Safety in Construction
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Lecture-19
Electrical Safety

So, this week primarily we will be discussing about electrical hazards and fire hazards. So, when as such we are discussing on the 4 fatal hazards, falls, cave-ins, then struck by or caught in between and the next in the list will be electrocution. So, primarily electrocution is an effect when you have an electrical hazard. So, now in this lecture we will be discussing about what is electricity, what happens, why workers should be really worried about when they are working with electrical equipments or maybe with electrical when they are working very close to an electrical appliance and what is the safe precaution advice? So, all these will be discussing in today's class.

So, what is electricity? Electricity I think many of these issues are known to you, but still to make everyone understand the same line. So, I have brought a few background basic issues, so, that you will understand what exactly we are moving into. Electricity flows through conductors.

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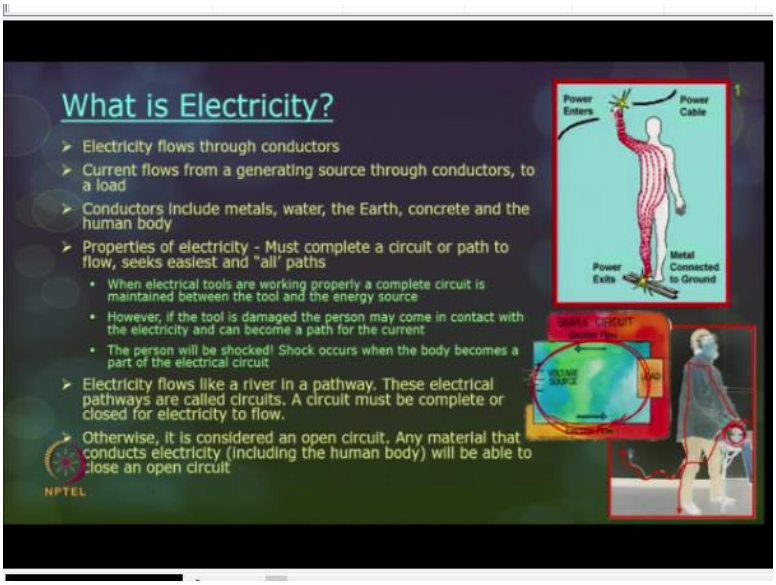

So, current flows from a generating source through a conductor to a load. So, if you see here always the current flows from positive to negative source. So, this is like this and conductors, we also have 2 terminology called conductors and insulators. Conductors are the ones which

will actually enable the movement of flow of electrons in the circuits and insulators will actually will not be a allowing a free movement of electrons in a particular direction.

So, as such you do not have an electrical energy passing on. So, example for conductors, metals, water, earth, concrete, sometimes human body can also become a conductor. So, properties of electricity, so any electrical circuit should have a complete path and it should have a complete circuit, there should be a connection also and a path to flow and what happens is whenever the connection is enclose it tries to see all the easiest and all possible paths for the electrons to flow around.

When the electrical tools are working properly a complete circuit is maintain between the tool and the energy source. So, when this is fine, then that is no problem, when this tool is not working or damaged or some problem has happened, then the person who is working the tool will come in contact with the electrical source and he will become a path for the current. So, the circuit starts connecting along with the human body and he starts to get a shock, the person gets a shock and shock occurs when the body becomes a part of the electrical circuit.

So, electricity flows like a river in a pathway. So, the electrical paths are always called circuits. A circuit must be complete or closed for the electricity to flow. So, sometimes we also put resistance to stop the flow or to at least divert the flow. So, that is also happens and when you place a bulb or something in the mean way, the light actually glows because of the conversion of electrical energy to light or heat energy. So, if the circuit is not closed, it becomes an open circuit.

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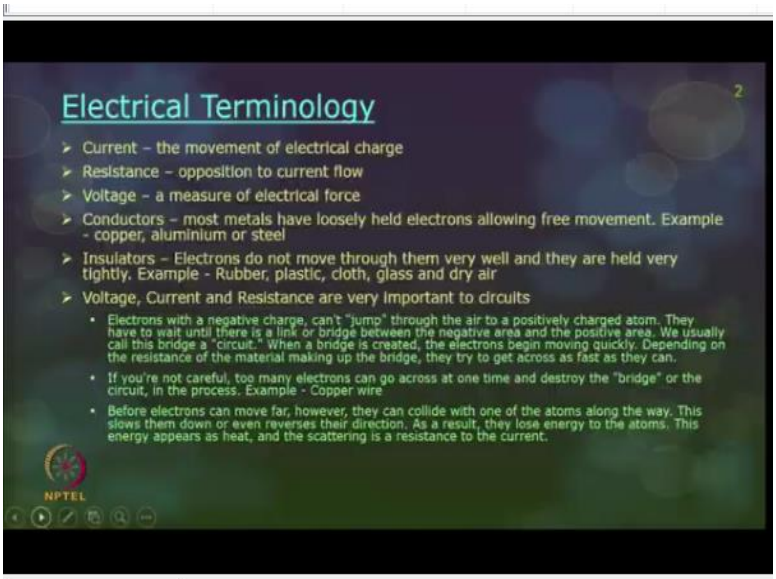

So, any material that can conduct electricity will be able to close that open circuit if the circuit is not closed properly, some of the terminology with electricity current. So, the movement of electrical charge is generally termed as current. Resistance: the opposition to current flow is called resistance. For example, suppose if you are taking an example of the garden hose which you use for watering the plants.

So, the current is generally like the water and the resistance is maybe like your tap or something which you close and open. And the voltage it is a measure of the electrical force. So, conductors most metals have loosely packed electrons allowing a free movement of electrons to flow through. Very best example for conductor, copper, aluminium or steel. Insulators, electrons that do not move through that freely and they are held very tightly then they are called insulators.

Examples can be rubber, plastic, cloth, gas, glass and dry air. So, voltage current and resistance are the 3 terms, you would have learned what is Ohms law and all, so very important in terms of circuits. So, electrons with a negative charge start flowing through and then it starts moving and meeting a positively charged atom. Now, what happens is these negatively charged atoms will not try to jump from one place to another place; it starts to transmit through a flow of medium which is primarily another atom in place.

So, now, what happens is they have to wait suppose if there is a break in the path they have to wait until a bridge is connected. So, this bridge can actually serve as a link or a bridge between the negative area to the positive area and we actually call this bridge as a circuit.

Now, very good example for a bridge in a circuit is the use of copper wires. Now, if you are not very careful too many electrons can start going across at one time and destroy the bridge also. And sometimes it can also be very slow progress of electrons as well based on the resistance you apply on to the circuit.

Before electrons can move for sometimes what happens they also try to collide with each other with the atoms along the way and hence the process slows down or sometimes the process also starts reversing in the process and as a result they start losing their energy.

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Now, what are the different types of electrical injury? So, electricity is an unseen killer, you cannot see the electricity, invisible to the human eye, it does not make any sound, it does not give any precaution that there is movement of electrical energy passing on. So, you do not get any notice or any signal at all and it also gives no smell or color or odour so whatever, it does not give any form of a symptom or a precaution.

Now, what are the different types of electrical energy? So, starting from electrocution, electrocution is nothing but death due to electric shock from interruption or stopping primarily it attacks the heart and damage to brain functions. Electrical shock, it is a next level of electrical injury, contact of a human body with any source of voltage high enough to cause sufficient current to pass through the muscles.

Now, the next one is burns, any burns with related to electrical accidents are really serious. And sometimes they all happen together and 3 basic types of burns are electrical burns, arc

burns and thermal contact burns. Electrical burns are a result of electric current flowing in the tissues and may be either skin deep or may affect even deeper layers such as muscles, bones and so on.

And the tissue damage is caused by the heat generated by the current flow and the energy delivered by the electric shock is high the body cannot dissipate the heat and the tissue starts burning. So, these types of electrical burns generally take time to heal, almost all of them they take very too long a time to get healed. Arc burns are result of high temperature produced by electric cords or by explosions which are close to the body primarily a worker is standing very close to these places then he may have an arc burn.

Thermal contact burn is primarily when you touch a hot surface, overheated conductor on a surface you may be getting a blister sometimes it may also turn out as a burn. If the current involved is very great enough then electric arcs start getting a fire also. So, arc flash is primarily extremely high temperature discharge produced by an electric fault, arc blasters. So, this is a picture to show the arc blast.

So, arc blast is like an explosion, high pressure sound waves passed by a sudden arc fault. Now what are the electrical hazards and how to prevent? So, let us first see what are the statistics in 2003 to 2005 the rate of death resulting from electrocution as documented is shown here.

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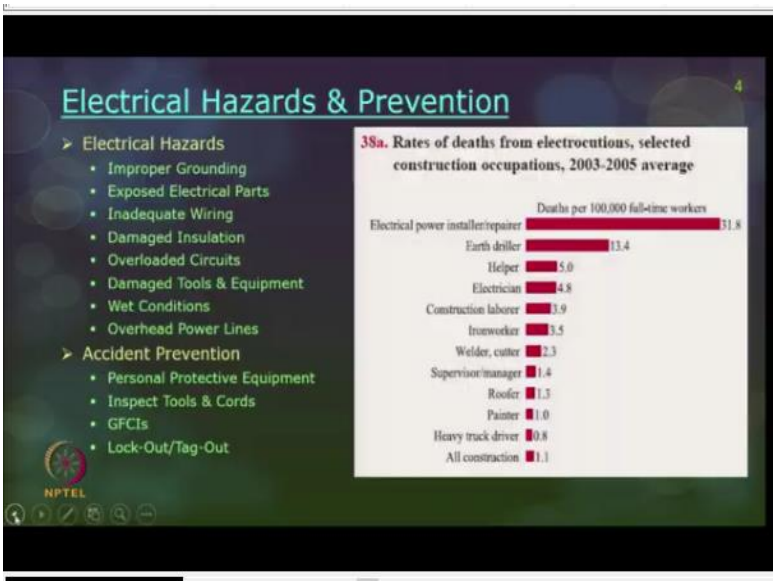

So, electrical power installer, deaths per 1,00,000, full time workers 31.8, earth driller 13.4, helper 5, electrician 4.8 construction worker 3.9 and so on. If you see there are so many electrocutions which has been reported and the electrical hazards if you see improper grounding, exposed electrical parts, inadequate wiring, damaged insulation, overloaded circuits, damaged tools and equipment, wet conditions, overhead power lines. Accident prevention, primarily you should have a proper PPE.

Anyway, PPE I am not covering for these the recent 2, 3 weeks because I have covered enough on PPE earlier. Inspect tools and cords, GFCIs, GFCI we will discuss and lock-out tag-out which we call it as a LOTO.

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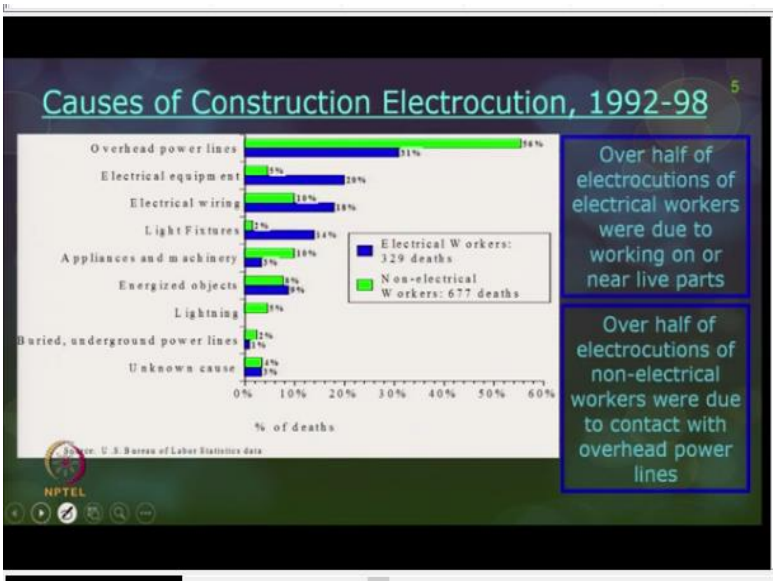

Now causes of construction electrocution. So, this is also the statistics taken for 6 years put together, overhead power lines is a number 1 of accident. This is primarily with regard to non-electrical workers, overhead power lines, then electrical equipment, electrical wiring, light fixtures, appliances and missionary, energized objects, lightning, buried underground power lines and unknown causes.

So, primarily if you see here the electrocution among the electrical workers were due to working on or close to live parts. And if you see electrocution with a non-electrical workers, many of them had electrocution because when they were working with overhead power lines, so, we will be discussing regarding these 2 why this hazard is happening and why this hazard and what to do for preventing that?

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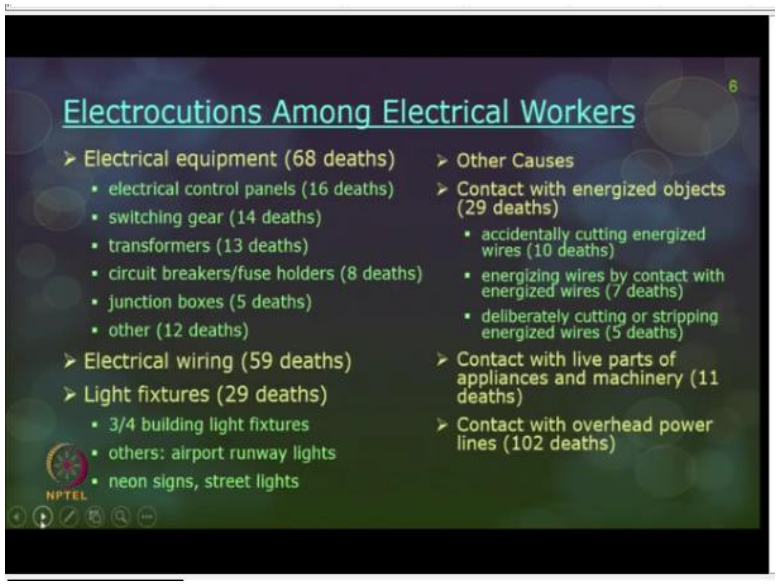

Now little detailed statistics on electrocution among electrical workers, electrical equipment 68 deaths, if you see the inner distribution, electrical control panels, switching gear, transformers, circuit breakers, junction boxes and others. Electrical wiring 59 deaths, light fixtures 29 deaths, three fourth for building light fixtures, others for airport, runway lights, neon lights, street lights and so on.

Other causes primarily contact with energized objects, contact with live parts of appliances and machinery, contacts with overhead power lines. So, these are the major causes of electrocution among the electrical workers.

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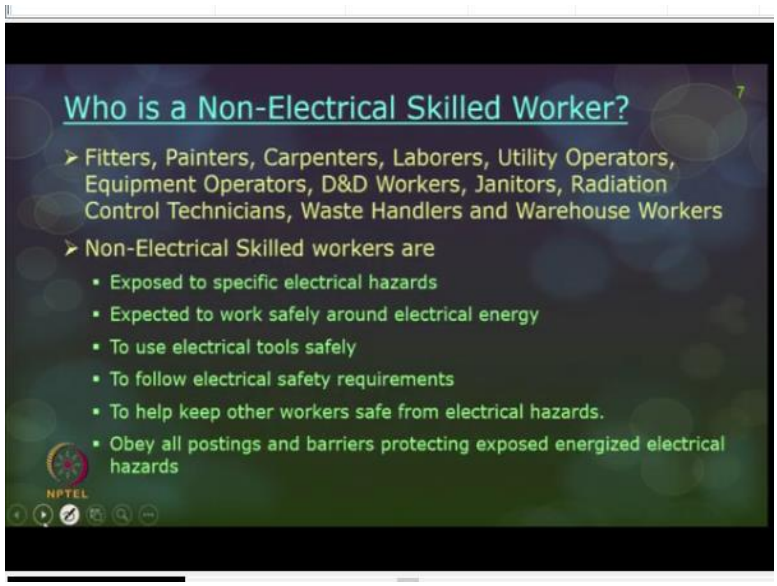

So, who is called a non-electrical skilled worker? So, a worker who does not know the basic knowledge of electrical engineering and who are supposed to work near electrical power

sources or appliances. They are primarily called non-electrical workers. Non-electrical skilled workers in construction include fitters, painters, carpenters, workers, utility operators, equipment operators, then radiation control technicians, waste handlers and so on.

So, these non-electrical skilled workers are exposed to several specific electrical hazards and if you do not train these non-electrical skilled workers, then they will not know how to safely handle the safe precautions in the construction sites.

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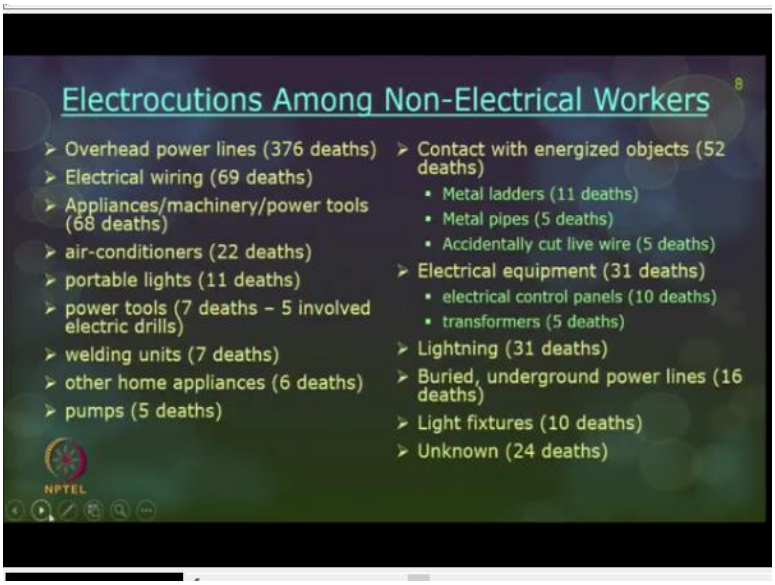

So, they may be handling electrical appliances without the background knowledge few checklists will be enough for them to be safe and they are working with electrical sources. Electrocutions among non-electrical workers overhead power line is the number 1 ranking among all of them. In the overhead power lines also if you see there are a lot of issues, one is operating on cranes or other excavating equipments, ladders, all these can all be sources of overhead power lines, electrical wiring, 69 deaths, appliances, machinery and power tools 68 deaths.

Air conditioners, portable lights, power tools, welding units, other home appliances pumps, contact with energized objects, metal ladders, metal pipes, accidentally cut live wires, electrical equipment, lightning buried underground utilities, light fixtures and unknown. Even though the reasons for electrocution among the electrical and non-electrical workers resemble the same, but the number of cases reported on electrocution between the 2 categories are different.

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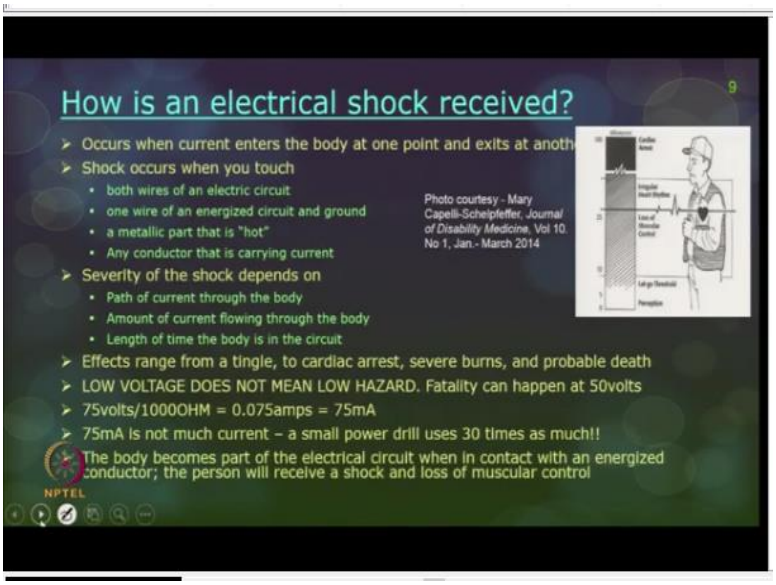

So, first we have discussed electrocution, electrocution is death resulting from electrical injury. Now, the next injury with regard to electrical hazard is electrical shock. So, what do you mean by electrical shock and what are the different issues with electrical shock? So, electrical shock occurs when current enters the body at one point and exits at another point we call it as an entrance wound and an exit wound.

And the shock occurs when you touch both wires of an electric circuit or one wire of an energized circuit underground or a metallic part that is too hot, any conductor that is carrying a current and the severity of the shock depends on so there are a lot of other issues, number 1 is path of the current through the body, amount of current flowing through the body (the amount of current flowing through the body we will discuss in the next slide), the length of time the body is in the part of the circuit.

And the effects range from a small tingling, a reaction to cardiac arrest, sometimes severe burns or maybe even probable death. And the general myth is low voltage does not mean it is actually not a serious hazard, low voltage is not a real low hazard, fatality can even happen at 50 volts. If you look at some of the equipments which you work in construction site for example, a small power drill will actually take 30 times more than 50 milliamperes current.

So, suppose if you see 75 volts divided by 1000 ohms actually 0.075 amperes which is 75 milliamperes. So, 75 volts if you see actually 75 milliamperes of current is passing on. So, you should not treat voltage also as a say light concern. The body becomes part of the

electrical circuit when it is in contact with energized conductor and the person generally receives a shock and other symptoms also.

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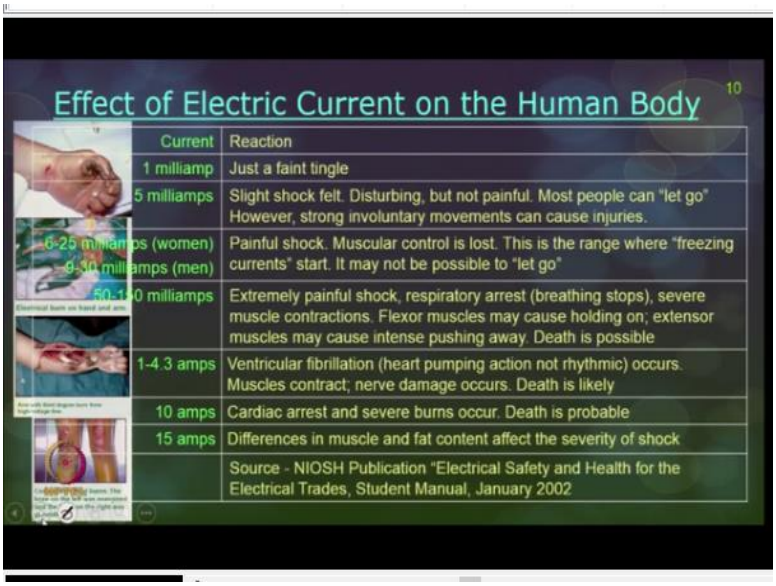

So, what is the effect of electric current on the human body? So, based on the current measured in amperes you will see the different reactions. So, 1 milliampere is just a faint tingle. So, you will not even notice that you were becoming a part of the electrical circuit at all, 5 amperes minor shock you may feel disturbing but it would not be that painful, most people can treat it as let go.

If you see here that is also shown here. So, this let go threshold is here then loss of muscular control, irregular heart rhythm and then cardiac arrest and the person dies. So, let go however, strong involuntary movements can cause injuries. Now, what happens is the minute you start feeling the shock. So, then you should not be ignoring even if it is in the let go threshold because sometimes based on the body condition and the resistance of the human body with the terms of the touch and the contact with the electrical circuit, you may be having other effects or other symptoms later on.

So, next is a little higher and current effect, painful shock, muscular control is lost, this is a range where freezing current start. So, it may not be possible to let go and you may have to go to your doctor for taking advice and medical treatment. 50 to 150 milliamperes extremely painful shock, respiratory arrest, sometimes breathing stops, severe muscle contractions and flexor muscles may also cause holding on.

And you may have intense pushing away and death possible. 1 amps to 4.3 amps ventricular fibrillation. So, here heart pumping action will not be rhythmic, it will start beating in a different pattern, muscles contract, nerve damage occurs death is more likely, 10 amperes cardiac arrest, severe burns occur and death is probable, 15 amperes differences in muscle and fat content affect the severity of the shock.

So, this is based on this NIOSH publication on electrical safety and health. So, like this the effect of current they based on the amount of current you will have on to the human body. Now, what are the different electrical hazards or electrical accidents? Most of these electrical accidents if you see are primarily due to combination of 3 probable factors. It may be one or a combination of any of these 3 factors.

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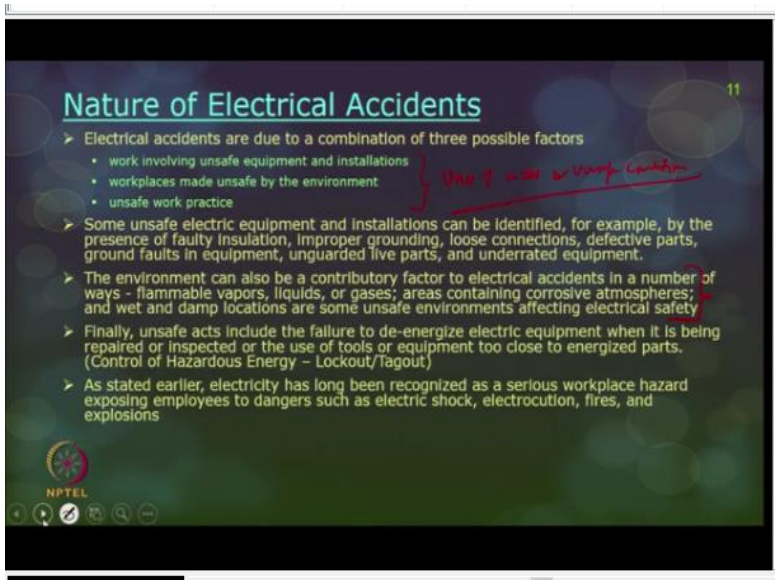

Number 1 is work involving unsafe equipment and installations, workplaces made unsafe by the environment or unsafe work practice. If you see all 3 of them it looks like most of them are related to unsafe acts and unsafe conditions only and which could be easily avoided. Some unsafe electric equipment and installations can be identified, for example, faulty insulation, improper grounding, loose connections, defective parts, ground faults in equipment, unguarded live parts and underrated equipment.

So, faults in equipment, so that you have to correct otherwise you should not be working on those faulty equipments, unless it is repaired. Because in the first slide itself, I have told when the equipments are not working properly then what happens is the human body becomes part

of the electric circuit. The environment can also be a contributing factor to electrical circuits for a number of ways.

For example, a standby worker may be doing some work on electric welding or electric arc welding and so on. So, that may create a lot of heat, flammable gases, vapours or sometimes areas may contain corrosive atmosphere, wet, damp location. So, all these you cannot control in a construction site can be triggering the unsafe conditions in a construction site. Finally, unsafe acts include failure to de-energize electrical equipment when it is being repaired or inspected.

So, even when the circuit is on you try to repair the equipment or the use of a tools or equipments too close to energize parts all these can happen. Electricity has been recognized as a serious workplace hazard, exposing the employees to dangers like electric shock, electrocution, fire and explosion.

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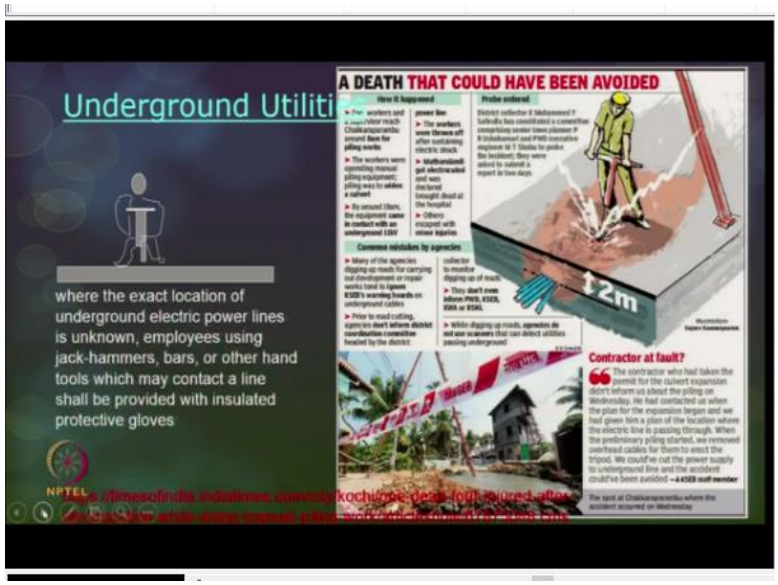

Now, if you see, let us start discussing each of the hazard and what is the real statistics behind? So, this is primarily on underground utilities. So, if you see here a worker has tried to dig in the underground utility without identifying all the probable locations and by mistake, he went in and caught with the electrical line which was 2 meters below the ground surface and he was electrocuted.

So, when the exact location of underground electric power lines is not known, employees should not be using equipments which will be getting in contact with an electric equipment

and it is a serious electrical hazard injury. So, you should have a proper insulated device for even for your crowbar or something so that it is not coming in touch with your body and also you should have proper insulated protective gloves and other precautions and proper PPE when you are working on underground utilities especially when you could not even track where the underground utilities are lying below the soil level. So, this is an article which has been taken up in showing electrocution.

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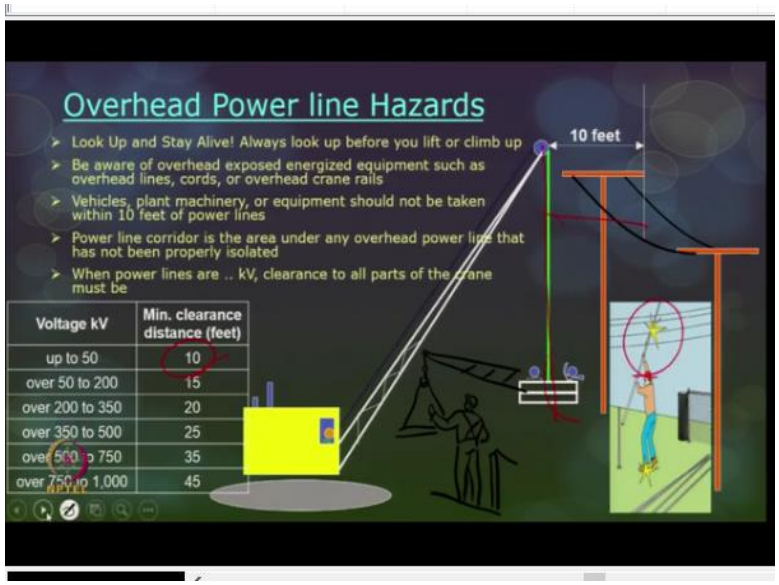

Now overhead power line hazards. So, same way like underground power line, you should also be very careful when you are working with overhead power line hazards especially when it is a very congested site and you are not able to divert the power line or de-energize the power line then you should be working very carefully with overhead power lines.

So, there is some safe clear distance with which you have to be away from these power lines, OSHA has identified those clear distances. Now, if you see here up to 50 kilovolts the minimum clearance distance is 10 feet, over 50 to 100 it is 15 feet, 200 to 350 it is 20 feet, 350 to 500 it is 25 feet. So, for every 250, 250 you start increasing the volts then you should be away at least 5 feet at least away from and so always look up and stay aligned.

So, always look up before you lift or you climb up maybe a ladder or maybe you are using a crane or maybe an equipment for digging. So, all these booms and other you have to be very careful for not going into the power line corridor. Be aware of overhead exposed energized equipment because all these power lines are not de-energized, they are all live conductors of electricity.

So, vehicles, plant, machinery or equipment should not be taken within 10 feet which is a minimum clearance and 10 feet of power lines, the power line corridor is an area where any overhead power line that has been properly isolated. So, this particular area has to be isolated, put barricades and so on. So, that you are not getting in accidentally and hitting against a power line.

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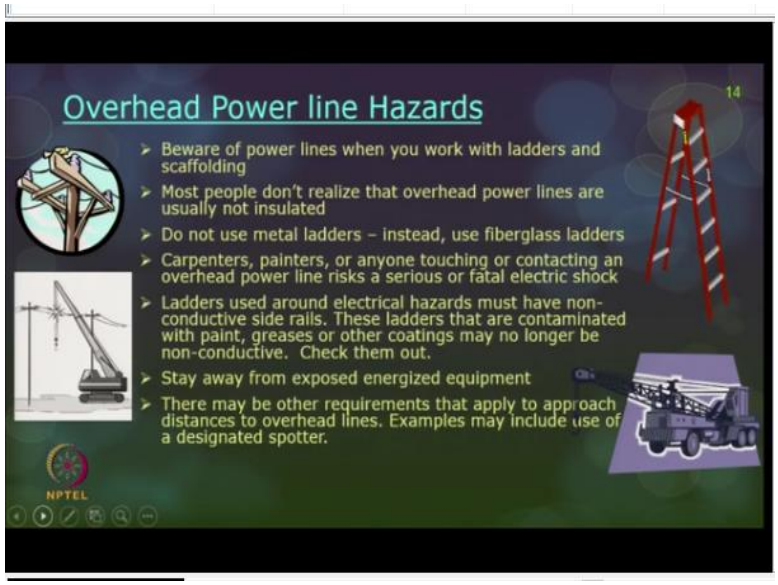

Overhead power line hazards: The other hazards include your ladders and other equipments. So, beware of power lines when you work with ladders and scaffolds, scaffolds are the means through which workers try to climb up on the formwork and do the construction work progress. So, most people do not realize overhead power lines are usually not insulated and, in these places, do not choose metal ladders.

So, this should not be a metal ladder which is a very good conductor of electricity. Instead use fiberglass ladders, carpenters, painters are anyone touching or contacting an overhead power line, risks a serious or fatal electrical shock. So, when your construction work progresses up the height, when you are moving up, maybe few stories about then you should be very careful that you may be no venturing out into these electrical hazards.

Ladders used around electrical hazards must have non conductive side rails, sometimes what happens these side rails may be contaminated with the paint, grease or any other coating and then they are no longer conductive, you have to check them out, clean the ladders properly,

so that they are actually safe for usage, stay away from exposed energized equipment, there may be other requirements that apply to approach distances to overhead lines.

And you may have to have a proper designated spotter suppose if you are not able to identify all these hazards. So, with regard to hazards, we have seen underground utilities, overhead power lines.

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Now hand-held electrical tools, most of these construction workers use hand-held electrical devices which are generally in contact with the hand till the equipment is in usage. So, these tools pose a potential danger because they make continuous good contact with the hand. So, to protect workers from shock, burns or electrocution, these tools must have a 3-wire cord with the ground and be plugged into grounded receptacle or double insulated or powered by a low voltage isolation transformer.

So, never carry a tool by the cord. So, cord is primarily the wire what we say know so which is connected with the power socket. So, never carry a tool by the cord because easily it may tend to wear and tear. Keep the cords so away from heat, oil or sharp edges. So, that you are not damaging the cord at any point of time. Disconnect the tools when they are not in use before servicing and when changing accessories are happening.

Avoid accidental starting of the equipment; you should check for all precautions before you turn on the equipment, do not hold fingers on the switch button while carrying a plugged-in tool, use proper safety protection like gloves and appropriate safety wear, footwear when you

are using electrical tools, do not use electrical tools in damp or wet locations because they will try to accelerate the hazard with electricity. Store electrical tools in a dry place when not in use and always use proper lighting when you are working on electrical tools.

Ensure that cords on electrical tools do not present a tripping hazard and when a damaged tool is kept there put a tag, do not use or at least give a warning that it is damaged, so that people are not getting in with those hazards. The next hazard is guarding of live parts; most of the times what happens is sometimes the workers have to work in along with the construction equipment for repairing or for maintenance when the power is on. There are situations that will arise. So, now how do you take care of working with live wires or live parts and also guarding of those live parts?

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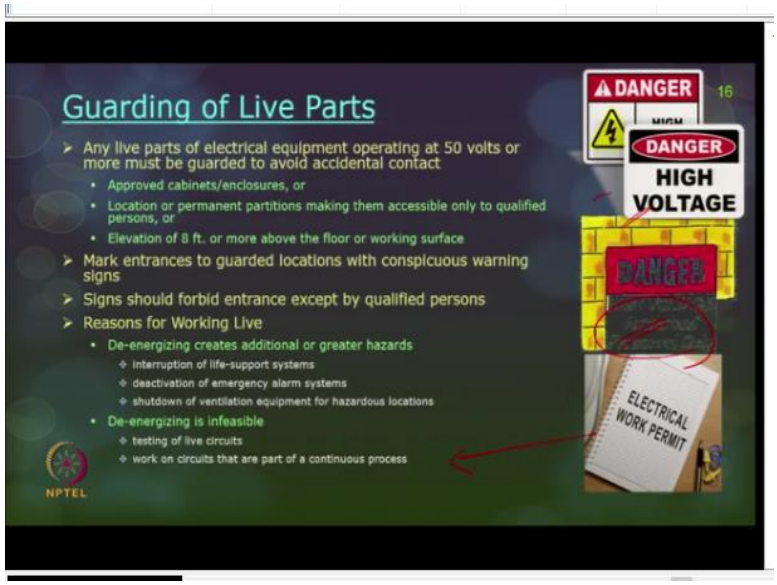

So, any live parts of electrical equipment operating at 50 volts or more must be guarded to avoid accidental contact. So, approved cabinets, enclosures all should be made, you should also mark the location and say danger, high voltage and so on or sometimes you can also move for an elevation of say 8 feet or more above the floor or working surface, so that it is not in contact with any of the workers.

And maybe you can think of permanent partitions making them accessible only to qualified personnel only authorized personnel entry and access. Make entrances to guarded locations with conspicuous warning signs as seen here. These signs should forbid entrance, except by qualified personnel who can be working on with the live parts safely. What are the reasons for working live?

Why cannot we trip off the circuit and then start repairing or maintaining? There are so many reasons. De-energizing sometimes creates additional or greater hazards. For example, life support systems that can be interruption, deactivation of emergency alarm systems, that will also be turned off when you are tripping of the entire circuit systems. Shut down of ventilation equipment especially when you are working in confined space ventilation also may be turned off if you are completely tripping off the circuit.

De-energizing is feasible. Suppose if you have to test a live circuit then you may have to keep the current on and the other one is working on circuits that are part of continuous processes then you would not be able to trip off and then do. So, sometimes you cannot be de-energizing the lines you may have to be very careful with live wires on. In those situations, the only one way is to get a proper electrical work permit you should know what are the hazards, what is the nature of work and so on.

Accordingly try to get a proper electrical work permit before you start working on live parts. The next is protection measures. So, lock-out and tag-out. So, in short form it is also referred as LOTO.

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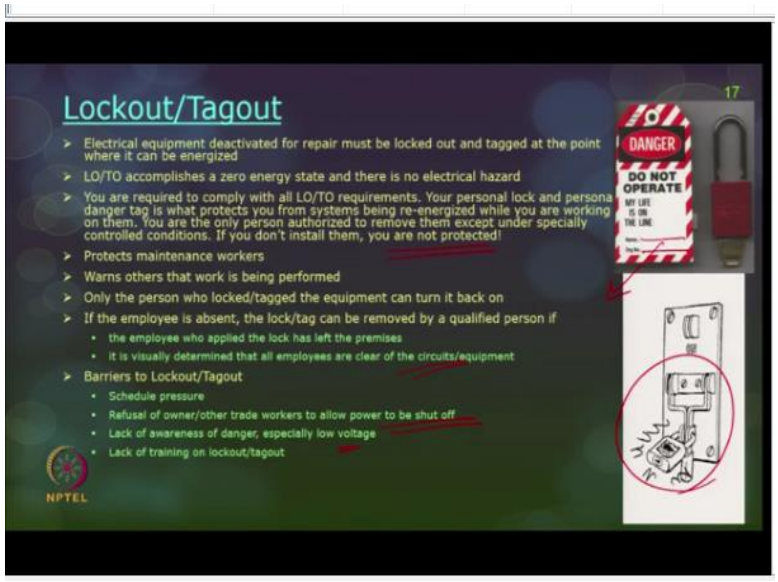

So, this electrical equipment deactivated for repair must be locked out and tagged at the point where it can be energized. So, which is nothing but simply putting a lock and actually it is a warning to everyone that they should not be turning on the power by mistake. So, and the

person who has gone for repair or maintenance after completing his full work then he may come there and then know put the key for opening up the lock.

This primary mechanism is called as LOTO and also it comes along with a lifeline as to who has put the LOTO tag. LOTO accomplishes a zero-energy state and there is no electrical hazard. So, when you are working on LOTO you have to comply with all the LOTO requirements. So, the personal lock and personal danger tag is what protects you from the system being re-energized while you are working on them.

So, now in those situations, the person who has put the lock will only have to come for unlocking it and if you do not install the lock system thinking it is like a disturbance to others then you are not protected when you are working in the construction sites. So, it protects all maintenance workers or for any falls or mess-ups which you wanted to repair, it wants other workers also that some work is going on and being performed.

So, only the person who locked or tagged the equipment can turn it back on, sometimes if the employee is absent, maybe some reason or the other, then there can be a qualified person who can do the unlocking. So, this lock or tag can be removed by a qualified person, when the employee who has applied the lock has left the premises due to some other issue and it is visually determined that all employees are clear of the circuits or equipment.

Only when the dangers are all identified and ignored, then only he can remove the lock and remove the tag from the LOTO. Barriers to lock-out or tag-out why it is not practiced, what are the barriers, schedule pressure, sometimes if you are tripping of the circuit just for some processes, then naturally know you are actually slowing down the construction progress also. So, that can be a schedule pressure.

Refusal of owner or other trade workers, there may be other construction groups or subcontracting groups who are in the construction site who may not allow the power to be shut off. So, the lock-out and tag-out may not happen, lack of awareness of danger especially the low voltage problems, when you are know not putting the lock-out and tag-out, also is not aware to many of them.

So, lack of training on lock-out and tag-out. So, the best advises give the workers a proper training. So, LOTO is a very powerful method for preventing the workers from electrocution.

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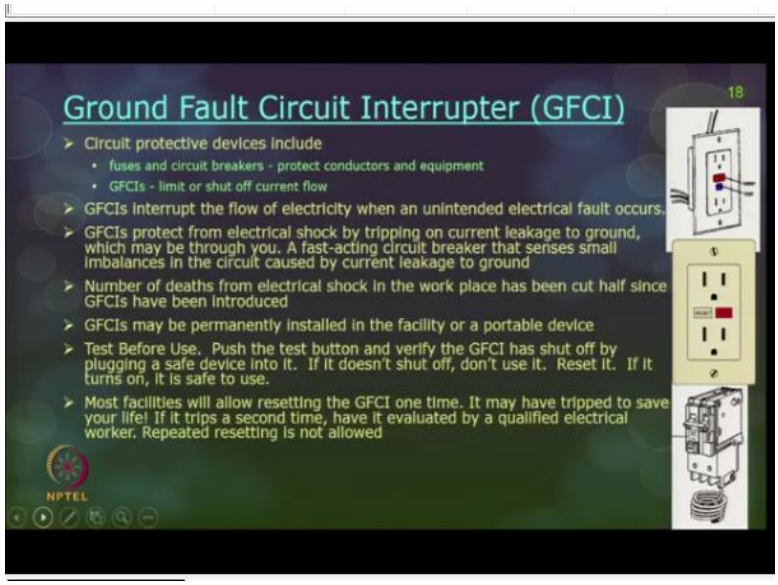

The other safe precaution is GFCI which we also call it as a ground fault circuit interrupter. So, circuit protection devices include fuses and circuit breakers primarily for protecting conductors and equipment. GFCIs so primarily to limit or shut off the current flow. So, this GFCI looks simpler like this. So, it will interrupt the flow of electricity when an unintended electrical fault occurs, it protects from electrical shock by tripping on currently gauge to ground which may be through you if it is not there.

So, a fast-acting circuit breaker that can send small imbalances in the circuit cost by current leakage to the ground. So, number of deaths from the electrical shock was reduced to half when the sites introduced GFCI. So, it is permanently installed in a facility or it is a portable device whatever way you want, you can still choose. But before you install or use the GFCI test before it is used, so push the test button.

So, there are 2 buttons here, push the test button and verify the GFCI has shut off by plugging a safe device into it. If it does not shut off then it is not safe to use. If it is fine, then reset it and if it is turned off, if it turns on then it is very safe to use. So, most facilities will allow resetting the GFCI only one time. So, if you want to have multiple times then you may have to have a qualified electrical worker to reset the whole setup. The GFCI trips off only to save the worker life. So, you may have to understand if it does not happen then the worker would have had a shock or an electrocution.

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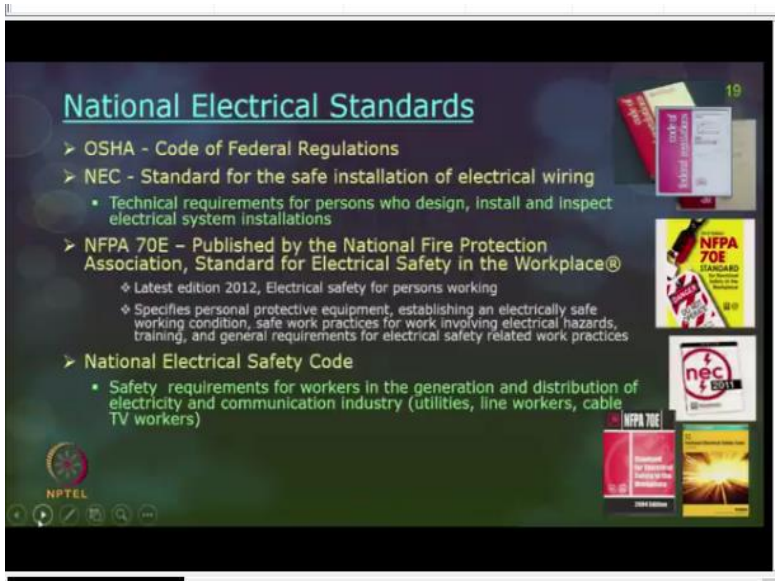

National electrical standards, there are so many standards OSHA has code of federal regulations, NEC is also there. So, NEC standard for safe installation of electrical wiring, primarily technical requirements for persons who design install and inspect electrical system installations, the most famous one is NFPA 70E which is published by National Fire Protection Association standard for electrical safety in the workplace.

And this specifies personal protection equipment, establishing an electrically safe work condition, safe work practices for work involving electrical hazards, training and so on. The other one is NESC which is nothing but National Electrical Safety Code which is primarily for electricity and communication industry like utilities, line workers and so on. So, recap electrical hazards, the most of the electrical hazards is very easy to remember just put the word be safe. So, B stands for burns, E for electrocution.

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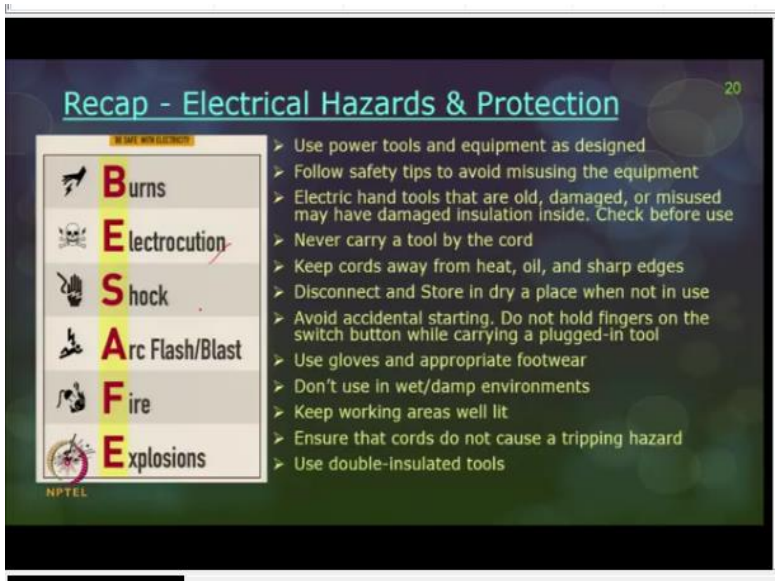

S for shock, A for arc blast or arc flash, F for fire and E for explosions. So, all the hazards with related to electricity can be arranged like this. So, what are the protection methods that use power tools and equipment as a design? Follow safety tips to avoid misusing the equipment. Electrical hand tools that are old, damaged or misused may have damaged insulation also inside. So, you may have to verify.

So, these are all small, small places where you can identify an electrical hazard, they never carry a tool by the cord. Keep cords away from heat, oil and sharp edges. Disconnect and store the tools in a dry place when not in use. Avoid accidental starting, use proper PPE. Do not use wet or damp environments for electrical appliances, keep working areas well lit, ensure cords, do not cause a tripping hazard and use double insulated tools. Some more recap.

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So, statistics show electricity is a major cause for death among construction workers. So, with electricians the most serious concern is working on live or near live parts instead of de-energizing and using LOTO procedures. Non-electrician's failure to avoid live overhead power lines and lack of knowledge on basic electrical safety are the major concern for electrical hazards.

So, what should the contractors do? Comply with OSHA regulations on electrical safety, train employees on electrical safety, contact utility companies in advance to de-energize or insulate overhead power lines. If asked to work life, verify with the owner or client that de-energizing live parts is not practical or would pass a greater hazard. Only allow work on live electrical parts or circuits in accordance with the permit system with specific procedures.

Electrical workers should also follow certain precautions, de-energize and lock-out or tag-out electrical circuits when they are working on, working on live electrical circuits or parts in accordance with the permit system where appropriate PPE and use proper tools when you are working on live electrical circuits. All other workers primarily the construction workers should make sure they are trained in electrical safety for the work they are doing.

Ensure machinery and power tools are properly grounded and double insulated. Check all extension and power cords for wear and tear before they are used. Disconnect the plug on any power tool or machinery before inspecting or repairing. Keep at least 10 feet away from all live overhead power lines and keep metal objects from a live electrical circuit or part. So, recap, so most of these materials are taken from OSHA subpart K electrical.

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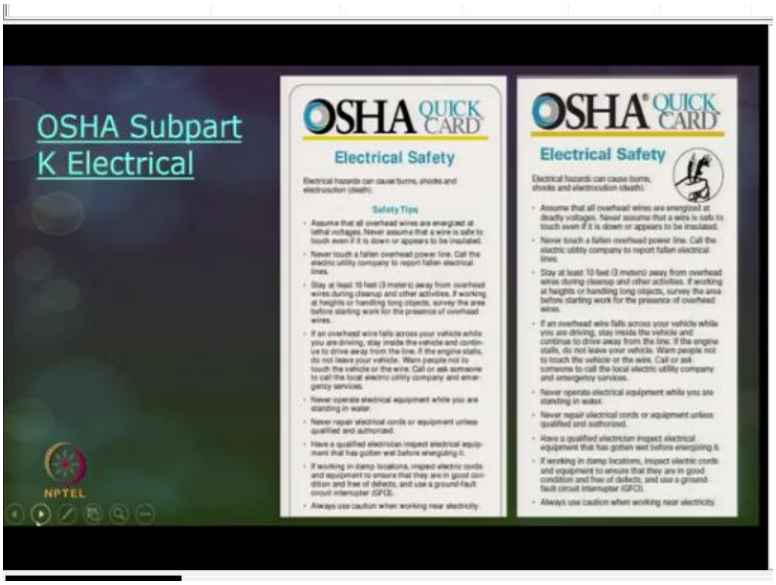

And a quick card on electrical safety, electrical hazards cause burns, shocks and electrocution. Some of the safety tips are also given here. Assume that all electrical overhead wires are energized. So, never assume wire is safe to touch even if it is down or appears to be insulated, never to touch a fallen and overhead power line. So, called the electric utility company to report on all these power lines.

Stay at least 3 feet, 3 meters or 10 feet away from overhead wires before you start working on and working at heights or handling long objects which may touch the overhead power line, survey the area before you start the work. If overhead wire falls across your vehicle while you are driving or stay inside the vehicle and continue to drive away from the line. Never operate electrical equipment while you are standing in water.

Never repair electric cords or equipments unless it is qualified and authorized. Have qualified electrician, inspect electrical equipment that has got wet before energizing it. If working in dam conditions inspect electric cords and equipments to ensure they are in good condition and free of defects and always use a GFCI, always use caution when you are working near electricity.

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Some of the fact sheets for working safely with electricity and working safely around down electrical wires. So, all these we have discussed. Thank you.