



TCM 2430 – Construction Safety

Week 11 – Masonry, Concrete, Stairways & Ladders, Cranes and Derricks Safety,

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Masonry Construction Safety

What do we mean by masonry construction

- Masonry construction refers to the building of structures using individual units, often made of materials like brick, stone, concrete blocks, or clay tiles, that are bound together by mortar.

When is masonry construction used?

- It is commonly used in the construction of houses, commercial buildings, bridges, retaining walls, and other structures.

What is the history behind masonry construction?

- Masonry is one of the oldest and most enduring construction methods and has been used for various types of buildings and structures throughout history.

What are the advantages of masonry construction?

- Masonry construction has several advantages, including durability, fire resistance, and thermal mass properties that contribute to energy efficiency.



Watch this video:
MASONRY WORK SAFETY



https://www.youtube.com/watch?v=gpU0-Weul_U&ab_channel=PhaniEHSinfo



https://www.youtube.com/watch?v=xgcKE1MhXPc&ab_channel=SWMGT

What are the hazards in masonry work?

Handling and Lifting Masonry Units

- Masonry units, such as bricks or concrete blocks, can be heavy, leading to strains, sprains, and musculoskeletal injuries if not lifted properly.
- Workers should be trained in safe lifting techniques, and mechanical aids like forklifts or cranes should be used to reduce the risk.



What are some safety guidelines when handling masonry units?

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- **Assess the Load:** Before lifting any masonry unit, assess its weight and size. If it is too heavy or awkward to lift by yourself, seek assistance from another worker or use mechanical lifting equipment.
- **Warm-Up:** Stretch and warm up your muscles before lifting. A few minutes of light stretching can help prepare your body for the task.
- **Proper Footing:** Stand with your feet shoulder-width apart to maintain balance. Your body should be aligned with the load.
- **Get a Good Grip:** Use both hands to grip the masonry unit securely. If the unit has handles or openings, use them to get a better grip.
- **Use Your Legs:** Bend at the knees and hips, not at the waist, to get closer to the masonry unit. This allows you to use your leg muscles, which are stronger, to lift the load.
- **Keep the Load Close:** Keep the masonry unit as close to your body as possible to minimize strain on your back. Hug the load to your chest or abdomen.

What are some safety guidelines when handling masonry units?

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- **Lift Slowly:** Lift the load smoothly and steadily, using your leg muscles to do most of the work. Avoid jerky or sudden movements.
- **Avoid Twisting:** When turning with the load, pivot your feet and your whole body rather than twisting your torso. Twisting can strain your back.
- **Team Lifting:** If the load is too heavy or awkward for one person, use a team lifting approach. Coordinate your movements with your partner and communicate clearly to ensure a safe lift.
- **Set Down Carefully:** To set the load down, use the same principles as lifting but in reverse. Bend at the knees and hips, keep the load close, and lower it slowly and carefully.
- **Maintain a Neutral Spine:** Keep your back in a neutral, straight position while lifting. Do not round your back or arch it excessively.
- **Rest Regularly:** If you have to perform repetitive lifting tasks, take regular breaks to avoid overexertion and muscle fatigue.
- **Use Mechanical Aids:** Whenever possible, use mechanical lifting aids like forklifts, hoists, or wheelbarrows to move heavy masonry units. These tools can significantly reduce the risk of injury.

What are OSHA's regulations about Masonry construction?

- A limited access zone shall be established whenever a masonry wall is being constructed. The limited access zone shall conform to the following.
 - The limited access zone shall be established prior to the start of construction of the wall.
 - The limited access zone shall be equal to the height of the wall to be constructed plus four feet, and shall run the entire length of the wall.
 - The limited access zone shall be established on the side of the wall which will be unscaffolded.
 - The limited access zone shall be restricted to entry by employees actively engaged in constructing the wall. No other employees shall be permitted to enter the zone.
 - The limited access zone shall remain in place until the wall is adequately supported to prevent overturning and to prevent collapse unless the height of wall is over eight feet, in which case, the limited access zone shall remain in place until the requirements of paragraph (b) of this section have been met.
- All masonry walls over eight feet in height shall be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing shall remain in place until permanent supporting elements of the structure are in place.



Concrete Manufacturing Safety



Why is safety in concrete manufacturing essential?

- More than 250,000 people work in concrete manufacturing.
- Over 10 percent of those workers — 28,000 — experienced a job-related injury or illness
- 42 died in just one year.



Watch this video: Concrete Safety and Safety Hazards to Avoid

- https://www.youtube.com/watch?v=bYYu5eu-BhI&ab_channel=TITANUniversity



What are the potential hazards for workers in concrete manufacturing?

- Eye, skin and respiratory tract irritation from exposure to cement dust
- Inadequate safety guards on equipment
- Inadequate lockout/tagout systems on machinery
- Overexertion and awkward postures
- Slips, trips and falls
- Chemical burns from wet concrete



Potential hazard while working with concrete and its solution

Cement Dust



- **Hazard:** Exposure to cement dust can irritate eyes, nose, throat and the upper respiratory system. Skin contact may result in moderate irritation to thickening/cracking of skin to severe skin damage from chemical burns. Silica exposure can lead to lung injuries including silicosis and lung cancer.
- **Solutions:**
 - Rinse eyes with water if they come into contact with cement dust and consult a physician.
 - Use soap and water to wash off dust to avoid skin damage.
 - Wear a P-, N- or R-95 respirator to minimize inhalation of cement dust.
 - Eat and drink only in dust-free areas to avoid ingesting cement dust.

Potential hazard while working with concrete and its solution

Wet Concrete



- **Hazard:** Exposure to wet concrete can result in skin irritation or even first-, second- or third-degree chemical burns. Compounds such as hexavalent chromium may also be harmful.
- **Solutions:**
 - Wear alkali-resistant gloves, coveralls with long sleeves and full-length pants, waterproof boots and eye protection.
 - Wash contaminated skin areas with cold, running water as soon as possible.
 - Rinse eyes splashed with wet concrete with water for at least 15 minutes and then go to the hospital for further treatment.

Potential hazard while working with concrete and its solution

Poor Ergonomics



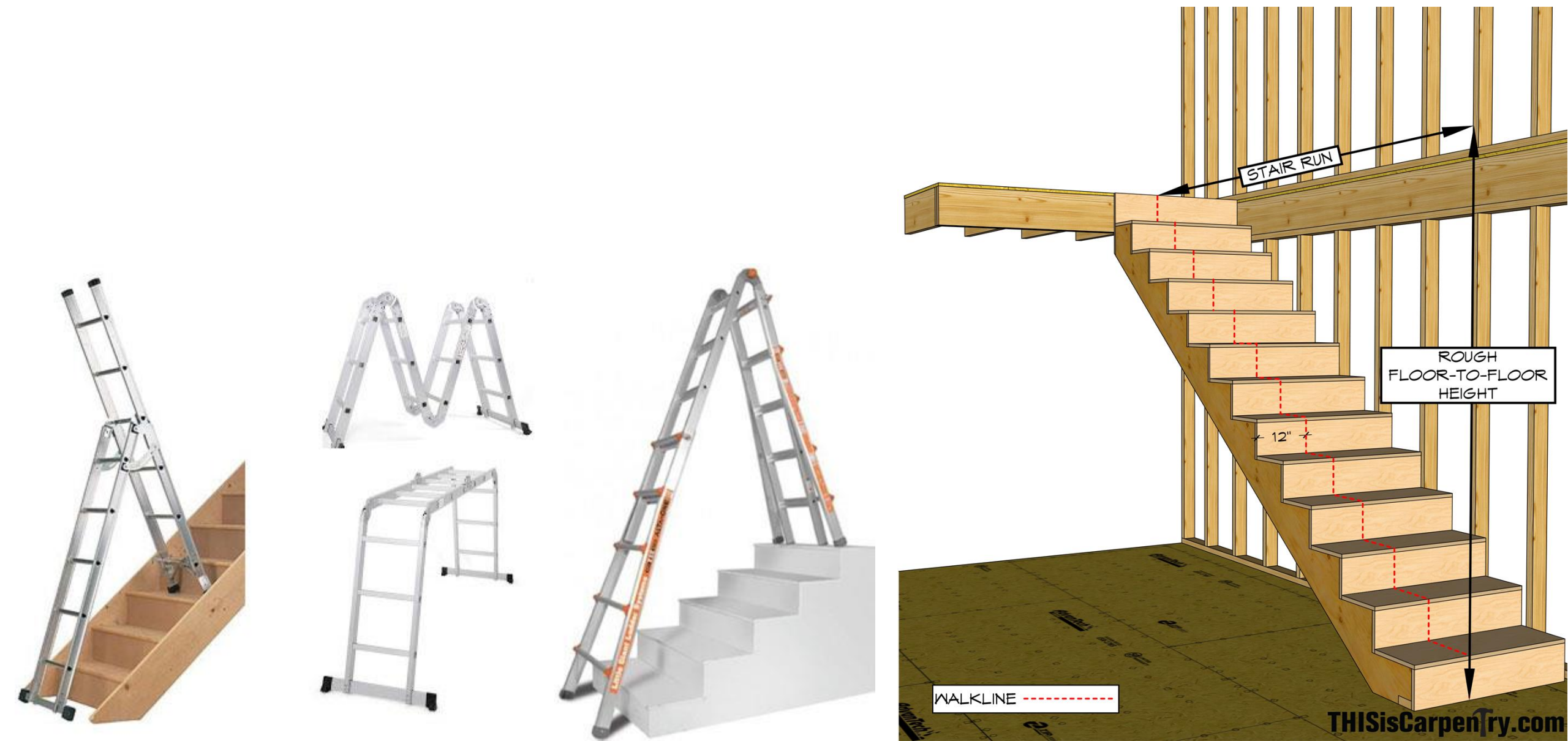
- **Hazard:** Improper lifting, awkward postures and repetitive motions can lead to sprains, strains and other musculoskeletal disorders.
- **Solutions:**
 - Use hand trucks or forklifts when possible.
 - Lift properly and get a coworker to help if a product is too heavy.
 - Avoid twisting while carrying a load. Shift your feet and take small steps in the direction you want to turn.
 - Keep floors clear to avoid slipping and tripping hazards.
 - Avoid working in awkward postures.

*Potential hazard while working
with concrete and its solution*

Other Hazards

- Welding operations can lead to flash burns.
- Makeshift ladders, platforms and stairs with improper or no guardrails make falls more likely.
- Workers can also be injured by falling concrete forms if the forms are improperly chocked, braced or cribbed.





Stairways & Ladders

What safety regulations does OSHA consider for stair rail and handrails?

- Handrails be on stairways with four or more risers, or over 30 inches
- If there is a fall hazard over six feet, a stairrail system must be installed
- Handrails and top rails withhold a load/force of 200 pounds
- Stair rails and handrails be smooth to prevent, punctures, cuts, etc.
- Handrails be 30 to 37 inches from rail top to surface of tread
- After 1991, stairwell handrails to be 36-37 inches from rail surface to tread; before 1991, stair rails can be 30-34 inches from rail surface to tread



Watch this video: *Stairway Safety*
Supervisor Safety Tip Series

- https://www.youtube.com/watch?v=2s0hEMS7-P0&ab_channel=VividLearningSystems

What safety regulations does OSHA consider for ladders ?

- Avoid slippery conditions and secure ladders especially in traffic areas.
- Rungs to be 10-14 inches apart; cleats and steps to be uniformly spaced.
- Use ladders only for designed use; never use the top step of a stepladder.
- Competent persons must inspect ladders; if defective, tag “Do Not Use.”
- Never allow anyone to climb on cross-bracing unless the design allows it
- Never move, shift, or extend a ladder while in use.
- Ladder surfaces must be free of puncture or laceration hazards.
- Ladders with a pitch over 90 degrees from horizontal are prohibited.
- The step-across space from step centerline or rungs of fixed ladders to the nearest structural edge worked on, must be under 12 inches



Ladders near Energized Electrical Equipment

- Ladders must have nonconductive side rails if they are used in places where workers or ladders could contact exposed energized electrical equipment.

Climbing a Ladder Safely

- Always face a ladder when using it. Grab it with at least one hand when mounting or dismounting. Never carry anything that could cause loss of balance. Use ladders only on stable, level surfaces unless secured properly

Double-Cleated Ladders

- Use double-cleated ladders when ladders are the only way to enter or exit areas with 25 or more workers and when used for two-way simultaneous traffic

Ladder Angles

- Non-self-supporting ladders must be placed or positioned at an angle where the horizontal distance from the top support to the foot of the ladder is $\frac{1}{4}$ the ladder's working length (the distance between the foot and top support).





Watch this video: *Ladder Safety*
Training for Construction from
SafetyVideos.com

- https://www.youtube.com/watch?v=s4UEGkXNcsw&ab_channel=SafetyVideos.com

What safety regulations does OSHA consider for tall ladders

All fixed ladders 24 feet or more must be equipped with:

- A ladder safety device
- Self-retracting lifelines with rest platforms every 150 feet or less
- Cage or well, and multiple ladder sections each less than 50 feet
- Strength to hold at least two loads of 250 pounds each, concentrated between any two consecutive attachments

The climb on a fixed ladder equipped only with a cage or well must not exceed 50 feet. If ladder safety devices are also present, the climb can exceed 50 feet



What are OSHA's recommended working loads for ladders?

Duty rating	Ladder type	(pounds)	Working load (Kg)
Extra heavy duty	IA	300	136.2
Heavy duty	I	250	113.5
Medium duty	II	225	102.2
Light duty	III	200	90.8





Cranes and Derricks Safety



Play the video here

What are the major types of cranes used in construction?

1. Mobile cranes
2. Tower cranes
3. Derricks



3



1



2

Video

Construction Crane Safety

https://www.youtube.com/watch?v=Ohu6ESmr17Q&ab_channel=Travelers



For more information on preventing struck-by incidents, visit:
www.cpw.com/struck-by-hazards

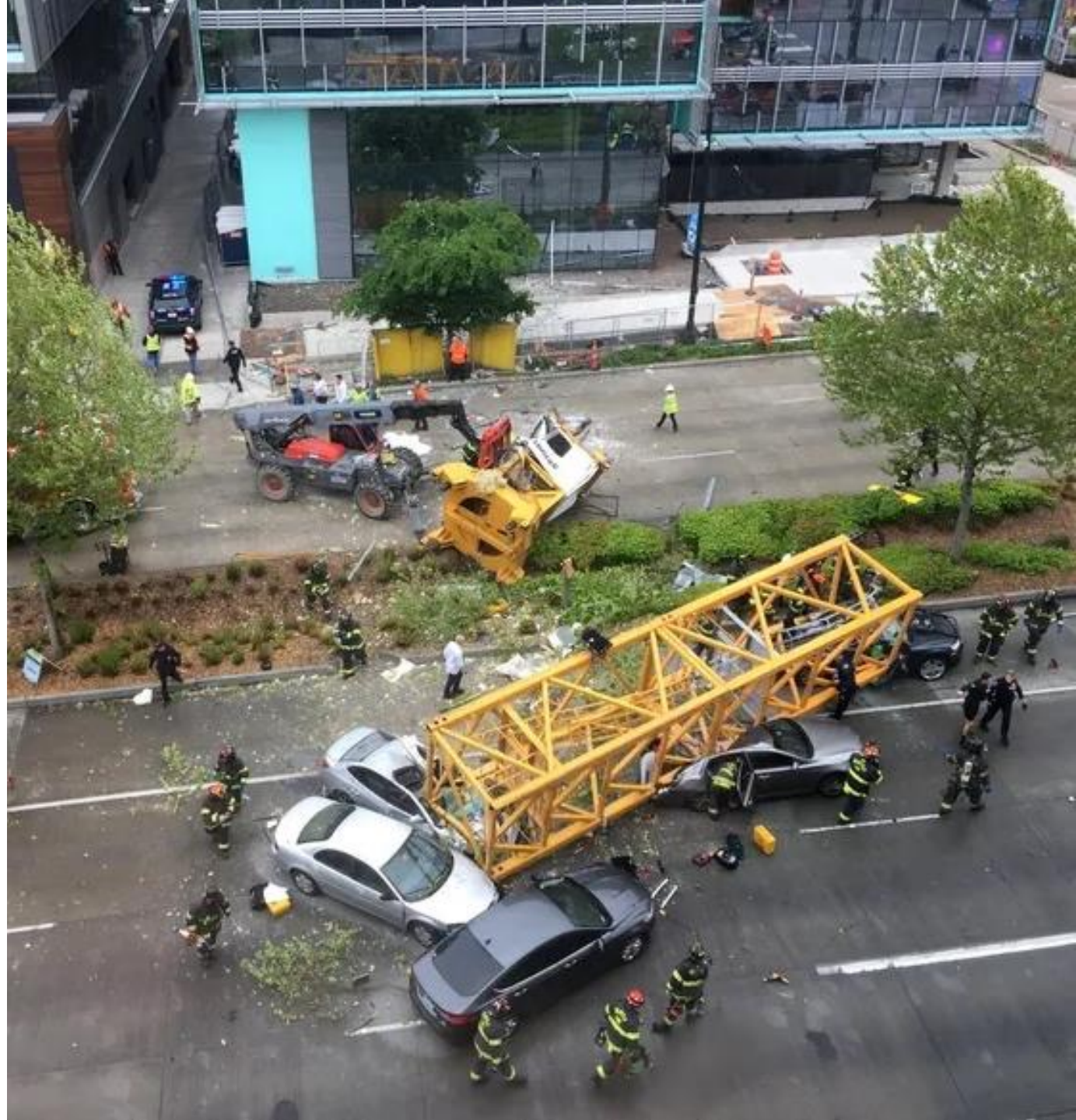


Major hazards when using cranes in construction

Overturning

Cranes can tip over primarily for three reasons:

1. the load is too heavy,
2. the ground is unstable,
3. the crane is not properly set up and level



*Major hazards when using
cranes in construction*

Contact with overhead power lines

Coming into contact with electrical
lines can result in electrocution
and severe injuries.

See the next slides for
prevention strategies



How to prevent crane's contact with overhead power lines? *(slide 1 of 2)*



- **Identify Power Lines:** Before starting any construction project, identify the location of overhead power lines in the work area. Contact the local utility company to provide this information if necessary.
- **Maintain Safe Distances:** Ensure that all equipment and materials are kept at a safe distance from power lines. This distance can vary depending on the voltage of the lines, so it's crucial to follow local regulations and safety guidelines. A common guideline is to maintain a minimum distance of 10 feet (3 meters) from power lines for voltages up to 50 kV.
- **Use a Spotter:** Appoint a trained spotter to monitor the equipment and materials when operating in close proximity to power lines. Their role is to maintain awareness and communicate with equipment operators to ensure safe distances are maintained.
- **Insulate Equipment:** For equipment that must work near power lines, use insulating materials like rubber tires or insulating links on equipment such as cranes. These can reduce the risk of electrical conductivity.
- **Plan Your Work:** When developing a construction plan, consider the location of power lines and the sequence of operations. Try to schedule work that requires heavy equipment near power lines at times when the lines are not energized, if possible.
- **Conduct Safety Meetings:** Prior to starting any construction project, conduct safety meetings to inform workers about the risks associated with overhead power lines and the safety measures in place.

How to prevent crane's contact with overhead power lines? *(slide 2 of 2)*



- **Mark Hazard Zones:** Clearly mark the areas near power lines with warning signs and tape to ensure that workers and equipment operators are aware of the danger.
- **Training and Awareness:** Provide comprehensive training to all construction workers regarding the hazards of overhead power lines and how to prevent contact. Workers should be able to recognize the potential dangers and respond appropriately.
- **Emergency Response Plan:** Develop an emergency response plan that includes procedures for dealing with accidents involving power lines. Ensure that all workers are aware of these procedures and how to contact emergency services.
- **Comply with Regulations:** Familiarize yourself with local, state, and federal regulations regarding overhead power lines. Compliance with these regulations is essential to avoid legal issues and ensure safety.
- **Regular Inspections:** Regularly inspect equipment and machinery to ensure they are in good working condition. This includes checking for damaged insulation and electrical components.
- **Monitor Weather Conditions:** Weather conditions can affect the safety of working near power lines. High winds, storms, or other adverse weather may increase the risk of accidents. Consider weather conditions in your safety planning.
- **Communication:** Establish clear communication protocols among workers, equipment operators, and spotters. Ensure everyone can communicate effectively to avoid accidents.
- **Continuous Supervision:** Supervise construction activities near power lines continuously to ensure that safety measures are being followed.

Major hazards when using cranes in construction

Dropped load

If the load is not properly secured, attached, or lifted, it can fall, causing damage, injury, or death.

See the next slides for prevention strategies



How to prevent crane's dropped loads? *(slide 1 of 2)*



- 1. Train Thoroughly:** Ensure that all crane operators and riggers receive comprehensive training and proper certification.
- 2. Maintain Regularly:** Keep the crane and its components well-maintained with routine inspections and maintenance.
- 3. Calculate Load Weight:** Accurately calculate the load weight and never exceed the crane's rated capacity.
- 4. Consult Load Charts:** Always refer to the crane's load chart to determine its capacity for various configurations and angles.
- 5. Conduct Pre-Lift Meeting:** Before initiating any lift, hold a pre-lift meeting to discuss the lift plan, load weight, and potential hazards.
- 6. Communicate Clearly:** Maintain clear communication between the crane operator and the signal person or crew members using radios or hand signals.
- 7. Rig Properly:** Ensure that rigging equipment, such as slings, shackles, and hooks, is in good condition and appropriately rated for the load.
- 8. Inspect the Load:** Prior to lifting, inspect the load for defects or loose items, and secure it properly.
- 9. Monitor Wind Conditions:** Be vigilant about wind conditions, as high winds can affect crane stability and load handling.

How to prevent crane's dropped loads? *(slide 2 of 2)*



10. **Avoid Overloading:** Never overload the crane, even briefly, to prevent structural failure.
11. **Ensure Safe Zones:** Keep workers and the public at a safe distance from the crane and the load, using barriers and signage.
12. **Watch for Obstacles:** Be alert to overhead obstacles like power lines and maintain a safe clearance.
13. **Establish Emergency Procedures:** Develop and communicate emergency procedures in case of a load drop.
14. **Monitor Continuously:** The crane operator should continuously monitor the load and conditions and stop if anything appears unsafe.
15. **Maintain Records:** Keep records of inspections, maintenance, and training to demonstrate compliance with safety regulations.
16. **Comply with Regulations:** Ensure full compliance with local, state, and national safety regulations, such as OSHA standards.
17. **Promote a Safety Culture:** Foster a safety-conscious culture on the construction site and encourage workers to report concerns or violations.

Name other **hazards** during crane operations and their **solutions**

- **Boom collapse** ➡ Avoid overloading and adhere to regulated maintenance to prevent mechanical failure.
- **Structural failure** ➡ Check for defects in components.
- **Operator errors** ➡ Train operators and teach them ways to informed judgment of loads as well as effective communication with assistance and other employees.
- **Weather conditions** ➡ Stop and postpone work in adverse weather, such as strong winds, can affect the crane's stability and safety.
- **Crush and pinch points** ➡ Teach the workers to avoid work zone of cranes, establish on ground safety strategies before starting crane work
- **Work area hazards** ➡ Avoid congested or cluttered work areas
- **Inadequate rigging** ➡ Ensure balance and security of rigging before loading