

**STEEL MANUFACTURERS ASSOCIATION
CRANE FATALITY PREVENTION
INITIATIVE**



Dedicated to Preventing Fatalities in the
Steel Industry
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1. Mission

To provide a formal process to communicate fatal and potentially fatal incidents occurring in the industry, including corrective actions, relating to cranes.

To better identify and communicate practices or techniques across the industry to prevent fatal injuries.

To provide a resource for SMA Member Companies to utilize for training and/or assessment of existing fatality prevention programs.

2. Statement of Intent

The purpose of this document is to:

- Assess five critical areas where fatalities typically occur relating to cranes;
- Identify practices that will help to eliminate fatalities in those areas;
- Effectively communicate to all parties involved in those areas; and
- Provide SMA Member Companies with resources to aid them in implementing or improving fatality prevention programs in their facilities.

This document is NOT an industry standard and does not set an industry best practice. This document IS a tool to assist individuals and companies in their efforts to prevent fatalities in the steel industry. The purpose of this document is not intended to take the place of an individual company policy or procedure, but rather provide general procedures and practices to assist member companies in developing safe procedures as part of a comprehensive safety program (i.e., training, maintenance, inspections, etc.).

This document includes select techniques, procedures, priorities actions, etc., that SMA member companies have found to be particularly useful in preventing potentially fatal accidents in the workplace. These practices have been prioritized based on the SMA Safety Committee's view as

to those more helpful in avoiding serious accidents that might lead to a fatality, with those most critical being categorized as “Cardinal Rules” and the others being classified as “Guidelines.” While use of these practices is not essential to the prevention of fatalities, these practices have been recognized as successful in minimizing the likelihood of a potential fatality.

For various reasons, the practices identified herein may not be suitable or apply to every facility within the industry. Facility safety managers are encouraged to consult these materials when developing individual, facility-specific safety programs, and tailor them to the individual facility needs and circumstances.

This document is a living document, and may be updated periodically to reflect any regulatory changes and to incorporate additional information and improved practices.

3. Practices

This initiative focuses on five areas (the “critical five”) where fatalities historically have occurred in the steel industry relating to cranes: operator visibility/attentiveness; maintenance; fall hazards; charging the EAF/ladle handling; and non-routine procedures. These five areas were selected based on historical data of fatal injuries occurring in the steel industry and a forced ranking by the SMA Safety Committee.

The following practices have been found to be particularly useful in preventing potentially fatal accidents in the workplace, and are intended to assist member companies in developing safe procedures as part of a comprehensive safety program.

An effective safety effort comes from a well rounded safety program that incorporates training, discipline, management commitment and personnel involvement. Every organization should have a clearly stated policy regarding training, discipline and safety responsibilities, which holds people accountable for actions taken or not taken in the course of their daily jobs, and is applied fairly across all levels of an organization. This initiative does not prescribe a specific policy or

method, but rather encourages facility safety managers to consider all aspects when developing individual, facility-specific safety programs.

3.1. Operator Visibility/Attentiveness

The purpose of this document is to provide general industry guidelines to reduce the number of safety incidents and accidents that have had crane operator visibility and/or operator attentiveness as a contributing factor. Although control cab positioning can vary by design, cab operated electronic overhead traveling (EOT) cranes inherently have “blind spots” that present themselves to the operator during routine lifts. Compounding this, operator attentiveness during *all* crane functions must be paramount to mitigate accidents that could otherwise be easily avoided.

3.1.1. Scope and Responsibility

SCOPE:

These guidelines will apply to all cab operated EOT cranes in the industry, but will also have merit in radio and pendant controlled cranes as well as mobile cranes operating in the facility.

RESPONSIBILITY:

It is the responsibility of all EOT crane operators to ensure that they have adequate visibility of the load and landing zone, or have a spotter/signalperson in place (as outlined and defined under the following “Policy” section, page 6) before proceeding with the lift.

It is the sole responsibility of the EOT crane operator to remain attentive and focus on the task at hand during all crane operations. The operator will not operate the equipment in an environment that would allow anything less than his or her full attention.

Crane operators should be trained on the type of crane equipment which they are operating. Operators should conduct an inspection of the crane before operating.

3.1.2. Cardinal Rules

- I. Operators shall not proceed with any lift or crane function unless clear visibility of all parts of the load, line and load handling devices are visible to them or a designated spotter/signalperson, to which they have a reliable means of communication.
- II. Operators shall refrain from any activity during crane operation that creates a distraction or pulls their full attention away from operation of the crane and/or load. Facilities should consider implementing a no cell phone and other media (i.e., portable music devices, TV, radio, etc.) policy for employees, especially crane operators.
- III. The operator will operate the EOT crane within all pertinent regulations and all manufacturers' design and capacity limits.
- IV. Operators shall never operate any EOT crane under the influence of any drugs or alcohol.

POLICY

For the purpose of this document, the following definitions will apply:

DEFINITIONS:

1. A ***spotter/signalperson*** is defined as an employee in a position to have an unobstructed view of all parts of the load, line, load handling devices and landing zone and who has a reliable means of communication with the EOT crane

operator. The spotter/signalperson will also have demonstrated ability and be trained in all applicable standards.

2. A ***reliable means of communication*** is defined as either a clear line of sight with the EOT crane operator for the purpose of hand signals, or a plant radio or other two-way communication device to relay voice commands to and from the EOT crane operator.
3. A ***blind spot*** or ***blind lift*** is defined as any lift where all or part of the load, line, load handling devices and landing zone are not clearly visible to the operator. This can be due to the position of process equipment, structural members or environmental conditions in the EOT crane bay.

3.1.3. Guidelines

A. GENERAL GUIDELINES

1. Visibility

- a. The operator should recognize any lifts he or she will perform in his or her operating areas that do not afford a full and unobstructed view, i.e. blind lifts.
- b. The EOT crane operator should not proceed with any crane function where a full and unobstructed view is not available without utilizing a ground spotter/signalperson.
- c. The operator should fully understand and follow all hand and or voice commands relayed to them by the spotter/signalperson during a blind lift.
- d. When the use of a spotter/signalperson is required, the operator and the spotter/signalperson should follow all applicable regulations and facility standards regarding radio and hand signal coordination during crane moves.

- e. The use of a dedicated radio channel with no potential for outside interference or other radio traffic should be used during commands given to the operator by the spotter/signalperson.
- f. The EOT crane operator at all times shall obey the “emergency stop” command if given to him or her by someone other than the spotter/signalperson.
- g. If the EOT crane operator is unsure of any command relayed to him or her at any time during a blind lift, he or she should stop all crane moves until clarification can be made.
- h. During blind lift communication, the spotter/signalperson shall maintain a steady communication with the EOT crane operator. If this transmission is broken or interrupted during a move, the EOT operator will stop all crane moves until he or she regains communication with the spotter/signalperson.
- i. If outside noise caused by production equipment or other source is present that would make radio communication impractical, the EOT crane operator and the spotter/signalperson should use hand signals in lieu of radio communication.
- j. The EOT crane operator shall have an understanding of the production practices in his or her area that could lead to a temporary loss of visibility on an otherwise routine lift, (i.e. tapping or charging of the EAF).
- k. The operator should recognize other circumstances that may impede his or her visibility and necessitate the use of a spotter/signalperson.
- l. The operator should consider cab positioning on the EOT crane itself in regards to overall visibility. Objects behind the operator will not be readily visible and in some cases, such as aerial lifts or mobile cranes operating in the

crane bay may require a dedicated cab based spotter/signalperson to ride along with the operator.

- m. It is not recommended to allow cab cameras to replace the use of a spotter/signalperson during aerial lift or mobile crane operation.
- n. Positioning indicator devices such as encoders can be added to the traverse and hoist functions of the EOT crane to aid the operator in positioning the bridge and trolley properly for routine lifts in a *low visibility* area. However, these devices can fall out of calibration, will not take into account load swing and should not be solely relied on during a blind lift. Even with the addition of operational aids such as positioning indicators, the EOT crane operator is ultimately responsible for the safe handling of the load and safe operation of his or her equipment.
- o. The EOT operators shall maintain clean window surfaces and unobstructed views from the cabs of their EOT cranes.

2. Attentiveness

- a. The EOT operator shall maintain full focus on his or her equipment and load during all crane operations.
- b. All items that have potential to provide distractions should not be used during operations. These items include, but are not limited to, the following:
 - all personal electronics such as cell phones, portable music devices, and electronic gaming devices;
 - newspapers and other periodicals;
 - stereos and other audio equipment;
 - non-essential plant radio communications; and
 - eating or preparing food.

- c. Operators should never remove themselves from the control chair or controls of an operating crane.
- d. The operator shall keep all loads, load lines, trolleys and other moving parts of the crane in their fields of view at all times during crane operation, with the exception of blind lifts in which a spotter/signalperson will be used.
- e. The EOT crane operator shall remain awake and alert at all times while at the controls of the crane.
- f. To prevent accidental or inadvertent activation of crane controls, EOT crane operators shall power down their crane before leaving or moving about the control cab.

3.1.4. References

1. ASME B30.2-2005.
2. OSHA Standard 1910.179.

3.2. Maintenance

The purpose of this document is to provide general industry guidelines to assist member companies in developing safe procedures for addressing common industry hazards associated with Maintenance of Overhead Cranes. A lack of hazard recognition, worker inexperience, and a lack of written task-specific work procedures contribute to many of the fatal workplace injuries that occur.

3.2.1. Scope and Responsibility

SCOPE:

Crane Maintenance

RESPONSIBILITY:

It is the responsibility of all authorized personnel to ensure that proper measures are taken whenever personnel are exposed to any hazards in this area.

Crane operators should be trained on the type of crane equipment which they are operating. Operators should conduct an inspection of the crane before operating.

3.2.2. Cardinal Rules**I. Crane Boarding**

- A. Only authorized personnel shall be permitted to board an overhead crane.
- B. Personnel shall not board an overhead crane while in motion.
- C. Boarding should occur in designated areas.
- D. Personnel boarding shall communicate with operator prior to boarding.

II. Crane Interference

- A. Personnel shall establish some method to protect personnel and equipment while work is being performed in the path of an overhead crane.

III. Crane Control

- A. A designated person shall maintain control of an overhead crane while onboard the overhead crane.

3.2.3. Guidelines**A. GENERAL GUIDELINES**

1. Control of Potential Energy

- a. Overhead cranes may contain stored potential energy. Under normal conditions this energy is held in place by equipment on the crane. During periods of maintenance, proper measures should be taken to release or control this energy.
 - i. Install wheel chocks or locking devices on travel functions.
 - ii. Remove all weight from the hoist equipment or install properly engineered locking devices to control stored energy on hoists.
2. Lock Out/Tag Out/Try Out (LO/TO/TO)
 - a. Properly performed LO/TO/TO shall remove hazards associated with electricity, hot rails, rotating equipment, pinch points, etc.
 - i. Energy sources shall be isolated, locked and tried out prior to the performance of any work on an overhead crane.
3. Electrical Safety
 - a. Personnel shall protect themselves from Arc Flash, Electrical Shock and Arc Blast hazards per standards, e.g. NFPA 70E.
 - i. Equipment shall be de-energized prior to performing work.
 - ii. Special precautions must be taken on equipment that cannot be de-energized to control or eliminate the arc flash, shock, and chemical hazards. For example, isolating battery banks into sections less than 50Vdc is an option.
4. Fall Protection
 - a. Fall protection should be worn when engineering controls are not available to protect personnel from fall hazards.
 - i. When fall protection must be worn to protect from fall hazards, the equipment should be locked out or measures should be taken to

prevent personnel from coming in contact with power or rotating equipment.

- ii. It is recommended to use self-retracting lanyards as fall protection lanyards have become entangled in rotating equipment.

B. CRANE BOARDING

1. Crane Boarding Procedures

- a. Boarding procedures shall address how to properly communicate with the operator of the overhead crane.
- b. Boarding procedures shall address how to control the crane if an operator is not present when boarding an overhead crane.

2. Crane Boarding Interlocking/E-STOPS

- a. It is recommended that for preventing motion of an overhead crane while boarding/de-boarding the crane is to have interlocks or E-STOPS installed at the boarding points of the crane to disable crane motion.
 - i. Interlocks or E-STOPS should not be used in place of LO/TO/TO.

C. CRANE INTERFERENCE

1. Crane Interference Procedures

- a. Crane interference procedures should be developed. Mobile equipment or personnel working in the path of an overhead crane bridge requires some form of protection from the travel of the overhead crane.
 - i. LO/TO/TO of the hot rails.
 - ii. LO/TO/TO of the individual overhead cranes.

- iii. Properly engineered and installed temporary runway stops to prevent cranes from entering the area of the work.
- iv. Establish a spotter/signalperson with a defined work area and communications with crane operators in the affected area of the work.

2. Crane Interference Permit

- a. An additional method of ensuring the safety of personnel while performing work in the path of the crane bridge is to use a permit system. The permit should identify key personnel and list the method of protection from the traveling overhead cranes in the area.

D. CRANE CONTROL

1. Communication Procedures

- a. When performing testing and troubleshooting of an overhead crane that requires personnel to be on an overhead crane while it is energized, communication methods must be established and procedures in place that will not allow the overhead crane to be used without the specific direction of the job leader performing the work.
 - i. The crane shall not have a load on the hoist unless it is specifically required to perform the task.
 - ii. The job leader shall ensure the safety of all personnel on the crane prior to directing any motion of the crane.
 - iii. The operator shall not move any function of the crane without specific direction from the job leader. Specific direction shall include function, direction of travel, and required distance.
 - iv. Prior to returning the control of the crane to the operator; all personnel, tools and equipment shall be removed from the crane. All guards must be installed and safety must be ensured.

3.2.4. References

1. OSHA 1910.179.
2. ASME B30.2-2005.
3. NFPA 70 E.

3.3. Fall Hazards

3.3.1. Scope and Responsibility

SCOPE:

Operation of Overhead Cranes

RESPONSIBILITY:

Any and all authorized personnel that must operate, board, or perform maintenance work on an overhead crane are potentially exposed to Fall Hazards while performing those duties. It is the responsibility of each personnel to comply with the protocols provided to better protect themselves from the hazards present.

Crane operators should be trained on the type of crane equipment which they are operating. Operators should conduct an inspection of the crane before operating.

3.3.2. Cardinal Rules

Fall Protection—Fall Protection Devices shall be used by all authorized personnel that are exposed to fall hazards while:

- I. Boarding
- II. Performing any work on unprotected area of the crane
- III. Accessing or walking any unprotected area of the crane runway

3.3.3. Guidelines

A. GENERAL GUIDELINES

1. Evaluate the authorized personnel access ways to all overhead cranes. The walkways or access shall provide adequate fall protection. The evaluation should include a review of the necessary fall prevention or fall arrest systems necessary to prevent personnel from being exposed to falls while attempting to access the crane.
2. Areas that present an open sided floor when the crane is moved away from the landing should be protected by approved self-closing gates. Ladder access points should be evaluated and self-closing gates installed where feasible.
3. All ladders on cranes that present a fall potential (side, back or front) greater than 20 feet should be protected by a cage or other approved fall protection device (i.e. safety slide mechanism). Distance should be measured from the furthest point of a potential fall which may be the ground level below the crane.
4. Stairways, access ways and ladders on or to cranes should be routinely inspected to ensure they are not damaged, in good usable condition and free from oil, grease or slippery material.

5. During the winter months EOT cranes may collect snow and ice. De-icing procedures should be developed for cranes that are susceptible to snow and ice accumulation.
6. There should be procedures in place for personnel to follow that describe the proper boarding steps for accessing any overhead crane.
7. Authorized personnel working on an overhead crane where those individuals will be working outside of the provided fall protection devices shall use adequate Fall Arrest Equipment.
8. Verbal and visual communication between the Crane Operator and any authorized personnel attempting to board an overhead crane shall be established prior to the individual(s) attempting to board.
9. Procedures should be developed to address any authorized personnel that must board a crane using a mobile manlift or any other type of mobile personnel access device to ensure that personnel comply with 100% tie-off. Authorized personnel need to ensure that they are protected from the fall exposure present while climbing in/out of the manlift onto the crane.
10. Where authorized personnel must access crane runways with horizontal electrical power rails (hot rails) running near the runway, proper LOTO procedures shall be followed, or personnel shall choose fall protection that would arrest a potential fall before the personnel contacted the electrical lines.
11. Fall protection should be considered when drafting and/or revising emergency preparedness procedures for EOT cranes. (IE: power loss, fire, emergency evacuation, medical emergencies on cranes, etc.)

12. Where personnel suspended man-baskets or platforms are utilized and tethered to an EOT crane, personnel should reference operational criteria of OSHA 29 CFR 1926.550 (g) or applicable regulatory guidelines.

3.3.4. References

1. OSHA Subpart D.
2. OSHA 1926 Subpart N

3.4. Charging the EAF/Ladle Handling

The purpose of this document is to provide general industry guidelines to assist member companies in developing safe procedures for addressing common industry hazards associated with charging Electric Arc Furnaces and working around ladles used for handling molten metal. A lack of hazard recognition, worker inexperience, and a lack of written task-specific work procedures may contribute to many of the fatal workplace injuries that occur.

3.4.1. Scope and Responsibility

SCOPE:

These guidelines apply to charging Electric Arc Furnaces and personnel exposure to molten metal hazards associated with furnace ladles.

RESPONSIBILITY:

It is the responsibility of all personnel to ensure that appropriate protection measures are used when charging Electric Arc Furnaces and those personnel are working around EAF and molten metal hazards.

Crane operators should be trained on the type of crane equipment which they are operating. Operators should conduct an inspection of the crane before operating.

3.4.2. Cardinal Rules

- I. Use proper personal protective equipment while working on or near furnaces ladles and during EAF furnace charging activities.
- II. Follow safe job procedures while working on or near furnace ladles and during EAF furnace charging activities.

3.4.3. Guidelines

A. GENERAL GUIDELINES

1. Personnel are expected to be trained to recognize the molten metal hazards related to their workplace or work area.
2. Authorized personnel shall perform assessments and identify and wear designated personnel protective equipment for each designated task.
3. Good housekeeping standards should be maintained to prevent materials, equipment, or debris from becoming tripping hazards in walkways and aisles near molten metal operations.
4. Only authorized personnel should be allowed in the operating area(s).
5. Pedestrian Controls – Appropriate warning signs, walkways, lights and procedures should be established to prohibit, protect and control unauthorized pedestrian traffic through melting operational areas.

B. EAF CHARGING GUIDELINES

1. Furnace Personnel

- a. Scrap Purchasing Guidelines – Purchasing guidelines should be established to clearly identify acceptable vs. non-acceptable forms of scrap. Guidelines should include but not limit to: scrap preparation, closed containers, pipe, aerosol cans etc. to ensure water and other unwanted material which could cause an eruption in the furnace are removed from the supply chain.
- b. Scrap inspection process should be developed for all in-bound scrap at facilities, and should include inspections for unwanted material, standing water, ice build-up, snow build-up, etc.
- c. Personnel are expected to be trained how to recognize impending molten metal eruption/reactions and cave-ins in the furnace.
- d. All designated personnel are expected to be trained to recognize water leaks in the furnace.
- e. All affected personnel are expected to be in a protected area while the furnace is being charged. It is highly recommended that a notification/alert procedure be developed to inform affected personnel in that area in which a charge is going.
- f. All affected personnel are expected to be trained to assume every charge is a wet charge and contains closed container(s).
- g. It is recommended that the furnace should be inspected on a regular basis after a tap.
- h. It is recommended that the furnace pulpit windows have appropriate blast shields to protect the furnace operator(s).

- i. The furnace floor should be well lit to ensure affected personnel can visually identify impending hazards associated with the melting process and work area.
- j. The furnace door and slag pit opening should be appropriately protected to prevent injury to authorized personnel and equipment damage.

2. Crane Operators

- a. The crane operator is expected to be trained to recognize the hazards of “packing the furnace” with the charge bucket.
- b. Crane operators are expected to be trained how to dry a wet charge by holding the bucket over the furnace.
- c. Remote Operated Cranes – Operator shall be in a protected area while the furnace is being charged.
- d. Cab Operated Cranes – It is recommended that cab windows have bullet proof glass to protect the operator.
- e. If a furnace eruption affects the crane, the crane should be shut down until a thorough inspection is done.
- f. Crane alarms and lights should be kept in good working order to provide clear communication between the crane operator and employees working the floor.
- g. Communication between the Crane Operator and any personnel working on the melt shop floor should be maintained while charging the furnace.

3. Maintenance Personnel

- a. It is recommended that a comprehensive charge bucket inspection program be required.
- b. It is recommended that a compliant comprehensive crane cable, J-hook and spreader beam inspection be required.
- c. It is recommended for twin shell operations to evaluate and establish approved maintenance activities for down furnaces adjacent to operating furnaces.

C. WORKING AROUND LADLE GUIDELINES

1. Personnel should be trained on appropriate procedures for connecting/disconnecting ladle stir hoses. (Note: Automated connection/disconnection systems are commercially available.)
2. Personnel should be trained how to recognize an impending molten metal reaction in a ladle. Emergency procedures should be developed for hot spots and ladle burn melt throughs. These procedures should be communicated to all affected personnel.
3. Personnel should be trained to recognize “hot spots” on a ladle.
4. It is recommended that elevated walkways near ladles shall be inspected on a frequent basis and kept in good working order.
5. Proper Fall Protection devices such as handrails or guardrails should be on all practical applications to prevent a fall into a ladle.

3.5. Non-Routine Procedures

The purpose of this document is to provide general industry guidelines to assist member companies in developing safe procedures for addressing common industry related safety hazards. The specific area of non-routine procedures relating to crane safety and fatality prevention will be covered in detail. There were 23 total fatalities in the US in 2009 related to Cranes, with 6 being directly in the manufacturing sector. Although the fatality rate involving cranes has declined in recent years, inexperience, time constraints, lack of information, and poor hazard and risk assessment continue to keep this rate above the goal of zero injuries.

3.5.1. Scope and Responsibility

SCOPE:

The guidelines address non-routine procedures such as: Side Pulls, Engineered Lifts, Cobble Removal, Tandem Lifts, and others that may be occurring in the industry. General Crane Safety Guidelines will be covered, followed by Non-Routine Specific Guidelines.

RESPONSIBILITY:

It is the responsibility of all personnel to ensure that proper crane hazard controls are used whenever those employees are exposed to a non-routine crane operation.

Crane operators should be trained on the type of crane equipment which they are operating. Operators should conduct an inspection of the crane before operating.

3.5.2. Cardinal Rules

- I. Whenever a lift is made, the authorized personnel shall identify a lift plan and visually confirm that the load is fully and properly engaged.
- II. Always utilize a spotter/signalperson any time the crane operator's view of the load is obstructed.

- III. In the event that a limit device needs to be bypassed in order to make a non-routine lift, special procedures to address this should be developed to prevent hook or block from striking the underside of the crane.
- IV. If there are any unresolved safety issues, the crane operator shall delay the lift until the safety issues are corrected.

3.5.3. Guidelines

A. GENERAL SAFETY GUIDELINES

1. Cranes should only be operated by trained/authorized personnel.
2. The Operation and Maintenance Manual should be available.
 - Every person who operates the crane should have read the safe operations section.
3. It is not recommended to engage in any practice that will divert the operator's attention while operating the crane.
4. Respond to signals only from the spotter/signalperson who is directing the lift, or an appointed spotter/signalperson. Obey a stop signal at all times, no matter who gives it.
5. Do not move a load over people. People shall not be placed in jeopardy by being under a suspended load. Also, do not work under a suspended load unless the load is supported by blocks, jacks, or a solid footing that will safely support the entire weight. Have a crane or hoist operator remain at the controls or lock open and tag the main electrical disconnect switch.
6. Maintain a safe distance under the load when elevated. A safe rule of thumb is to keep a radius under the load greater than twice the height of the load. Taglines

and push sticks are a good way to maintain safe distance and ensure the load is controlled.

7. Ensure that the rated load capacity of a crane's bridge, individual hoist, or any sling or fitting is not exceeded. Know the weight of the object being lifted or use a dynamometer or load cell to determine the weight.
8. Check that all controls are in the OFF position before closing the main-line disconnect switch.
9. To prevent shock loading, avoid sudden stops or starts. Shock loading can occur when a suspended load is accelerated or decelerated, and can overload the crane or hoist. When completing an upward or downward motion, ease the load slowly to a stop.

B. GUIDELINES FOR NON-ROUTINE LIFTS

1. Engineered Lifts

- a. Knowing the weight of the load is essential for the safe operation of an overhead crane.
- b. It is important to know that not all cranes are supplied/equipped with overload protection devices.
- c. It is recommended that the operator should never intentionally or unintentionally overload an overhead crane.
 - i. If intending to use an engineered lift, please consult ASME B30.2 guidelines.

2. Side Pulls

- a. The crane should not be used for side pulls unless specifically authorized by a responsible person who has determined that the stability of the crane is not thereby endangered and that various parts of the crane will not be overstressed.
- b. Side pulling can cause the wire ropes to become cross grooved resulting in severe damage such as kinks, crushing, scrubbing.
- c. Side pulling also produces stress on the bridge and trolley in a manner that it was not designed to undertake.
- d. Side pulling can put equal lateral and vertical stresses on the crane causing loads to be heavier than their actual weight.
- e. Load swinging is a dangerous consequence of side pulling and poses a serious threat to area personnel.

3. Cobble Removal

- a. Always maintain a safe speed during cobble removal, time and comfort will inevitably be a pressure, but safe speeds will make the job more efficient.
- b. The material you are lifting may have sharp edges and can cut normal nylon slings, therefore the use of wire ropes or steel lifting devices is recommended.
- c. Heat can alter the life of a wire rope, shackle or lifting device. Know the manufacturer's recommendations for inspection and removal from service.
- d. Always maintain a safe working distance away from the load. Cobble pieces will not be as secure as this material can break in transit.

- e. After a cobble is removed, it is recommended to visually inspect the crane to see if abnormal movements caused any issues.

4. Multiple Hoists (Hooks)

- a. If a lift requires the use of both hooks, a sling capable of holding the weight of the load should be used for each hook.
- b. The load should always remain level, so raise and lower the hooks alternately in short bursts.
- c. Always use the lowest speeds possible to maintain a secure load; swinging using multiple hoists is very dangerous.

5. Tandem Lift (Multiple Cranes)

- a. Preferably, it is recommended that multiple cranes are never used for an overhead lift, alternate lifts should be researched to avoid the use of multiple cranes. Treat multiple crane lifts as critical lifts per applicable standards.
- b. The load of the weight as well as the pull load from a second crane could alter the lifting capabilities of each crane and increase the static weight of the load.
- c. The angle of the lift will also produce a side pull and could damage the ropes and drum.

6. Underground, Well, Basement, Below grade

- a. Always maintain at least 2 full wraps of rope when running hoists down.
- b. Visually check the remaining rope on the drum as you lower hoists below ground level.

- c. Do not use the emergency lower limits as operational limits.

7. Operational (Non-Emergency) Limit Switch

- a. The upper (Emergency) limit switch is a safety device not an operational device, designed to prevent double blocking, or colliding the hook assembly to the crane carriage.
- b. Never utilize the upper (Emergency) limit as an operational stop.
- c. Never operate the crane above the manufacturer's operational (Non-Emergency) limits.
- d. If you know the lift will be near the operational limit, raise the load slowly, utilize a spotter/signalperson, and stop if you believe you are at or above the limit. Consistently using the operational (Non-Emergency) limit switch may cause fatigue and failure of the limit.

8. Restrictive Area/Congested Landing

- a. Know the landing spot prior to commencing lift; hazard identification can save time and energy.
- b. Never carry a load over people.
- c. Do not lower the load if it creates a potential pinch point for area personnel.
- d. It is recommended that personnel use a tag line or no touch tool to control the movement of a load.

- e. A clearance of >3 inches overhead and >2 inches laterally shall be maintained from the crane while in operation.
9. Complex Geometries (With special considerations for demolition)
- a. Know the load weight and the working load limits.
 - b. Make sure all slings are rated for the load and sling angle.
 - c. If lifting material during a tear out, know that loads could still be anchored. A thorough check of the load with special consideration of how it is mounted can prevent overloading the crane.

3.5.4. References

1. Code of Federal Regulation, Title 29, Part 1910.179, "Overhead and Gantry Cranes."
2. Code of Federal Regulation, Title 29, Part 1910.184, "Slings."
3. Code of Federal Regulation, Title 29, Part 1926.550, "Cranes and Derricks."
4. *Mechanical Engineering Department Design Safety Standards, Chapter 2.2, "Lifting equipment."*
5. ASME/ANSI B30.2-2005, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)."
6. ASME/ANSI B30.17, "Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)."

4. Communication

Communication is essential to effective fatality prevention. Fatality prevention cannot be achieved without cooperation and reporting. It is the responsibility of all individuals working in a steel facility to properly report all incidents, including near misses and property damage, according to their policy.

5. Conclusion – Reports and Updates

The mission of the SMA Crane Fatality Prevention Initiative is to provide a formal process to communicate fatal and potentially fatal incidents occurring in the industry, including corrective actions, better identify and communicate practices or techniques across the industry to prevent fatal injuries, and provide a resource for SMA Member Companies to utilize for training and/or assessment of existing fatality prevention programs.

Fatal and potentially fatal incidents occurring in the industry can be reported on incident / near miss reporting system on the SMA Safety Website: www.steelsafety.org.

Practices and techniques to prevent fatal injuries in five critical areas relating to cranes – operator visibility/attentiveness; maintenance; fall hazards; charging the EAF/ladle handling; and non-routine procedures – are listed in the document above. This document is a living document, and may be updated periodically to reflect any regulatory changes and to incorporate additional information and improved practices. **To make any suggestions or provide additional input, please contact the SMA at (202) 296-1515 or via email at cipicchio@steelnet.org.**

As a reminder, this initiative is not intended to take the place of an individual company policy or procedure, but rather provide general procedures and practices to assist member companies in developing safe procedures as part of a comprehensive safety program. **It is NOT an industry standard and does not set industry best practice, but rather is a tool to assist individuals and companies in their efforts to prevent fatalities in the steel industry.**