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When separated from Attachments 1 and 2, this document is decontrolled.

January 17, 2014
BW140009

Mr. Steven K. Orth
NRC Region III Enforcement/Investigations Officer
U. S. Nuclear Regulatory Commission, Region III
2443 Warrenville Road, Suite 210
Lisle, Illinois 60532-4352

Subject: Braidwood Station, Units 1 and 2
Response to Request for Information – Tracking Number 13-A-0082

Reference: Letter from Steven K. Orth (U. S. NRC) to M. J. Pacilio (Exelon Generation Company, LLC), "Request for Information: Tracking Number 13-A-0082," dated November 22, 2013

Pursuant to your request, Exelon Generation Company, LLC (EGC) is providing the results of the evaluation of the matter described in the referenced letter. As requested, this response is not being submitted on the station docket. This response was requested to be submitted to NRC Region III within 30 days of the referenced letter. On December 19th, EGC contacted NRC Region III Allegation coordinator Jim Heller and discussed an extension due to the Holiday schedule in late December. An extension until January 17, 2014 was agreed to during that phone conversation.

The evaluation was conducted independently by an individual from Exelon Corporate Outage Services. The EGC evaluator is independent of Braidwood Station, is knowledgeable on the subject of outage services, and has over 7 years of nuclear power experience and 13 years experience performing turbine services work. EGC has determined that the evaluation was of sufficient depth and scope to address the issues identified in the referenced letter.

In summary, and as detailed in Attachment 1 to this letter, the concern that an unqualified worker operated the forklifts, overhead cranes, and hydraulic mobile cranes was not validated. There is no indication that a Local 150 District 5 crane operator operated cranes without the proper qualifications or provided inaccurate information to Siemens Generation Services about his qualifications. There was a Local 150 District 5 operator that was unqualified at the time of hire to operate mobile cranes, however that operator obtained his qualification on August 29, 2013 prior to the start of the Braidwood Station refueling outage beginning on September 9, 2013. Both the Siemens Lead Operating Engineer and Local 150 Business Agent were aware that this operator was not qualified for mobile cranes at the time of hire and required that the

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operator obtain the requested qualifications prior to the start of A1R17, thus ensuring that all crane operators were qualified to operate the mobile cranes.

In addition to the evaluation details for the information described above, the additional information requested by the NRC is provided in this letter.

This response does not contain any proprietary or safeguards information. However, Attachments 1 and 2 contain personal privacy information including the names of individuals and their certifications, phone numbers and e-mail addresses. Therefore, in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding," Attachment 1 contains an additional parenthetical marking of Personally Identifiable information (PII) adjacent to each paragraph that contains PII. There are no regulatory commitments in this letter.

Please contact Jessica Krejcie at (630) 657-2816 if you have any questions regarding this matter.

Respectfully,



Mark E. Kanavos
Site Vice President – Braidwood Station Nuclear Power Station
Exelon Generation Company, LLC

Attachment 1: Evaluation Report - NRC Tracking Number 13-A-0082

Attachment 2: Letter from Mike Johnson (Siemens Generation Services) to Scott Pavlis:
Laborers Local 75, Dean Rankovich: OE Local 150, Billy Meyer: UA Local 597,
Ray Chamberlain: MW Local 1693, John Scheidt: CP/MW Local 174, Robert
Schwartz: BM1, "Manpower Request/Pre-Job Brief Exelon Braidwood Station
A1R17 Outage," dated July 17, 2013

Attachment 3: Exelon Procedure, MA-AA-716-021, Revision 22, "Rigging and Lifting Program"

RIGGING AND LIFTING PROGRAM

Table of Contents

| | |
|---|-----------|
| 1. PURPOSE | 3 |
| 2. TERMS AND DEFINITIONS | 3 |
| 2.1. BREAKING STRENGTH | 3 |
| 2.2. CRITICAL LOAD | 3 |
| 2.3. DYNAMOMETER / LOAD CELL | 3 |
| 2.4. DYNAMIC LOADING | 3 |
| 2.5. DYNAMIC LOAD FACTOR | 3 |
| 2.6. FABRICATED RIGGING DEVICES. | 3 |
| 2.7. FALL ZONE | 3 |
| 2.8. LIFTING EQUIPMENT | 3 |
| 2.9. LOAD BEARING PARTS | 4 |
| 2.10. LOAD RATING | 4 |
| 2.11. MATERIAL HANDLING | 4 |
| 2.12. NIL DUCTILITY TEMPERATURE | 4 |
| 2.13. NOMINAL STRENGTH | 4 |
| 2.14. QUALIFIED PERSON | 4 |
| 2.15. RATED CAPACITY | 4 |
| 2.16. RIGGING | 5 |
| 2.17. RIGGING EQUIPMENT | 5 |
| 2.18. RIGGING AND LIFTING PLAN | 5 |
| 2.19. SAFE LOAD PATH | 5 |
| 2.20. SAFE WORKING LOAD (SWL) / WORKING LOAD LIMIT (WLL) | 5 |
| 2.21. SPECIAL LIFTING DEVICES | 5 |
| 2.22. STATIC LOAD | 5 |
| 2.23. SUSPENDED LOAD | 5 |
| 3. RESPONSIBILITIES | 6 |
| 3.1. MAINTENANCE DIRECTOR | 6 |
| 3.2. TOOL ROOM SUPERVISOR / MAINTENANCE SUPERVISOR (EXELON/CONTRACTOR) | 6 |
| 3.3. RIGGING AND LIFTING STORAGE AREA ATTENDANT | 7 |
| 3.4. MAINTENANCE SUPERVISOR (EXELON/CONTRACTOR) | 7 |
| 3.5. MAINTENANCE PERSONNEL (EXELON/CONTRACTOR) | 7 |
| 3.6. DESIGNATED SPOTTER | 8 |
| 3.7. CRANE OPERATOR | 8 |
| 3.8. SIGNALMAN RESPONSIBILITIES | 8 |
| 3.9. TRAINING | 9 |
| 3.10. DEPARTMENT TRAINING COORDINATOR | 9 |
| 3.11. WORKFORCE SUPERVISORS | 10 |
| 4. MAIN BODY | 11 |
| 4.1. GENERAL REQUIREMENTS | 11 |
| 4.2. RIGGING EQUIPMENT REQUIREMENTS | 17 |
| 4.3. INSPECTIONS | 21 |
| 4.4. LIFTING CONCRETE BLOCKS | 23 |
| 4.5. LOADS WITH TIGHT CLEARANCES (I.E., LOADS SUSPECT TO BINDING, DRAGGING, ETC.) | 24 |
| 4.6. PERFORMANCE OF LIFTING AND RIGGING | 24 |
| 4.7. TRAINING, EVALUATION, AND OBSERVATION OF RIGGING/LIFTING ACTIVITIES | 27 |
| 4.8. CONTRACTOR CRANE OPERATOR QUALIFICATIONS | 28 |

| | |
|-------------------------|----|
| 5. DOCUMENTATION - NONE | 28 |
| 6. REFERENCES | 28 |
| 6.1. COMMITMENTS | 28 |
| 6.2. STANDARDS | 28 |
| 6.3. PROCEDURES | 29 |
| 6.4. OTHER | 29 |
| 7. ATTACHMENTS | 31 |

1. **PURPOSE**

- 1.1. The purpose of this procedure is to provide requirements and guidance to support safe rigging and handling of loads. Guidance is included for identification, control, storage, issuance, usage and prior to use inspections of lifting and rigging equipment (cranes, mobile cranes, hand operated hoists, wire ropes, chains, slings, rigging tackle), and for determining the center of gravity, safe working load, and signals. This procedure is applicable to all Exelon/AmerGen workers and Contractors performing rigging and lifting on Exelon Nuclear property. **(CM-5)**
- 1.2. This procedure includes guidance that meets the requirements for periodic inspection of crane and hoist components that are within the scope of license renewal. **(CM-6)**

2. **TERMS AND DEFINITIONS**

- 2.1. **Breaking Strength** – The measured strength required to break cable, chain, synthetic webbing, etc.
- 2.2. **Critical Load** – A lifted load whose uncontrolled movement or release could adversely affect safety related system(s) when such system(s) are required for unit safety **or** result in potential off-site exposure comparable to the guideline exposures outlined in 10 CFR 100.
- 2.3. **Dynamometer / Load Cell** – A device used to measure/determine the weight of the load being lifted. Dynamometer / load cell are also used as equivalents in the mobile cranes that have a computer assisted load determining systems.
- 2.4. **Dynamic Loading** – Is the loading that occurs from force generated by acceleration or deceleration. A dynamic load results from a force applied to the load/rigging (for example, during operation of the crane moving the load). Dynamic load is equal to static load plus the dynamic force applied to the rigging as a result of accelerating or decelerating the crane hook caring the load (typically about 25% greater than the load weight to be lifted).
- 2.5. **Dynamic Load Factor** – The safety factor use to select the proper rated slings/rigging for a specific load to be lifted. Multiply the Dynamic Load Factor times the weight of the load to be rigged (Static load).
- 2.6. **Fabricated Rigging Devices** – The design, fabrication, labeling, testing and utilization of fabricated rigging devices shall comply with the requirements of ASME B30.20.
- 2.7. **Fall Zone** – The area (including but not limited to the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended materials could fall in the event of an accident.
- 2.8. **Lifting Equipment** – All equipment used for hoisting and lowering loads.

- 2.9. **Load Bearing Parts** – Any part of a material-handling device in which the induced stress is influenced by a hook load. A primary load-bearing part is one, the failure of which could result in dropping, upset, or uncontrolled motion of the load. Load-bearing parts which, if failed, would result in **no** more than stoppage of the equipment without causing dropping, upset, or loss of control of the load, are **not** considered to be primary load-bearing parts.
- 2.10. **Load Rating** – The amount of weight that a component or assembly can safely lift.
- 2.11. **Material Handling** – The process of moving material using devices that are **not** classified as rigging and lifting tools. (i.e. be moving material using carts, fork lifts, pallet jacks, dollies and rope)
- 2.12. **Nil Ductility Temperature** – Is defined as that temperature at which a material is subject to catastrophic brittle failure when placed under load or stress. This condition **may** occur in cold weather conditions to carbon steel or carbon steel alloys.
- 2.13. **Nominal Strength** – Breaking strength of rope which begins to reduce the moment a rope is put in service.
- 2.14. **Qualified Person** – A person, who by documented training, knowledge and experience, is competent to perform the required task.
- 2.15. **Rated Capacity** – The manufacturer's rated capacity. The maximum load which a piece of hoisting equipment is designed to safely carry. Also, the maximum load which a sling, hook, shackle, or other rigging tackle is designed to safely carry.
- 2.15.1. When shackles are to be used at temperatures above 400°F(204°C) or below -40°F(-40°C), the shackle manufacturer or a qualified person should be consulted.
- 2.15.2. When adjustable hardware, excluding swivel hoist rings and carbon steel eyebolts, is to be used at temperatures above 400°F(204°C) or below -40°F(-40°C), the hardware manufacturer or a qualified person should be consulted.
- 2.15.3. When swivel hoist rings are to be used at temperatures above 400°F(204°C) or below -20°F(-29°C), the hardware manufacturer or a qualified person should be consulted.
- 2.15.4. When carbon steel eyebolts are to be used at temperatures above 275°F(135°C) or below 30°F(-1°C), the hardware manufacturer or a qualified person should be consulted.
- 2.15.5. When wire rope clips are to be used at temperatures above 400°F(204°C) or below -40°F(-40°C), the wire rope clip manufacturer or a qualified person should be consulted.

- 2.15.6. When wedge sockets are to be used at temperatures above 400°F(204°C) or below -4°F(-20°C), the wedge socket manufacturer or a qualified person should be consulted.
- 2.15.7. When steel links, rings, or swivels, are to be used at temperatures above 400°F(204°C) or below -40°F(-40°C), the steel link, ring, or swivel manufacturer or a qualified person should be consulted.
- 2.15.8. For links, rings, or swivels made from other materials than steel, the steel link, ring, or swivel manufacturer or a qualified person should be consulted.
- 2.16. **Rigging** – The act of lifting or moving an object with equipment and/or materials designed for that purpose.
- 2.17. **Rigging Equipment** – Defined as shackles, turnbuckles, eyebolts, wire rope clips, ropes, pulleys, etc. and includes attachments used for connecting, anchoring, fixing or supporting the load. **Using non rigging equipment devices (unless approved by Engineering) as rigging equipment are not acceptable (i.e. C-Clamps, manufactured parts, etc.)**
- 2.18. **Rigging and Lifting Plan** – Defined as an identification of the load, an assurance that correct rigging equipment is used, a safe travel path designation, and that a lay down area has been designated and any other considerations that apply (Ref: Attachment 13). Rigging and lifting plans that were reviewed, evaluated, or approved by Engineering will require additional reviews, evaluations or approvals if the plan requires a revision.
- 2.19. **Safe Load Path** – A path (direction and clearances) defined for transport of heavy or critical loads to minimize the actual or increased potential for exposure release as defined in 10 CFR or would adversely affect safety related system(s) if dropped.
- 2.20. **Safe Working Load (SWL) / Working Load Limit (WLL)** – The maximum allowable working load for lifting and handling equipment (rigging). Also called load capacity, maximum working load or load rating.
- 2.21. **Special Lifting Devices** – Pieces of equipment especially designed to handle specific types of loads. They are usually made to hang from the hook of a crane during a Special Lift. Examples of Special Lifts include; Reactor Head, Turbine Rotors, etc. (Ref; ANSI 14.6).
- 2.22. **Static Load** – Is the load that would be indicated on a dynamometer / load cell when a load is suspend in a stationary position.
- 2.23. **Suspended Load**
- 2.23.1. The total superimposed weight on the load block or hook that would result in a load drop if the hoisting device or interfacing rigging equipment were to fail.

- 2.23.2. ASME/ANSI B30.20, Below the Hook Lifting Devices, such as lifting beams, spreader beams, "C" beams, and hook boxes are considered suspended loads and shall **not** be carried over personnel. Portable Load Cells are also considered suspended loads.
- 2.23.3. Crane operators should avoid carrying unloaded slings, chain falls, and rigging hardware over personnel when practical.
- 2.23.4. All rigging equipment suspended from the crane hook(s) shall be removed prior to leaving the crane unattended.

3. **RESPONSIBILITIES**

3.1. **Maintenance Director** – is responsible for the following activities:

- 3.1.1. Determining when detailed special handling procedures / work instructions are required due to weight, size, susceptibility to shock damage, high nil ductility temperature, or any other conditions warranting special instructions.
- 3.1.2. Ensuring necessary inspection frequencies are maintained in the General Surveillance Program or other periodic Maintenance Program. Vendor/Contractor owned rigging equipment is to be controlled and inspected by the Vendor/Contractor per their program. All vendor/contractor owned rigging/lifting equipment shall be reviewed by Exelon for current certification/documentation prior to use on site.

3.2. **Tool Room Supervisor / Maintenance Supervisor (Exelon/Contractor)** – is responsible for the following activities:

- 3.2.1. Establishing and maintaining proper storage of lifting equipment in designated clean "cold" and Radiological Controlled "hot" storage areas.
- 3.2.2. Ensuring each piece of lifting equipment is appropriately identified.
- 3.2.3. Maintaining documentation as required on lifting equipment.
- 3.2.4. Maintaining rigging or lifting equipment
 - 1. Repairing, discarding or destroying damaged or defective rigging / lifting equipment.
 - 2. Assuring proper tagging (depicting rigging or lifting equipment is unsuitable for use) is placed on damaged or defective equipment.
- 3.2.5. Maintaining all special lifting equipment within required periodic inspection intervals.
- 3.2.6. Ensuring manufacturer's recommended preventative maintenance is performed on rigging or lifting equipment.

- 3.2.7. Interfacing with Maintenance Supervisor and Planners to ensure an adequate inventory of rigging or lifting equipment for anticipated plant needs.
- 3.2.8. Purchasing new / replacement lifting, rigging and special equipment, as required.
- 3.3. **Rigging and Lifting Storage Area Attendant** – is responsible for the following activities:
 - 3.3.1. Submitting reports to Tool Room Supervisor.
 - 3.3.2. Performing or assisting vendors in performing required periodic inspections of rigging or lifting equipment.
 - 1. Ensuring portable hoists controlled by Exelon which pass periodic inspection are tagged with the color tag as specified on Attachment 17 for the current year the hoist is inspected in and the date of expiration (month and year) is identified on the tag.
 - 3.3.3. Ensuring proper storage, issuance, maintenance, and inspection of rigging / lifting equipment in the storage location.
 - 3.3.4. Maintaining storage and inspection records for each piece of lifting equipment in storage.
- 3.4. **Maintenance Supervisor (Exelon/Contractor)** – is responsible for the following activities:
 - 3.4.1. Review any current revision of the rigging and lifting plans prior to implementation.
 - 3.4.2. Provide oversight of lifting/rigging activities requiring HLA/IPA pre-job briefs.
 - 3.4.3. Ensuring personnel assigned rigging tasks are sufficiently trained and qualified in safe rigging practices to adequately and safely perform assigned task.
 - 3.4.4. Ensuring any rigging and lifting plan is discussed and reviewed during the pre-job brief prior to making the lift.
- 3.5. **Maintenance Personnel (Exelon/Contractor)** – are responsible for the following activities:
 - 3.5.1. Performance of proper planning, pre-use inspection, safe and correct rigging practices and tagging of equipment that is found damaged or defective.
 - 3.5.2. Safe rigging and handling of loads during any rigging task (lead mechanic / task leader has overall responsibility).
 - 3.5.3. Performing any necessary decontamination of rigging or lifting equipment as appropriate.

- 3.5.4. Returning rigging or lifting equipment to appropriate rigging and lifting equipment storage area (e.g., tool room).
- 3.5.5. Ensuring portable hoists controlled by Exelon are tagged with the color tag as specified on Attachment 17 for the current year the hoist was inspected in and ensuring that the expiration date (month and year) has **not** been exceeded. Depending on what month of the year the hoist was inspected on and what month it is being used the color of the tag may be from the previous year or the current year (I.e. a hoist being used in February of 2008 which was inspected in June of 2007 would have a tag with the color for 2007 and expire in 2008).
- 3.6. **Designated Spotter** – is responsible for:
 - 3.6.1. Communicating with the signalman during lifting load evolutions to ensure the crane maintains a safe distance from hazards.
 - 3.6.2. Communicating with the mobile crane operator when a signalman is **not** being used during crane travel and maneuvering under “No Load” conditions.
 - 3.6.3. Know the location of the crane mainline disconnect.
 - 3.6.4. Walking down the planned travel path before moving the crane to ensure possible hazards and obstructions are identified and communicated to the crane operator / signalman.
- 3.7. **Crane Operator** – is responsible for:
 - 3.7.1. **Not** engaging in any practice that could divert attention while actually engaged in crane operation.
 - 3.7.2. Being physically or otherwise fit for the proficient and safe operation of any crane under his/her controls.
 - 3.7.3. Being familiar with and understanding hand signals.
 - 3.7.4. Obeying an emergency stop signal at all times, no matter who gives it.
 - 3.7.5. Evaluating potential emergent or abnormal conditions during a lift, and stopping the lift to resolve such conditions, if necessary.
- 3.8. **Signalman Responsibilities**
 - 3.8.1. The Signalman’s primary responsibility is to give signal/communicate directions to the crane operator and he/she should be clearly identifiable (e.g., wearing bright colored vest).
 - 3.8.2. Know the location of the crane mainline disconnect.

- 3.8.3. An appropriate pre-job brief should be conducted with the signalman and rigging team to ensure the rigging expectations are clear. There are several instances when it is acceptable for the Signalman to touch/guide the load and they are as follows:
1. To check/inspect and adjust the rigging setup prior to lifting the load.
 2. When the load is being lifted lowered into a fitted area and the fit is preventing the load from swinging or shifting.
 3. When the load is being aligned for lowering over guide rods/alignment pins or lifted/lowered over guide rods/alignment pins that are preventing the load from swinging or shifting.
 4. The load is at a minimal height (less than approximately 6 inches above the landing location) and is being lifted/lowered initially or being guided to a precise landing location.
 5. When the item is being/lowered into a location that requires hands on guidance (insufficient room for tag lines) AND there is room for only one person to guide the load AND the crane operator will still have a clear view of the Signalman.

These instances allows the Signalman to determine if there are signs of binding and precise positioning without posing an equipment or personnel safety risk. The signalman's actions should be such that he/she has the ability to immediately provide hand signals with both hands if required.

During periods when the designated signalman is **not** working in the capacity of a signalman and performing other rigging activities he/she should remove his/her vest. |

- 3.8.4. For Non-Heavy Load lifts, A Signalman is **not** required if the load is such that the hoist/crane operator will have control, will be in the immediate vicinity of the load (i.e., pendant controller), and is able to visually see the load during all phases of lifting, moving, and setting the load. A Signalman is to be used for all other hoist/crane handling situation.

- 3.9. **Training** – is responsible for:

- 3.9.1. Performance of initial training for plant personnel that will be assigned to perform Rigging/Lifting activities.

- 3.10. **Department Training Coordinator** – is responsible for:

- 3.10.1. Ensure that training is documented for all employees that will perform Rigging/Lifting activities.

- 3.10.2. Ensure observations of Rigging/Lifting activities are documented and information forwarded to training for records input/update and retention.

- 3.11. **Workforce Supervisors** - Responsible for rigging/lifting by supplemental workers – is responsible for:
1. Verify that qualifications for rigging/lifting activities are current for supplemental personnel prior to independently performing rigging/lifting activities.
 2. Ensure that rigging and lifting proficiency has been validated and documented using Attachment 18 for Supplemental Personnel prior to independently performing Rigging/Lifting activities.

4. MAIN BODY

4.1. General Requirements

- 4.1.1. Rigging tasks that require special detailed handling instructions require certain minimum information be supplied prior to performance of task. Information may include:
- Weight of object to be rigged.
 - Special precautions for handling of load.
 - A sketch or drawing showing sling locations, balance points, angle of attachment, and methods of attachments.
 - Types and size of rigging to be used should be identified on the drawing plan.
 - A rigging and lifting plan should be considered for conditions identified on Attachment 13. The rigging and lifting plan checklist on Attachment 13 is optional and may be used as a rigging and lifting plan.
- 4.1.2. Precautions shall be taken during performance of task as follows:
- To prevent personnel from passing below or standing under suspended loads. Ensure Personnel are clear of the fall zone and load path.
 - **Exercise care** when rigging around electrical wiring or equipment. (See Attachment 13)
 - Protective (e.g., leather) gloves shall be worn when handling rigging.
 - Hands, feet, arms and legs shall be kept clear of pinch points.
 - Shock loading of rigging equipment shall be avoided.
 - Rigging or lifting equipment shall be removed from load prior to performing arc welding.

Exception:

- Rigging or lifting equipment may be left in place provided the arc welding is performed in accordance with CC-AA-501-1027, Hot Work Precautions and Safety Practices, and the potential for the crane chain or wire rope from becoming a path for current flow is mitigated by:
 - Using a **DRY** non-conductive sling rated for the load (to ensure the chain, wire rope, and/or hook are insulated from the work piece), **and**
 - Establishing the welding ground directly adjacent to the welding joint **and** ensuring that there is electrical contact between the two pieces being welded, **and**
 - Covering the portions of the crane chain, wire rope, and/or hook located within 4 feet of the weld location with a non-conductive insulating material, to prevent accidental electrical contact, when applicable.

- 4.1.3. Fabrication or modification of rigging devices (tools), **or** special rigging and lifting equipment outside the control of the company engineering programs is **not** permitted.
1. An Engineering Request should be initiated to solicit Engineering support when a need for fabrication or modification of a rigging device (tool) is identified.
 2. The station shall maintain records of design, fabrication, testing, use and inspection of the rigging device (tool).
- 4.1.4. Rigging and lifting equipment that does **not** meet manufacturer's specifications shall **not** be used.
- 4.1.5. Rigging and lifting equipment **not** specifically addressed in approved procedures shall be used in accordance with manufacturer's recommendations.
- 4.1.6. Use of scaffolding as an attachment or anchor point during rigging activities shall **not** be allowed unless evaluated and approved by Engineering.
- 4.1.7. Rigging points shall **not** be made from permanently installed plant system components or associated supports (e.g., cable trays, cable tray supports, piping, snubbers), unless approved by Engineering.
- 4.1.8. Loads equal to or greater than a site fuel assembly shall **not** be moved over pools when fuel is present or over open Reactor vessel without specific approved procedures and designated safe load paths. Furthermore the rigging of Heavy Loads over Safe Shutdown equipment is required to meet the Heavy Load rigging requirements of NUREG 0612. Refer to MA-AA-716-022, Control of Heavy Loads Program for guidance.
1. Engineering shall be contacted if required for assistance in Heavy Load rigging.
 2. Operations shall be contacted for identification of Safe Shutdown equipment.
- 4.1.9. Whenever a spent fuel shipping cask is carried by the Reactor Building overhead crane, the crane must be locked in the cask mode position (LaSalle Only). **(CM-2)**
- 4.1.10. Use of non-shouldered eyebolts shall be strictly limited to specialized vertical lift applications where the design of load attachment points prohibit safe use of shouldered type.
- 4.1.11. Modifications to rigging, lifting and special lifting equipment shall only be authorized by equipment manufacturer and installed through station approved procedures.
- 4.1.12. Rope shall **not** be used as direct or indirect load bearing elements of any rigging operation. Rope may be used for tether lines.

- 4.1.13. Damaged or defective lifting, rigging and special equipment shall be tagged and removed from service. Furthermore an IR should be written to ensure that when a special lifting device is overloaded, damaged, or distorted, an engineering assessment shall be performed. This assessment shall address ANSI N14.6 and include consideration of the load test up to the original procurement load test value or 150%, whichever is less.
- 4.1.14. Maintenance, repair and replacement of lifting, rigging, and special lifting equipment shall be performed consistent with guidance within ASME Safety Standard B30.2, or other appropriate standard in the ASME B30 series. **(CM-6)**
- 4.1.15. Only rigging and lifting equipment identified, inspected and issued in accordance with approved procedures shall be used.

NOTE: An immovable load rigged in such a way that a failure of the primary securing mechanism will **not** result in movement of the load (i.e., cribbing to support load from underneath, pipe rigged in place for welding, redundant rigging system, etc.) is **not** considered a suspended load.

- 4.1.16. Work shall **not** be performed on or under a suspended load.

Exceptions:

1. For infrequent situations, work may be performed on or under a suspended load while it is stationary (e.g., **not** being raised, lowered, or moved) when it is infeasible to conduct the work while the load is **not** suspended and the work is limited, authorized, and performed in accordance with step 4.1.17 and Attachment 16. Infeasible situation is defined as a situation which there is **no other way** to accomplish the work. Working under suspended loads will **not** be performed simply due to convenience or as an alternate way to accomplish work.

- 4.1.17. **If** it is infeasible to conduct the work while the load is **not** suspended, **then:**

1. **CONDUCT** a Job Hazards Analysis that documents why the activity **cannot** be performed while the load is landed or by using normal means of blocking or cribbing.
 - A. The Job Hazard Analysis shall address the height the load will be raised, potential swing of the load, trip hazards, body positioning, and explanation of how workers are **not** at risk of being struck by the load should the rigging shift or fail.
 - B. Whenever possible, long handle tools and/or redundant rigging systems should be used.

2. **PRIOR** to starting the activity:

- A. The Maintenance Director and the Site Safety Advisor, or their designees must grant authorization on Attachment 16. A Pre-Job Brief shall be conducted with all workers prior to starting the activity and at the beginning of each subsequent shift.

NOTE: A single JHA and Attachment 16 may be used to authorize multiple activities at a single work location (e.g., required activities in the Turbine Deck Sand Blast Housing during a refuel outage).

- B. The Job Hazard Analysis and a completed Attachment 16 shall be posted at the job site.

3. **DURING** the activity, a dedicated First Line Supervisor/Craft Labor Supervisor shall be assigned to the work activity and be in attendance until work activity is completed.

4.1.18. Suspended loads shall **not** be left unattended unless specific precautions have been instituted, are in place, and have been approved by the Maintenance Director. The following criteria must be met:

- Softener material placed under load to lessen impact if drop occurs.
- No safety related areas.
- Keep load as low as possible.
- Safety rope/barriers in place with signage.
- For short periods of time only - < 4hrs.
- No crane hook suspended loads.

4.1.19. While operator is not moving a suspended load, no employee must be within fall zone, except for following employees:

- Employees engaged in hooking, unhooking, or guiding load.
- Employees engaged in initial attachment of load to component or structure.

4.1.20. When employees are engaged in hooking, unhooking, or guiding load, or in initial connection of load to component or structure and are within fall zone, all following criteria must be met:

- Materials being hoisted must be rigged to prevent unintentional displacement.
- Hooks with self-closing latches or their equivalent must be used.
- Materials must be rigged by qualified rigger.

- 4.1.21. Only employees essential to the operation are permitted in fall zone (but not directly under load except as identified in Step 4.1.16.1). An employee is essential to the operation if employee is conducting one of following operations and employer can demonstrate it is infeasible for employee to perform that operation from outside fall zone:
- Physically guide load.
 - Closely monitor and give instructions regarding load's movement.
 - Either detach load from or initially attach it to another component or structure (such as, but not limited to, making an initial connection or installing bracing).
- 4.1.22. Loads shall be maintained balanced and/or level.
- 4.1.23. Do **not** swing loads.
- 4.1.24. Loads shall be blocked / cribbed in a stable condition.
- 4.1.25. Uncontrolled movement shall be prevented when rotating a load by maintaining center of gravity below rigging point.
- 4.1.26. Loads, rigging or lifting equipment shall **not** be dragged.
- 4.1.27. Damaged or deteriorated rigging or lifting equipment shall **not** be used.
- 4.1.28. Loads shall be maintained as close as possible to nearest floor or load bearing structure.
- 4.1.29. Rigging equipment shall **not** be loaded above its rated capacity. (Observe temperature limitations identified in Step 2.15 for rigging equipment).
- 4.1.30. Special lifting devices shall be controlled per applicable site documents in accordance with ANSI 14.6
- 4.1.31. Portable hoist annual inspection shall be verified current prior to use.
1. Portable hoists controlled by Exelon are tagged with the color tag as specified on Attachment 17 for the current year the hoist was inspected in and the expiration date (month and year) is identified on the tag. Depending on what month of the year the hoist was inspected on and what month the hoist is being used the color of the tag on the hoist being used may be from the previous year or the current year (I.e. a hoist being used in February of 2008 which was inspected in June of 2007 would have a tag with the color for 2007 and expire in 2008.).
- 4.1.32. Portable hoist examination shall be in accordance with applicable requirements.
- 4.1.33. Personnel shall **not** engage in any activity, which will divert his/her attention.
- 4.1.34. Operator shall ensure personnel are clear before commencing lift.

4.1.35. Load chain shall **not** be exposed to temperatures in excess of 600° F.

4.1.36. Hoisting wire rope or chain shall **not** be wrapped around load.

NOTE: Planned engineered lifts are only applicable to powered hoists having a load rating of 5 tons and above.

4.1.37. **Except** for planned engineered lifts and equipment load testing, lifted load shall **not** exceed maximum load capacity of supporting structure (beam clamps, trolleys, etc.), or hoist and equipment used for rigging. Adhere to the requirements of ASME B30.16-2003 (or latest rev), Section 16-2.2, "Testing", and Section 16-3.2.2, "Planned Engineered Lifts", **prior** to performing all lifts above rated capacity.

4.1.38. Hoist shall **not** be operated to jam or dead block at upper travel limit (Two-Block).

4.1.39. Hooks shall be equipped with a latch except where it would interfere with operation of equipment or create additional personnel hazards.

4.1.40. Do **not** place a side, back or tip load on hooks. Rigging shall be centered in hook.

4.1.41. Swivel hooks shall rotate freely 360°.

4.1.42. Hooks shall be positioned over the center of gravity of the load to minimize swinging.

4.1.43. Rated load capacities, and recommended operating speeds, special hazard warnings, or instruction, shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while he/she is at his control station. **If** all warnings are **not** visible to the crane operator, **then** they shall be included in the pre-job brief.

4.1.44. An illustration of the signals shall be provided at the job site.

4.1.45. Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane.

4.1.46. All exhaust pipes shall be guarded or insulated in areas where contact by employees is possible in the performance of normal duties.

4.1.47. All windows in cabs shall be of safety glass, or equivalent, that introduces no visible distortion that will interfere with the safe operation of the machine.

4.1.48. Where necessary for rigging or service requirements, a ladder, or steps, shall be provided to give access to a cab roof.

4.1.49. Guardrails, handholds, and steps shall be provided on cranes for easy access to the car and cab.

4.1.50. Platforms and walkways shall have anti-skid surfaces.

- 4.1.51. An accessible fire extinguisher of 5BC rating, or higher, shall be available at all operator stations or cabs of mobile cranes.
- 4.1.52. Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is **not** an energized line and it has been visibly grounded.
- 4.1.53. Whenever a crane powered with an internal combustion engine exhausts in enclosed spaces, tests shall be made and recorded to see that employees are **not** exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres. Contact the Site Safety Professional for guidance.
- 4.1.54. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees, or otherwise create a hazard.

4.2. Rigging Equipment Requirements

4.2.1. The following requirements apply to Slings:

1. Slings shall **not** be loaded beyond capacity indicated on manufacturer's tag for hitch being used.
2. For all configurations, lifting devices that are **not** specially designed should be installed and used in accordance with this procedure. In selecting the proper sling, the load used should be the sum of the static and maximum dynamic load. The rating on the sling should be in terms of the "static load" which produces the maximum static and dynamic load. For purposes of selecting the proper sling, loads imposed by the Safe Shutdown Earthquake (SSE) need **not** be included in the dynamic loads imposed on the sling or lifting device,
3. Use a "Dynamic Load Factor" of 1.25 times the load to be lifted (static load) when selecting rigging (i.e. wire/synthetic/nylon slings) unless another value is specified in site specific procedures.
4. Slings shall **not** be pulled from under a load when load is resting on sling.
5. Twisting and kinking of slings shall be avoided.
6. Slings shall **not** be shortened with knots, bolts, rope clips or other unapproved methods.
7. Temporary repairs to slings is **not** permitted.
8. Multiple part slings or chains shall **not** be twisted around each other.
9. Loads shall **not** be lifted with unused sling legs dangling loose, use right equipment for job.

10. A single sling shall **not** be used as a bridle to lift a load by hanging it over the hook, if the sling can shift over the hook / shackle.
11. A single sling with spliced eyes shall **not** be used alone to lift a load.
12. Longest sling(s) possible shall be used to provide minimum angle to load.
13. Slings used in a choker hitch shall be of sufficient length to assure choking action is on webbing.
14. Nylon, Polyester and Polypropylene slings shall **not** be used where acid or caustic conditions exist.
15. Synthetic and fiber slings may be used at rated capacity between temperatures of minus 20°F to 180°F except for frozen slings, which may **not** be used.
16. Fiber slings shall be protected when being used near a heat source of 220°F or more.
17. Fiber core wire rope slings shall **not** be exposed to temperatures in excess of 200°F.
18. Synthetic and fiber slings shall **not** be left in wet or chemical environments or exposed to direct sunlight for extended periods.
19. Fiber slings shall **not** be subjected to a sustained load equal to rated capacity for more than three days.
20. Wire rope slings shall **not** be used above temperature of 400°F or below minus 60°F.
21. Wire rope slings with turned back eyes configurations should **not** be used.
22. Slings should be stored in an area where they will **not** be subjected to mechanical, chemical, or ultraviolet damage or extreme temperatures.

4.2.2. The following requirements apply to rigging hardware / fittings:

1. Aluminum rigging fittings shall **not** be used in caustic environments.
2. Homemade links, make shift fasteners formed from bolts, rods, etc. or other such attachments shall **not** be used.
3. Temporary repairs of rigging hardware / fittings is **not** permitted.
4. Protective covers, pads, softeners, or guards shall be used to protect slings from edges and corners that may cut or damage slings (such as sharp edges, sharp corners, or abrasive edges). Engineered edge protectors/softeners/corner protectors are preferred.
5. Loads lifted in a basket hitch shall be balanced.

6. Eyebolts

- A. Eyebolts must have full thread engagement, shoulder fully seated, only one washer/shim should be used under eyebolts if needed for orientation purposes to alleviate side pulling on the eyebolt. Loads must always be applied to the eyebolts in the plane of the eye, **not** at an angle to the plane.
- B. Eyebolts should be tightened or otherwise secured against rotation during lifting or load-handling activities.
- C. When used in a tapped blind hole, the effective thread length shall be **1 ½ times** the diameter of the bolt for engagement in steel. For those that are less than **1 ½ times** the diameter thread engagements or engagement in other materials, contact site structural engineer.
- D. When used in a tapped through-hole of less than one diameter thickness, a nut shall be used under the load and fully engaged and tightened securely against the load.
- E. When used in an untapped-hole, the nut under the load shall be fully engaged. If the eyebolt is **not** shouldered to the load, a second nut on top of the load should be used where possible. This configuration shall be used only on vertical lifts.
- F. Eyebolts **not** shouldered to the load shall only be used for vertical / in-line loads.
- G. Only shouldered eyebolts shall be used for angular loading. When used for angular loading, the shoulder shall be flush and securely tightened against the load. The working load limit (WLL) must be reduced in accordance with the angle to the eyebolt.
- H. When using eyebolts for angular load handling, the plane of the eyebolts shall be aligned with the direction of pull. Steel flat washers may be used under the shoulder to position the plane of the eye.
- I. Eyebolts shall be in good working condition prior to use. Alterations or modifications shall be as specified by the hardware manufacturer or approved by a qualified engineer.
- J. Replacement parts, including nuts, pins, and bolts, shall meet or exceed the original equipment manufacturer's specifications.
- K. Shock loading should be avoided.
- L. Eyebolt manufacturer/supplier shall be consulted for safe load ratings of non-shouldered eyebolts prior to use.

7. Swivel Hoist Rings

- A. Swivel hoist rings when used in a threaded hole, the effective thread length shall be **1 ½ times** the diameter of the bolt for steel. Other thread engagements less than the required length or engagement in other materials, contact the swivel hoist ring manufacturer or station structural engineer.
 - B. When used in a through-hole application, a nut and washer shall be used. The washer and nut shall be in accordance with the swivel hoist ring manufacturer's recommendations. The nut shall be fully engaged.
 - C. The bushing flange shall fully contact the load surface.
 - D. Spacers or washers shall **not** be used between the bushing flange and the mounting surface of the load.
 - E. The swivel hoist ring shall be free to rotate and pivot without interference during load-handling activities.
 - F. The load applied to the swivel hoist ring shall be centered in the bail to prevent side loading.
 - G. Any attached load-handling component shall be narrower than the inside width of the bail to avoid spreading.
 - H. Components shall be in good working condition prior to use. Alterations or modifications shall be as specified by the hardware manufacturer or approved by a qualified engineer.
 - I. Ensure that the swivel hoist ring WLL meets or exceeds the anticipated angular rigging tension.
 - J. Shock loading should be avoided.
 - K. When using swivel hoist rings the user must torque hoist rings to the manufacturer's specifications.
8. Load pins shall be fully seated and secure in shackles and turnbuckles.
9. Shackles with round non-threaded pins shall **not** be used.
10. Observe temperature limitations identified in Step 2.15 for rigging hardware.

4.2.3. The following requirements apply to selecting proper connection hardware for use with Tuflex Roundslings manufactured by Lift-All:

1. Tuflex Roundslings may be connected to hardware that is either specifically designed for use with them or they may be connected to standard hardware, as long as the hardware meets the following criteria:
 - Must be approved for use in lifting applications by the manufacturer
 - Must have an adequate capacity for the lift requirements
 - The hardware opening at the sling attachment must be sufficient to allow the roundslings to slide freely
 - Must be of an adequate size such that the bearing area of the hardware conforms to the size requirements specified by Lift-All or is sized such that the bearing stress value at the connection does **not** exceed 7,000 lbs./in² during sling loading. (Refer to Lift-All Technical Bulletin RS-29)

4.3. Inspections

4.3.1. A Pre-use visual inspection by a qualified person is required to be performed prior to the start of each work shift **or** prior to each use of rigging and lifting equipment for the following equipment using the appropriate attachment guidelines. **(CM-3, CM-4)**

- | | | |
|-----|---|---------------|
| 1. | Overhead and Gantry Crane | Attachment 1 |
| 2. | Hand Chain Hoists and Come-Alongs | Attachment 2 |
| 3. | Electric/Air Hoists | Attachment 3 |
| 4. | Wire Rope Slings | Attachment 4 |
| 5. | Synthetic/Nylon Slings | Attachment 5 |
| 6. | Rigging Hardware | Attachment 6 |
| 7. | Mobile Crane (typical) | Attachment 7 |
| 8. | Mobile Crane Pre-Lift Checklist | Attachment 8 |
| 9. | Monorail and Underhung Cranes <u>with</u> Integral Hoisting Mechanism | Attachment 9 |
| 10. | Monorail and Underhung Cranes <u>without</u> Integral Hoisting Mechanism | Attachment 10 |
| 11. | Padeye to Steel and Concrete Embedments | Attachment 11 |

4.3.2. An undocumented pre-use visual inspection of rigging and lifting equipment should be performed by the Tool Room Attendant / designee prior to being issued.

- 4.3.3. Synthetic and Wire Rope Slings shall have a documented inspection performed in all areas where the slings are stored on an annual basis using Attachment 4 and Attachment 5 inspection guidelines respectively. Each station shall have rolling documented PM's in place to which these annual documented sling inspections shall be performed. These documented inspections will be performed by a qualified rigger. A copy of the most current documented annual inspection (the PM) will be stored in a logical designated location determined by the stations in each inspection area and the electronic versions retained in the PM. The annual PM inspection shall be based on the storage location of the slings.

Examples of Inspections:

- Wire rope slings annual documented inspection was performed satisfactory in the "Cold Tool room area" on 5/12/XXXX in accordance with the Attachment 4 Inspection Guide; all wire rope slings in this location were inspected satisfactorily.
- Synthetic slings annual documented inspection was performed satisfactory in the "Hot Tool room area" on 5/12/XXX in accordance with the Attachment 5 Inspection Guide; all synthetic slings in this location were inspected satisfactorily.

- 4.3.4. An undocumented pre-use sling inspection shall be performed by a qualified rigger upon sling issuance and prior to each initial use in accordance with Attachment 4 and Attachment 5 guides as applicable depending on the type (Wire Rope or Synthetic Sling). Lifting rigging tasks that are long term in duration require that after the initial issuance inspection and when a task stops (break, lunch, overnight etc) a pre-use undocumented inspection using Attachment 4 or 5 as an inspection guide will be performed on the rigging prior to continuing work.

- 4.3.5. Documented periodic inspection of rigging and lifting equipment shall be performed in accordance with approved procedures and performed by qualified personnel.
(CM-1, CM-6)

1. The scope of the periodic inspection should be consistent with that defined in ASME Safety Standard B30.2, or other appropriate standard in the ASME B30 series.
2. The periodic inspection of cranes, hoists and lifting components within the scope of license renewal shall also include inspection for wear of the rails in the rail system.
3. Portable hoists controlled by Exelon which pass periodic inspection are to be tagged with the color tag as specified on Attachment 17 for the current year the hoist is inspected in and the expiration date (month and year) is to be identified on the tag.

- 4.3.6. Vendor/Contractor owned rigging equipment is to be controlled and inspected by the Vendor/Contractor per their program.

4.4. Lifting Concrete Blocks

4.4.1. **PRIOR** to lifting concrete blocks, floor plugs, floor covers, and security vehicle barrier system (VBS) blocks by attaching rigging equipment to metal connections that are integral to the load:

1. **VERIFY** the connections installed on the load are intended to be used as rigging points and have rated capacities sufficient for the load based on the lift plan (via design drawings, vendors specifications, or engineering evaluation). Connections that have been verified to have adequate rated capacity for the load may be documented in the library copy of the work order or have the connections marked as verified to avoid unnecessary repeat evaluations.
2. **CONFIRM** the connections are free of cracks, excessive wear, or corrosion, and that the integral attachments to the load, i.e., inserts that are embedded in concrete blocks, are **not** degraded and/or loose. **If** excessive wear or corrosion is present, **then CONDUCT** a non-destructive examination (NDE) to **CONFIRM** the connections are still acceptable for use and **DOCUMENT** results in the associated work package.
3. **VERIFY** the sling angles are appropriate for the type of fittings / hardware (i.e., eye bolts, lifting lugs, etc.) being used.

NOTE A lifting beam specifically designed for both the 9 foot and 10 foot VBS concrete barriers is available that provides a direct, vertical lift for each VBS and avoids any stresses other than the direct "dead weight" of each block (Ref. NER LS-04-058).

4. **If** a security VBS block is being lifted, **then** the slings shall be kept vertical.

4.5. Loads With Tight Clearances (i.e., loads suspect to binding, dragging, etc.)

CAUTION

In order to ensure against rigging failure with disastrous consequences due to over stressing rigging equipment, adhere to this policy when conducting lifts that have potential interferences, drag, binding, or suspect load values.

4.5.1. All rigging lifts that are greater than 1,000 pounds and that have potential interferences, drag, binding, or suspect load values, such as concrete blocks, shield walls, etc., must utilize a load cell with a safety factor of at least 5 to 1 to prevent excessive stress which could inadvertently load equipment above its rated capacity.

1. If the configuration of lift is **not** conducive to the use of a load cell such that a load cell **cannot** be used, **then DEVELOP and IMPLEMENT** a rigging and lifting plan (i.e., MA-AA-716-021, Attachment 13), reviewed and approved by the Maintenance Director or Site Rigging SME, that utilizes appropriate means to alleviate excessive stress from the allowable concentrated load values, such as:

- A. Increasing the rigging capacity by at least 100%.
- B. Mechanically agitating, lubricating, heating, hydraulically jacking and/or prying loose from the rest point prior to lifting.
- C. Placing indicators / precision levels to visually verify if load is moving correctly (i.e., horizontal / vertical).

4.6. Performance of Lifting and Rigging

4.6.1. Rigging activities shall be reviewed and discussed during the pre-job briefing. When possible and practical the pre-job brief should include a tour of the job site. The pre-job brief shall include a review of the roles and responsibilities of all persons involved with the lifting evolution. When using a mobile crane a spotter individual shall be designated during the pre-job brief.

4.6.2. One person shall be designated (typically during pre-job brief) as in charge of the lift.

4.6.3. A qualified rigger shall be present during rigging evolutions.

4.6.4. A signalman shall be:

- 1. A qualified rigger per the Exelon Nuclear Training Program (N-GC40501) or
- 2. Qualified as a signalman in accordance with 1926.1428(c).

- 4.6.5. Any mobile crane that is operated shall have a designated spotter.
- 4.6.6. The safe travel path should be walked down when required to ensure it is clear of obstacles and personnel hazards. When a spotter is supporting the operator of a mobile crane, then the spotter and the operator shall have a clear understanding of the crane travel path.
1. Use a spotter if temporary obstructions have the potential to impact the crane's travel path.
- 4.6.7. Due to wind having a significant effect on loads, Grove Crane manufacturer recommends when wind velocity exceeds 20 mph, the crane's capacities be reduced to 44% of the allowable stability and structural capacities appearing on the crane's load capacity charts and that all crane operation cease when wind velocity reaches or exceeds 30 mph.
- 4.6.8. Radios may be used to enhance communications between the signalman (when used) and crane operator.
- 4.6.9. For Non-Heavy Load lifts, A Signalman is **not** required if the load is such that the hoist/crane operator will have control, will be in the immediate vicinity of the load (i.e., pendant controller), and is able to visually see the load during all phases of lifting, moving, and setting the load. A Signalman is to be used for all other hoist/crane handling situation.
1. To avoid personnel injury or equipment damage, only one qualified person shall be designated to give hand signals to the crane / hoist operator.
 - A. ANSI / ASME approved hand signals shall be used as the primary means of communication for all crane / hoist movements (see attachment 14 and 15).
 - Special operations may require additions to or modifications of standard signals.
 - Special signals shall be agreed upon in advance and understood by the signalperson and the operator.
 - Special signals shall **not** conflict with standard hand signals
 - B. The designated signalman shall wear a bright colored vest or other apparel so the signal person can be clearly identified.
 - C. When the crane / hoist operator's view is obstructed, hand signals **may** be relayed to the crane / hoist operator by more than one person – Continuous radio headset communications would also be an acceptable practice and in this case be the preferred method.
 2. The crane / hoist operator shall obey ANY emergency stop signal given by ANYONE in the lift area.

- 4.6.10. When loads are moved past several elevations, personnel performing the lift shall evaluate the need to position attendants at each elevation the load travels past. This evaluation shall include, but is **not** limited to the following items:
- Size, weight and shape of load
 - Visibility between load and crane / hoist operator
 - Size of opening in relation to size of load
 - Orientation of load in relation to opening
 - Any obstructions in lift path
- 4.6.11. **ENSURE** that access to the lift area or any openings created is strictly controlled by a watch person, barriers or both. Sufficient watch persons and/or barriers must be used to completely limit access to the lift area except for personnel involved with the lift. Barriers may consist of safety ropes and stanchions as necessary and shall be posted with warning signs in accordance with SA-AA-2115. The use of barriers is expected when it is possible and practical in those areas where personnel traffic is probable. Consider weight and size of load when determining minimum safe lift area.
- 4.6.12. Weight of load shall be determined from one of the following:
- Equipment name plate
 - Manufacturer's technical manual or drawing
 - Work history
 - Calculation using weight chart and formula on Attachment 12
 - Use of the dynamometer/load cell
- NOTE: Planned engineered lifts are only applicable to powered hoists having a load rating of 5 tons and above.
- 4.6.13. Any load greater than equipment rated capacity shall **not** be lifted, unless reviewed by Engineering. Adhere to the requirements of ASME B30.16-2003 (or latest rev), Section 16-2.2, "Testing", and Section 16-3.2.2, "Planned Engineered Lifts", prior to performing all lifts above rated capacity.
- 4.6.14. Type, quantity, rating and use configuration of rigging equipment required to perform lift shall be determined from Manufacturer's recommendations. Where manufacturer's specifications are **not** available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded.
- 4.6.15. Pre-use and operational check of rigging and lifting equipment shall be performed.

- 4.6.16. Rigging or lifting equipment shall be installed with hook positioned at center of gravity **and** rigging attached to load.
1. If load is a close fit, odd shaped or unbalanced, **then** a chain fall, come-along or turnbuckle of the appropriate load rating should be used to provide additional control.
 2. Hitches shall be adjusted so that each will share its part of the load.
 3. Size of rigging shall be adjusted as necessary to support unbalanced loads.
 4. A tag line should be used if possible and should be of sufficient length and strength to allow manipulation of the load without endangering personnel.
- 4.6.17. Precautions shall be taken during load movement to prevent personal injury and equipment damage. All personnel must be clear before lifting load.
- 4.6.18. Loads shall be lifted, moved, started and stopped slowly to minimize dynamic loading **of** rigging and lifting equipment.
- 4.6.19. Load shall be lifted just enough to check for balance and level. **If** necessary, load should be lowered, adjustments performed, **then** lifted and rechecked.
- 4.6.20. Load shall be moved slowly and under control to destination. Load shall be lifted the minimum amount necessary to clear obstacles, keeping load as close as possible to nearest load bearing surface.
- 4.6.21. Load shall be securely blocked before relaxing rigging.
- 4.6.22. All rigging and lifting equipment shall be returned to appropriate storage area at completion of the lifting activity. Any Exelon equipment found defective due to rigging and lifting shall be tagged with defective equipment tag and reported to the Tool Room. Any vendor/contractor owned equipment found defective shall be controlled by the vendor/contractor per their program to prevent use.
- 4.7. Training, Evaluation, And Observation Of Rigging/Lifting Activities
- 4.7.1. Initial training and Evaluation for all plant personnel performing Rigging/Lifting activities shall be provided by a qualified Instructor/Subject Matter Expert (SME), and qualified OJT/TPE evaluators.
- 4.7.2. Designated Supervisors or Rigging/Lifting personnel shall conduct performance Observations of personnel performing Rigging/Lifting and material handling quadrennially. Designated Observers will have experience, and knowledge of Rigging/Lifting and material handling activities.
1. Designated Observers shall use Attachment 18 to document observation.
 2. Attachment 18 will be forwarded to the Data Base Administrator for entry.

4.8. Contractor Crane Operator Qualifications

4.8.1. Contractor Crane Operators - Operating Engineers that will be operating station cranes will be required to prove current crane operator certification by presenting a certification license/card that must contain the following information:

- Photo of individual
- Name of operator
- A listing of all the cranes he/she is qualified to operate
- The issue and expiration date of the crane operator certification

1. Additionally, the Crane operator must have Medical Examiner's certification that individual is medically qualified to perform duties.

5. DOCUMENTATION - None

6. REFERENCES

6.1. Commitments

- 6.1.1. **CM-1** LaSalle ATM AR#2889, Sling Requirements per NEIL Insurance Evaluation (Step 4.3.5)
- 6.1.2. **CM-2** LaSalle, Commitment Tracking System Section 3.9.7, Crane Travel. (UFSAR Sections 9.1.2.1.2, 9.1.2.1.3, and 9.1.4) (Step 4.1.9)
- 6.1.3. **CM-3** Dresden License Renewal Commitment (AR 101522.23.06) (Step 4.3.1)
- 6.1.4. **CM-4** Quad Cities License Renewal Commitment (AR 101562.23.05) (Step 4.3.1)
- 6.1.5. **CM-5** 1985T0095, commitment to revise Rigging and Lifting procedure MA-AA-716-021 (Step 1.1)
- 6.1.6. **CM-6** T04724 Limerick License Renewal Commitment, Inspection of Overhead Heavy Load and Light Load Refueling Handling Systems Aging Management Program. (Steps 1.2, 4.1.14, and 4.3.5)

6.2. Standards

- 6.2.1. Code of Federal Regulations, Title 29, Part 1926 - OSHA Construction Standard
- 6.2.2. Code of Federal Regulations, Title 29, Part 1910 - OSHA General Industry Standard
- 6.2.3. Code of Federal Regulations, Title 29, Part 1910.184, Slings
- 6.2.4. ASME B30.2-2001, Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)

- 6.2.5. ANSI B30.5, Mobile and Locomotive Cranes
- 6.2.6. ANSI B30.9, Slings **(CM-5)**
- 6.2.7. ANSI B30.10, Hooks
- 6.2.8. ANSI B30.11, Monorail Systems and Underhung Cranes
- 6.2.9. ANSI B30.16, Overhead Hoists (Underhung)
- 6.2.10. ANSI B30.17, Overhead and Gantry Cranes
- 6.2.11. ANSI 45.2.2, Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants
- 6.2.12. ANSI 45.2.15, Hoisting, Rigging, and Transporting of Items for Nuclear Power Plants
- 6.2.13. ANSI / AWS D14.1, Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment
- 6.2.14. ANSI B30.26, Rigging Hardware
- 6.2.15. NUREG-1801, Generic Aging Lessons Learned (GALL) Report, Revision 2
- 6.3. Procedures
 - 6.3.1. CC-AA-402, Maintenance Specification: Installation of Temporary Rigging
 - 6.3.2. CC-AA-501-1027, Hot Work Precautions and Safety Practices
 - 6.3.3. MA-AA-716-022, Control of Heavy Loads Program
 - 6.3.4. SA-AA-129, Electrical Safety
 - 6.3.5. SA-AA-2115, Safety Signage
- 6.4. Other
 - 6.4.1. NUREG 0612, Control of Heavy Loads at Nuclear Power Plants
 - 6.4.2. IT-7000, Installation Tolerance Drawings (LaSalle)
 - 6.4.3. T-3763, Mechanical and Structural Work Specification for Maintenance/Modification Work
 - 6.4.4. Crane Operation and Hitching Manual, Allis Chalmers, No. 25E6208F
 - 6.4.5. Recommended Operating and Inspection Manual, Web Sling Association, 1984
 - 6.4.6. Exelon Nuclear Industrial Safety Pocket Guide

- 6.4.7. Riggers Handbook, Alloy Sling Chains, Inc.
- 6.4.8. Lift-All Technical Bulletin RS-29
- 6.4.9. NER LI-06-011, Manhole Roof Block Connections Fail During Rigging & Lifting Activity.
- 6.4.10. NER NC-06-003, Rigging and Lifting Event at DC Cook
- 6.4.11. Jerry Klinke's (rigging) handbook
- 6.4.12. Bob's Book of Rigging
- 6.4.13. INPO SOER 06-1 Rigging, Lifting, and Material Handling
- 6.4.14. EPRI 1007914 Lifting, Rigging, and Small Hoist Usage Program Guide
- 6.4.15. IR 1065119
- 6.4.16. IR 1009810-13, Enhance procedures to consider static and dynamic loads for sizing slings. (Check-In Self Assessment 1009810-02, Outage Control of Heavy Loads")
- 6.4.17. Letter from ComEd (E. D. Swartz) to NRC (D. G. Eisenhower), dated 11/18/82: attachment pg. 7
- 6.4.18. Letter from NRC (D. B. Vassallo) to ComEd (D. L. Farrar), dated 6/27/83: attached Technical Evaluation Report section 2.1.5

7. **ATTACHMENTS**

- 7.1. Attachment 1, Inspection Requirements for Overhead and Gantry Cranes
- 7.2. Attachment 2, Minimum Inspection for Hand Chain Operated Hoists and Come-Alongs
- 7.3. Attachment 3, Minimum Inspection for Electric or Air Operated Hoist
- 7.4. Attachment 4, Minimum Inspection Requirements Guide for Wire Rope Slings
- 7.5. Attachment 5, Minimum Inspection Requirements Guide for Synthetic/Nylon Slings
- 7.6. Attachment 6, Minimum Inspection Standards for General Rigging Hardware
- 7.7. Attachment 7, Minimum Inspection Requirements for Mobile Cranes
- 7.8. Attachment 8, Mobile Crane Pre-Lift Checklist
- 7.9. Attachment 9, Minimum Inspection Requirements for Monorail and Underhung Cranes with Integral Hoisting Mechanism
- 7.10. Attachment 10, Minimum Inspection Requirements for Monorail and Underhung Cranes Without Integral Hoisting Mechanisms
- 7.11. Attachment 11, Inspection Requirements for Padeye to Steel and Concrete Embedments
- 7.12. Attachment 12, Load Weight Chart and Calculating Load/Tension on Each Leg of a Sling
- 7.13. Attachment 13, Rigging and Lifting Plan Guidance
- 7.14. Attachment 14, Bridge Crane Signals
- 7.15. Attachment 15, Mobile Crane Signals
- 7.16. Attachment 16, Work on/under a Suspended Load – Limited Exceptions.
- 7.17. Attachment 17, Portable Hoist Periodic Inspection Color Scheme Chart
- 7.18. Attachment 18, Observation Form For Rigging/Lifting Competency

ATTACHMENT 1**Minimum Inspection Requirements for Overhead and Gantry Cranes****Page 1 of 1**

1.0 **PERFORM** the following pre-use inspections:

- Visually **INSPECT** hoist ropes for gross damage such as distortion of the rope, corrosion, broken strands, kinks or any other unusual abnormalities.
- Visually **INSPECT** lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leaks.
- Visually **INSPECT** general rigging hardware in accordance with Attachment 6.
- Functionally **TEST** hoisting limit switch.
- Functionally **TEST** lower travel limit switch, if hoist is being used at or near its lower travel limit.
- Functionally **TEST** all other limit switches as applicable (i.e., Trolley/Bridge travel, etc.)
- **CHECK** that the rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block, and this marking shall be clearly legible from the ground or floor.
- **CHECK** that bridge trucks are equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.

NOTE: A gong or other audible alarm is **not** required for floor-operated cranes.

- **CHECK** that a gong or other effective audible warning signal shall be provided for each crane equipped with a power traveling mechanism.
- The location of the crane mainline disconnect/breaker must be known and discussed between the riggers and crane operator prior to conducting rigging evolutions associated with the crane.

2.0 **If** any abnormal conditions / defects are found, **then CONTACT** Maintenance Supervision for resolution prior to utilizing the equipment.

ATTACHMENT 2

Minimum Inspection Requirements for Hand Chain Operated Hoists and Come-Alongs

Page 1 of 1

1.0 **PERFORM** the following pre-use inspections:

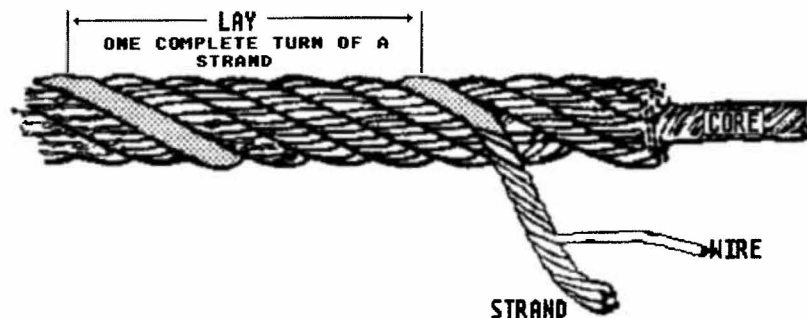
- **VERIFY** Portable hoist annual inspection current prior to use
- Functionally **TEST** controls and operating mechanisms for proper operation in hoisting and lowering directions.
- **CHECK** all load bearing components for apparent damage.
- Visually **INSPECT** load chain for the following:
 - Stretch
 - Wear
 - Twists
 - Broken or damaged links
- Visually **INSPECT** general rigging hardware in accordance with Attachment 6.
- **CHECK** load chain for proper operation of chain and sprockets with special focus on the travel area of the chain.

2.0 **If** any abnormal conditions / defects are found, **then CONTACT** Maintenance Supervision for resolution prior to utilizing the equipment.

ATTACHMENT 3
Minimum Inspection Requirements for Electric or Air Operated Hoist
Page 1 of 1

- 1.0 **PERFORM** the following pre-use inspections:
- **VERIFY** Portable hoist annual inspection current prior to use
 - **CHECK** upper limit switch cut off.
 - **CHECK** for proper operation of safety devices.
 - **CHECK** all load bearing components for apparent damage.
 - **CHECK** wire rope per Attachment 4 (if applicable).
 - **CHECK** wire rope securely attached to hoist drum (if applicable).
 - Visually **INSPECT** load chain (if applicable) for the following:
 - Stretch
 - Wear
 - Twists
 - Broken or damaged links
 - **CHECK** load chain (if applicable) for proper operation of chain and sprockets with special focus on the travel area of the chain.
 - Visually **INSPECT** general rigging hardware in accordance with Attachment 6.
 - Functionally **TEST** controls and operating mechanisms for proper operation in hoisting and lowering directions.
 - **VERIFY** controls, except in automatic cycling operation, return to the off position when released, and hook motion stops.
 - Functionally **TEST** Lower Travel Limit Switch, as applicable, if hoist is being used at or near it's lower travel limit.
 - Functionally **TEST** all other limit switches as applicable (i.e., Trolley/Bridge travel, etc.)
- 2.0 **If** any abnormal conditions / defects are found, **then CONTACT** Maintenance Supervision for resolution prior to utilizing the equipment.

ATTACHMENT 4
Minimum Inspection Requirements Guide for Wire Rope Slings
Page 1 of 1



NOTE: Wire Rope Sling inspection shall be conducted on the entire length of the sling including splices, end attachments and fittings for deterioration which would result in loss of original strength.

WARNING

Protective gloves shall be worn while inspecting wire rope to prevent hand injury.

1.0 **Always PERFORM** the following pre-use inspections (Any unsat condition listed below is cause for rejection):

- **VERIFY** manufacturer's tag is installed indicating rated load.
- Visually **INSPECT** for worn, corroded or broken wires
- Sling shall be considered defective if any of the following conditions exist:
 - Six broken wires in one rope lay
 - Kinked, crushed, bird caged or distorted rope structure
 - **Evidence of heat damage**
 - Deformed, cracked, corroded or worn end attachments
 - Three broken wires in one strand in one rope lay
 - Wear or scraping of one-third original diameter of outside individual wires
 - In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection

If any unusual defects are detected during the inspection, **CONTACT** Maintenance Supervision to ensure proper documentation and final disposition of the Sling.

ATTACHMENT 5
Minimum Inspection Requirements Guide for Synthetic / Nylon Slings
Page 1 of 1

NOTE: Synthetic / Nylon Sling inspection shall be conducted on the entire length of the sling including splices, end attachments and fittings for deterioration which would result in loss of original strength.

1.0 **Always PERFORM** the following pre-use visual inspections for: (Any unsat condition listed below is cause for rejection):

- Acid or Caustic burns
- Melting or charring
- Snags, punctures, tears or cuts
- Broken or worn stitches
- Abnormal wear and wear or elongation exceeding manufacturer's recommendations
- Distortion of fittings/hardware
- Discoloration or rotting
- Excessive stretching or evidence of over-loading
- Powdered fiber between strands (unjacketed slings only)
- Manufacturer's tag is installed indicating rated load.
- Hardened sling or stiffness in sling.
- If applicable, One or both of the tell-tails is **not** visible or is less than ½ inch in length. Remove sling from service.
- Lack of fiber-optic light transfer in sling models with the fiber-optic. Remove sling from service.

If any unusual defects are detected during the inspection, **CONTACT** Maintenance Supervision to ensure a proper documentation and final disposition of the Sling.

ATTACHMENT 6
Minimum Inspection Requirements for General Rigging Hardware
Page 1 of 2

1.0 Visually **INSPECT** Hooks for the following:

- Deformation
- Cracks
- Excessive throat opening / overloading
- Twisting
- Safety Latch in place and operating correctly
- Hook secure
- Hook rotates freely (where required)
- Excessive corrosion

2.0 Visually **INSPECT** Shackles for the following:

- Excessive wear of crown and pin
- Overloading
- Excessive pitting or corrosion
- Missing or illegible manufacturer's name or trademark and/or rated load identification
- Indications of heat damage including weld spatter or arc strikes
- Bent, twisted, distorted, stretched, elongated, cracked, or broken load-bearing components
- Excessive nicks or gouges
- A 10% reduction of the original or catalog dimension at any point around the body or pin
- Incomplete pin engagement
- Excessive thread damage
- Evidence of unauthorized welding
- Other conditions, including visible damage, that cause doubt as to the continued use of the shackle

3.0 Visually **INSPECT** turnbuckles for the following:

- Cracks in the end fittings, especially at the neck of the shank
- Deformed end fittings
- Deformed and bent rods and bodies
- Cracks and bends around the internally threaded portion
- Any signs of thread damage

ATTACHMENT 6
Minimum Inspection Requirements for General Rigging Hardware
Page 2 of 2

- 4.0 Visually **INSPECT** Compression Hardware, Davit Lifting Eyebolts, Eyebolts, Rings, Links, and Swivels for the following: **(All installed hardware must be removed and thoroughly inspected including the blind hole to the criteria below)**
- Excessive wear
 - Overloading
 - Excessive pitting or corrosion
 - Missing or illegible identification
 - Indications of heat damage including weld spatter or arc strikes
 - Bent, twisted, distorted, stretched, elongated, cracked, or broken load-bearing components
 - Excessive nicks or gouges
 - A 10% reduction of the original or catalog dimension at any point around the body or pin
 - Excessive thread damage
 - Evidence of unauthorized welding or modification
 - For swivels / swivel hoist rings, lack of the ability to freely rotate or pivot when **not** loaded
 - For swivels, loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices
 - For compression hardware
 - Unauthorized replacement components
 - Insufficient number of wire rope clips
 - Improperly tightened wire rope clips
 - Indications of damaged wire rope
 - Indications of wire rope slippage
 - Improper assembly
 - Other conditions, including visible damage, that cause doubt as to continued use
- 5.0 Visually **INSPECT** Special Rigging or Lifting Hardware for the following:
- Cracks
 - Excessive wear
 - Overloading
 - Excessive corrosion

If any abnormal conditions / defects are found, then contact Maintenance Supervision for resolution prior to utilizing the equipment.

ATTACHMENT 7
Minimum Inspection Requirements for Mobile Cranes
Page 1 of 1

NOTE: The mobile crane manufacturers pre-use inspection checklist specific to the machine being used should be consulted for additional pre-use inspections. The following are minimum typical pre-use inspection attributes.

1.0 **PERFORM** the following pre-use inspections:

- **CHECK** control mechanisms for proper operation.
- **CHECK** all hydraulic hoses for leaks or damage, and particularly those which flex during normal crane operation.
- **CHECK** hydraulic system for proper fluid level.
 - **IF** hydraulic fluid level is low, **then ADD** fluid approved in accordance with Station Lubricant Program and/or Manufacturer's recommendation.
- **CHECK** wire rope which will be used during crane operation for gross damage such as distortion, corrosion, broken strands, kinks, or any other unusual abnormalities.
- **CHECK** engine oil.
 - **IF** oil level is low, **then ADD** oil approved in accordance with Station Lubricant Program and/or Manufacturer's recommendation.
- **CHECK** radiator coolant level.
 - **IF** radiator coolant level is low, **then ADD** coolant approved in accordance with Manufacturer's recommendation.
- **CHECK** tire pressure for proper inflation.
 - **IF** tire pressure is low, **then ADD** air to Manufacturer's pressure recommendation.
- **CHECK** fuel level. Fuel tank shall be at least half full. Fuel tank filler pipe shall be located in such a position, or protected in such manner, as to **not** allow spill or overflow to run onto the engine, exhaust, or electrical equipment of any machine being fueled.
- Visually **INSPECT** general rigging hardware in accordance with Attachment 6.

2.0 **If** any abnormal conditions / defects are found, **then CONTACT** Maintenance Supervision for resolution prior to utilizing the equipment.

NOTE: Cranes parked outside in cold weather may have an engine block heater connected. The engine block heater must be disconnected and the engine allowed to warm up at idle prior to increasing throttle position / crane use.

ATTACHMENT 8
Mobile Crane Pre-Lift Checklist
Page 1 of 2

MOBILE CRANE PRE-LIFT CHECKLIST

Perform inspection on the following (as applicable):

Yes No N/A

- | | | | |
|--------------------------|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 1) Has the travel path been walked down to identify obstructions and hazards? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 2) Has the minimum clear distance from power lines been verified by measurement (i.e., laser measuring device in lieu of eyeball estimate)? If less than distances specified in SA-AA-0301 a High Risk Activity brief should be conducted. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 3) Are crane operations taking place at night? Install adequate lighting. <u>Management Approval is required for night operations.</u> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 4) Are the tires properly inflated? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 5) Is the fuel tank at least half full? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 6) Did you complete the pre-use inspection checklist? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 7) Is the crane properly grounded? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 8) Are all personnel clear of the crane carriage? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 9) Are all of the outriggers fully extended and the crane level? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 10) Are you set up on safe ground? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 11) Do you have an accurate estimate for the weight of the load? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 12) Did you allow for the weight of the jib boom, hook block, crane cable, and the rigging? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 13) Did you read and understand all notes on the load chart? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 14) Are you reeved for the proper mechanical advantage? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 15) Are you aware of what quadrants you can safely operate in? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 16) Have you identified your work radius according to the load chart? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 17) Do you have clear communications between the crane operator and the rigger? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 18) Is the counterweight fully extended and clear? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 19) Have you considered reduced crane capacity due to wind loading (wind velocity >20mph)? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 20) Is the designated spotter identified? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 21) If used indoors, is the Fuel Selector Switch in <i>PROPANE</i> mode? |

ATTACHMENT 8
Mobile Crane Pre-Lift Checklist
Page 2 of 2

SYMMETRICAL BOOM POINT REEVING

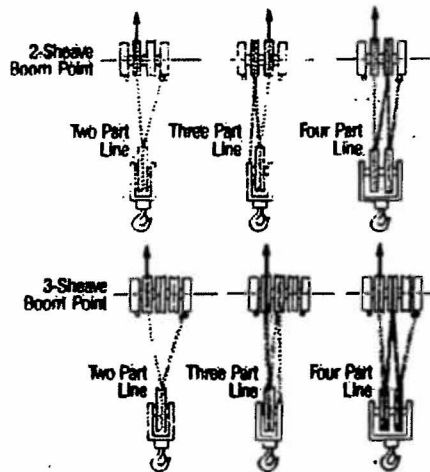


TABLE 1

REQUIRED CLEARANCE FOR NORMAL VOLTAGE IN OPERATION NEAR HIGH VOLTAGE POWER LINES
 AND OPERATION IN TRANSIT WITH NO LOAD AND BOOM OR MAST LOWERED.

The values in the following table was derived from OSHA 1910.333(c)(3)(iii)(A) requirements as follows: Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 ft. is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage. Any reduction in the clearances below would have to be considered an exception and in accordance with OSHA exceptions. If the vehicle is in transit with it's structure lowered, the clearance may be reduced to 4 ft (1.22 m). If the voltage is higher than 50kV, the clearance shall be increased 4 in (10cm) for every 10 kV over that voltage.

Examples of minimum required clearances:

| Operation Near High Voltage Power Lines | | In Transit (No Load and Boom / Mast Lowered) | |
|---|-------------------------------------|--|-------------------------------------|
| Normal Voltage, kV (Phase to Phase) | Minimum Required Clearance ft(m) | Normal Voltage, kV (Phase to Phase) | Minimum Required Clearance ft(m) |
| to 50 | 10 ft (3.05m) | to 50 | 4 ft (1.22m) |
| 100 | 11ft 8 in (3.56m) | 100 | 5 ft 8 in (1.73m) |
| 150 | 13 ft 4 in(4.06m) | 150 | 7 ft 4 in (2.24m) |
| 200 | 15 ft (4.57m) | 200 | 9 ft (2.74m) |
| 350 | 20 ft (6.10m) | 350 | 14 ft (4.27m) |
| 500 | 25 ft (7.62m) | 500 | 19 ft (5.79m) |

Table 1

ATTACHMENT 9
Minimum Inspection Requirements for Monorail and Underhung Cranes
with Integral Hoisting Mechanism
Page 1 of 1

NOTE: The following inspection requirements apply to cranes whose end trunks operate on the bottom flange of a runway track section and to trolleys operating on monorail systems with integral hoisting mechanisms.

1.0 **PERFORM** the following pre-use inspections:

- Visually **INSPECT** hoist ropes for gross damage such as distortion of the rope, corrosion, broken strands, kinks, or any other unusual abnormalities.
- **CHECK** all load bearing components for apparent damage.
- Visually **INSPECT** lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leaks.
- Visually **INSPECT** load chain for the following:
 - Stretch
 - Wear
 - Twists
 - Broken or damaged links
- Visually **INSPECT** general rigging hardware in accordance with Attachment 6.
- **CHECK** load chain for proper operation of chain and sprockets with special focus on the travel area of the chain.
- Functionally **TEST** to assure proper operation of, but **not** limited to, control systems, bridge travel, trolley travel, brake mechanisms and hoisting mechanism.
- Functionally **TEST** all limit switches.

2.0 **If** any abnormal conditions / defects are found, **then CONTACT** Maintenance Supervision for resolution prior to utilizing the equipment.

ATTACHMENT 10
Minimum Inspection Requirements for Monorail and Underhung Cranes
Without Integral Hoisting Mechanisms
Page 1 of 1

NOTE: These inspection requirements apply to hoisting equipment whose end trunks operate on the bottom flange of a runway track section and to trolleys operating on monorail systems and do **not** have a hoisting mechanism as a permanent part of the system.

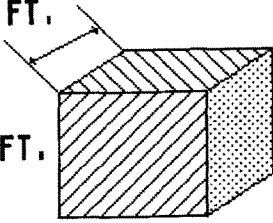
- 1.0 **REFER TO** Attachment 2, 3, and 6 as appropriate for inspections requirements associated with hoists used with these type cranes.
- 2.0 **If** any abnormal conditions / defects are found, **then CONTACT** Maintenance Supervision for resolution prior to utilizing the equipment.

ATTACHMENT 11
Inspection Requirements for Padeye to Steel and Concrete Embedments
Page 1 of 1

- 1.0 **PERFORM** the following pre-use inspections:
- Visually **INSPECT** padeye welds for obvious cracking.
 - Visually **INSPECT** padeye main body for indications of twisting or stretching.
 - Visually **INSPECT** padeye hole for indications elongation.
 - **If** concrete embedment is used, then Visually **INSPECT** padeye base bolts to ensure padeye is solid and stable.
- 2.0 **If** any abnormal conditions / defects are found, **then CONTACT** Maintenance Supervision for resolution prior to utilizing the equipment.

ATTACHMENT 12
Load Weight Chart and Calculating Load/Tension on Each Leg of a Sling
Page 1 of 2

Load Weight Chart



LENGTH FT.

HEIGHT FT.

WIDTH FT.

WEIGHTS OF DIFFERENT MATERIALS

| MATERIAL | LBS./FT. ³ |
|-----------------|-----------------------|
| ALUMINUM..... | 170 |
| BRASS..... | 530 |
| BRICK..... | 130 |
| COPPER..... | 550 |
| CONCRETE..... | 150 |
| EARTH..... | 100 |
| IRON-STEEL..... | 500 |
| LEAD..... | 700 |
| OIL..... | 50 |
| PAPER..... | 70 |
| WATER..... | 62 |
| WOOD..... | 50 |

HEIGHT X WIDTH X LENGTH X LBS./FT.³ = TOTAL WEIGHT

Calculating Load/Tension on Each Leg of a Sling

*THE ACTUAL LOAD MUST **NOT** EXCEED THE RATED SLING CAPACITY*

As the horizontal angle between the legs of a sling decreases, the load on each leg increases. The effect is the same whether a single sling is used as a basket, or two slings are used with each in a straight pull, as with a 2-legged bridle. Load/ Tension on each leg of a sling may be calculated by (1) measuring length and height of a sling leg or (2) using the Leg Angle Load Factor as follows:

1. Calculating the Load on Each Leg of a Sling by Measuring Length and Height of a Sling Leg:

- A. Determine tension/load on each sling by using the following formula

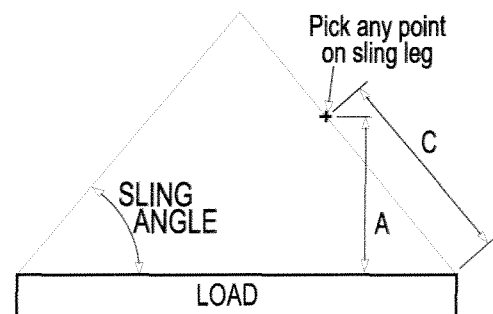
$$\text{Load/Tension on Sling Leg} = \frac{\text{length } C}{\text{length } A} \times \text{share of load wt.}$$

C = sling length

A = Point on sling to load length

C ÷ A = load factor

$$\text{Share of Load Weight} = \frac{\text{Load Weight}}{\text{Number of Legs}}$$



EXAMPLE:

C = 10', A = 8', Load Weight = 10,000#

Share of Load= 10,000# divided by 2 legs = 5000# each leg

$$\text{Load/Tension on Sling Leg} = \frac{10}{8} \times 5000 = 1.25 \times 5000 = 6250\#$$

ATTACHMENT 12
Load Weight Chart and Calculating Load/Tension on Each Leg of a Sling
Page 2 of 2

Calculating Load/Tension on Each Leg of a Sling (continued)

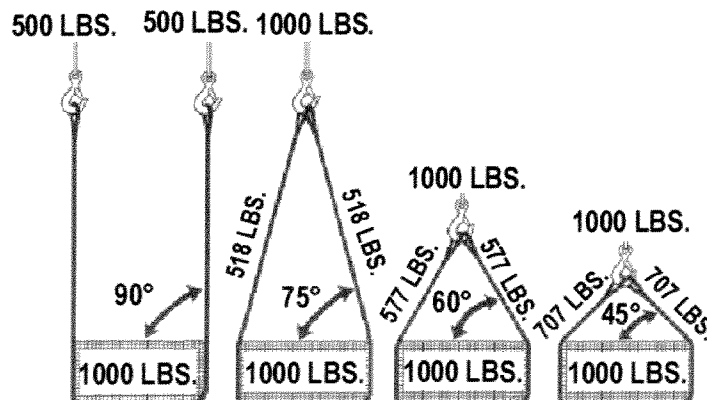
2. Calculating the Load on Each Leg of a Sling by Using the Leg Angle Load Factor:

Anytime pull is exerted at an angle on a leg or legs of a sling, the load per leg can be determined by using the data in the table at right. Proceed as follows to calculate this load and determine the rated capacity required of the sling, or slings, needed for a lift.

- A. First, divide the total load to be lifted by the number of legs to be used. This provides the load per leg if the lift were being made with all legs lifting vertically.
- B. Determine the horizontal angle.
- C. Then MULTIPLY the load per leg (as computed in Step A above) by the Load Factor for the leg angle being used (from the table at right) to compute the ACTUAL LOAD on each leg for this lift and angle.

| LEG ANGLE (Degrees) | LOAD FACTOR |
|---------------------------|----------------|
| 90° | 1.000 |
| 85° | 1.003 |
| 80° | 1.015 |
| 75° | 1.035 |
| 70° | 1.064 |
| 65° | 1.103 |
| 60° | 1.154 |
| 55° | 1.220 |
| 50° | 1.305 |
| 45° | 1.414 |

EXAMPLE:



ATTACHMENT 13
Rigging and Lifting Plan Guidance
Page 1 of 3

Conditions When a Rigging and Lifting Plan is Recommended

- The load weight & configuration (including all rigging components) exceeds 85% capacity of crane or rigging equipment.
- The load is “one of a kind” and critical to plant operations/ damage or destruction from the load would result in generation reduction or outage extension.
- The Sling Rating selected for lifting a load should be a minimum of 1.25 times the actual load weight to be lifted is greater than 25% due to the of the approved dynamic loading factor (1.25 x actual load weight = minimum rigging rating)
- The lift requires more than one crane (multiple-crane lift).
- The lift requires a mobile crane with outriggers that will be directly over underground piping or tunnels that could be damaged or collapse.
- The load is being moved horizontally with 2 or more hoists and the angle (at the loads highest position) of the load chain(s) are greater than 45 degrees from horizontal.
- The rigging used will have horizontal sling angles less than 30 degrees/ low headroom in location.
- The load will be lifted near energized power lines as defined in the Safety manual.
- The load is in a hazardous environment and or contains environmentally sensitive or controlled materials.
- Does the load have potential binding or an interference fit & load cell usage is needed but **not** practical.
- Infrequently performed rigging activity or first time evolution?
- Does the rigging evolution involve/include two or more work groups and have all the rigging equipment/hardware been inspected to verify free of defects and satisfactory for performing the required lifts. All vendor supplied equipment/hardware is required to be inspected and meet the requirements of this procedure.

The Rigging and Lifting Plan Checklist on the next page is optional and may be used as the rigging plan.

ATTACHMENT 13
Rigging and Lifting Plan Guidance
 Page 2 of 3

Rigging and Lifting Plan Checklist:

(Page 1 of 2)

| | |
|--------------------------|---|
| <input type="checkbox"/> | <ul style="list-style-type: none"> Is this a heavy load? If lifting over or near/over irradiated fuel or safety-related equipment/equipment required for decay heat removal see procedure MA-AA-716-022. (NUREG 0612 applies). |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Signalman & Single Point of Contact (qualified rigger) has been designated? |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Do you know how much the load weighs by calculation, drawing or markings? Weight = _____ Lbs. Load cell required. |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Is the lift going to be near unprotected energized conductors, such as crane bus or electrical equipment, wires, etc? – Robust barriers installed – Electrical lines protected or OOS? |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Do you understand the load path? Has the load path been walked down for tag line requirements (for uncontrolled movement of loads) and obstructions or sharp objects that could damage slings? |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Have you inspected your rigging, verified load reductions, and is it satisfactory? |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Is the center of gravity known? Verify stability and capacity according to hitch type. (Vertical, Basket, Choke) |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Calculated for sling angle and de-rated the slings accordingly. Dynamic loading/additional stresses assessed. |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Is all rigging hardware selection adequate for the lift? Inspect periodically during lifting evolutions for signs of imminent failure. |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Does the load have any corners that require softeners / abrasion protection required. (Cornermax) |
| <input type="checkbox"/> | <ul style="list-style-type: none"> For inverted basket hitches, ensure sling attachment points are above the center of gravity |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Have you verified that nothing can shift when the load is lifted. (i.e. loaded gang box) |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Are the appropriate hand signals, if required, available at the job site? (OSHA standard) |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Has a safe lift zone been properly established and communicated. |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Safe set down contingency established? Cribbing available and inspected for set down. |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Are you aware that outdoor cranes shall be secured at wind speeds sustained 30 mph or above. Crane Capacity is reduced to 44% of the allowable stability and structural capacities appearing on the crane's load capacity charts when winds are sustained at 20 mph. |
| <input type="checkbox"/> | <ul style="list-style-type: none"> Hoist ring usage – Torqued per manufacturers specifications |

ATTACHMENT 13
Rigging and Lifting Plan Guidance
Page 3 of 3

Rigging and Lifting Plan Checklist:
(Page 2 of 2)

Additional items to consider:

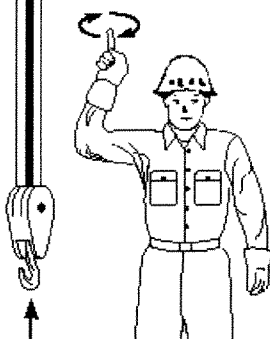
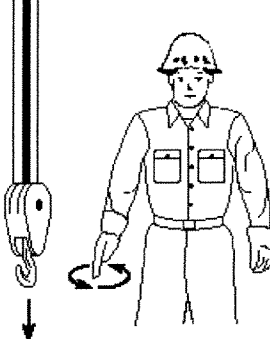
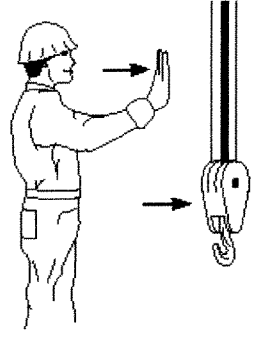
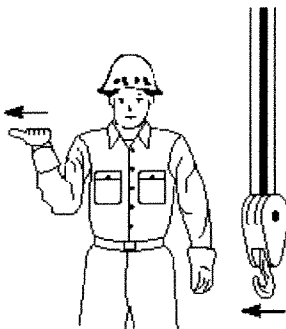
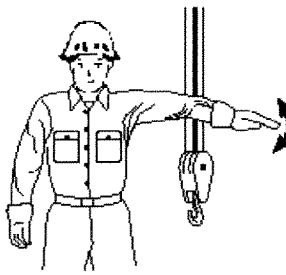
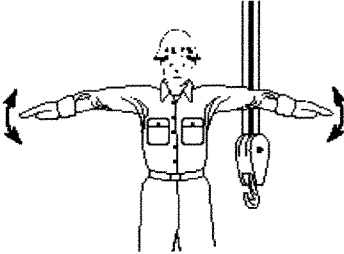
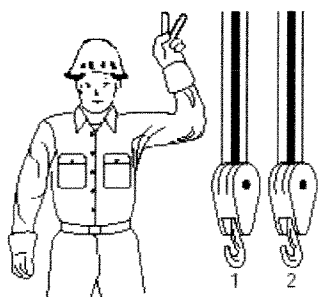
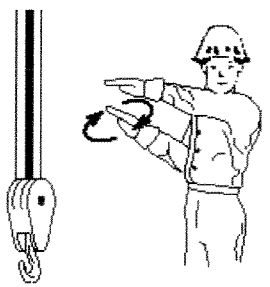
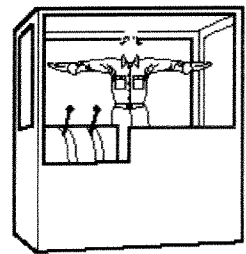
- What is being lifted? _____
- Who is in charge of the lift? Is a competent rigger / Exelon oversight person required prior to moving the load? _____
- Shackle pins fully seated? – Eyebolts shouldered and adequate thread engagement?
- Does the rigging have appropriate identification? – Pre-use inspections completed?
- Does all rigging have adequate/known working load limits?
- Will there be any side or angular loading?
- Turnbuckles have at least full thread engagement?
- Will personnel be clear of suspended load? Safe lift zone established?
- Rigging attachment points approved for use, capacity, and visually inspected?
- Any unusual environmental concerns (weather, electrical wires, visibility, noise, high rad areas, heat stress, etc)? _____
- Will personnel be restricted from elevations below the load path?
- For Mobil Crane lifts see attachment 8 of MA-AA-716-021

Brief description of lifting operation:

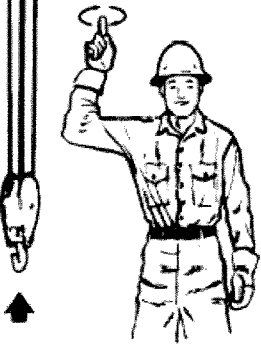
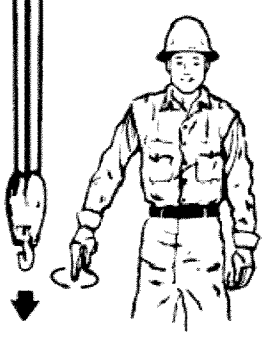
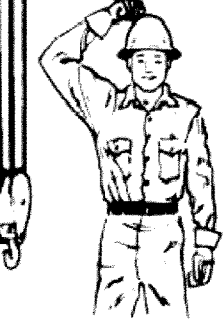

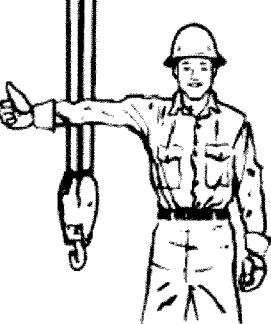
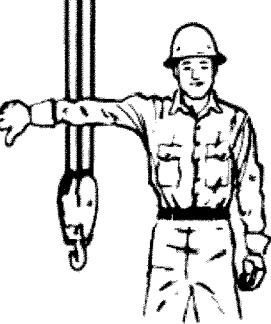
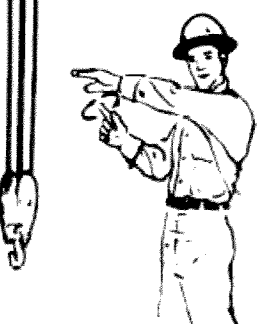
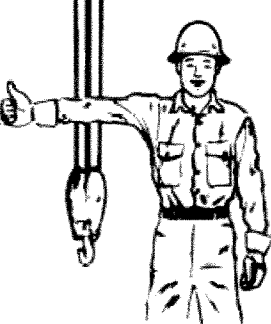
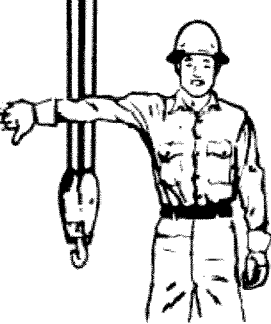
Checklist completion performed by: _____ / ____ / ____

Rigging Supervisor / Date _____ / ____ / ____

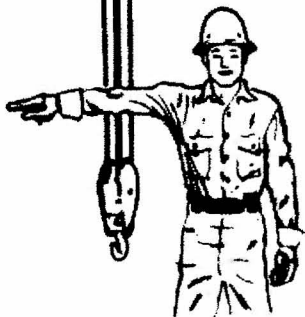
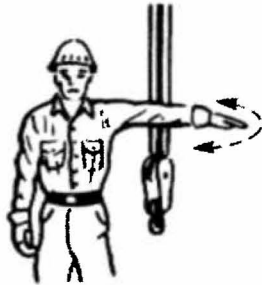
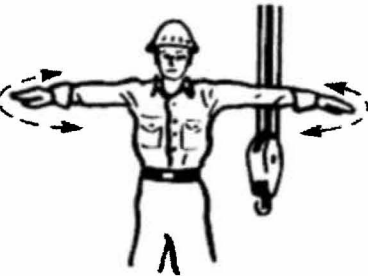
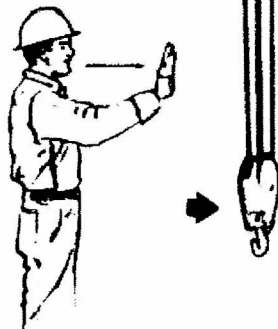
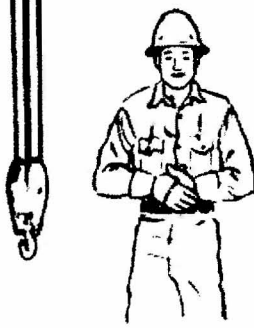




ATTACHMENT 14
Bridge Crane Signals
 Page 1 of 1

| | | |
|--|--|---|
|  <p>HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p> |  <p>LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circle.</p> |  <p>BRIDGE TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.</p> |
|  <p>TROLLEY TRAVEL. Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.</p> |  <p>STOP. Arm extended, palm down, move arm back and forth horizontally.</p> |  <p>EMERGENCY STOP. Both arms extended, palms down, move arms back and forth horizontally.</p> |
|  <p>MULTIPLE TROLLEYS. Hold up one finger for block marked "1" and two fingers for block marked "2". Regular signals follow.</p> |  <p>MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (<i>Hoist slowly</i> shown as example.)</p> |  <p>MAGNET IS DISCONNECTED. Crane operator spreads both hands apart — palms up.</p> |

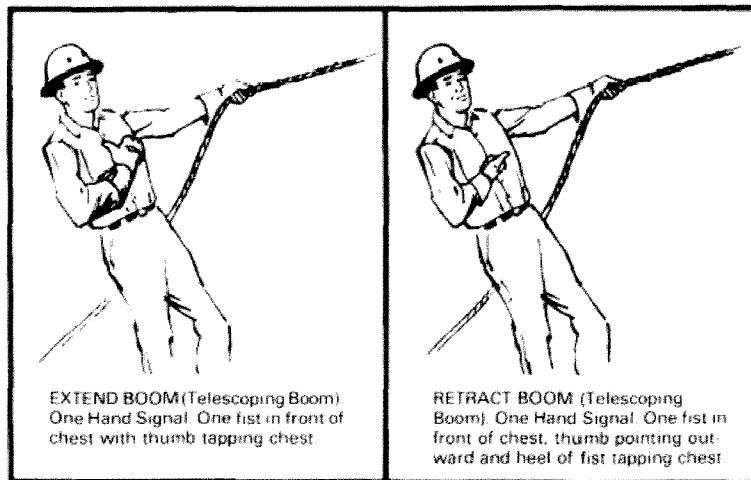
ATTACHMENT 15
Mobile Crane Signals
Page 1 of 3

| | | |
|---|---|---|
|  <p>HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p> |  <p>LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circle.</p> |  <p>USE MAIN HOIST. Tap fist on head; then use regular signals.</p> |
|  <p>USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand; then use regular signals.</p> |  <p>RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.</p> |  <p>LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.</p> |
|  <p>MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)</p> |  <p>RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.</p> |  <p>LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.</p> |

ATTACHMENT 15 **Mobile Crane Signals** **Page 2 of 3**

| | | |
|---|--|--|
|  <p>SWING Arm extended, point with finger in direction of swing of boom</p> |  <p>STOP Arm extended, palm down, move arm back and forth horizontally</p> |  <p>EMERGENCY STOP Both arms extended, palms down, move arms back and forth horizontally</p> |
|  <p>TRAVEL Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel</p> |  <p>DOG EVERYTHING Clasp hands in front of body</p> |  <p>TRAVEL (Both Tracks) Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward. (For land cranes only.)</p> |
|  <p>TRAVEL (One Track) Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For land cranes only.)</p> |  <p>EXTEND BOOM (Telescoping Booms) Both fists in front of body with thumbs pointing outward</p> |  <p>RETRACT BOOM (Telescoping Booms) Both fists in front of body with thumbs pointing toward each other</p> |

ATTACHMENT 15
Mobile Crane Signals
Page 3 of 3



Mobile Crane Signals (Cont'd)

ATTACHMENT 16
Work On/Under a Suspended Load Authorization
Page 1 of 1

Description of Job: _____

Work Order # _____ Location: _____

Start Date #: _____ Expiration Date: _____

Requirements

- ☐ The Job Hazard Analysis shall be attached to this authorization and will be posted at the site. Job Hazard Analysis includes (as applicable):
 1. Height the load will be raised
 2. Potential swing of the load
 3. Trip Hazards
 4. Body Positioning
 5. Explanation of how workers are **not** at risk of being struck by the load should rigging shift or fail.
 6. Reasons why long handle tools and/or redundant rigging systems could **not** be used to eliminate the need for working under suspended load.
- ☐ A Pre-Job Brief shall be conducted with all workers prior to starting the activity and at the beginning of each subsequent shift.
- ☐ A Dedicated First Line Supervisor / Craft Labor supervisor (or designee) shall be assigned to the work activity and be in attendance until work activity is completed.
Name of Dedicated Supervisor _____

Authorization:

I have reviewed the attached Job Hazard Analysis and request for an exception from the normal prohibition against working on/under a suspended load and agree that this limited exception is warranted for the time frame listed above and the activities specified on the JHA.

The activity will be supervised by a dedicated First Line Supervisor/Craft Labor Supervisor (or designee) to ensure the work activity is limited to the described scope and all precautions and limitations documented in the Job Hazard Analysis are followed.

Submitted by (Supervisor):
Name Printed _____ Signature _____ Date _____

Concurrence (Safety or designee):
Name Printed _____ Signature _____ Date _____

Approved (Maintenance Director or designee):
Name Printed _____ Signature _____ Date _____

ATTACHMENT 17
Portable Hoist Periodic Inspection Color Scheme Chart
Page 1 of 1

For Portable Hoists which pass periodic inspection, the hoist shall be tagged with a color tag for the current year in which the inspection is performed per the color scheme in the chart below and the date (month and year) of expiration shall be identified on the tag. The tag will expire at the end of the month one year after the hoist was inspected.

| YEAR | COLOR |
|------|--------|
| 2007 | Orange |
| 2008 | Green |
| 2009 | Blue |
| 2010 | Yellow |
| 2011 | Purple |
| 2012 | White |
| 2013 | Pink |
| 2014 | Tan |
| 2015 | Orange |
| 2016 | Green |
| 2017 | Blue |
| 2018 | Yellow |
| 2019 | Purple |
| 2020 | White |
| 2021 | Pink |
| 2022 | Tan |

NOTE: Portable hoists controlled by Exelon are tagged with the color tag as specified above for the current year the hoist was inspected in and the expiration date is to be identified on the tag. Depending on what month of the year the hoist was inspected on and what month the hoist is being used the color of the tag on the hoist being used may be from the previous year or the current year (I.e. a hoist being used in February of 2008 which was inspected in June of 2007 would have a tag with the color for 2007 and expire in 2008.).

ATTACHMENT 18
Observation Form For Rigging/Lifting Competency
Page 1 of 3

| | | | |
|---|------------------------------|-------------------|--------------|
| WORKER'S NAME: | DATE OBSERVED: | | |
| WORKER'S SIGNATURE: | | | |
| WORKER'S ID: | | | |
| LMS COURSE COMPONENT ID (LMS CODE): "N-AN-MA-AA-716-021-RIGOBS" | | | |
| Observer's Name/Employee #: | | Observer's Title: | |
| OVERALL OBSERVATION CRITERIA | SAT | UNSAT | |
| *** THE INTENT OF THIS FORM IS TO BE A PROFFICIENCY OBSERVATION OF AN ACTUAL RIGGING/LIFTING ACTIVITY*** | | | |
| <p>Performance levels are defined below:</p> <p>P = Perform – Use plant equipment, simulator, or laboratory to demonstrate performance. When performing task in a laboratory setting, equipment similar to plant equipment shall be used.</p> <p>S = Simulate – Create a realistic representation of task performance by simulating performance while explaining the task, expected responses, and required performance standards. When simulating task in laboratory setting, equipment similar to plant equipment shall be used.</p> <p>D = Discuss – Perform a thorough discussion of the task and required performance standards using procedures, drawings, photos, prints or other similar equipment. This option should only be used if plant equipment or realistic simulation is not readily available.</p> | | | |
| <p>SAT (Satisfactory) = Acceptable performance of all observable attributes</p> <p>UNSAT (Unsatisfactory) = Unacceptable attributes are observed and mandates disqualification of RIGGING/LIFTING activities.</p> | | | |
| | PERFORMANCE LEVEL | SAT | UNSAT |
| Make necessary calculations to determine the weight of an object. | P/D | | |
| Determine what rigging is necessary and insure that it is rated appropriately to perform the task. | P | | |

ATTACHMENT 18
Observation Form For Rigging/Lifting Competency
Page 2 of 3

| | PERFORMANCE LEVEL | SAT | UNSAT |
|---|----------------------|-----|-------|
| Following the rigging plan, discussed during the pre-job brief, set up the rigging. During set up activities the observer will focus on the proper pre-use inspection of all RIGGING/LIFTING equipment. | P | | |
| Perform a pre-use inspection of the crane. | P/S/D | | |
| Attach the rigging to the hook and to the object to be lifted. | P | | |
| Using the proper hand signals, direct the lifting device to center the hook over the object to be lifted. | P/S/D | | |
| Raise and level the load. Level may be verified visually if a level was <u>not</u> needed for criticality of the lift. | P/S/D | | |
| Using proper hand signals, direct lifting device operator to raise, move, and stabilize the load. | P/S/D | | |
| Prepare cribbing/blocking to set the load upon. Lower the load onto the cribbing/blocking and properly secure. | P/S/D | | |
| Perform a transfer of the load. The load may be transferred from a stationary hoist to an overhead crane. The load may be transferred from the lifting device to a lay down area. | P/D | | |
| Turn the lifted object over in a controlled manner. | P/D | | |
| Upright the lifted object in a controlled manner. | P/D | | |
| Lift the object, transfer it over an obstacle, then lower the object onto a cart and secure it. | P/D | | |
| Proper use of a guide line was utilized when required. | P/D | | |
| Stop a load swing and gain control within 5 moves. | D | | |
| Lower the load and remove all rigging. | P | | |
| All rigging equipment has been properly stored. | P | | |

ATTACHMENT 18
Observation Form For Rigging/Lifting Competency
Page 3 of 3

OBSERVATION FACTS AND RECOMMENDATIONS

Using the Observation attributes above as a guide, list any observed facts that support the passing or failure of the Rigging/Lifting qualified individual.

Observer's signature:

Date:

Rigging/Lifting Activity Acceptable ☐ Yes ☐ No

DTC notified : _____

**IF RIGGING/LIFTING ACTIVITY WAS NOT ACCEPTABLE, THEN DEPARTMENT
TRAINING COORDINATOR MUST BE NOTIFIED TO REMOVE QUALIFICATIONS
UNTIL SATISFACTORY REMEDIATION HAS BEEN PERFORMED.**