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### 1 PURPOSE


- 1.1 To establish safe operating practices to minimize hazards associated with the installation, operation and maintenance of fixed overhead cranes, hoists and slings.

### 2 SCOPE

- 2.1 This guideline applies to all MTS employees, contractors, and suppliers using MTS cranes, hoists or performing rigging activities.


### 3 DEFINITIONS AND ACRONYMS

- 3.1 ANSI: The American National Standards Institute.
- 3.2 Auxiliary hoist: A supplemental hoisting unit of lighter capacity and usually higher speed than provided for the main hoist.
- 3.3 Brake: A device used for retarding or stopping motion by friction or power means.
- 3.4 Bridge: That part of a crane consisting of girders, trucks, end ties, foot walks, and drive mechanism which carries the trolley or trolleys.
- 3.5 Bridge travel: The crane movement in a direction parallel to the crane runway.
- 3.6 Bumper: An energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel; or when two moving


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cranes or trolleys come in contact.


- 3.7 Choker hitch: Sling configuration with one end of the sling passing under the load and through an end attachment, handle or eye on the other end of the sling.
- 3.8 Clearance: The distance from any part of the crane to a point of the nearest obstruction.
- 3.9 Coating: An elastomer or other suitable material applied to a sling, or a sling component, to impart desirable properties.
- 3.10 Collectors current: Contacting devices for collecting current from runway or bridge conductors.
- 3.11 Competent Person: One who is capable of identifying existing and predictable hazards in the surrounds or working conditions that are unsanitary, hazardous, or dangerous to employees and who has the authority to take prompt corrective measures to eliminate such hazards.
- 3.12 Conductors, runway: The electrical conductors located along a crane runway to provide power to the trolley.
- 3.13 Crane: A machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine. Cranes, whether fixed or mobile, are driven manually or by power.
- 3.14 Cribbing: process of using materials used to build a (structural) crib, usually of timbers or logs, but also of concrete, or steel - to support anything from below or on a side, or to prop up, secure and support a piece of heavy machinery, equipment or components
- 3.15 Cross rod: Wire used to join spirals of metal mesh to form a complete fabric.
- 3.16 Designated: Selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.
- 3.17 Deviation: A variance that authorizes departure from a particular safety requirement, where the intent of the requirement is met through alternate means that provide an equal or greater level of safety - \*requires a Risk Assessment, prior to noting and granting of any deviations\*

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- 3.18 Drag brake: A brake which provides retarding force without external control.
- 3.19 Drum: The cylindrical member around whom the ropes are wound for raising or lowering the load.
- 3.20 EHS: Environmental, health and safety.
- 3.21 Equivalent entity: A person or organization (including an employer) which, by possession of equipment, technical knowledge and skills, can perform with equal competence, the same repairs and tests as the person or organization with which it is equated.
- 3.22** Fabric (metal mesh): Flexible portion of a metal mesh sling consisting of a series of transverse coils and cross rods.
- 3.23 Fixed overhead crane: A crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.
- 3.24 Floor operated crane: A crane which is pendant or nonconductive rope controlled by an operator on the floor or an independent system.
- 3.25 Handle: Terminal fitting to which metal mesh fabric is attached.
- 3.26** Hands on user: Class room and hands on trained operator authorized to perform lifts of capacities less than 1000 pounds requiring basic rigging for vertical lifting only after realizing a minimum of two weeks on the job training, qualified by a mentor and verified by their immediate supervisor.
- 3.27** Hitch: Sling configuration whereby the sling is fastened to an object or load, either directly to it or around it.
- 3.28 Holding brake: A brake that automatically prevents motion when power is off.
- 3.29 Hoist: An apparatus which may be a part of the crane, exerting force for lifting or lowering.
- 3.30 Hoist chain: The load bearing chain in a hoist.
- 3.31 Lift: A device designed / used to lift a specific part / sub-assembly of production or facilities equipment instead of a crane or hoist.
- 3.32 Limit switch: A switch which is operated by some part or motion of a power driven machine or equipment to alter the electric circuit associated with the machine or equipment.


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- 3.33 Link: Single ring of a chain.
- 3.34 Load: The total superimposed weight on the load block or hook.
- 3.35 Load block: The assembly of hook or shackle, swivel, bearing, sheaves, pins and frame suspended by the hoisting rope.
- 3.36 Master coupling link: Alloy steel welded coupling link used as an intermediate link to join alloy steel chain to master links.
- 3.37 Master link or gather ring: Forged or welded steel link used to support all members (legs) of an alloy steel chain sling or wire rope sling.
- 3.38 Mentor: Experienced, power user level personnel, that provide the on the job training for the purposes of qualifying personnel to the hands on and power user levels.
- 3.39 Power operated crane: A crane whose mechanism is driven by electric, air, hydraulic or internal combustion means.
- 3.40 Power user: Class room and hands on trained operator authorized to perform lifts of capacities greater than 1000 pounds requiring advanced rigging beyond basic, vertical lifts after realizing a minimum of one month on the job training, qualified by a mentor and verified by their immediate supervisor.
- 3.41 Proof load: Load applied in performance of a proof test.
- 3.42 Proof test: Nondestructive tension test performed by the sling manufacturer or an equivalent entity to verify construction and workmanship of a sling.
- 3.43 Qualified crane operator: A person who is certified to inspect and operate overhead cranes and hoist equipment in all situations. Requires experience and training in operating and rigging.
- 3.44 Qualified rigger: Person who is certified to inspect rigging equipment and use the equipment to attach a load to a lifting device.
- 3.45 Rated capacity or working load limit: Maximum working load permitted by the provisions of this section.
- 3.46 Rated load: The maximum load for which a crane, or individual hoist, is designed and built by the manufacturer and shown on the equipment nameplate(s).
- 3.47 Remote operated crane: A crane controlled by an operator, not in a pulpit or

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in the cab, attached to the crane by any method other than pendant or rope control.

- 3.48 Rope: Wire rope, unless otherwise specified, occasionally or intermittently as required.
- 3.49 Risk Assessment: A systematic process of evaluating the potential risks that may be involved in a projected activity or undertaking (at MTS – performed by designated and trained Qualified Individuals, with the support of area expert staff and supervisors)
- 3.50 Sling: Assembly which connects the load to the material handling equipment.
- 3.51 Sling manufacturer: Person or organization that assembles sling components into their final form for sale to users.
- 3.52 Stop: A device to limit travel of a trolley or crane bridge. This device normally is attached to a fixed structure and normally does not have energy absorbing ability.
- 3.53 Suspended Load Operation Definition: An operation is considered a suspended load operation and subject to the requirements of this standard if it meets all three of the following criteria:
  - 1. The operation involves the use of a crane or hoist that supports the weight of a suspended load.
    - (This excludes operations where the load is secured in a holding fixture or on substantial blocks supporting the entire load even though the crane/hoist hook may still be attached.)
    - No distinction is made between a static load and a dynamic load. Rigging, i.e., slings, Hydra-sets, lifting fixtures, shackles, straps, when attached to the hook, is considered part of the load.
  - 2. Personnel involved in the operation have any part of the body directly beneath the suspended load.
    - (This excludes operations where employees have their hands on the sides of a load, i.e., to guide the load.)

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3. In the event of a crane/hoist failure, as the load drops it could contact personnel working directly beneath it, with injury or death as a possible result.

- (This excludes operations where employees have their hands only partially under a load such that a crane or hoist device failure would push their hands out of the way not resulting in injury. This also excludes situations where the falling load would come to rest on hardware that is not suspended before an employee could be injured)

- If such conditions are met , prior to any lifting action a Risk Assessment must be performed addressing the following:

(a) A justification why the operation cannot be conducted without personnel beneath the load. Feasible procedure/design options will be investigated to determine if the work can be accomplished without personnel working under a load suspended from a crane/hoist.


(b) Details of the precautions taken to protect personnel should the load drop. Secondary support systems, i.e., equipment designed to assume support of (catch) the load preventing injury to personnel should the crane/hoist fail, shall be evaluated and used whenever feasible. Secondary support systems will be constructed with a minimum safety factor of 2 to 1 yield.

(c) The maximum number of exposed personnel allowed. Steps shall be taken to limit the number of personnel working under a load suspended from a crane/hoist. Only those essential personnel absolutely necessary to perform the operation will be allowed to work in the safety controlled area.

(d) The time of exposure. Steps shall be taken to ensure that personnel do not remain under the load any longer than necessary to complete the work.

\* Each operation will be reviewed on a case-by-case basis.

\* Only those suspended load operations approved by EH&S upon completion of all Controls measure items associated with the designated task Risk Assessment

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**3.54** Trolley: The unit that travels on the bridge rails and supports the load block.

#### 4 GRAPHIC (IF NEEDED)

#### 5 RESPONSIBILITIES


##### 5.1 Employees

- 5.1.1 Follow procedures and requirements of MTS' Fixed Overhead Crane, Hoist and Sling program as well as the Operation of Cranes and Hoists in Manufacturing Plants policy.
- 5.1.2 Complete all necessary training prior to operating a crane or hoist or rigging equipment.
- 5.1.3 Operate cranes and hoists and perform rigging tasks only if trained and qualified to do so.
- 5.1.4 Defer to more qualified, proficient operations personnel to operate cranes and hoists and perform any rigging for lifting tasks.
- 5.1.5 Report any conditions where potential suspended load work may be needed or required during the course of managing/manipulation system equipment, components, fixtures or related items, (including the final build elements).

##### 5.2 Supervisors / Managers

- 5.2.1 Ensure all employees in their organization are aware of this Fixed Overhead Crane, Hoist and Sling program as well as the Operation of Cranes and Hoists in Manufacturing Plants policy.
- 5.2.2 Ensure employees whose job responsibilities require the use of cranes and hoists are trained and certified.
- 5.2.3 Ensure that only authorized employees, trained, qualified and proficient operate hoists, cranes or perform rigging tasks (contractor confirmation included).
- 5.2.4 Verify personnel are trained and proficient in all requirements of the Fixed Overhead Crane, Hoist and Sling program and provide such



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verification to EHS & Training whenever various operating levels (e.g., hands on, power user, etc.) are achieved.

- 5.2.5 Implement, manage and audit personnel for compliance with the Fixed Overhead Crane, Hoist and Sling program.
- 5.2.6 Ensure any deficiencies or deviations found in the working procedures or in employee competency are corrected.
- 5.2.7 Enforcement of this Fixed Overhead Crane, Hoist and Sling program and the Operation of Cranes and Hoists in Manufacturing Plants policy including the use of disciplinary actions per MTS policy.


### 5.3 EHS

- 5.3.1 Ensure a written Fixed Overhead Crane, Hoist and Sling program which addresses the authority, responsibilities and controls needed to protect employees from improper operation or maintenance is implemented.
- 5.3.2 Ensure all managers, supervisors and employees are informed of the Overhead Crane, Hoist and Sling program and the policy for operating cranes and hoist in manufacturing plants.
- 5.3.3 Ensure only those employees identified by managers/supervisors that will utilize Crane/Hoist devices on a regular basis (daily/weekly) are provided with the training (infrequent use needs can be supplemented by manufacturing floor staff/personnel to ensure competency is maintained).
- 5.3.4 Update program to remain current with OSHA and applicable state and local regulations.
- 5.3.5 Periodically audit/inspect program to ensure content and employee practices are current with applicable regulations and this Fixed Overhead Crane, Hoist and Sling program.

### 5.4 Training

- 5.4.1 Provide trainers, materials and logistics for fixed overhead crane, hoist and rigging training.



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5.4.2 Maintain training records of all employees.

## 5.5 General

5.5.1 Annual inspection records of cranes and hoisting equipment including the date, inspector and results shall be maintained for each piece of equipment.

5.5.2 The equipment operator shall conduct a pre-operational daily inspection prior to using any crane or hoist equipment and record the results on the MTS Crane Operator Daily Checklist (EHS-500-130).

5.5.3 Only trained, authorized individuals shall operate crane and hoist equipment (see roles and responsibilities).

5.5.4 Operating controls shall be plainly marked to indicate direction of travel.

5.5.5 Electrical equipment shall be located or enclosed so that no energized parts are exposed to accidental contact under normal operating conditions. Electrical equipment shall be protected from dirt, grease, oil and moisture. Guards shall be substantial and located so that they cannot be deformed allowing electrical contact.


5.5.5.1 Electrical disconnect controls for cranes shall be so located as to be within view of the runway contact conductors.

5.5.6 All new overhead and gantry cranes constructed and installed on or after August 31, 1971, shall meet the design specifications of the American National Safety code for overhead and gantry cranes, ANSI B30.2.0-1967.

5.5.7 All slings shall be used according to capacities identified in tables N-184-1-22, 29 CFR 1910.184 or other applicable standards. Slings not included in these tables shall be used only in accordance with the manufacturer's recommendations.


5.5.8 All lifting hooks shall be equipped with a safety latch.

## 6 PROCEDURE

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## 6.1 Design and Installation

- 6.1.1 Overhead cranes, hoisting and rigging equipment shall be designed and installed according to requirements set forth in 29 CFR 1910.179, 1910.184, the B30 series of ASME standards or other applicable standards.
- 6.1.2 Changes or modifications to cranes, hoisting or rigging equipment shall only be performed by the equipment manufacturer or their representative.
- 6.1.3 Markings:
- 6.1.3.1 The rated load of the hoist shall be marked on the hoist, trolley unit or its load block and each rated load shall be legible from the floor.
  - 6.1.3.2 If the crane has more than one hoisting unit, each hoist unit shall have its rated load marked on the hoist, trolley unit or its load block and each rated load shall be legible from the floor. These markings shall also appear on the appropriate controllers used by the operators.
  - 6.1.3.3 Cranes shall have a safety label or labels affixed to the pendant station or load block containing cautionary language against:
    - 6.1.3.3.1 Lifting more than the rated load
    - 6.1.3.3.2 Operating hoist when load is not centered under hoist
    - 6.1.3.3.3 Operating hoist with twisted, kinked or damaged chain or rope
    - 6.1.3.3.4 Operating damaged or malfunctioning crane
    - 6.1.3.3.5 Lifting people
    - 6.1.3.3.6 Lifting loads over people
    - 6.1.3.3.7 Operating a rope hoist with a rope that is not properly seated in its groove

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6.1.3.3.8 Operating manual motions with other than manual power (floor or remote operated).

6.1.3.3.9 Removing or obscuring safety label

6.1.3.4 A safety label shall be affixed on all electrical control boxes and shall include information as follows:

6.1.3.4.1 Disconnect power and lockout disconnecting means before removing cover or servicing this equipment

6.1.3.4.2 Service on electrical control boxes shall be performed only by a qualified electrician

6.1.3.5 Alloy steel chain slings shall have permanently affixed durable identification stating size, grade, rated capacity and reach.

6.1.3.6 Metal mesh slings shall have permanently affixed durable marking that states the rated capacity for vertical basket hitch and choker hitch loadings.


6.1.3.7 Synthetic web slings shall be marked or coded to show the rated capacities for each type of hitch and type of synthetic web material.

6.1.4 Except for floor operated cranes, a gong or other effective warning signal shall be provided for each crane equipped with a power traveling mechanism.

## 6.2 Clearances

6.2.1 Clearance shall be maintained between the crane and the building, as well as between parallel running cranes and cranes operating at different elevation, under all operating conditions.

6.2.2 Minimum clearance of 3 inches overhead and 2 inches laterally shall be provided and maintained between crane and obstructions in conformity with Crane Manufacturers Association of America, Inc., and Specification No. 61. Where safety of personnel will be jeopardized by


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movements of the crane.

- 6.2.3 If the runways of two cranes are parallel and there are no intervening walls or structures, there shall be clearance provided and maintained between the two bridges.
- 6.2.4 Runways for each crane must be checked for mobile elevated work platforms – MEWP’s (e.g., scissor lifts, booms, etc.) that may be located in the area. Under no circumstances can a crane be operated if an MEWP is in use in the crane runway area, or in the immediate area on either end of the crane runway. Cranes must be locked out when MEWP’s are used in the crane runway area.

### 6.3 Inspection and Testing

- 6.3.1 New, reinstalled, altered, repaired and modified cranes shall be inspected by the manufacturer or appropriate certification agency prior to initial use. The inspection may be limited to the provisions affected by the alteration, repair or modification, as determined by the manufacturer or representative. Inspection shall include a rated load test not be with more than 125 percent of the crane’s rated load.
- 6.3.2 The following items shall be inspected daily prior to use by using the MTS Crane Operator Daily Checklist (EHS-500-130). Deficiencies presenting a hazard shall be corrected prior to use.
  - 6.3.2.1 Functional operating mechanisms for maladjustment interfering with proper operation including; hoisting and lowering, trolley travel, bridge travel, limit switches (upper limit under a no load condition, inching to the limit switch) and locking and safety devices.
  - 6.3.2.2 Deterioration or leakages in lines, tanks, valves, drain pumps and other parts of air or hydraulic systems.
  - 6.3.2.3 Hooks with deformation or cracks
  - 6.3.2.4 Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function or stretch beyond manufacturer’s recommendations; and
  - 6.3.2.5 All functional operating mechanisms, including chain blocks/load blocks, for excessive wear of components.

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6.3.2.6 Test pendant emergency stop. Except for Kone cranes, bridge will still operate with the E-stop activated.

6.3.2.7 Remove from service, any damaged / defective equipment. Notify maintenance for any crane or hoist that fails any of the above identified tests.

6.3.2.7.1 Leave crane in position of failure or observed defect

6.3.2.7.2 Deliver remote pendant to Maintenance Department and provide details of failure or defect.

6.3.3 The following items shall be inspected for quarterly or on an alternative interval. Inspections shall include a certification record containing the signature of the person who performed the inspection and a unique identifier representing specific equipment. Examples of items to inspect for are:

6.3.3.1 Deformed, cracked or corroded members

6.3.3.2 Loose bolts or rivets

6.3.3.3 Cracked or worn sheaves and drums

6.3.3.4 Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices.

6.3.3.5 Excessive wear on brake system parts, linings, pawls and ratchets.


6.3.3.6 Load, wind and other indicators over their full range, for any significant inaccuracies.

6.3.3.7 Electric, or other power plants for improper performance or non-compliance with applicable safety requirements

6.3.3.8 Condition of hooks, safety latches and hoist chains

6.3.3.9 Excessive wear of chain drive sprockets and excessive chain stretch

6.3.3.10 Electrical apparatus for signs of pitting or any deterioration

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of controller contactors, limit switches and pushbutton stations.

6.3.4 Annual rated load or equivalent regulatory requirements tests shall not be with more than 125 percent of the crane's rated load. The test reports shall be maintained and accessible for inspection. An inspection shall be carried out in conjunction with each rated load test.

6.3.5 Wire rope inspection

6.3.5.1 A thorough inspection of all running ropes shall be made at least once a month. The inspection shall be recorded and maintained for review. Any deterioration, resulting in appreciable loss of original strength, shall be carefully observed and determination made as to whether further use of the rope would constitute a safety hazard. Conditions that may result in the appreciable loss of strength include:

6.3.5.1.1 Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.

6.3.5.1.2 A number of broken outside wires and the degree of distribution or concentration of such broken wires.


6.3.5.1.3 Worn outside wires.

6.3.5.1.4 Corroded or broken wires at end connections.

6.3.5.1.5 Corroded, cracked, bent, worn or improperly applied end connections.

6.3.5.1.6 Severe kinking, crushing, cutting or unstringing.

6.3.6 Sling inspection

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6.3.6.1 Prior to use, the sling and all fastenings and attachments shall be inspected for damage or defects by an MTS employee that has received and is current with MTS Hoist, Crane and Sling training. Additional inspections shall be performed during sling use, where service conditions warrant.

Damaged or defective slings shall be immediately removed from service by:

6.3.6.1.1 Disassembling the sling to make it unusable for the intended purpose. Synthetic and natural fiber slings **MUST** be cut in to a minimum of two pieces and placed in trash.

6.3.6.2 Periodic inspections of slings shall be performed by EHS.

6.3.7 Slings – conditions that require removal from service

6.3.7.1 The sling identification tag is in any way unreadable.

6.3.7.2 Alloy steel chain slings with cracked or deformed master links, coupling links or other components shall be removed from service.

6.3.7.3 Slings shall be removed from service if hooks are cracked, have been opened more than 15 percent of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook.


6.3.7.4 Wire rope slings shall be immediately removed from service if any of the following conditions are present:

6.3.7.4.1 Ten randomly distributed broken wires five broken wires in one strand in one rope lay.


6.3.7.4.2 Wear or scraping of one-third the original diameter of outside individual wires.

6.3.7.4.3 Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure.



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- 6.3.7.4.4 Evidence of heat damage.
- 6.3.7.4.5 End attachments that are cracked, deformed or worn.
- 6.3.7.4.6 Corrosion of the rope or end attachments.
- 6.3.7.5 Metal mesh slings shall be immediately removed from service if any of the following conditions are present:
  - 6.3.7.5.1 A broken weld or broken brazed joint along the sling edge.
  - 6.3.7.5.2 Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.
  - 6.3.7.5.3 Lack of flexibility due to distortion of the fabric.
  - 6.3.7.5.4 Distortion of the female handle so that the depth of the slot is increased more than 10 percent.
  - 6.3.7.5.5 Distortion of either handle so that the width of the eye is decreased more than 10 percent.
  - 6.3.7.5.6 A 15 percent reduction of the original cross sectional area of metal at any point around the handle eye.
  - 6.3.7.5.7 Distortions of either handle out of its plane.
- 6.3.7.6 Natural and synthetic fiber rope slings shall be immediately removed from service if any of the following conditions are present:
  - 6.3.7.6.1 Abnormal wear.
  - 6.3.7.6.2 Powdered fiber between strands.
  - 6.3.7.6.3 Broken or cut fibers.
  - 6.3.7.6.4 Variations in the size or roundness of strands.

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6.3.7.6.5 Discoloration or rotting.

6.3.7.6.6 Distortion of hardware in the sling.

6.3.7.7 Synthetic web slings shall be immediately removed from service if any of the following conditions are present:

6.3.7.7.1 Acid or caustic burns.

6.3.7.7.2 Melting or charring of any part of the sling surface.

6.3.7.7.3 Snags, punctures, tears or cuts.

6.3.7.7.4 Broken or worn stitches.

6.3.7.7.5 Distortion of fittings.

## 6.4 Equipment Operations

### 6.4.1 Hoisting equipment


6.4.1.1 Sheave grooves shall be smooth and free from surface defects which could cause rope damage.

6.4.1.2 Sheaves carrying ropes which can be momentarily unloaded shall be provided with close fitting guards or other suitable devices to guide the rope back into the groove when the load is reapplied.

6.4.1.3 The sheaves in the bottom block shall be equipped with close fitting guards that will prevent ropes from becoming fouled when the block is lying on the ground with ropes loose.


6.4.1.4 Pockets and flanges of sheaves used with hoist chains shall be of such dimensions that the chain does not catch or bind during operation.

6.4.1.5 All running sheaves shall be equipped with means for lubrication. Permanently lubricated, sealed and/or shielded bearings meet this requirement.


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- 6.4.1.6 In using hoisting ropes, the crane manufacturer's recommendation shall be followed. The rated load divided by the number of parts of rope shall not exceed 20 percent of the nominal breaking strength of the rope.
- 6.4.1.7 No less than two wraps of rope shall remain on the drum when the hook is in its extreme low position.
- 6.4.1.8 The rope end shall be anchored by a clamp securely attached to the drum, or by a socket arrangement approved by the crane or rope manufacturer.
- 6.4.1.9 Rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope. Spacing and number of all types of clips shall be in accordance with the clip manufacturer's recommendation. Clips shall be drop-forged steel in all sizes manufactured commercially. When a newly installed rope has been in operation for an hour, all nuts on the clip bolts shall be tightened.
- 6.4.1.10 Swaged or compressed fittings shall be applied as recommended by the rope or crane manufacturer.
- 6.4.1.11 Wherever exposed to temperatures, at which fiber cores would be damaged, rope having an independent wire rope, wire strand core or other temperature damage resistant core shall be used.
- 6.4.1.12 Replacement rope shall be the same size, grade and construction as the original rope furnished by the crane manufacturer, unless otherwise recommended by a wire rope manufacturer due to actual working condition requirements.
- 6.4.1.13 Hooks shall meet the manufacturer's recommendations and shall not be overloaded.
- 6.4.1.14 Splicing of any ropes, slings or cables is prohibited. Remove damaged equipment from service and replace with new.

#### 6.4.2 Handling the load

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- 6.4.2.1 The crane shall not be loaded beyond its rated load except for test purposes.
- 6.4.2.2 Operators should refer to and follow any and all lifting notes or instructions included with the part, component ,or equipment being moved and seek out additional lift support/assistance (managers/supervisors, senior lift personnel ,or EHS) for any items which they may be uncertain as to how to safely balance and secure
- 6.4.2.3 The load shall be attached to the load block hook by means of slings or other approved devices.
- 6.4.2.4 The load shall be well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches (look for lifting posts and other built in securing points on the item).
- 6.4.2.5 Plan and check the travel path to avoid personnel and obstructions.
- 6.4.2.6 Before starting to hoist, the operator shall confirm that the hoist rope is not kinked, multiple part lines are not twisted around each other, the slings or equipment are properly aligned and the hook is brought over the load in such a manner as to prevent swinging.
- 6.4.2.7 During the lift, there shall be no sudden acceleration or deceleration of the moving load. Care shall be taken to ensure the load does not contact any obstructions. Lift the load only high enough to clear the tallest obstruction in the travel path.
- 6.4.2.8 Cranes shall not be used for side pulls.
- 6.4.2.9 The operator shall not cause the crane to lift, lower or travel while anyone is on the load or hook.
- 6.4.2.10 *Tag line.* Where hazards to employees exist, tag lines or other suitable devices shall be used to control loads being handled by hoisting equipment. Manila rope may be used for tag lines.

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6.4.2.11 Loads shall not be carried over people.

6.4.2.12 Land the load when the move is finished. Choose a safe landing zone.

6.4.2.13 The operator shall test the brakes each time a load approaching the rated load is handled. The brakes shall be tested by raising the load a few inches and applying the brakes.

6.4.2.14 Loads shall not be lowered below the point where less than two full wraps remain on the hoisting drum.

6.4.2.15 The operator shall not leave the position at the controls while the load is suspended.

6.4.2.16 The operator shall not leave a suspended load unattended.

6.4.2.17 The hoist limit switch, which controls the upper limit of travel of the load block, shall never be used as an operating control.

#### 6.4.3 Tow crane lifts

6.4.3.1 When two or more cranes are used to lift a load, one qualified responsible person must be in charge of the operation. The qualified responsible person must analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.

6.4.3.2 Respond to signals only from the person directing the lift or the appointed signal person.


6.4.3.3 Obey stop signal at all times, no matter who gives it.

#### 6.4.4 Sling operating practices – general


6.4.4.1 Slings that are damaged or defective shall not be used.

6.4.4.2 Slings shall not be shortened with knots or bolts or other makeshift devices.

6.4.4.3 Sling legs shall not be kinked.

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- 6.4.4.4 Slings shall not be loaded in excess of their rated capacities.
- 6.4.4.5 Slings used in a basket hitch shall have the loads balanced to prevent slippage.
- 6.4.4.6 Slings shall be securely attached to their loads.
- 6.4.4.7 Slings shall be padded or protected from the sharp edges of their loads.
- 6.4.4.8 Suspended loads shall be kept clear of all obstructions.
- 6.4.4.9 All employees shall be kept clear of loads about to be lifted and of suspended loads.
- 6.4.4.10 Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.
- 6.4.4.11 Shock loading is prohibited.
- 6.4.4.12 A sling shall not be pulled from under a load when the load is resting on the sling.
- 6.4.5 Sling operating practices – alloy steel chains
  - 6.4.5.1 Hooks, rings, oblong links, spear shaped links, welded or mechanical coupling links or other attachments shall have a rated capacity at least equal to that of the alloy steel chain with which they are used or the sling shall not be used in excess of the rated capacity of the weakest component.
  - 6.4.5.2 Makeshift links or fasteners formed from bolts or rods, or other such attachments, shall not be used.
- 6.4.6 Sling operating practices – metal mesh slings
  - 6.4.6.1 Handles shall have a rated capacity at least equal to the metal fabric and exhibit no deformation after proof testing.
  - 6.4.6.2 Coatings which diminish the rated capacity of a sling shall not be applied.
- 6.4.7 Sling operating practices – natural and synthetic fiber rope slings

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6.4.7.1 For operations outside this temperature range and for wet, frozen slings, the sling manufacturer's recommendations shall be followed.

6.4.7.2 Fiber rope slings shall not be used if end attachments in contact with the rope have sharp edges or projections.

6.4.8 Parking a crane or hoist

6.4.8.1 Leave chain slings on the hook. Return other rigging devices to their designated storage location.

6.4.8.2 Hang pendant on lowest point of chain sling or hook and raise to seven feet above the floor to eliminate hazard.

6.5 Maintenance

6.5.1 A preventive maintenance program (PM) based on crane/hoist/lifting equipment manufacturer's recommendations shall be established and followed.

6.5.1.1 The environment, frequency of use, or other stresses on crane/hoist/lifting equipment can affect the frequency of maintenance inspections.

6.5.2 Before adjustments and repairs are started on a crane, the following precautions shall be taken:

6.5.2.1 The crane shall be repaired in an area where it will cause the least interference with other cranes and operations in the area.


6.5.2.2 All controllers shall be at the off position.

6.5.2.3 The main or emergency switch shall be locked out according to the Control of Hazardous Energies (Lockout / Tagout) procedure.

6.5.2.4 Warning or "out of order" signs shall be placed on the crane, also on the floor beneath or on the hook where visible from the floor.

6.5.2.5 Where other cranes are in operation on the same runway,



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rail stops or other suitable means shall be provided to prevent interference with the idle crane.

6.5.3 After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices reactivated and maintenance equipment removed, and an inspection shall be performed.

6.5.4 All moving parts of the crane for which lubrication is specified should be regularly lubricated. Machinery shall be stationary while lubricants are being applied. The Control of Hazardous Energies (Lockout / Tagout) procedure shall be followed if access to point-of-operation hazards is possible.

## 6.6 Adjustments and Repairs

6.6.1 Any unsafe conditions disclosed by the inspection requirements shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.

6.6.2 Adjustments of functional operating mechanisms, limit switches, control systems, brakes, power plants, etc., shall be maintained to assure correct functioning of components.


## 6.7 Lifts

6.7.1 When a generic lifting device, like a hoist chain, cannot be used to remove or replace a part or sub-assembly, a lift specifically designed to accomplish that task can be used.

6.7.2 Preventive maintenance procedures and frequency for PMs shall be developed using the manufacturer's recommendations using the environment, frequency of use and the weight of the load as factors in developing those PM procedures.

6.7.2.1 Specific PM procedures will be incorporated into the preventive maintenance procedures / specs for the lift.

6.7.3 All controls shall be clearly marked as to their function.

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## 6.8 Suspended Loads

6.8.1 An operation is considered a suspended load operation and subject to additional requirements if it meets all three of the following:

6.8.2. . The operation involves the use of a crane or hoist that supports the weight of a suspended load.

(This excludes operations where the load is secured in a holding fixture or on substantial blocks supporting the entire load even though the crane/hoist hook may still be attached.) No distinction is made between a static load and a dynamic load. Rigging, i.e., slings, Hydra-sets, lifting fixtures, shackles, straps, when attached to the hook, is considered part of the load.


6.8.3. . Personnel involved in the operation have any part of the body directly beneath the suspended load. (This excludes operations where employees have their hands on the sides of a load, i.e., to guide the load.)

6.8.4. In the event of a crane/hoist failure, as the load drops it could contact personnel working directly beneath it, with injury or death as a possible result. (This excludes operations where employees have their hands only partially under a load such that a crane or hoist device failure would push their hands out of the way not resulting in injury. This also excludes situations where the falling load would come to rest on hardware that is not suspended before an employee could be injured

6.8.5 If such conditions are met, prior to any lifting action a Risk Assessment must be performed addressing the following:

(a) A justification why the operation cannot be conducted without personnel beneath the load. Feasible procedure/design options will be investigated to determine if the work can be accomplished without personnel working under a load suspended from a crane/hoist.

(b) Details of the precautions taken to protect personnel should the load drop. Secondary support systems, i.e., equipment designed to assume support of (catch) the load preventing injury to personnel should the crane/hoist fail, shall be evaluated and used whenever feasible. Secondary support systems will be constructed with a

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minimum safety factor of 2 to 1 yield.

(c) The maximum number of exposed personnel allowed. Steps shall be taken to limit the number of personnel working under a load suspended from a crane/hoist. Only those essential personnel absolutely necessary to perform the operation will be allowed to work in the safety controlled area.

(d) The time of exposure. Steps shall be taken to ensure that personnel do not remain under the load any longer than necessary to complete the work.

\* Each operation will be reviewed on a case-by-case basis.

\* Only those suspended load operations approved by EH&S upon completion of all controls measure items associated with the designated task Risk Assessment

## 6.9 Training Requirements

6.9.1 Crane, hoist and rigging equipment shall be operated only by the following qualified personnel:

6.9.1.1 Designated persons


6.9.1.2 Trainees under the direct supervision of a designated person (Department Group Lead), qualified and proficient in lifting and rigging activities.

6.9.1.3 Maintenance personnel, when necessary in the performance of their duties.

6.9.1.4 Crane inspectors and service personnel who are qualified and authorized to use Cranes/hoists.

6.9.2 Training shall be provided before the employee is assigned or given new duties covered under this program.


6.9.2.1 If time does not allow for a new employee to receive the Qualified crane operator training prior to their needing to operate a crane, that employee shall receive introductory

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internal crane safety training provided by the MTS EHS Department. This training will allow the employee to operate cranes under the direct supervision of a designated Department Group Lead, up until Qualified crane operator training is received.

- 6.9.2.2 Qualified crane operator training shall be valid for (2) years, at which time retraining is required. An employee that is operating a crane that is involved in an accident or near-miss shall lose their card/authorization and begin the crane training process as “new” employees (i.e.- hands on portion - crane re-training session). Near misses shall include swinging loads.
- 6.9.3 Training for qualified crane operators shall address crane and hoist inspection and operation.
- 6.9.4 Training for qualified riggers shall address proper rigging inspection and use.
- 6.9.5 Personnel shall be required to pass a practical operating examination. Qualification shall be limited to the specific type of equipment for which the operator observed and examined.
- 6.9.6 All Crane/Hoist units are equipped with red reminder tags on the controller unit that state: “You must complete MTS Crane/Hoist Training prior to operating any crane or lift unit.”
- 6.9.7 Training shall be certified by a qualified crane operator instructor. Certification must contain the employee’s name, identification of the qualified crane operator instructor and the date of the training / certification. Certification shall be available to employees and/or their representatives.
- 6.9.8 Control of Hazardous Energies (Lockout / Tag out) training is required for individuals performing maintenance on powered cranes and hoisting equipment.

**7 ASSOCIATED QUALITY RECORDS – AS STATED IN THE QUALITY RECORDS**

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## LIST


Required Record
Crane Operator Checklist
Training Records

## 8 REFERENCE FORMS / TEMPLATES / DOCUMENTS

Form / Template / Document Title	Location
1. 29 CFR 1910.179 – OSHA general industry standard for overhead and gantry cranes  2. 29 CFR 1910.184 – OSHA general industry standard for slings  3. ASME B30.2-1996, American Society of Mechanical Engineers for overhead and gantry cranes (top running bridge, single or multiple girders, top running trolley hoist).  4. ASME B30.17-1992 and addenda, American Society of Mechanical Engineers for overhead and gantry cranes (top running bridge, single girder & underhung hoist).  5. Applicable local and international regulations (e.g., S.I. NO. 138 of 1995 – Ireland).	EHS office
6. Crane Operator Daily Checklist (EHS-500-130)	EHS Office
7. MTS Control of Hazardous Energies (Lockout / Tag out) written program	EHS web
8. Overhead Hoist & Crane Training Records	LMS

## 9 CURRENT REVISION'S TRAINING REQUIREMENTS


Training requirements are determined by the document owner – either awareness or formal.

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Select One (mark X)	Training Type	Training Definition
	Awareness	Awareness training is conducted by communication, which is sent/delivered by the approver/author/owner of the document to the affected employees/groups.
X	Formal	Formal training requires the approver/author/owner to collect/store evidence that the affected employees/groups were trained.

## 10 REVISION HISTORY & APPROVAL

REVISION HISTORY			
Rev	Description of Change	Author	Effective Date
A	Changed to new Controlled Document format		1/3/12
B	Section 5.5.2: Added that daily pre-operational crane inspections shall be recorded. Section 5.5.5.1: Added requirement that electrical disconnects shall be within view of runway conductors. Section 6.3.2: Added that daily pre-operational crane inspections shall be recorded on EHS-500-130. Section 6.3.3: Removed reference to Appendix B. Section 6.3.6.1: Added Sling inspection qualifications and sling removal from service requirements. Section 6.3.6.2: Added periodic sling inspections to be completed by EHS.		1/28/13
C	Section 6.2.4: Added section to check for mobile elevated work platforms in runway. Section 6.8.1.2: added qualification for “designated person”. Section 6.8.2.1 through 6.8.2.5: added training requirements for new employees, badge requirements and engineering employees. Section 6.8.6: Added certification requirement by a Qualified crane operator instructor.		6/8/14

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D	Section 3.53 – Added definition of Suspended load and suspended load work. Section 6.8- Definition of suspended load and qualifications for Risk Assessment evaluation prior to any necessary suspended load work requirement/activity, 6.8.2.3 – Removed Badge sticker item- completion of crane wallet cards distributed to all trained staff, 6.9.6 – added notation referencing labeling of all controller units = require MTS training to operate, 6.9.2.4 Revised period of training from 3 to 2 yrs. – match training needs assessment assignment (2 yrs.)		9/30/15
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APPROVAL OF CURRENT REVISION		
Name / Function	Signature	Date
James Kinney, EHS Manager-EHS		
Tom Milas- Global Vice President of Operations – Management Representative		