Crane, Hoist, Lifts, and Slings Procedure

REVISION

Rev No.	DCN No.	Change Summary	Release Date	DCN Initiator	Document Owner
4	DCN2570	Merger of Cranes (EHS-00040) and Overhead Gantry Cranes, Hoists, Lifts and Slings (EHS-0067) into this document.	4-12-23	G. Matteson	K. Rydberg

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1. PURPOSE AND SCOPE

1.1 This document outlines the general procedure for the safe practice and use of outdoor cranes, overhead cranes, gantry cranes, hoists, lifts, and slings at the Albany Nanotech Complex (ANC) (Site). The purpose of this procedure is to ensure that all temporary operations that move elevated objects or people at the ANC are conducted in a safe manner which minimizes the risk of injury or property damage; and in accordance with OSHA's General Industry and Construction Industry Standards listed under 29 CFR 1910 Subpart F and 29 CFR 1926 Subpart N respectively and ANSI Standards.

1.2 This program applies to all employees, tenants, contractors, and students that use and operate overhead and gantry cranes, hoists, lifts, and slings.

1.3 Cranes are designed for both general use and for specific purposes. Crane manufacturers produce similar models or types of cranes for the same purpose, often with different sizes of the same model of crane. Each type, model, or size of crane manufactured, may have different operating controls, and require specialized operator training, individualized inspection criteria, and different preventive maintenance schedules. This information must be given prior to the operation of any temporary crane.

2. DEFINITIONS

2.1 General Definitions

2.1.1 **Contractor Name**: Company / Contractor performing the requested work listed on the permit. The phone number listed on the permit must be a cell phone number or number where 'Contractor' can be reached, not an office number.

2.1.2 **Emergency Stop Switch** – A manually or automatically operated electric switch to cut off power independent of the regular operating controls.

2.1.3 **Permit Requestor:** Person requesting the work listed on the permit. The phone number listed on the permit must be a cell phone number or number where 'Requestor' can be reached, not an office number.

2.1.4 **Work Sponsor**: Person the work is being performed for, (firm, name and contact information) to be listed on the permit.

2.2 Crane Definitions

2.2.1 **Automatic Crane:** A crane which, when activated, goes through a pre-set cycle or cycles.

2.2.2 **Basket Hitch:** A sling configuration where the sling is passed under the load and has both ends and the end attachments on a hook or a single master link.

2.2.3 **Brake:** A device used for retarding or stopping motion by friction or power means.

2.2.4 **Bridge:** Part of a crane consisting of girders, trucks, end ties, foot walks, and drive mechanism which carries the trolley or trolleys.

2.2.5 **Bumper:** An energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel, or when two cranes or trolleys come in contact.

2.2.6 **Clearance:** The distance from any part of the device in reference to the nearest obstruction.

2.2.7 **Crane Operator**: Person licensed by New York State to operate crane listed on permit (which must match the crane on site), who is physically operating the crane.

2.2.8 **Floor-Operated Crane**: A crane which is pendant or non-conductive rope, controlled by an operator on the floor or an independent platform.

2.2.9 **Gantry Crane** – Similar to an overhead crane, except that the bridge for carrying the trolley or trolleys is rigidly supported by two or more legs running on fixed rails or another runway.

2.2.10 **Hoist**: An apparatus which may be part of a crane, exerting a force for lifting or lowering.

2.2.11 **Hoist Chain:** The load bearing chain in a hoist.

2.2.12 **Lift** – A mechanical device for lifting or lowering loads that may be manual or electrically powered. A lift is typically mounted on the floor, or is mobile.

2.2.13 **Overhead Crane** – A crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.

2.2.14 **Power-Operated Crane**: A crane whose mechanism is driven by electric, air, hydraulic or internal combustion.

2.2.15 **Rated Load:** The maximum load for which for which a crane, individual hoist, sling, or attachment is designed and built by the manufacturer and is shown on the equipment nameplate.

2.2.16 **Rope** – Refers to wire rope unless otherwise specified.

2.2.17 **Remote-Operated Crane**: A crane controlled by an operator not in a pulpit or cab attached to the crane, by any method other than pendant or rope control.

2.2.18 **Sling –** An assembly which connects the load to the material handling device, which can be made of alloy steel chains, wire ropes, metal mesh, natural or synthetic fiber rope or synthetic web (nylon, polyester, polypropylene).

2.2.19 **Temporary Crane (crane)**: For this policy, all outdoor overhead cranes are considered temporary, and defined as a machine for lifting, lowering, and/or moving a load horizontally with the hoisting mechanism (an integral part of the machine). Cranes, whether fixed or mobile, are driven manually or by power.

2.2.20 **Wall Crane**: A crane having a jib with or without trolley, and supported from a side wall or line of columns of a building. It is a traveling type and operates on a runway attached to the side wall or columns.

3. ASSOCIATED DOCUMENTS

3.1 **EHS-00008** – Lockout/Tagout (LOTO) Procedure

3.2 **EHS-00067-F1** – Crane, Hoist and Lift Inspection Checklist

3.3 **EHS-00067-F2** – Sling Inspection Checklist

3.4 **EHS-00067-F3** – Crane, Hoist, Lift, and Sling Inventory

3.5 **EHS-00067-F4** - Crane Work Permit

3.6 OSHA 29 CFR 1910.179

3.7 OSHA 29 CFR 1910.184

4. RESPONSIBILITIES

4.1 The **EHS Department (EHS)** is responsible for the implementation, enforcement and maintenance of the provisions outlined in this program and as specified below:

- Oversee the policies and procedures of the program,
- Provide guidance on the requirements of the program
- Ensure inspections are performed and accurate
- Maintain an inventory of all owned overhead and gantry cranes, hoists, lift and slings

4.2 The Work Sponsor is the responsible for ensuring that the permit is completed prior to the start of work, that the Contractor and the Operator follow all procedures and that the equipment listed on the relevant permits is used on the day(s) the work is performed. Any changes in equipment must be approved by EHS.

4.3 The Contractor is responsible for ensuring all equipment is in proper operating condition. The equipment should be inspected in accordance with the manufacturer's specification. The operators are qualified and properly trained. Training as recommended by the manufacturer is desirable. The contractor shall ensure the aerial device and crane comply with applicable sections of OSHA's General Industry and Construction Industry Standards listed under 29 CFR 1910 Subpart F and 29 CFR 1926 Subpart N and R, respectively.

4.3.1 The EHS Department reserves the right to request pertinent inspection or maintenance records and request written proof of training prior to issuing a permit.

4.3.2 The **Crane Operator** shall designate qualified individuals as signal person, ground person, lift director, and rigger. One person may account for more than one of these functions.

5. CRANE GENERAL REQUIREMENTS

5.1 Any piece of equipment lifting or transporting a suspended load over any building or within any space inside the buildings must follow these procedures.

5.2 Temporary operations that move elevated objects or people shall include the use of a temporary crane. All temporary crane operations will require a Crane Work Permit (**EHS-00067-F4**) prior to conducting work.

5.3 A Crane Pre-walk will be conducted with the Contractor, the Work Sponsor, EHS, ERT, Security and all affected parties (shipping receiving, UPW, gas deliveries, etc.) a minimum of five(5) business days prior to the lift.

5.4 The permit will be issued by EHS or ERT the day of the lift.

5.5 Any time the crane moves location or modification is made from the initial ERT / EHS permit inspection, the crane must be re-inspected by ERT / EHS.

5.6 Work Sponsor, Contractor Name, Crane Operator and Permit Requestor must be filled in at time of submission to Work Authorization Permit meeting, on both the Work Authorization Permit and the Crane Permit.

5.7 Two copies of the entire package (completed permit, annual inspection, monthly inspection, operator license, and crane plan map showing the lift area, restricted areas, road closures, and Building Evacuation Areas) shall be submitted to the Work Authorization Permit meeting 72 hours prior to the start of the work.

5.8 The permit must be visibly posted in the work area.

5.9 The EHS Department will maintain a file of permits issued.

5.10 Crane set-up / demobilization is not allowed before 7:00 AM or after 6:00 PM, unless pre-approved by the EHS Department. Pre-approval will be based on a case by case basis.

5.11 Any occupied building areas which are beneath the crane work area must be evacuated during the work (one floor below where the lift will be), and a spotter must be provided during the lift operations. Spotter can be provided by either Crane Company, work sponsor or ANC personnel, but must be arranged and assigned during Crane Walk. Spotters must use an agreed upon method of communication: either hand signals or radio.

Note: If office space(s) at ANC need to be evacuated during a crane lift, the lifts shall be completed on the weekend or during off-hours (after 5pm or before 7am).

5.12 The crane work area must be adequately roped off or secured and signage posted to prevent unauthorized entry. Only individuals involved in the crane work may enter the area.

5.13 Make sure signage is appropriate (to exits, paths of egress, detour, overhead work, etc.)

5.14 The Contractor must ensure that proper areas are roped off and sufficient personnel are on-site to direct traffic. In the event of an accident or injury, immediately call Security at **EXTENSION 78600** (from an internal phone) for emergency response or dial **518-437-8600** (from a cell phone).

5.15 Flaggers shall be posted with a safety vest, flag(s), and hard hat in designated areas; if the road is going to be blocked, post detour signs by the road for truck deliveries to follow alternate route to the loading docks.

5.16 Safe Operating Precautions and Considerations

5.16.1 Hard hats and safety eyeglasses must be worn within the crane work area. This must be strictly adhered to at all times.

5.16.2 Prior to lifting, the rigger / spotter must signal the action by use of a single air horn blast to alert anyone in the area that a lift is commencing. The operator may also use the horn on the crane in the event an air horn is not available.

5.16.3 Riding the load or crane hook is never allowed.

5.16.4 Do not operate close to power lines or other dangerous objects. Obstructions such as roofs, utilities, etc. must be identified prior to work. They should be avoided where possible. Work near power lines must be conducted in accordance with OSHA requirements. There must be a minimum of a 10' clearance of power lines and trellis'.

5.16.5 Cranes are carefully designed, tested, and manufactured for safe operation. When used properly, they can provide safe, reliable service to lift or move loads. Because cranes have the ability to lift heavy loads to great heights, they also have an increased potential for catastrophic accidents, if safe operating practices are not followed.

5.16.6 Crane operators and personnel working with cranes need to be knowledgeable of the capacities and limitations of the crane they will be operating, and specific job site restrictions, such as location of overhead electric power lines, unstable soil, or high wind conditions. Copies of the crane operator's training records and New York State Licensure must be submitted to the EHS Department prior to the start of work.

5.16.7 Personnel working around crane work operations also need to be aware of hoisting activities or any job restrictions imposed by crane work operations, and ensure job site coordination of such operations.

5.16.8 Job site inspectors therefore should become aware of these issues and, prior to starting an inspection, take time to observe the overall crane work operation with respect to load capacity, site coordination, and any job site restrictions in effect.

5.16.9 Accidents can be avoided by careful job planning. The person in charge must have a clear understanding of the work to be performed and consider all potential dangers at the job site. A safety plan must be developed for the job, and must be explained to all personnel involved in the lift.

5.16.10 Prior to daily operations, a frequent inspection shall be conducted to ensure that the machine is in proper working condition. Only qualified and properly designated people shall operate the crane or aerial devices.

5.16.11 A copy of the most recent regular documented inspection conducted by the contractor must be submitted with the Work Permit.

5.16.12 The requirements for helicopter lifting are the same as those specified in this procedure. However, a larger building area may need to be evacuated prior to work.

5.16.13 Exceptions to the activities in this procedure may only be made upon approval from the EHS Manager, or their designee.

5.16.14 Outriggers, crawler tracks, or tires should not be raised off the ground while operating. There should be no visible structural damage on the crane or rigging.

5.16.15 There is little or no backup system in the load-supporting components of most cranes. A damaged component can fail completely and without warning, causing the boom or load to fall.

5.16.16 No modifications are allowed by adding extra counterweight or holding down the rear of the crane. All job-initiated modifications are illegal and may permit overloading the crane. If not approved by the crane manufacturer in writing, these modifications can over-stress critical structural components, which could cause a catastrophic failure of the crane.

5.16.17 Cranes should not operate near a trench or excavation. Cranes exert extremely high loads on the soil near the tracks, outriggers, or tires. A crane set up in close proximity to an excavation can cause soil failure, crane turnover, and possible disaster.

5.16.18 The crane's hoist line should be vertical at all times during operation. This indicates proper operation. A hoist line which is not vertical obviously indicates that the load is not hanging straight down. Out of plumb loads can cause crane collapse by generating side forces on the boom. In some instances, the crane may tip over, if the load swings.

6. INTERNAL OVERHEAD, GANTRY CRANES AND HOISTS

This section applies to overhead and gantry cranes, automatic cranes, floor-operated cranes, power-operated cranes, remote-operated cranes, and wall cranes.

6.1 All new overhead and gantry cranes constructed or installed after August 31st, 1971, shall meet the design specifications of the American National Standard Institute ASNI B30.2, Overhead and Gantry Cranes.

6.2 The rated load of the crane shall be clearly marked on each side of the crane. If the crane has multiple hoisting units each one shall be clearly marked.

6.3 A minimum clearance of 3” overhead and 2” laterally shall be provided and maintained between the crane and any obstruction.

6.4 The safety of any personnel shall not be jeopardized by the movement of the crane at any time. Sufficient barriers shall be positioned to keep unauthorized personnel away from the crane and swing zone.

6.5 Trolley stops shall be provided at the limit of travel of the trolley. The stops shall be fastened to resist forces applied when contacted. A stop engaging the tread of the wheel shall be of a height at least equal to the radius of the wheel.

6.6 If the runways of two cranes are parallel, and there are no intervening walls or structure, there shall be adequate clearance provided and maintained between the two bridges.

6.7 All moving parts that may present a hazard under normal operating conditions shall be equipped with guards to prevent injury. All guards shall be securely fastened.

6.8 If hoisting ropes run close to other parts it can cause breakage or damage, guards shall be installed to prevent this condition. A guard shall be provided to prevent contact between bridge conductors and hoisting ropes.

6.9 Load Handling

6.9.1 Size of the Load: The crane shall not be loaded beyond its rated capacity except for test purposes. Test loads shall not be more than 125 percent of the rated load, unless otherwise recommended by the manufacturer. The test reports shall be placed on file where readily available to appointed personnel.

6.9.2 Attaching the Load: The ropes and/or chains used to attach the load shall be free from kinks and twists, and shall not be wrapped around the load. The load shall be attached to the load block hook by means of slings or other approved devices. Care shall be taken that the slings and load clear all obstacles. The load shall be balanced prior to lifting more than a few inches. Multiple lines shall not be twisted around each other. The load shall be attached in a manner that prevents swinging.

6.9.3 During the Lift: There shall be no sudden acceleration or deceleration of the load once the lift is in progress. No load should ever be carried or lifted over people. The operator shall not leave the controls while the load is suspended, and the lift is in progress.

6.10 Brakes

6.10.1 Each independent hoisting unit of a crane shall be equipped with at least one self-setting brake, referred to as a holding brake, applied directly to the motor shaft or some part of the gear train.

6.10.2 With the exception of worm-geared hoists where the angle of the worm prevents the load from accelerating in the lowering direction; in addition to the holding brake, each independent hoisting unit shall be equipped with a control braking method to prevent over speeding.

6.10.3 Holding brakes shall be applied automatically when power is removed.

6.10.4 Holding brakes shall have ample thermal capacity for the frequency of operation required by the service.

6.10.5 Where necessary, holding brakes shall be provided with an adjustment method to compensate for wear.

6.10.6 The wearing surface of all holding brake drums or discs shall be smooth.

6.10.7 A power control braking method such as regenerative, dynamic, or counter-torque braking, or a mechanically controlled braking method shall be capable of maintaining safe lowering speeds of rated loads.

6.10.8 Foot-operated brakes shall not require more than 70 lbs. of force to develop the manufacturer's rated brake torque.

6.10.9 All foot brake pedals shall be constructed so the operator's foot will not easily slip off the pedal.

- Foot operated brakes shall be equipped with automatic means for positive release when pressure is released from the pedal.
- Brakes may be applied by mechanical, electrical, pneumatic, and hydraulic or gravity means.
- Brakes for stopping the motion of the trolley or bridge shall be of sufficient size to stop the trolley or bridge within a distance in feet equal to 10 percent of full load speed in feet-per-minute when traveling at full speed with full load.
- A drag brake may be applied to hold the trolley in a desired position on the bridge, and to eliminate creep with the power off.
- On all floors, remote and pulpit operated crane bridge drives, a brake of non-coasting mechanical drive shall be provided.

6.11 Electrical Equipment

6.11.1 The control circuit voltage shall not exceed 600 volts AC or DC.

6.11.2 The voltage at pendant push buttons shall not exceed 150 volts AC and 300 volts DC.

6.11.3 For suspended push button stations, the station must be supported in a manner to protect the electrical wiring from strain.

6.11.4 Pendant control boxes shall be constructed to prevent electrical shock and shall have the functions clearly marked.

6.11.5 Electrical equipment shall be located or enclosed such that live parts will not be exposed to accidental contact under normal operating conditions.

6.11.6 Electrical equipment shall be protected from dirt, grease, oil, and moisture.

6.11.7 Guards for live parts shall be substantial and located so they cannot be accidentally deformed and subsequently contact live electrical parts.

6.11.8 The controller operating handle shall be located within convenient reach of the operator.

6.11.9 The control for the bridge and trolley shall be located so the operator can face the direction of travel.

6.11.10 For floor operated cranes, the controller shall automatically return to the off position when released.

6.11.11 Push buttons in pendant stations shall return to the off position when released.

6.11.12 Automatic cranes shall be designed so that all motions fail safe if any malfunction of operation occurs.

6.11.13 Remote operated cranes shall function so that if the control signal for any crane motion becomes ineffective the crane motion shall stop.

6.11.14 The power supply to the runway conductors shall be controlled by a switch or circuit breaker located on a fixed structure, accessible from the floor and arranged to be locked in the open position.

6.11.15 The hoisting motion of all electrical traveling cranes shall be provided with an over travel limit switch in the hoisting direction.

6.12 Hoisting Equipment

6.12.1 Sheave grooves shall be smooth and free from surface defects that could cause rope damage.

6.12.2 Sheaves which can be momentarily unloaded shall have guards to guide the rope back into the groove when the load is applied. This also applies to the bottom block to prevent the rope from being fouled when the block is lying on the ground with the ropes loose.

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

6.12.4 All running sheaves shall be equipped with means for lubrication.

6.12.5 In using hoisting ropes, the crane manufacturer's recommendations 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.

6.12.6 Socketing shall be done in the manner specified by the manufacturer of the assembly.

6.12.7 No less than two wraps of rope shall remain on the drum when the hook is in its extreme low position. Rope ends shall be securely attached to the drum, or by a socket approved by the manufacturer.

6.12.8 Replacement rope shall be the same size, grade, and construction as the original rope furnished by the crane manufacturer.

6.12.9 If a load is supported by more than one part of a rope, the tension in the parts shall be equalized.

6.12.10 Hooks shall meet the manufacturer's recommendations and shall not be overloaded.

6.12.11 Except for floor operated cranes, a warning signal shall be provided for each crane equipped with a power traveling mechanism.

6.13 Training

6.13.1 Only designated personnel shall operate a gantry or floor crane. Initial training for designated personnel shall include a review of this program, as well as any manufacturer information or required training related to the equipment that will be used.

6.14 Inspection

6.14.1 Five types of inspections are defined, each with the common purpose of keeping equipment performing as intended. Each inspection is directed toward a separate set of circumstances. All new and altered cranes shall be inspected to ensure compliance with OSHA 29 CFR 1910.179 and ASME B30.2. The five types of inspection are:

- Initial inspection (upon installation)
- Functional test inspection (included with installation or changes recommended by Manufacturer.)
- Frequent inspection or periodic inspection; shall be performed with a certification record that includes:
    - The date of inspection
    - Signature of a qualified inspector
    - Serial number or identifier of the equipment
    - Any noted deficiencies including deformed, cracked, or corroded members
    - Loose bolts of rivets
    - Cracked or worm sheaves and drums
    - Any worn, cracked, corroded, or distorted parts such as clips, hooks, snaps, bearings, gears, shafts, rollers, sprockets etc.
    - Brakes: operational and in good condition; and for excessive wear
    - Load rating present
    - All electrical apparatus in good condition
    - Ropes or chains in good condition with no excessive wear, stretch twist, distortion, kinking, cuts, corrosion etc.
    - All guards securely fastened
    - Clearance from obstruction
    - Remote control operational
    - Control box labeled
    - Free from excessive dirt, grime, grease, oil, and moisture
    - Load, wind and other indicators over their full range or any significant inaccuracies
    - Gasoline, diesel, electric or other power plants for improper performance or noncompliance with safety requirements

- Inspection of equipment not in regular use; could include a crane that has been idle for longer than six (6) months shall be given a full monthly inspection prior to use. Standby cranes shall be inspected at least semi-annually in accordance with this policy.

- Visual Inspections shall be performed to check for proper functionality of the crane and could include but is not limited to:
    - Excessive wear of all components
    - Cracks
    - Deformation
    - Leaks in air or hydraulic systems/lines.
    - Broken, frayed, stretched, or damaged chains or cables.
    - Hooks with deformations or cracks
    - Hoist chains and end attachments: with excessive wear, or twist, distortion; for proper function and stretch.
    - Proper function of all operating mechanisms

6.14.2 Cranes must be inspected at intervals as recommended by the manufacturer.

6.14.3 Operational Testing prior to initial use and in addition to inspecting the crane, all new and altered cranes shall be tested to ensure compliance with section 5.2 of this policy as well and the following functions:

- Hoisting and lowering
- Trolley travel
- Bridge travel
- Locking, braking and safety devices functional
- Limit switches, locking and safety devices

The trip setting of hoist limit switches shall be determined by tests with an empty hook traveling in increasing speeds up to the maximum speed. The actuating mechanism of the limit switch shall be located so that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley.

6.15 Rated Load Test load shall not be more than 125 percent of the rated load, unless otherwise recommended by the manufacturer. The test reports shall be kept on file and readily available to appropriate personnel and forwarded to EHS.

6.15.1 A preventative maintenance program based on the manufacturer's recommendations shall be established for each piece of equipment.

6.15.2 Prior to maintenance on any equipment the following precautions shall be taken:

- The equipment shall be placed in a safe location where repairs / maintenance will not interfere with other operations.
- All controls shall be in the off position.
- Warning and "Out of Order" notices shall be placed on the crane.
- All electrical and mechanical sources of energy shall be locked and tagged out in accordance with **EHS-00008: Lockout/ Tagout (LOTO) Procedure**.
- Where other cranes are in operation in the same area, suitable means shall be provided to prevent interference with the idle crane.
- Any unsafe condition or deficiency as indicated by the form **EHS-00067-F1 Crane, Hoist and Lift Inspection Checklist** shall be corrected before operation of the crane is resumed.

7. HOISTS AND LIFTS

7.1 General Requirements applicable to all hoists and lifts

7.1.1 All hoists and lifts shall be clearly marked with the rated load capacity.

7.1.2 All moving parts shall be equipped with guards.

7.1.3 Sufficient clearance shall be given so that nothing interferes with the lift while in progress.

7.1.4 Barriers shall be erected, when required, so that personnel are kept a safe distance away from the lift.

7.2 Load Handling

7.2.1 The hoist or lift shall not be loaded beyond its rated capacity except for test purposes.

7.3 Attaching the Load

7.3.1 The ropes and / or chains used to attach the load shall be free from kinks and twists and shall not be wrapped around the load.

7.3.2 The load shall be attached to the load block hook by means of slings or other approved devices.

7.3.3 Care shall be taken that the slings and load clear all obstacles.

7.3.4 The load shall be balanced prior to lifting more than a few inches.

7.3.5 Multiple lines shall not be twisted around each other.

7.3.6 The load shall be attached in a manner that prevents swinging.

7.4 During the Lift

7.4.1 There shall be no sudden acceleration or deceleration of the load once the lift is in progress.

7.4.2 No load should ever be carried over people.

7.4.3 The operator shall not leave the controls while the load is suspended, and the lift is in progress.

7.5 Training

7.5.1 Only designated personnel shall operate a hoist or lift. Initial training for designated personnel shall include a review of this program, as well as any manufacturer information or required training related to the equipment that will be used.

7.6 Inspections

7.6.1 Prior to initial use all new and altered hoists and lifts shall be inspected to ensure compliance with OSHA 29 CFR 1910.179 and this document.

7.6.2 Prior to each use, Visual Inspections shall be performed to check for proper functionality of the crane. This includes but is not limited to:

- Excessive wear of all components
- Cracks
- Deformation
- Leaks in air or hydraulic systems/lines
- Broken, frayed, stretched, or damaged chains or cables
- Hooks with deformations or cracks
- Hoist chains and end attachments: with excessive wear, or twist, distortion; and for proper function and stretch
- Proper function of all operating mechanisms

7.6.3 Monthly inspections shall be performed with a certification record that includes the date of inspection, signature of a qualified inspector, serial number or identifier of the equipment and any noted deficiencies. Items to be inspected include:

- Deformed, cracked, or corroded members
- Loose bolts of rivets
- Cracked or worm sheaves and drums
- Any worn, cracked, corroded, or distorted parts such as clips, hooks, snaps, bearings, gears, shafts, rollers, sprockets etc.
- Brakes: operational and in good condition; and for excessive wear
- Load rating present
- All electrical apparatus is in good condition
- Ropes and or chains in good condition with no excessive wear, stretch twist, distortion, kinking, cuts, corrosion etc.
- All guards securely fastened
- Clearance from obstruction
- Remote control operational
- Control box labeled
- Free from excessive dirt, grime, grease, oil, and moisture
- Load, wind and other indicators over their full range or any significant inaccuracies
- Gasoline, diesel, electric or other power plants for improper performance or noncompliance with safety requirements

7.7 Hoists and lifts shall also be inspected at intervals as recommended by the manufacturer.

7.8 Operational Testing prior to initial use all new and altered hoists and lifts shall be tested to ensure compliance with section 6.4 of this policy as well as hoisting and lowering, locking, braking and safety devices functional.

7.9 Rated Load Test shall not be more than 125 percent of the rated load, unless otherwise recommended by the manufacturer. The test reports shall be kept on file and readily available to appropriate personnel and EHS.

7.10 A preventative maintenance program based on the manufacturer's recommendations shall be established for each piece of equipment.

7.10.1 Prior to maintenance on any equipment the following precautions shall be taken:

- The equipment shall be placed in a safe location where repairs / maintenance will not interfere with other operations.
- All controls shall be in the off position.
- Warning and "Out of Order" notices shall be placed on the crane.
- All electrical and mechanical sources of energy shall be locked and tagged out in accordance with **EHS-00008 Lockout/ Tagout (LOTO) Procedure**.
- Any unsafe condition or deficiency as indicated by the form **EHS-00067-F1 Crane, Hoist and Lift Inspection Checklist** shall be corrected before operation of the crane is resumed.

8. SLINGS

This section applies to slings used in conjunction with other material handling equipment for the movement of material by hoisting, in employments covered by this part. The types of slings covered are those made from alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope (conventional three strand construction) and synthetic web (nylon, polyester, and polypropylene).

8.1 All slings in use shall meet the requirements of OSHA 29 CFR 1910.184 as well as those in this document.

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

8.3 Slings shall not be shortened with knots, bolts, or any other makeshift device.

8.4 Sling legs shall not be kinked.

8.5 Slings shall not be loaded beyond their rated capacity.

8.6 All slings shall have a rated capacity clearly marked and / or labeled.

8.7 Slings shall be securely attached to their loads.

8.8 Slings used in a basket hitch shall have the loads balanced to prevent slippage.

8.9 Slings shall be padded or protected from sharp edges of their loads.

8.10 Suspended loads shall be kept clear of all obstructions.

8.11 All personnel shall be kept clear of suspended loads or loads about to be lifted. Barriers shall be placed if necessary.

8.12 Shock loading is prohibited.

8.13 Hands of fingers shall not be placed between the sling and the load while the sling is being tightened around the load.

8.14 A sling shall not be pulled from under a load while the load is resting on the sling.

8.15 Specific Requirements

8.15.1 Alloy Steel Chain Slings

- All attachments shall have a rated capacity at least equal to that of the sling on which they are being used.
- If the sling is heated above 1000 degrees Fahrenheit (F) it shall be permanently removed from service. When heated above 600 degrees F the capacity shall be reduced based on the manufacturer's recommendations.
- Slings with cracked, deformed, worn or otherwise damaged links, hooks or components shall be removed from service.
- Worn or damaged slings shall not be used until repaired and sufficiently proof tested by the manufacturer or an equivalent entity.
    - Mechanical coupling links or low carbon steel links shall not be used for repairs.

8.15.2 Wire Rope Slings

- Welding of end attachments must be performed prior to the assembly of the sling.
- All welded end attachments shall not be used unless proof tested at twice their rated capacity. Their rated capacity shall be at least equal to that of the sling in use.
- Fiber core slings shall not be used when temperatures are above 200 degrees F and non-fiber core slings shall not be used when temperatures are above 400 degrees F.
- Slings shall be immediately removed from use if any of the following conditions are present:
  - Five broken individual wires
  - Kinking, crushing, bird caging or any other damage or distortion of the wire rope structure
  - Evidence of heat damage
  - End attachments or hooks that are worn, cracked, deformed, or damaged
  - Any corrosion present on the wire rope or attachments

8.15.3 Metal Mesh Slings

- Each sling shall have the stated capacity for various configurations clearly marked.
- The fabric and handles shall be joined so that the rated capacity is not reduced, the load is evenly distributed across the fabric, and sharp edges will not damage the fabric.
- Coatings which diminish the rated capacity of the sling shall not be applied.
- All new and repaired slings shall be proof tested to a minimum of 1 ½ times their rated capacity.
- Sling without elastomers shall only be used in a temperature range of minus 20 degrees F to 550 degrees F. Slings with elastomers shall only be used in a range of zero (0) degrees F to 200 degrees F.
- All repairs shall be made by the manufacturer or an equivalent entity. All records of repairs shall be kept on file and made available upon request.

- Slings shall be immediately removed from service if any of the following conditions exist:
  - A broken weld or brazed joint along the sling edge
  - A reduction in wire diameter due to abrasion or corrosion
  - Lack of flexibility
  - Any damage or distortion of the sling or handles

8.15.4 Natural and Synthetic Fiber Rope Slings

- Slings shall be used in the temperature range of minus 20 degrees F to 180 degrees F, except for wet or frozen slings. For use outside of this temperate range follow the manufacturer's recommendations.
- Spliced slings shall not be used unless they have been spliced by following these minimum requirements as well as any manufacturer's recommendations:
  - In manila rope, eye splices shall consist of at least three full tucks and with short splices at least six full tucks.
  - In synthetic fiber rope, eye splices shall consist of at least four full tucks and with short splices at least eight full tucks.
  - Strand end tails shall not be trimmed flush with the rope. This applies for all types, natural and synthetic. The tails shall extend a minimum of 6 inches.
  - Knots shall not be used in lieu of splices.
  - Clamps not designed specifically for fiber ropes shall not be used for splicing.
  - For all eye splices, the eye shall be of such size to provide an included angle of not greater than 60 degrees.
  - Fiber rope slings shall have a minimum clear length of rope between eye splices equal to 10 times the rope diameter.
- No end attachments shall have sharp edges or projections.
- Slings shall be removed from service if any of the following conditions exist:
  - Abnormal or excessive wear.
  - Powdered fiber between strands.
  - Broken or cut fibers.
  - Discoloration or rotting.
  - Distortion or damage of hardware on the sling.
  - Any damage that will reduce the rated capacity of the sling.
- Only new slings shall be used. The use of repaired or reconditioned slings is prohibited.

8.15.5 Synthetic Web Slings

- Each sling shall be marked to show the different rated capacities for each type of hitch and sling material.
- Synthetic webbing shall be of uniform thickness and width and selvage edges shall not be split from the webbing's width.
- Fittings shall be of equal rated capacity to that of the sling and be free of any sharp edges that could in any way damage the sling.
- Stitching shall be the only method used to attach end fittings and to form eyes. The stitching shall be sufficient to develop the full breaking strength of the sling.
- Slings shall not be used where: fumes, vapors, sprays, mists or liquids of acids, caustics or phenolics are present.
- Slings shall not be used in temperatures exceeding 180 degrees F.
- Slings which are repaired shall not be used unless repaired by the sling manufacturer or an equivalent entity. Temporary repairs are strictly prohibited.
- Each repaired sling shall be proof tested to twice the rated capacity prior to its return to service. A certificate of the proof test shall be kept on file and made available upon request.
- Slings shall be removed from service if any of the following conditions are present:
  - Acid or caustic burns,
  - Melting or charring of any part of the sling,
  - Snags, punctures, cuts, tears, or any damage,
  - Broken or work stitches,
  - Distortion or damage of fittings.

8.15.6 Inspection shall be completed each day before being used, and once per month while in service. A certification record shall be kept that includes the date of inspection, signature of a qualified inspector, serial number or identifier of the sling and any noted deficiencies. The sling and all fastenings and attachments shall be inspected for damage or defects by a competent person designated by the employer. Additional inspections shall be performed during sling use where service conditions warrant. Damaged or defective slings shall be immediately removed from service.

8.15.7 Items to check may include:

- Excessive wear and tear
- Cracked or corroded parts of metal slings
- Damage of any kind
- Rips or tears in fabric slings
- Deformed or misshapen parts of a sling
- Damaged end attachments
- Proper labeling with rated load capacity
- Discolored or deformed parts
- All sewn seams in good condition
- Evidence of heat damage

8.15.8 Slings shall also be inspected at intervals as recommended by the manufacturer.

8.16 All new and repaired slings shall be accompanied with a proof test certification for the rated load capacity or greater as recommended by the manufacturer. All proof tests shall be kept on file and be made available and forwarded to EHS.

8.16.1 No sling shall be used if it is not accompanied by a proof test certification.

9. RECORDS

A copy of issued permits, training records, inspection records and any other pertinent documents associated with crane work operations will be kept on file by the EHS Department. Each operating group shall maintain all operating records of all cranes, hoists, lifts, or slings.