Safety Hazards

Rebar - Working Safely Near

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What is a reinforcing bar?

A reinforcing bar, commonly known as rebar, is also known as reinforcing or reinforcement steel. The rebar consists of a steel bar or a mesh that is made of many small steel wires. Rebar is used as a tension device and a reinforcement mechanism in concrete and masonry to strengthen and stabilize the concrete under tension.

Who works with rebar?

Metal workers, ironworkers, rodmen, concrete workers, labourers, and electricians during the slab phase (starting phase or foundation) of construction work with rebar. This list is not exhaustive; other workers work with rebar, and many more workers will find rebar in their work environment, especially on construction sites.

This document does not cover the hazards of the manufacturing of rebar.

What is tensile strength?

Tensile strength is the maximum amount of pulling (tensile) force or load a material can handle before it breaks. Tensile strength is typically measured in megapascals (MPa), a unit of pressure or stress. MPa is measured in force per square meter and is a metric unit of measurement. Tensile strength is also measured in imperial units of measurement, in pounds per square inch (PSI). PSI is commonly used in the United States.

Although we follow the metric system in Canada, you may find both units of measurement used, as PSI is still commonly used in some industries, such as construction, tire pressure measurement, and manufacturing.

What are the types of rebar most commonly used?

Many different types of rebars are used. Different types of rebar can have different hazards associated with them and require different controls and handling methods. It is important that your hazard identification and risk assessment is specific to the type of rebar used during your operation. Types of rebar commonly used include:

- **Carbon Steel Rebar:** This type of rebar is very cost-effective, strong, and usually used in concrete pouring. However, it is prone to corrosion.
- **Glass Fibre Reinforced Polymer (GFRP) Rebar:** This rebar is an alternative to traditional carbon steel. It is made of fibreglass and has great tensile strength. Special considerations must be taken when cutting GFRP rebar. It must be cut with a diamond tip.
- **Galvanized Rebar:** Galvanized rebar is coated with zinc using a variety of processes and is greatly resistant to corrosion. The zinc coating acts as a barrier to corrosive elements. Galvanized rebar is used when moisture and dampness are concerns. When welding or cutting, workers are exposed to zinc oxide fumes, which can lead to a phenomenon known as “metal-fume fever,” which can resemble flu-like symptoms.
- **Stainless Steel:** Stainless steel rebar is used for purposes where corrosion is an issue, but zinc cannot be used due to its tendency to galvanize. It’s very expensive and rarely used. Stainless steel rebar is used in corrosive environments, such as where seawater is present, the environment is hot or humid, or in locations that use de-icing salts.
- **Epoxy Rebar:** Rebar coated in epoxy is an economical alternative. It is very resistant to corrosion; however, motions such as bending will damage the coating. Cutting or grinding epoxy-coated rebar can release harmful dust and fumes containing toxins.

What are the hazards associated with working with rebar?

Hazards associated with working with rebar include:

Chemical Hazards

- Chemical exposure when welding or handling treated rebar
    - Respiratory hazard: metal dust and fumes from cutting rebar, which may lead to metal fume fever

- Exposure to rust inhibitors, corrosion treatments, cleaning agents, and solvents
    - Review the safety data sheet (SDS) for each product to know what hazards are present
    - Use gloves and skin protection
    - Maintain eye wash stations
    - Use respiratory protection where necessary

- Recycling or disposal of materials containing chemical residue or contaminated materials
    - Prevent chemicals, metal waste, or debris from contaminating the surrounding soil and water.
    - Use designated cutting areas
    - Store materials in areas with impermeable surfaces
    - Conduct an environmental impact assessment where applicable. Please refer to the environmental regulations for your jurisdiction.

Ergonomic Hazards

- Risk of pain or injury from awkward positions, repetitive manual tasks, or lifting heavy objects.

Physical Hazards

- Exposure to extreme temperatures when working outdoors
- Respiratory hazards and air quality hazards when welding rebar. Note that respiratory hazards will vary based on the type of rebar being welded or cut
- Noise levels while cutting rebar

Safety Hazards

- Impalement – unguarded protruding rebar may cause cuts or serious injuries if a worker falls onto the rebar
- Working at heights
- Working from a ladder

- Electrical hazards (rebar can conduct electricity and can be a risk when working near welding or live wires)
    - Electrical hazard when rebar is tied into a conductive system
- Power tools (e.g., grinders and saws)
    - When used in close proximity to rebar, it can come into contact with energized components.
    - Incompatibility of the blade used to cut different types of rebar (a concern when cutting fibreglass)
    - Cuts, punctures and lacerations from the rebar or tools
- Trips and falls when working with and around the rebar
- Striking (hitting) workers when lifting or transporting rebar due to the size of the load, or material falling or rolling from the work area
- Eye and face injury
    - Risk of debris and metal going into the eye when cutting or welding rebar
    - Risk of injury when unbundling rebar
- Pinch points

How can impalement hazards be controlled?

While impalement may not be common, it can result in a serious or fatal injury. When the impalement hazard cannot be eliminated, consider:

- Barricading or marking hazardous areas.
- Bending, or using pre-bent rebar, so that the protruding end of the rebar is pointing toward the ground.
- Using a fall protection system when working above rebar.
- Capping the rebar.

Make sure rebar caps can withstand loads that may be applied and are suitable for the hazards present.

- Verify jurisdictional requirements for impalement hazards and rebar caps.
- A good practice is to make sure that rebar caps can withstand at least 250 pounds dropped from a height of ten feet. This practice is used in the United States and is referred to as a 'drop test' (there is no direct Canadian equivalent).

- If protective wood troughs are constructed on the job site, they should be built according to a professional engineer's drawings. These plans and drawings should be available on-site.

For more information, refer to your jurisdictional requirements, the CSA Standard G30.18 Carbon steel bars for concrete reinforcement, and the Reinforcing Steel Institute of Canada (RSIC).

What control measures may be required when working with rebar?

Conduct a risk assessment to determine suitable controls for your operation. We have included control measures that may need to be implemented when working with rebar, but this list is not exhaustive.

Fall Protection

- A fall protection system is in place when working at height.
- A travel restraint system is preferred, with the radius of travel restraints not within reach of rebar.
- Alternatively, use a fall arrest system.
- Use fall protection in addition to capping rebar. Fall protection is NOT a substitute for capping.
- Identify vertical rebar (protruding rebar) in your working at heights plan

Housekeeping

- Make sure the rebar is organized so it will not be a tripping hazard
- Make sure the rebar is stored in a manner where it does not interfere with emergency access and egress
- Follow good workplace housekeeping practices, for example, using a checklist for construction sites

Material Handling

- Use mechanical lifting aids such as a forklift
- Use safe lifting techniques when materials handling
- Stockpile appropriately

Tools

- Make sure the tool blade is in good condition when cutting
- Follow the manufacturer's instructions for hand tools and power tools

Workflow

- Select prefabricated items where possible, such as rebar that is pre-bent or pre-tied
- Identify suitable storage areas ahead of time and place rebar in a location to minimize moving it
- Block off areas where work is being done, such as areas where rebar can present a trip hazard to other workers or where the cuttings may present a hazard

Electrical hazard

- Identify electrical hazards before starting work
- Establish grounding procedures
- Establish and follow lock-out tag-out procedures
- Maintain a safe distance from a powerline. The Electrical Safety Authority (ESA) advises a 3-meter (10-foot) distance from the powerline; however, refer to your jurisdiction's requirements, as they may differ. Different distance requirements are based on the voltage present
- Use insulated tools where possible

Hot work – Fire Hazards

- Establish a hot work plan
- Select and place suitable fire extinguishers
- Inspect the area for fire hazards before beginning work. Make sure there are no combustible materials, such as wood or cardboard, present
- Inspect adjacent workspaces to identify fire hazards

Chemical exposure

- Review safety data sheets for hazardous products
- Use stripping products to remove coatings from the weld area to minimize the fume.
- Dispose of chemical residue or contaminated materials properly
- Refer to your jurisdiction’s environmental agencies for any requirements to ensure compliance

Welding

- Follow procedures for hot work
- Wear appropriate personal protective equipment
- Monitor for occupational exposure limits
- Maintain good indoor air quality (IAQ) - When cutting or welding rebar, make sure the area is well-ventilated and that any respiratory protection and personal protective equipment used is suitable to the hazards present

Noise

- Use hearing protection
- Make sure noise limits are within the occupational exposure limits for your jurisdiction

Working Outdoors

- Assess weather conditions before beginning work, and re-assess as necessary
- Take the necessary precautions for cold environments, hot environments (including humidex), and ultraviolet radiation exposure.

Effective communication

- Communication when performing a paired lift
- Communication with the site and team members when the activity can pose a hazard to those around you

What personal protection should be used when handling rebar?

It is important to conduct a hazard assessment specific to your operation to determine suitable personal protective equipment for the hazards present. We have included some personal protective equipment that is commonly used when working with rebar. Always use any personal protective equipment (PPE) that is needed for the specific tasks being performed.

- Design an effective PPE program
- Use gloves that are puncture and abrasion-resistant
- Select suitable eye and face protection
- Cover exposed skin – wear long-sleeve shirts and pants
- Wear safety boots
- If welding, use appropriate personal protective equipment for the task and the types of materials present

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