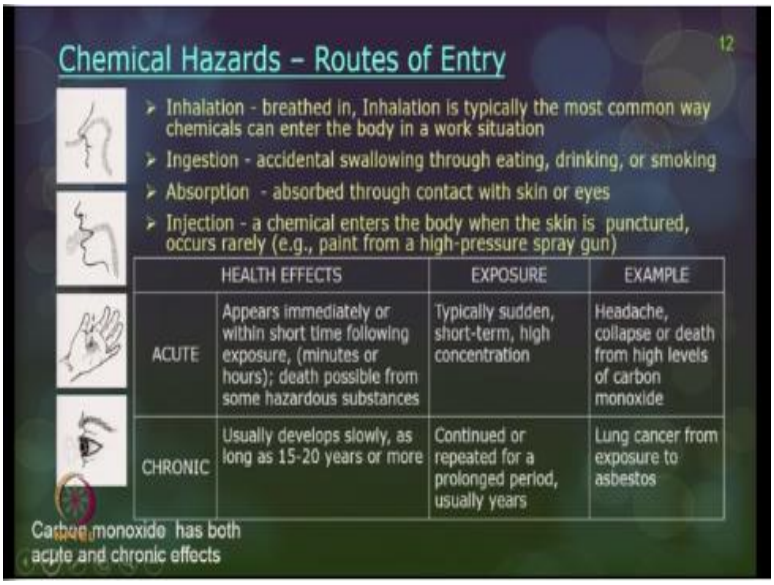

So, now let us discuss one after the other where is the source? How is it inhaled or how is it entering into the body? What are the different hazards it causes and so on? Chemical hazards number 1, that we have to note down is what is a route of entry for all these chemical hazards? There is minimum 4 forms at which these chemicals enter into your human being**.** Number 1 is inhalation, so inhalation is nothing but breathing in.

So, when you are breathing air along with the air some of these chemicals in the form of dust or fumes in the vapour stage can enter into the human beings. In the next is ingestion, ingestion is accidentally you are swallowing while you are eating, drinking or smoking. So, primarily without washing your hands or without completely cleaning your hands if you have taken some food or if you have tried to drink something.

And by mistake you take away all these chemicals also inside. Absorption, it can be absorbed through contact with the skin or eyes. Injection, so a chemical can enter the body when the skin is punctured maybe you had a little scratch or something. So, as a result you had entered this chemical or maybe through some cuts or punctures then you are actually taken up the hazard also into your body.

So, these health effects are primarily of two categories, one is acute, other one is chronic. Acute implies the effects are very seen very immediately within a short span of time following the exposure maybe minutes or hours and sometimes even death can also happen. And some of these chronic usually develop very slowly, it takes even 5 years, 10 years, sometimes even 15, 20 years or even more. And primarily what happens is you would have had this exposure very frequently and repeatedly over a prolonged period of time. And that is where you would have caught up all these infections.

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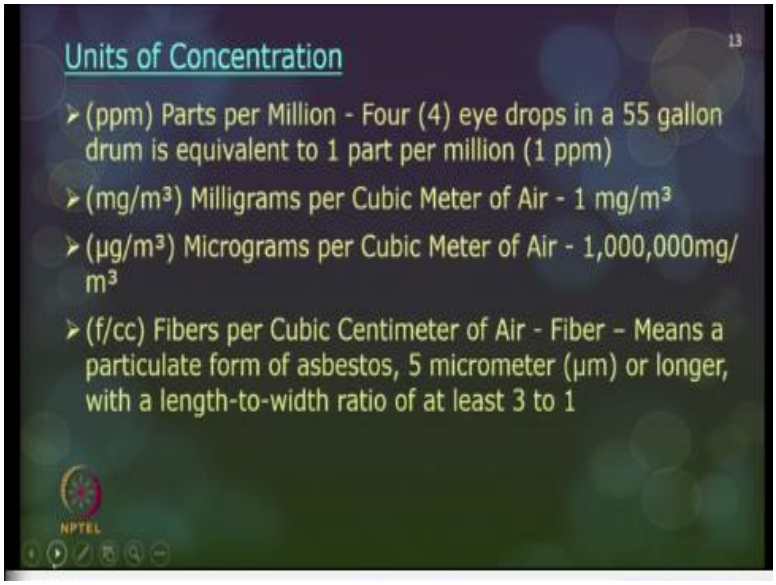

Now how is the measurement when you talk about chemical hazard, how is a measurement done? Chemical hazards are generally measured in terms of different units, we call it as a units of concentration ppm, mg per meter cube, micrograms per meter cube or fibres per meter cube. And if you fibers per cubic centimeters, ppm is nothing but parts per million.

So, how do you define or how do you assess these parts per million maybe 4 or 5 drops of a chemical in a 55-gallon drum of water is primarily called 1 part per million. Milligrams per cubic meter of air is primarily 1 mg in 1 cubic meter of air, 1 microgram in 1 cubic meter of air. And fibers again it means a particulate form of asbestos. So, 5 micrometer or longer and which is just in a in 1 cubic centimeter of air**.**

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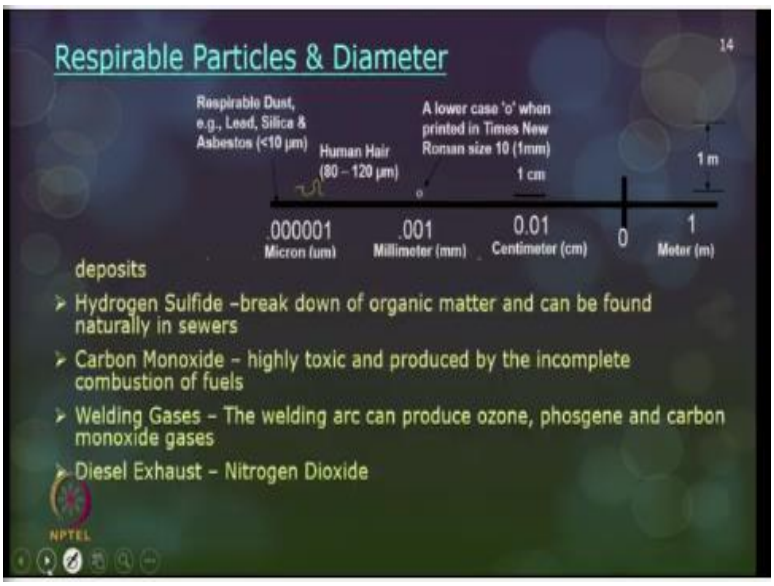

Respirable dust is primarily example lead, silica and asbestos and so these are actually in terms of is very small microns. And in millimeter microns you have your fibers there is primarily size of a human hair. Then fumes, dust, mist, so they are also in terms of 1 micron to in primary a hair visible sizes. So, fumes are actually invisible and dust and mist you could see really see because of the colour or the odour from which you can really see.

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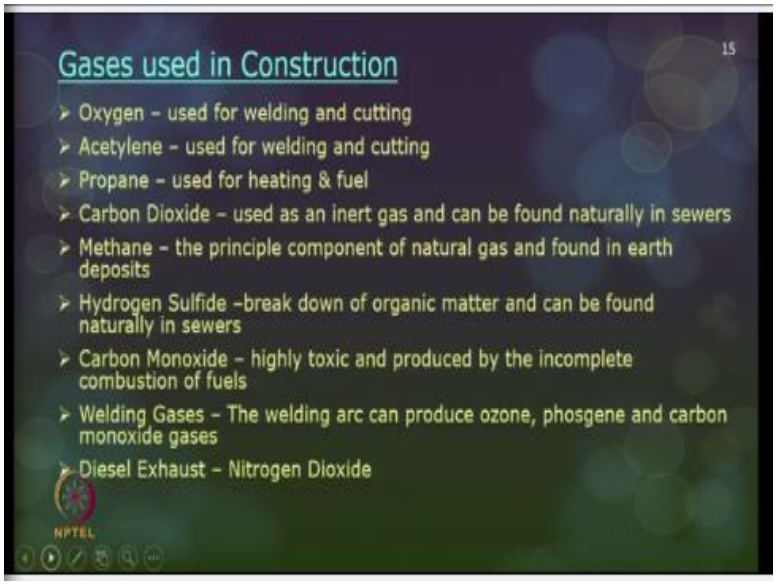

What are the different gases which are primarily seen in a construction site or used to perform some construction activities? Number one oxygen, oxygen is used for welding and cutting. Acetylene is also used for welding and cutting, propane is used for heating and fuel. Carbon dioxide is used as an inert gas and can be found naturally in sewers, methane it is a principle

component of natural gas and found in earth deposits. Hydrogen sulfide is a breakdown of organic matter and found naturally in sewers, carbon monoxide highly toxic and also is seen in the construction sites. Then welding gases, diesel exhaust primary the nitrogen dioxide.

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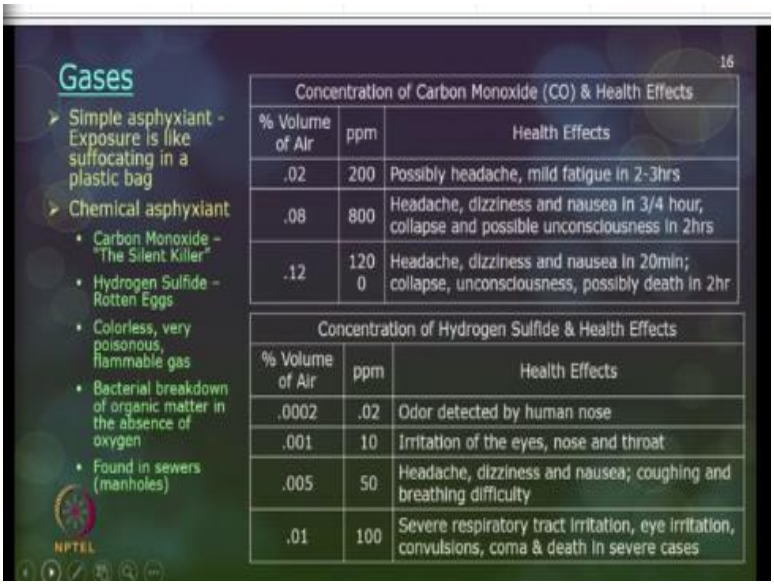

So, the gases primarily there are two types, one is simple asphyxiant and other one is a chemical asphyxiant. Simple asphyxiant is like exposure in primarily in a suffocating plastic band. Assume that you are inside a plastic bag and the suffocation that is primarily called an simple asphyxiant. Chemical asphyxiant will have a chemical also along with the suffocation.

Number one is carbon monoxide is generally called as a silent killer. And the next one is hydrogen sulfide. It is also called rotten eggs because the smell of the hydrogen sulfide is primarily equivalent to a rotten egg smell. And hydrogen sulfide is generally colourless, but it is very poisonous and also it is a flammable gas. And it generally starts happening because of the bacterial growth and because of the absence of oxygen.

And most often this is found in sewers and manholes**.** Now, what is the concentration of carbon monoxide and what is the health effect? Very less percentage of volume of air of carbon monoxide, you generally have a headache or mild fatigue in just 2 to 3 hours. But 0.1 to primarily 1200 ppm of carbon monoxide, headache, dizziness nausea in 20 minutes, sometimes unconsciousness, collapse and possibly even death in next 2 hours.

Hydrogen sulfide 0.0002% of volume of concentration which is nothing but 0.02 ppm. The odour can be detected by normal human nose. And when the ppm level is 10, irritation of the eyes, nose and throat when the ppm level goes to 100, severe respiratory tract irritation, eye irritation, convulsions, coma and sometimes even death in severe cases.

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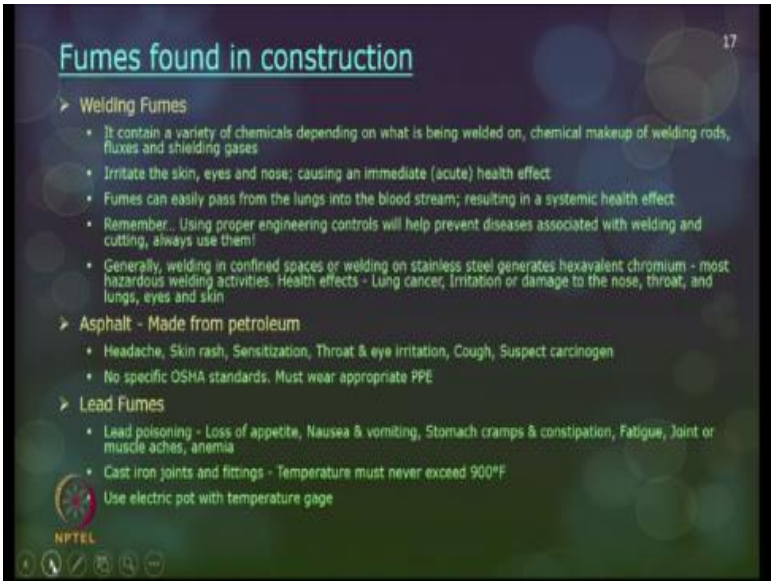

So, this is all about on the asphyxiants. The next is fumes where are all the fumes found in construction? It can be seen in welding fumes, welding activities, asphalt and lead. Welding activities, it contains variety of chemicals depending on what is welded? What chemical is used? Because there are so many types of welding activities are there, welding rods, fluxes, shielding gases, it can irritate the skin, eyes, nose causing an immediate health effect.

The fumes can easily pass through the lungs into the bloodstream resulting in a systematic health effect. So, you should have wear always a proper PPE in order to not inhale the fumes into your body. And generally welding in confined spaces or welding on stainless steel can also produce hexavalent chromium which is very, very dangerous and hazardous. So, health effects of hexavalent chromium, lung cancer, irritation or damage to the nose, throat, eyes, skin and so on.

Asphalt is made from petroleum headaches, skin rash, sensitization, throat, eye irritations and so on, and you should wear a proper PPE. The next is a lead fumes, lead poisoning, loss of appetite,

nausea, vomiting, stomach cramps and so on. And cast-iron joints and fittings generally you see lot of lead fumes.

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And use electric pot, so that you are avoiding the lead coming out of the air. So, now we have discussed about fumes, now dusts and fibers. Dust is nothing but solid particle suspended in the air and they may be produced by crushing, grinding or maybe due to sanding or sawing and because of some activity or other that you do in the construction site. So, the different dust and fiber forms you see on crystalline silica, quartz and asbestos.

Crystalline silica, so silica or the quartz dust is primarily very hazardous and it is very common an exposure in construction site. So, the exposure to excessive silica dust can cause lung scarring and lung disease over some period of time. Silicosis is a common disease of the lungs due to the breathing of dust which contains the crystalline silica particles. And so far, there is no cure for silicosis.

Exposures can be concrete cutting, slant blasting for surface preparation, crushing and drilling rocks for concreting, masonry and concrete work, then mining, tunneling work, demolition work, cement, asphalt pavement and so on. Respiratory protection must be used in conjunction with other safety practices. Primarily you may have to have a wet sort of a cutting and mixing in the construction site.

Quartz, it is generally produced from sand, gravel, clay or granite and other forms of rock. Smaller particles can be inhaled very deep into the lungs and can cause damage, asbestos exposure during demolition or remodelling jobs. And what happens is the infection can cause asbestosis or mesotheiloma which is a rare form of cancer that develops from the protective lining that covers many of the body's internal organs.

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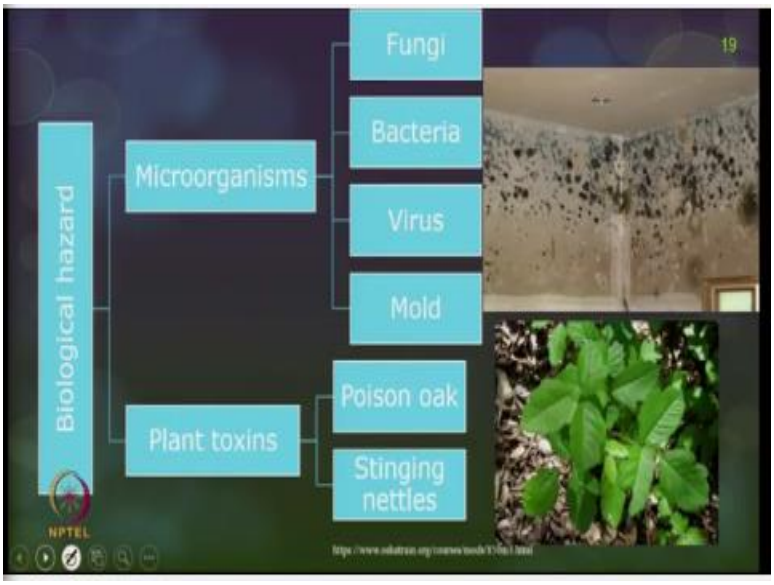

Next is biological hazard, primarily in terms of microorganisms or plant toxins. Microorganisms can be fungus, bacteria, virus and mold, plant toxins can be poison oak or poison stings. Biological hazards, exposures can occur primarily during demolition work, renovation work, sewer treatments or work on air handling street systems and so on.

And primarily when you are contacting a disease carrying organism or a plant along with the soil exposure, water exposure or directly with insects or bird or bird droppings, animals are old unsafe or unhealthy structures. And if you stake off the poisonous plants, poison ivy or poison oak and so on, contact with that primarily in the soil can also give you contact dermatitis which is primarily itches along with the rashes.

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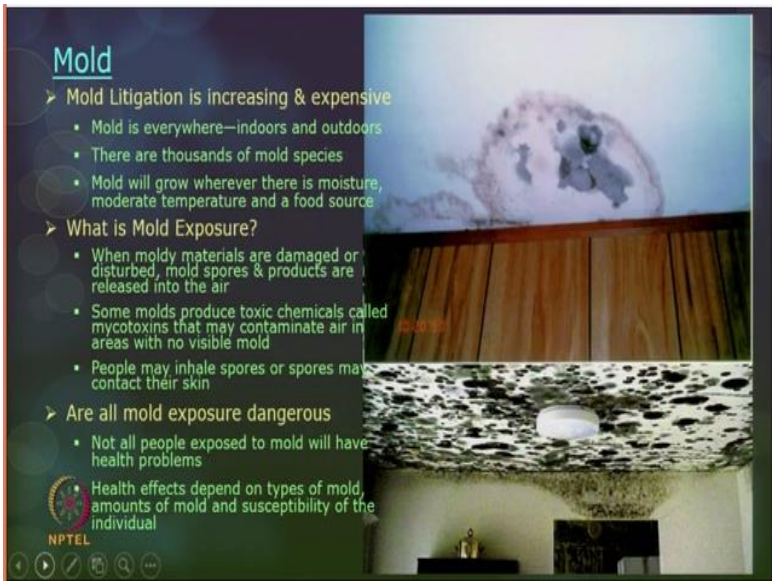

So, in biological hazard the one very hazardous is molds, molds litigation is still increasing an expensive even till date. Mold is seen everywhere indoors, outdoors and so on, the minute you have lot of moisture and oxygen mold starts growing and it is a very unhealthy situation. And you see in every even after construction you may see so many of these molds coming in. And molds are primarily visible in demolition structures, primarily when the workers are trying to demolish a structure where molds are there then they pick up all those hazards.

There are thousands of mold species and not all of them are really dangerous, but there are some molds which are really dangerous to human beings. Molds will grow when there is moisture, moderate temperature and a food source, what is a mold exposure? When the molds materials are damaged or dispersed, the mold spores or products are generally released into the air. And some of these molds they produce toxic chemicals which we call it as a mycotoxins.

And that contaminate with the air and what happens when you inhale the spores or the spores may contact your skin? Then you start getting all the molds infections. So, not all the mold exposures are dangerous primarily depends on the resistivity level or your hygiene level of your body and your immune system, you generally pick up those infections with the molds.

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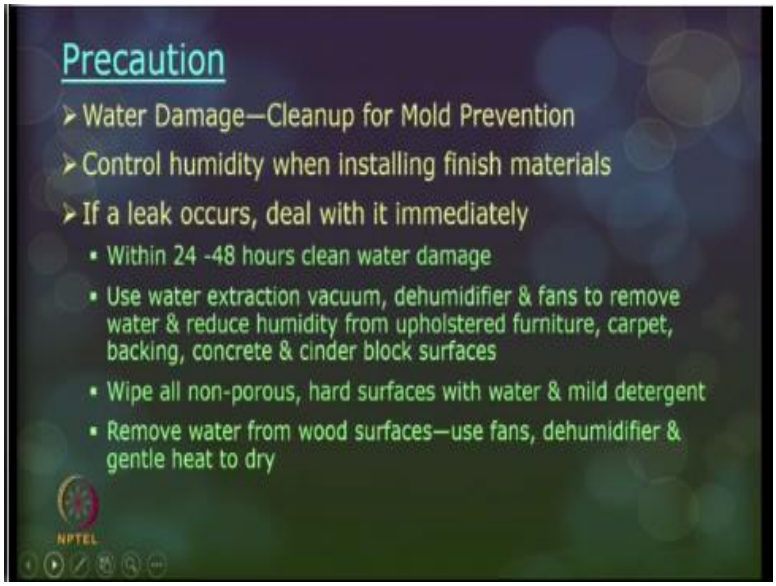

Precaution, try not to accumulate water, clean up all your water systems, so that you are very clean with the no mold growing up. Whenever there is a leak in the pipe or something immediately attend on the molds are not growing up. Wipe all wooden types of fittings of wood or exposures with no water, so that the molds will not have a place to grow and so on.

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So, with this we have discussed physical hazard, then chemical hazard and also on biological hazard**.** And quick recap, so physical hazards, we have discussed about whole-body vibration and hand-arm vibration, noise, heat extreme temperatures and cold extreme temperatures. So, we have lot of quick cards and fact sheets from OSHA which will help you to understand and list it out the different things that we have discussed.

What is the heat illness? The risk factors for heat illness, symptoms for heat exhaustion, symptoms for heat stroke, and how to prevent the heaters are all seen in this OSHA quick card.

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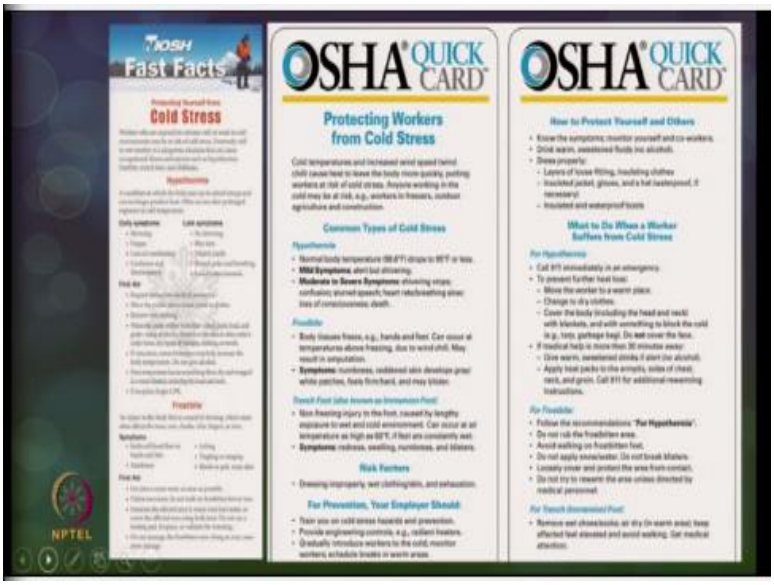

Same way for cold distress, you have NIOSH fast facts on cold stress and how to protect the workers from cold stress especially with hypothermia, frostbite and trench foot. And also, what are the risk factors and how to protect yourselves, that is also given in the quick card.

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Recap, again so this is on the physical, the next is chemical, chemical we have seen lot of different chemicals found in terms of dust, fibers or vapours or in gas forms and liquid forms.

And if you see, so we have discussed about hexavalent chromium, silica, then asbestos, quartzite (36:19) crystals. We have discussed so many chemicals which are seen in construction sites.

And we have also discussed about asbestosis, silicosis then carbon monoxide and so on. So, most of these are through inhalation or contact with the skin dermatitis problems, commonly you see with all these fumes. And you have to have a proper respiratory system, so that you are primarily safe. In the lot of quick cards on protect yourself from silicosis, protect yourself from lead in construction and also carbon monoxide poisoning.

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So, last recap is on what are the different respirators. So, respiratory protection must be worn whenever you are working in hazardous atmosphere. And the appropriate respirator will depend on the contaminants to which you are exposed and the protection factor. So, there are so many types of masks, single strap dust mask, they are not NIOSH approved, they must not be used to protect against hazardous atmospheres, but they are primarily for molds or allergens.

Approved filtering facepieces which is called as a dust mask, they can be used for dust, mist, welding fumes etcetera. They do not provide protection from gases or vapours, so do not use for asbestos or lead but you can still use the same for filtering on dust and other fumes which are present in the air. Half face respirators can be used for protection against most vapours, acid gases, dust or welding fumes.

Cartridges or filters must smash the contaminants and you should be also maintaining all these respirators. Full face respirators, they are more protective than the half face they can be used for protection against most vapours, acid gases, dust or welding fumes. And this face shield can protect your face, eyes from irritants and also from the contaminants. The loose-fitting powered air purifying respirators which are often for breathing comfort from your battery of powered fan.

Which pulls out through the filters and circulates the air through the helmet or the hood and they can be worn by most workers. The next is self contained breath apparatus, which we call it as is SCBA. SCBA is most often used as a leading respirator recommended in construction industry, it is used for entry and escape, primarily in confined zones or atmospheres. That are considered immediately dangerous to life and health or oxygen deficient.

So, they have their own air tank along with the apparatus, so this primarily on the recap. And the last one we have seen is on biological hazards. So, primarily from organisms, microorganisms or plants, plants generally the poison ivy or poison oak and contact dermatitis is only one exposure hazard you may see. And especially in microorganisms there are so many types available but we have discussed on molds.

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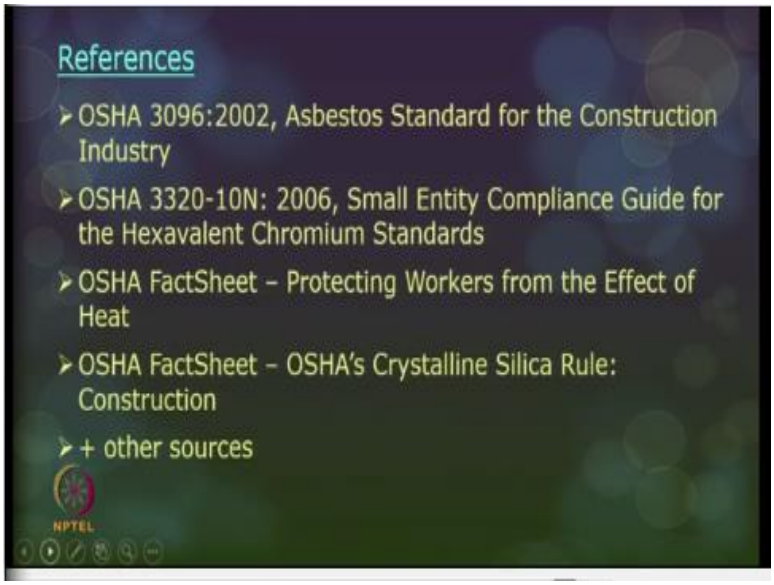

And these are the different references from where I have picked out all these materials, and there is no proper standards or guidelines as to how to be healthy? But one thing to keep in mind when you are wearing a proper PPE, you can actually minimize the exposure on health hazard into the human body. Thank you.