

Subject: Hoisting and Rigging Program	Effective Date: October 24, 2003	Initiated by: Head, Engineering and Technical Infrastructure
	Supersedes: ENG-021 Rev. 2 dated 4/21/99, and TCR-ENG-021,R2- 01	Approved: Director

Applicability

This procedure applies to all PPPL sites and operations, including subcontractors and subcontracted organizations.

Introduction

This procedure describes the requirements for mechanical hoisting operation where rigging is required on the PPPL site, lift equipment inspection testing and maintenance, training and qualification for operating/using any lift equipment and procurement of rigging equipment or services. Lifts are generally made to support installation or removal of equipment. Any installation or removal procedures are considered prerequisite to and separate from the lift procedure. The lift procedure shall only cover the specific steps necessary to rig and move the equipment. Standard material handling operations (i.e. forklift use) and aerial lift operations are not governed by this procedure. Attachment 17 may be used to disposition other items. Only qualified crane operators may operate cranes at PPPL.

Reference Documents

OSHA Sections 1910 and 1926 applicable to Hoisting and Rigging Equipment
ANSI/ASME B30 Standards for Hoisting and Rigging Equipment
DOE-STD-1090, DOE Hoisting & Rigging Standard (reference guide only, not a mandatory requirement)
PPPL Environment, Safety & Health Manual
QA-005, Control of Nonconformances
PPPL Procedure TR-001, "Laboratory Wide Training Program."
PPPL Procedure TR-005 "Instructor Qualification and Requalification"

Definitions

Refer to Attachment 1 for definitions and Attachment 2 for management line of responsibility for the PPPL Hoisting & Rigging Program.

Procedure

This procedure is presented in the following sections:

- A. Hoisting and Rigging Procedure
- B. Lift Equipment Inspection, Maintenance, and Testing Procedure
- C. Training and Qualification Requirements
 - C.1. Initial Training and Qualification Requirements
 - C.2. Continuing Training and Qualification Requirements
- D. Procurement of Rigging Equipment or Services

Attachments

1. Definitions
2. Line Responsibility Chart for PPPL Hoisting & Rigging Program
3. Lift Classification Document
4. Lift Personnel Qualification Requirements and Qualification Card
5. Critical Lift Procedure
6. Lift Data Sheet
7. Load Test Data Sheet
8. Crane Operator's Daily Check List (ODCL)
9. Standards and Criteria for Inspection, Testing, and Maintenance Requirements
10. Overhead Crane Inspection Report
11. Mobile Crane Inspection Report
12. Hoist Inspection Report
13. Sling Inspection Form
14. Sample Operator CheckList
15. Procurement Guidelines
16. Fasteners Identified by DOE as "Suspect"
17. Lift Equipment Review Request

A. Hoisting and Rigging Procedure**A.1. Determination of Lift Categorization****Responsibility****Action**

Cognizant
Engineer/Physicist

1. Identify the need to perform the lift.
2. Assure the items in the lift are free from any connection or obstruction. Generate a separate procedure to assure this step if needed.
3. Determine the lift classification using Attachment 3. Consult with Lift Manager if needed.
 - a. For Critical Lifts, go to Sections A.2 for written lift procedure instructions.
 - b. For Ordinary lifts, go to Section A.3.

A.2. Developing Critical Lift Procedures

<u>Responsibility</u>	<u>Action</u>
Cognizant Engineer/Physicist	<ol style="list-style-type: none"> 1. From Attachments 5 and 6 determine if a PPPL Operations Center [OPs Center] procedure has a lift data sheet adaptable to the lift requirement. <ol style="list-style-type: none"> a. If yes, obtain the following from the OPs Center: <ul style="list-style-type: none"> • One copy of the latest revision to the lift procedure. • Two copies of the selected Lift Data Sheet (Attachment 6) for use. • One copy of the last recorded Lift Data Sheet for reference. b. If not, develop or revise the procedure to conform to Attachments 5 and 6 as follows.
Cognizant Engineer/Physicist	<ol style="list-style-type: none"> 2. Consult with the Responsible Line Manager (RLM) for appointment of Person-in-Charge (PIC).
Responsible Line Manager (RLM)	<ol style="list-style-type: none"> 3. Appoint and designates one qualified PIC for the entire lifting operation (normally the cognizant engineer) as per definitions in Attachment 1.
Cognizant Engineer/Physicist	<ol style="list-style-type: none"> 4. Obtain the information for the Lift Data Sheet (Attachment 6) from the area's Qualified Rigging Specialist (QRS). 5. Sign and distribute the procedure and Lift Data Sheet for review to: the RLM, PIC, and the Lift Manager. 6. Retrieve and resolve comments. 7. Obtains approval signatures from the RLM, PIC, and Lift Manager. <p>NOTE: Signatures signify:</p> <ol style="list-style-type: none"> a. PIC has reviewed the equipment safety aspects of the lift. b. RLM understands the lift and accepts responsibility for its safety. c. Lift Manager has reviewed the technical aspects of the lift procedure to assure adequate and safe compliance with the hoisting & rigging program and accepts responsibility for the activity. 8. Forward approved lift procedure to OPs Center.
OPs Center	<ol style="list-style-type: none"> 9. Send copy of approved procedure to Lift Manager, QC and, if requested, PIC.

A.3 Performance of Ordinary Lifts

Responsibility **Action**

NOTE: Any person may request the stoppage of any lift that appears unsafe at any time.

Cognizant
Engineer/Physicist

1. Determine if a crane or hoist (see definitions-Attachment 1) is required.
 - a. For cranes or hoist’s with rated capacity of 5 tons or less, arrange for a Qualified Rigger (Attachment 4) and checks their qualification card.
 - b. For cranes or hoist’s greater than 5 tons rated capacity, arrange for a qualified crane operator and checks their qualification card.
 - c. For mobile cranes at more than 75 percent of crane capacity (per load chart) notify the Lift Manager.

Qualified Rigger/
Qualified Crane
Operator*

2. Perform the following:
 - a. Ensure involved personnel understand the lift and check their qualification cards.
 - b. Ensure that the weight of the load is known and that proper equipment and accessories are selected.

NOTE: If weight of load is estimated and exceeds 75% of the rated capacity, a load cell is recommended.
 - c. Survey the lift site for hazardous/unsafe conditions.
 - d. Visually inspect and approve all lifting equipment prior to use.
 - e. Verify the annual inspection color mark on slings.
 - f. Verify the inspection date on cranes or hoists.
 - g. For overhead cranes with unsatisfactory or expired ODCL including monthly wire rope inspection, perform new ODCL (Attachment 8).

NOTE: ODCL’s will be maintained for 3 years in ODCL holders installed at cranes that have running wire ropes.
 - h. Ensure that equipment is properly set up and positioned.
 - i. Ensure that a signal man is assigned, if needed, and identify him to the operator.
 - j. Direct lift operation safely and efficiently.

NOTE: Hard hats are to be worn by all personnel in the lift area.
 - k. Perform the lift.

* If more than one person, a designated lead must be assigned.

A.4. Performance of Critical Lifts

NOTE: Any person may request the stoppage of any lift which appears unsafe at any time.

<u>Responsibility</u>	<u>Action</u>
Responsible Line Manager (RLM)	1. Support staffing requirements of lift teams.
Lift Manager	2. Assign the Lift Engineer and confirm the rigging team.
	3. Approve repetitive lift data sheets for a specified time (normally one year). Repetitive lifts shall be performed as non-repetitive lifts for the first time.
Cognizant Engineer/Physicist	4. Obtain the following: <ul style="list-style-type: none"> a. One copy of the latest revision to the lift procedure. b. Two copies of the Lift Data Sheet (Attachment 6) specifying the configuration of the planned lift for use. c. One copy of the last recorded Lift Data Sheet, from the lift procedure for reference.
	5. Determine if this is a repetitive lift. <ul style="list-style-type: none"> a. If yes, arrange for a QRS, Critical Lift Crane Operator, and riggers to perform the lift using the existing procedure. Include at least two members of the original lift team. Notify the lift engineer and QC. b. For Non-Repetitive Lifts, arrange the lift with the Lift Engineer, the rigging team and QC.
	6. For mobile cranes at more than 75 percent of crane capacity (per load chart) notify the Lift Manager.
	7. Conduct a pre-lift meeting including all personnel, the Lift Engineer, and QC.
Person-in-Charge (PIC)	8. Sign the Lift Data Sheet indicating disassembly is complete.
Cognizant Engineer/Physicist	9. Request QC and Lift Engineer at the lift site.
	NOTE: Provide a 72-hour notice of lift to the Lift Manager, QC and lift team members.
	NOTE: Non-Repetitive critical lifts may commence only when the PPPL Lift Manager or his designee is present.

- QC
10. Interpret quality assurance aspects of the lift procedure that protect the item to be lifted and affect the hoisting and rigging, witness their implementation, and for Non-Repetitive Lifts sign the Lift Data Sheet that all prerequisites have been completed.
 11. Sign the lift data sheet that all prerequisites have been completed prior to the lift (i.e. shutdown, disconnection, and disassembly).
- QC (for non repetitive lifts)
QRS (for Repetitive Lifts)
12. Check the qualification cards of the crane operator and each rigger.
- Critical Lift Crane Operator
13. Maintain a thorough knowledge of ENG-021 crane operation requirements, implement them on each lift and stop any lift that appears unsafe. Prior to using the crane, the crane operator shall:
 - a. Verify that the inspection tag on the lift device is current.
 - b. Perform an Operator's Daily Check List (ODCL) for cranes without current ODCL (Attachment 8).

NOTE: ODCL's will be maintained for 3 years in ODCL holders installed at cranes that have running wire ropes.
 - c. Verify the monthly wire rope inspection is current or arrange with the QRS if needed.
 14. Respond to the direction of the QRS for performing the lift. Only a qualified crane operator may operate a crane (see Attachment 1).
- Riggers
15. Respond to the direction of the QRS for performing the lift. Inspect all lifting equipment used and assure that the rigging is performed according to procedure. Other personnel may assist the riggers during the lift procedure as needed, however, qualified PPPL riggers, QRS or subcontractor QRS with Lift Manager approval must check all rigging.
- QRS
16. Complete and approve the Lift Data Sheet.
 17. Visually inspect, check for current equipment inspection, and approve all lifting equipment prior to use.
- PIC
18. Sign the Lift Data Sheet accepting responsibility for the equipment safety.

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| Lift Engineer (for Non-repetitive lifts) | 19. Interpret technical aspects of lift procedures that affect the hoisting and rigging; and witness their implementation. |
| QRS (for Repetitive Lifts) | 20. Review Lift Data Sheet (Attachment 6), documents any modifications and allows rigging to be placed. |
| PIC | 21. Interpret technical aspects of the lift procedure and Lift Data Sheet that protect the item to be lifted and witness their implementation. |
| Lift Personnel (all) | 22. Ensure that all personnel in the lift area wear hard hats. |
| PIC and Lift Engineer | 23. Concur that the Lift Data Sheet reflects the hoisting and rigging setup; revise the spare copy of the Lift Data Sheet, approve the Lift Data Sheet, and give permission to the QRS to proceed with the lift. Both individuals shall remain on site during the lift: |
| PIC | a. monitor and retain overall responsibility for the safety of the equipment. |
| Lift Engineer | b. monitor and retain overall responsibility for the hoisting and rigging for non-repetitive lifts. |
| QRS | 24. Directs riggers to place rigging.
NOTE: If weight of load is estimated and exceeds 75% of the rated capacity, a load cell is recommended unless waived by the lift engineer. |
| Qualified Riggers | 25. Place rigging. |
| QRS | 26. Verify rigging has been placed and direct the lift according to the procedure. |
| PIC | 27. Sign Lift Data Sheet to indicate that the equipment is secure and that rigging may be removed. |
| QRS | 28. Direct the rigging removal and returns hoisting and rigging to equipment storage area. |
| PIC | 29. Return completed and signed-off Lift Data Sheet, and, if applicable, the revised Lift Data Sheet with a new effective date to the PPPL Operations Center. |
| OPs Center | 30. File the Lift Data Sheet(s) and logs the pertinent information into the lift log. |

B. Lift Equipment Periodic Inspection, Maintenance, and Testing Procedure

B.1. Cranes, Hoists and Chainfalls

<u>Responsibility</u>	<u>Action</u>
Equipment Owner	1. Know where equipment is at all times and provide equipment for inspection.
OPs Center	2. Maintain the inspection records for periodic inspection/maintenance.
Lift Manager	3. Maintain due date to inspect equipment annually on Inspection Status List. If the maintenance or inspection is not completed within 90 days of the date due, the equipment shall be CAUTION tagged OUT OF SERVICE until such time as the required actions are completed.
	4. Determine if each crane, hoist, or chainfall is to be kept in service. <ul style="list-style-type: none"> a. If crane, hoist, or chainfall is not to be kept in service, requests the equipment owner to CAUTION tag item OUT OF SERVICE. b. If crane, hoist, or chainfall is to be kept in service continue to step 5.
	5. Determine when crane, hoist, or chainfall annual inspection/maintenance is due.
	6. Arrange for the qualified M&O crane technician or subcontractor to perform the inspection/maintenance.
M&O Crane Technician or Qualified Subcontractor	7. Perform required crane maintenance and periodic inspection as per Mobile Crane, Overhead Crane, or Hoist Inspection Criteria (Attachment 9) whichever is applicable.
	NOTE: Annually for cranes and hoists, semiannually for mobile crane. (Attachment 11)
	8. Record the inspection/maintenance. [See samples Attachment 10 (Overhead Building Crane Inspection Report), or Attachment 11 (Mobile Crane Inspection Report), or Attachment 12 (Hoist Inspection Report)].
	9. Determine if deficiencies are found. <ul style="list-style-type: none"> a. If no, submit inspection report to Lift Manager and affix inspection sticker, showing expiration date either to pendant control and/or cab control. b. If yes, submit inspection report to Lift Manager and CAUTION tags-out crane.

- 10. Performs running wire rope inspection (Attachment 9).
- 11. Determine if rope needs maintenance.
 - a. If yes, perform required rope maintenance.
 - b. If no, continue
- 12. Perform Hook Non Destructive Examination (NDE) as per Hook Inspection Criteria (Attachment 9) for greater than 10 ton capacity and greater than normal service duty and records the inspection (Attachment 13).

NOTE: All PPPL lifting equipment falls under normal service use. NDE is not normally required.

- 13. Return to step 2 for each crane, hoist, or chainfall.

Lift Manager 14. Review and submits all inspection reports to OPs Center, and updates inspection status list.

OPs Center 15. File inspection reports.

Area QRS 16. Perform monthly wire rope inspection and records inspection on ODCL form.

NOTE: ODCL's will be maintained for 3 years in ODCL holders installed at cranes that have running wire ropes.

B.2. Rigging Maintenance and Inspection

Responsibility

Action

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| Area QRS | <ul style="list-style-type: none"> 1. Maintain rigging in site storage location (see Maintenance and Storage Criteria, Attachment 9). 2. Perform annual periodic sling inspections per Attachment 9 with written records (Attachments 14 and 15) using a unique identification for each sling. 3. Tag out rigging, if rigging is determined unacceptable or if the inspection exceeds 90 days of the due date, with a "CAUTION" tag. See Attachment 9 for acceptable rigging criteria |
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B.3. Crane, Hoist, Chainfall and Lift Fixture Load Tests

[Rated Load Test: Prior to initial use, all new or reinstalled hoists/cranes and hoists/cranes in which the load sustaining parts have been altered, modified, repaired, or replaced, or whose rated capacities have been affected shall be tested by or under the direction of a qualified inspector Test loads shall not be less than 100 percent or more than 125 percent of the rated capacity, unless otherwise recommended by the manufacturer. The replacement of load chain and rope is specifically excluded from this requirement; however, an operational test of the crane shall be made prior to putting the equipment back in service.]

<u>Responsibility</u>	<u>Action</u>
Qualified Subcontractor for crane inspection	1 Perform periodic inspection per Mobile Crane, Overhead Crane, or Hoist Inspection Criteria (Attachment 9) whichever is applicable. Assures NDE of hook is current (if hook is greater than 10 ton capacity for greater than normal service category). If the maintenance or inspection is not completed, the equipment shall be CAUTION tagged OUT OF SERVICE until such time as the required actions are completed.
QRS	2. Determine load test weights and rigging. 3. Document load test configuration on Load Test Data Sheet (Attachment 7) and approves. 4. Arrange to have weights moved to the load test site. Notifies QC of load test.
Crane Operator	5. Perform ODCL inspection per Attachment 8. NOTE: ODCL's will be maintained for 3 years in ODCL holders installed at cranes that have running wire ropes.
Riggers	6. Perform rigging inspection and reports to QRS all items are acceptable.
QRS	7. Verify and sign the Load Test Data Sheet.
Riggers	8. Place rigging.
QRS	9. Perform load test according to the Load Test Data Sheet.
QC	10. Witness and sign the Load Test Data Sheet confirming that load test was performed as documented.
QRS	11. Submit Load Test Data Sheet to M&O.

C. Training and Qualification Requirements *

This section details the training and qualification requirements for Riggers, Pendant Crane Operators, Cab Crane Operators, Mobile Crane Operators, Critical Lift Crane Operators, and Qualified Rigging Specialists. There are no minimum education requirements established by the DOE Hoisting and Rigging Standard for Hoisting and Rigging candidates.

C.1. INITIAL Training and Qualification Requirements

<u>Responsibility</u>	<u>Action</u>
Candidate's Supervisor or Manager	1. Determine the qualification required and requests training and qualification of personnel by initiating a Performance Evaluation checklist (see example on Attachment 4). Requests guidance from the Lift Manager, as necessary.
Human Resources (Training Staff)	2. Consult with the PPPL Lift Manager and select a qualified instructor to provide classroom training, practical training, and required tests, as applicable. [Courses are approved PPPL courses or outside training approved by Lift Manager.]
	3. Schedule training and makes all necessary logistical arrangements for the training.
	4. Notify the candidate of scheduled training and arranges for practical training, as necessary.
Candidate	5. Attend the scheduled training course, or arranges to challenge any required training and tests through Human Resources.
	6. Provide resume/experience summary, as required, for the qualification sought.
	7. Complete medical examination requirements, as applicable.
Qualified Instructor	8. Provide the appropriate training and testing. If crane operations qualification is requested, the candidate is evaluated on each type of crane used and the instructor documents the training on a Performance Evaluation checklist (see form example on Attachment 4).
	NOTE: Because of their unique nature, each cab crane requires individual instruction.
Human Resources (Training Staff)	9. Prepare and maintain a qualification package for each successful candidate.

* The Lift Manager with the Cognizant Engineer/Physicist will determine and approve the requirements for subcontractors performing lifts at PPPL. Typically, an operating license and experience are required.

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| Human Resources
(Training Staff) | 10. Prepare a PPPL Qualifications Card with the appropriate qualification and date entered on the card (Attachment 4). If a crane qualification is given, the applicable cranes are listed on the card. PPPL qualifications are valid for a period not to exceed three (3) years from the date of the practical or written test, whichever date is earliest provided the medical examination requirements, if applicable, are current. |
| Human Resources
(Training Staff) | 11. Signs the PPPL Qualifications Card for Rigger and pendant crane operator positions, and/or forwards the card to the Lift Manager for approval. |
| Lift Manager or
Designee (Lift
Engineer or
Appropriate Lift
Instructor) | 12. Sign the PPPL Qualifications Card and Performance Evaluation checklist (example on Attachment 4) for cab and pendant crane operator positions, and returns the card to Human Resources for distribution. |
| Lift Manager | 13. Sign the PPPL Qualifications Card for Critical Lift Crane Operator (CLCO) and Qualified Rigging Specialist (QRS) positions, and returns the card to Human Resources for distribution. |
| Human Resources
(Training Staff) | 14. Copy the completed card (both sides) for file, and distributes the card to the individual. |
| | 15. Maintain training and qualification records |
| | 16. Monitor due dates and notifies the individual's manager or supervisor of actions needed to maintain or renew qualifications. |
| | 17. Perform periodic program evaluation with PPPL Lift Manager and Engineers. |

C.2. CONTINUING Training and Qualification Requirements

This section outlines the continuing (ongoing) training and qualification requirements for the Lift Qualifications listed in Lift Personnel Qualifications Requirements, Attachment 4.

<u>Responsibility</u>	<u>Action</u>
Human Resources (Training Staff)	1. Notify the individual's supervisor or manager of continuing training and qualification requirements (such as medical examinations) that require completion. NOTE: Initial qualifications are issued for an effective period not to exceed three (3) years, unless otherwise specified or revoked, at which time requalification is required. If it is determined at any time that the capabilities of an individual are not in accordance with the qualifications specified for that job, that individual shall be removed from that job. Such removals shall be handled on a case-by-case basis by the PPPL Lift Manager and the applicable supervisor.
Individual's Supervisor and Manager	2. Notify the individual of these continuing training and qualification requirements (such as medical examinations).
Human Resources (Training Staff)	3. Arrange for refresher training, and required tests, for applicable qualification. Initiates a Performance Evaluation checklist (see Attachment 4 for an example of the form).
Human Resources (Training Staff)	4. Schedule practical training and make all necessary logistical arrangements for Rigger and Cab Crane Operator qualifications. 5. Notify the individual of scheduled practical training.
Individual/Candidate	6. Complete refresher training and challenge tests through Human Resources. 7. Complete medical examination requirements, as applicable.
Qualified Instructor	8. Provide the practical training and testing for Rigger and Cab Crane Operator qualifications and documents it on a Performance Evaluation checklist (see form example on Attachment 4). Cab Crane Operator individuals only need to be evaluated on one cab-type crane in order to renew all cab and pendant-type crane qualifications.
Human Resources (Training Staff)	9. Prepare a PPPL Qualifications Card (Attachment 4) with the appropriate qualification and date entered on the card. If a crane qualification is given, the applicable cranes are listed on the card. PPPL qualifications are valid for a period not to exceed three (3) years from the date of the practical or written test, whichever date is earliest provided the medical examination requirements, if applicable, are current.

10. Sign the PPPL Qualifications Card for Rigger and pendant crane operator positions, or forward the card to the appropriate signature authority.
- Lift Manager or Designee (Lift Engineer or Qualified Lift Instructor) 11. Sign the PPPL Qualifications Card and Performance Evaluation checklist (see form example on Attachment 4) for cab and pendant crane operator positions, and return the card to Human Resources for distribution.
- Lift Manager 12. Affirm continued proficiency within qualification area of a QRS by signing the PPPL Qualifications Card, indicating qualification as a CLCO and QRS, and returning the card to Human Resources for distribution.
- Human Resources (Training Staff) 13. Copy the completed card (both sides) for file, and distribute the card to the individual.
14. Maintain training and qualification records
15. Monitor due dates and notify the individual's manager or supervisor of actions needed to maintain or renew qualifications.
- Lift Manager 16. Perform periodic program evaluation with PPPL Lift Engineers and QRS's. Distribute Lessons Learned from PPPL, other Laboratories, and industry operating experience to Riggers, Crane Operators, and Lift Operators.

D. Procurement of Equipment or Services

<u>Responsibility</u>	<u>Action</u>
Cognizant Engineer/Physicist	1. Prepare requisition and/or Statement of Work (SOW) for incorporation into Purchase Order or Subcontract. Include requirements from Attachment 15 in SOW or requisition. Indicate on requisition that receipt inspection and Lift Manager’s review is required.
Lift Manager	2. Review each requisition and approve indicating that the appropriate requirements from Attachment 15 have been included. Approve suppliers of subcontracted hoisting and rigging services for each Purchase Order or Subcontract.
Procurement	3. Ensure steps 1 and 2 have been completed prior to awarding subcontracts or purchase orders for hoisting and rigging equipment or services.
Cognizant Engineer/Physicist	4. On receipt of equipment, contact Lift Manager to have equipment and documentation inspected by a QRS prior to use.
Lift Manager/QRS	5. Inspect equipment and documentation.
	6. Add equipment to the Inspection Status Database.
Receiving	7. Ensure any lift equipment is inspected by a QRS or the Lift Manager prior to release to the cognizant Engineer/Physicist.

Definitions

Attachment 1

Definitions of particular terms appropriate to this procedure are:

Appointed. Assigned specific responsibilities by the cognizant manager.

Cab Crane. A crane controlled by an operator in a cab located on the bridge or trolley of the crane.

Certification. Process by which management provides written endorsement of the satisfactory achievement of qualification of an individual for a specialized operations position based upon its criticality or safety impact, and generally response to a DOE Order or a national consensus code or standard.

Cognizant Engineer/ Physicist. A member of the Engineering or Scientific and Research Staff who has been placed in charge of a specific project, job, or task by senior management.

Crane. A lifting device which has top running rails.

Critical Lift A lift is designated a critical lift if collision, upset, or dropping could result in

- 1) unacceptable risk of personnel injury or significant adverse health impact (onsite or offsite);
- 2) significant release of radioactive or other hazardous material or other undesirable conditions;
- 3) undetectable damage that would jeopardize future operations or the safety of a facility; or
- 4) damage that would result in unacceptable delay to schedule or other significant program impact such as loss of vital data.

A lift should also be designated as critical if the load requires exceptional care and handling because of size, weight, close-tolerance installation, high susceptibility to damage, or other unusual factors.

A CRITICAL LIFT REQUIRES MITIGATIVE ACTIONS THAT INCLUDES A WRITTEN LIFT PROCEDURE APPROVED BY THE LIFT MANAGER TO REDUCE THE RISKS.

Designated. Selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

Hoist. A lifting device which does not have top running rails. A hoist may be either portable (i.e. chainfall) or underhung (i.e. gantry, jib).

Hoisting. *vt.* the lifting of equipment. *adj.* hoisting equipment. see hoist.

Lift. A lift is the mechanically assisted raising up of any load.

Lift Fixture. Any below the hook lifting device as defined in ANSI/ASME B.30.20 or DOE Hoisting & Rigging Manual.

Lift Data Sheet. A Lift Data Sheet is the specification of the method of rigging to be used for the lift.

Lift Engineer. Up to three PPPL designated engineers who are appointed to review and approve written lift procedures for Critical Lifts. Qualifications for a PPPL Lift Engineer will include a mechanical or civil engineering degree, at least 5 years of construction experience, specific training relative to performing lifts,

and recommendation of the Lift Manager. Lift Engineers are appointed by the Engineering and Technical Infrastructure Department Head.

Lift Manager. A PPPL designated engineer and/or alternates who review and approve written lift procedures for all Critical Lifts and assures compliance with the technical operations hoisting and rigging procedure. The Lift Manager is appointed by the PPPL Deputy Director.

Lift Procedure. A Lift procedure is a statement of work which states what tasks must be performed to perform the lift. A lift procedure shall have a lift data sheet attached to it.

PPPL/TFTR Operations Center. A central record archive and distribution center of information including Lift Procedures and Lift Data Sheets.

Pendant Crane. A crane whose operation is controlled by the use of a pendant in the hands of an operator on the floor or on an independent platform.

Person-in-Charge (PIC) The manager or other responsible person (other than the equipment operator) appointed to be responsible for the safe handling of critical loads and for the safe handling of noncritical items in, around, or above spaces in which critical items are located. The PIC should be knowledgeable of the specific item to be lifted and be qualified to specify the handling requirements for the item to be lifted.

Qualification. Process by which factors, such as education, experience, and any special requirements (e.g., medical examinations) are evaluated in addition to training to assure that an individual can competently perform a specialized job function to an anticipated level of proficiency.

Qualified. A person, who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems relating to the subject matter and work.

Qualified Crane Inspector. A qualified and appointed PPPL employee who has been trained and qualified in the inspection and repair and maintenance of cranes and hoists. The Qualified Inspector is qualified to perform the required frequent and/or periodic inspections and maintenance in accordance with Inspection, Testing, and Maintenance, Attachment 9. The Qualified Inspector shall record all inspection/maintenance on the appropriate inspection report. The Qualified Inspector shall tag out of service any crane which does not satisfactorily pass his inspection or is not inspected within 90 days of the due date and notify the Lift Manager of the tag out. These responsibilities may also be carried out by qualified subcontractor personnel hired to perform the Qualified Inspector duties. Subcontract inspectors must provide a statement of qualification as inspectors and operators including a current medical examination. Such statement must be approved by the Lift Manager.

Qualified Crane Operator is a person who has demonstrated his or her ability to safely operate a specific crane (or cranes). One whose competence to operate equipment safely and effectively (including the ability to accurately spot and control loads) has been demonstrated by extensive experience, operational tests, and training, and must possess a current PPPL crane operator's card, valid Crane Operators state license, or valid operating engineer's card. The various types of Crane operators follow.

Cab Crane Operator is a person who is qualified to operate overhead cranes and hoists for Ordinary lifts or maintenance items only. Cab Crane Operator Qualification is for a period of three years and requires passing a written and a practical test meeting the minimum experience requirements listed below, having an annual medical evaluation meeting the requirements listed above under Lab crane operator, and designation by the Lift Manager. In the absence of a medical evaluation in the past year, a Cab Crane Operator is automatically downgraded to a Pendant Crane Operator.

Minimum physical qualifications required on the annual medical evaluation are:

- a) Vision 20/30 Snellen in one eye and 20/50 in the other with or without corrective lenses, adequate depth perception, field of vision, and be able to distinguish colors, if required for operation.
- b) Hearing, with or without a hearing aid, adequate for specific operations.
- c) Must have sufficient strength, endurance, agility, coordination, and speed of reaction to meet the demands of equipment operation and to climb up and down vertical ladders.
- d) Must have no diseases, physical defect or emotional instability which could interfere with the operator's safe performance of crane operation.

Minimum experience required is 6 months and 12 documented lifts as an Pendant Crane Operator.

Mobile Crane Operator is a person who is qualified to operate mobile cranes for ordinary lifts. Qualifications for Mobile Crane Operators are the same as Cab Crane Operators.

Pendant Crane Operator is a person who is qualified to operate pendant-controlled cranes (those without cabs) and hoists for ordinary lifts or maintenance items only. Pendant Crane Operator Qualification is for a period of three years and requires passing a written and a practical test meeting the minimum experience requirements of 1 month and 10 lifts as a rigger, and designation by the Lift Manager. There are no medical requirements for Pendant Crane Operators.

Critical Lift Crane Operator (CLCO) This is the most advanced crane operator designation. A Critical Lift Crane Operator is a qualified cab or pendant crane operator who is designated to perform Ordinary and Critical Lifts. Critical Lift Crane Operator Qualification is for a period of three years and requires passing a written and a practical test meeting the minimum experience of 1 year as a cab or pendant Crane Operator, having an annual medical evaluation per the requirements of a cab crane operator, being recommended by a QRS and designated by the Lift Manager. In the absence of a medical evaluation in the past year, a Critical Lift Crane Operator is automatically downgraded to a Pendant Crane Operator.

Crane Operator Instructor is a person who has demonstrated their ability to safely operate a specific class of equipment and possess current qualification to operate the equipment. Additionally, this person has demonstrated their ability to proficiently instruct others in the operation of the equipment and has been recommended by the Lift Manager to become a qualified instructor per TR-005. Crane operator instructors are qualified operators who have been designated by the Lift Manager, with Training concurrence, to instruct in the operation of hoisting equipment. The instructor must: 1) be currently qualified and proficient on the equipment for which he is instructing; 2) have the ability to communicate verbally, in writing, and demonstrate operating techniques applicable to the specific equipment; 3) have the ability to evaluate trainee operator performance and verify that the trainee has achieved the degree of proficiency required to operate the equipment safely.

Definitions**Attachment 1**

Qualified Rigger. Qualification as a Rigger requires passing a written and a practical test. This allows the person to perform rigging and operate up to 5 ton hoists for ordinary lifts. It does not qualify a person to operate a crane. Rigger qualification is for a period of three years. There are no medical requirements for Riggers. The term “rigger” or “qualified rigger” refers to the function performed, and in no way relates to the workmen’s classification in any union or bargaining unit. Qualified riggers shall maintain a basic understanding of rigging requirements and implement them on each lift. Qualified riggers are familiar with, and competent in the use of, the rigging equipment they are required to use.

Qualified Rigging Specialist (QRS). The QRS is designated by the Lift Manager to direct all PPPL Critical Lifts. The QRS shall be a qualified crane operator. Minimum physical qualifications required on the medical evaluations are: no physical restrictions that would render employee incapable of safe rigging duties; normal depth perception, field of vision, reaction time, manual dexterity and coordination.

Qualified Subcontractor. One whose qualifications have either been evaluated and accepted by the PPPL Lift Manager or whose parent company qualification program has been evaluated and accepted by the Lift Manager and the individual carries documentation (e.g. card) which shows completion.

Quality Control (QC). A PPPL individual reporting to the Quality Assurance Division responsible for independent verification of activities specified by this procedure.

Rated Capacity. A capacity based upon design and a load test. The maximum hook load which hoisting equipment is tested to safely carry. Also the maximum load which a sling, hook, shackle, or other rigging tackle is tested to safely carry.

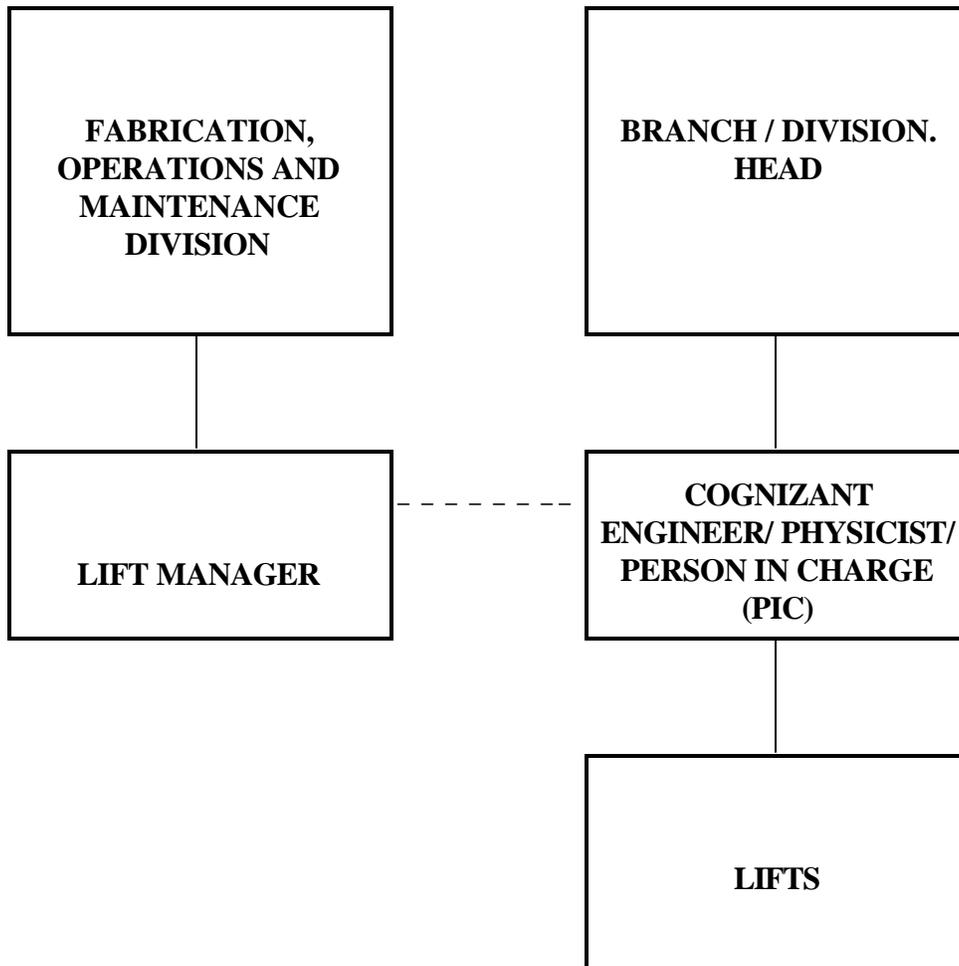
Repetitive Lift. A repetitive lift is the second or subsequent occurrence of an approved lift using at least two members of the original lift team members.

Responsible Line Manager (RLM) The Branch or Division Head responsible for the system or equipment being moved.

Rigging. *vt.* to put together, assemble, prepare for use. *n.* the ropes, chains, slings, shackles, or other gear without moving parts used to support a load.

Training. Instruction designed to develop or improve job performance.

Remote Controlled Crane: A crane outfitted with some type of remote control device. The existence of a remote control does not change the category, type, operator qualification, or inspection requirements of that crane.



Lift Classification Document

CONDITIONS	CLASSIFICATION	
	ORDINARY [all conditions must be met]	CRITICAL [any one condition]
INJURY TO PERSONNEL	PROBABILITY LOW FOR A LOST TIME ACCIDENT	LIFT COULD POTENTIALLY RESULT IN A LOST TIME ACCIDENT
SCHEDULE IMPACT	LESS THAN TWO MONTHS	TWO MONTHS OR MORE
ENVIRONMENTAL IMPACT	NONE POSSIBLE	FAILURE COULD RESULT IN AN ENVIRONMENTAL IMPACT
LOCATION OF HOOK VS. HARDWARE	MORE THAN 5 FT. HORIZ. CLEARANCE TO ALL HARDWARE VALUED GREATER THAN \$200K	TRAVEL WITHIN 5 FT HORIZ. CLEARANCE OF EXP. DEVICE / CRITICAL HARDWARE AND POTENTIAL DAMAGE GREATER THAN \$200K
COST IMPACT	LESS THAN \$ 200K	\$ 200K OR MORE
RADIATION EXPOSURE TO WORKER	LESS THAN 100 mREM	100 mREM OR MORE
ADDITIONAL FACTORS		A lift should also be designated as critical if the load requires exceptional care and handling because of size, weight, close-tolerance installation, high susceptibility to damage, or other unusual factors.

NOTE: The lift classification may be determined using the above chart. Any one condition will place the lift within the classification. Note that some lifts are classified as critical lifts because of items they are lifted over or attached to.

A CRITICAL LIFT REQUIRES MITIGATIVE ACTIONS THAT INCLUDE A WRITTEN LIFT PROCEDURE APPROVED BY THE LIFT MANAGER TO REDUCE THE RISKS.

Lift Personnel Qualification Requirements page 1 of 3

	Rigger (includes all hoists <= 5 tons)	Pendant Crane Operator	Cab Crane Operator	M&O Crane Technicians * Qualified Inspectors	Mobile Crane Operator (MCO)
Prerequisite	None	Rigger	Rigger and Pendant Crane Operator	Approved Maintenance/ Inspector Course	Rigger and Overhead Crane Operator
Initial Training and Testing	Hoisting and Rigging (H&R)	Overhead Crane Operator	Overhead Crane Operator	Overhead Crane written exam	Mobile Crane Operator
Initial OJT and Practical Test	Rigging Practical	Pendant Crane Practical by Individual Crane	Cab Crane Practical by Individual Crane	Crane Practical by Individual Crane	Mobile Crane Practical
Annual Medical	No	No	Yes Per Att. 1	Yes Per Att. 1	Yes Per Att. 1
3 Year Requalifica- tion	<ul style="list-style-type: none"> • H&R Refresher and Test • Practical Evaluation 	<ul style="list-style-type: none"> • Current Prerequisite Qualification • Overhead Crane Refresher and Test • Practical Evaluation on One (1) Pendant Crane 	<ul style="list-style-type: none"> • Current Prerequisite Qualification • Overhead Crane Refresher and Test • Practical Evaluation on One (1) Cab Crane 	<ul style="list-style-type: none"> • Current Prerequisite Qualification • Lift Manager Approval 	<ul style="list-style-type: none"> • Current Prerequisite Qualification • Overhead Crane Refresher and Test • Practical Evaluation on One (1) Mobile Crane
Minimum Experience	None	1 month as RIGGER	1 year as RIGGER and 6 months as Pendant Crane Operator	1 month as RIGGER	1 year as RIGGER and 6 months as Overhead Crane Operator

* To operate cranes, M&O Technicians and Qualified Inspectors only require the Crane Operator Course and the practical training. This provides qualification for operating all cranes without a load. Lifting is only allowed using pendant type cranes if the individual complies with page 1 of this attachment. A qualified subcontractor may also carry out these responsibilities. Subcontract personnel may be hired to perform the qualified inspector crane duties. Subcontract inspectors must provide a statement of qualification as inspectors and operators including a current medical examination. The Lift Manager must approve such statement.

Lift Personnel Qualification Requirements page 2 of 3

	Critical Lift Crane Operator (CLCO)	Qualified Rigging Specialist (QRS)	LIFT ENGINEER
Prerequisite	Rigger and Cab Crane Operator	Rigger and CLCO	None
Initial Training and Testing	Overhead Crane Operator	Specialized Training, as determined by the Lift Manager, including running wire rope inspection	Specialized Training, as determined by the Lift Manager
Initial OJT and Practical Test	Critical Practical		Specialized Training, as determined by the Lift Manager
Annual Medical	Yes	Yes	No
3 Year Requalification	<ul style="list-style-type: none"> • Current Prerequisite Qualification • Overhead Crane Refresher and Test • Lift Manager Approval 	<ul style="list-style-type: none"> • Current Prerequisite Qualification • Lift Manager Approval • Running wire rope inspection 	<ul style="list-style-type: none"> • Current Prerequisite Qualification • Lift Manager Approval
Minimum Experience	1 year as Cab Crane Operator and Approved by Lift Manager	2 years as CLCO and Approved by Lift Manager	2 years as an engineer and approved by Lift Manager.

Lift Personnel Qualification Requirements page 3 of 3

Qualification Records

Personnel qualifications shall be documented in an easily auditable format and shall include, as a minimum, the following types of information:

- a. Records of training completed at PPPL, or elsewhere, such as attendance sheets or computer summaries.
- b. Results of medical examinations where applicable.
- c. Records of training exceptions.
- d. Results of examinations, including written and performance evaluations.
- e. A Statement of Qualification, including qualification signature and effective dates of qualification.
- f. Statement of continued competence (for requalification).

When training is completed, candidates for qualification shall be examined by written examination and performance evaluation.

Written Examinations

- a. Written examinations are based upon the topics presented in the classroom portions of the Hoisting and Rigging Training Curriculum (such as Hoisting and Rigging, Crane Operation, and ES&H training courses).
- b. A score of 80% or higher is required to pass any individual examination.
- c. Written examinations are required for initial qualification only.

Performance Evaluations

- a. Performance evaluations are based upon the performance items enumerated in the applicable Performance Evaluation Checklist.
- b. No numerical value is assigned to operational evaluations. The candidate's demonstrations are evaluated by the examiner as "satisfactory" or "unsatisfactory" based upon the following criteria:
 - 1) The individual exhibits a basic ability in the performance area.
 - 2) The individual is capable of correctly performing the action after some clarification by the examiner.
- c. The job functions demonstrated, the candidate's performance in these demonstrations, and the examiner's evaluation shall be documented.
- d. The operational evaluation score for qualification shall be a composite grade of all individual operational evaluations. The composite score for operational evaluations shall be "satisfactory," with no outstanding "unsatisfactory" items (i.e., 100% of demonstrations must be "satisfactory").
- e. Candidates must initially qualify for each crane they operate. Candidates for requalification need only successfully complete a performance on one (1) of the type of crane operated (pendant or cab) in order to extend qualifications on each individual crane operated.

Lift Resume page 1 of 2

NAME: _____ **Date:** _____

1. Years employed at PPPL: _____

2. Years working in the Hoisting and Rigging Program: _____

3. Classroom Lift Training: Course: _____ Date: _____

4. Practical Training: Course: _____ Date: _____

5. Indicate 12 lifts (at the highest qualified position), you participated in, preferably where a lift procedure was required:

Lift: _____ Date: _____

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

11) _____

12) _____

6. Last PPPL Medical Exam: _____

Lift Resume page 2 of 2

NAME: _____

The above named individual is qualified to operate the following cranes:

<u>Crane & Weight (Tons)</u>	<u>Minimum position required to operate</u>	<u>Date Qualified or Initials</u>
NSTX TC (75/15)	Cab CO	
TFTR TC (110/25)	Cab CO	
NBPC 1st Floor (15/5)	Pendant CO	
D-MU (100/25)	CAB CO	
D-MG (S) (25/3)	Pendant CO	
D-MG (N) (25/3)	Pendant CO	
Rad Waste (10)	Pendant CO	
RESA (40)	Cab CO	
C-MG (75/15)	Cab CO	
CS (30/5)	Cab CO	
RF (15)	Pendant CO	
ESAT (10)	Pendant CO	
Broderson (15)	Mobile CO	
Grove (35)	Mobile CO	

Signature of Instructor or Training: _____ Date: _____

Approved Lift Manager: _____ Date: _____

**CRANE/HOIST OPERATOR REQUEST FORM AND PERFORMANCE
EVALUATION Page 1 of 2**

Trainee (Please Print): _____ **Date:** _____

- Existing Qualifications:** Crane Classroom Course or Resume Completed
 Current Crane Expiration _____
 Medical (if applicable) _____
- Type:** Pendant Cab Mobile Critical Maintenance
- Location:** D-Site C-Site Shops

List desired crane: _____

Trainee Signature _____ **Date:** _____

{Forward form to Supervisor}

Supervisor's Recommendation:

Concur / Disagree _____

Supervisor Signature _____ **Date:** _____

{Forward form to HR Training to Schedule OJT}

Training: obtain verbal concurrence from Lift Manager and Schedule OJT Instructor:

Signature _____ **Date:** _____

{Forward form to Crane Instructor}

Crane Instructor's Evaluation:

Evaluated Cranes:

- | | | |
|---|--|---|
| <input type="checkbox"/> NSTX Test Cell (NTC)* | <input type="checkbox"/> D-Site MG (D-MG) | <input type="checkbox"/> C-Site MG (C-MG) |
| <input type="checkbox"/> TFTR Test Cell (D-TC)* | <input type="checkbox"/> Neutral Beam (NBPC) | <input type="checkbox"/> ESAT |
| <input type="checkbox"/> Mock Up (D-MU)* | <input type="checkbox"/> Rad Waste Building | <input type="checkbox"/> CS |
| <input type="checkbox"/> RESA* | <input type="checkbox"/> Grove | <input type="checkbox"/> RF #15 (15 ton) |
| <input type="checkbox"/> * Remote | <input type="checkbox"/> Broderson | <input type="checkbox"/> _____ |

Performance Evaluation: Satisfactory Unsatisfactory

Comments: _____

Signature _____ **Date:** _____

{Forward form to Lift Manager}

Lift Manager Review:

Approve / Disapprove _____

Signature _____ **Date:** _____

{Forward Form to Human Resources for filing}

CRANE/HOIST OPERATOR PERFORMANCE EVALUATION
Page 2 of 2

*For each statement below, check (.) either S (Satisfactory) or U (Unsatisfactory).
For items that do not apply, use NA (Not Applicable).*

	<u>S</u>	<u>U</u>
1. Performed Operator's Daily Checklist.	_____	_____
2. Secured work area(s) prior to operations (e.g., roped, coned off area, placed signs)	_____	_____
3. Accessed crane properly during normal conditions.	_____	_____
4. Tested Lift.	_____	_____
5. Operated Controls properly.	_____	_____
a. Performed smooth operation of bridge/trolley controls	_____	_____
b. Performed smooth operation of mobile crane controls.	_____	_____
c. Raised & Lowered hook(s) so as not to shock load.	_____	_____
d. Remote (if applicable)	_____	_____
6. Cleared obstacles at a safe distance.	_____	_____
7. Understood/responded properly to hand signals.	_____	_____
8. Understood/responded properly to verbal instructions.	_____	_____
9. Demonstrated acceptable depth perception.	_____	_____
10. Shutdown the crane properly:	_____	_____
a. Placed bridge/trolley in correct position.	_____	_____
b. Placed cab in proper position.	_____	_____
11. Egressed crane properly during normal conditions.	_____	_____
12. Egressed crane properly during emergency conditions using rope and tether.	_____	_____

Restrictions: _____

Comments: _____

Approved by: _____

Instructor's Signature

FRONT of CARD

PPPL Qualification Card	
Name: _____	
<input type="checkbox"/> Rigger	Valid to: _____
<input type="checkbox"/> Forklift	_____
<input type="checkbox"/> Forklift Rigger	_____
<input type="checkbox"/> Scissor Lift	_____
<input type="checkbox"/> Aerial Boom Lift	_____
<input type="checkbox"/> See Other Side <input type="checkbox"/> Other Side NA	
Issued by: _____	
Training Office	

BACK of CARD

Crane Operator:	<input type="checkbox"/> Mobile
Valid to: ____	
<input type="checkbox"/> Cab	<input type="checkbox"/> Pendant Valid to: _____
Cranes Qualified to Operate:	

<input type="checkbox"/> QRS <input type="checkbox"/> CLCO	_____
Lift Manager Approval/Date	
<div style="border: 1px solid black; border-radius: 15px; width: 100px; height: 20px; margin: 0 auto;"></div>	Medical Exam Expiration Date Required for Mobile, Cab, CLCO

Procedure No. L - _____

TITLE: _____**Note: LIFT DATA SHEET NEEDED TO PERFORM THIS LIFT**

PREPARED BY (COG ENGINEER): _____ DATE _____

BRANCH/DIVISION HEAD: _____ DATE _____

PIC: _____ DATE _____

LIFT MANAGER: _____ DATE _____

PROCEDURE INCLUDES ALL ATTACHMENTS**1.0 INTRODUCTION:**

Describes component to be lifted, classification and reason for classification.

2.0 PREREQUISITES:

- 2.1 PIC will attest on the Lift Data Sheet that any installation, disassembly, or removal procedures required to allow the equipment to be moved have been completed.
- 2.2 PPPL Lift Manager and QC shall be notified in advance of a Critical lift.
- 2.3 No Critical lift may be commenced without the presence of a PPPL Lift Engineer or his designee (e.g., the QRS for repetitive lifts)

3.0 PRECAUTIONS:

Include in the procedure only those precautions which are directly applicable:

- 3.1 Protection of slings and equipment from edges.
- 3.2 Protection of finished surfaces from damage.
- 3.3 Areas needed to be roped off.
- 3.4 Security guards, if necessary.
- 3.5 Adjacent equipment protection needed.

4.0 PROCEDURE FIELD CHANGES

Procedure field change can be made on site if approved by the PPPL Lift Engineer by working up or using a new Lift Data Sheet. (See ENG-021, Attachment 6.)

5.0 LIFT DATA SHEET INSTRUCTIONS

The Lift Data Sheet provides the specification for the hoisting and rigging aspects of the lift and shall be initiated by the cognizant engineer.

Reference any drawings/sketches in Lift Data Sheet. Include as attachments any required drawings. These can be marked up blue prints or a sketch. Sketch inclusions: (see attached example also)

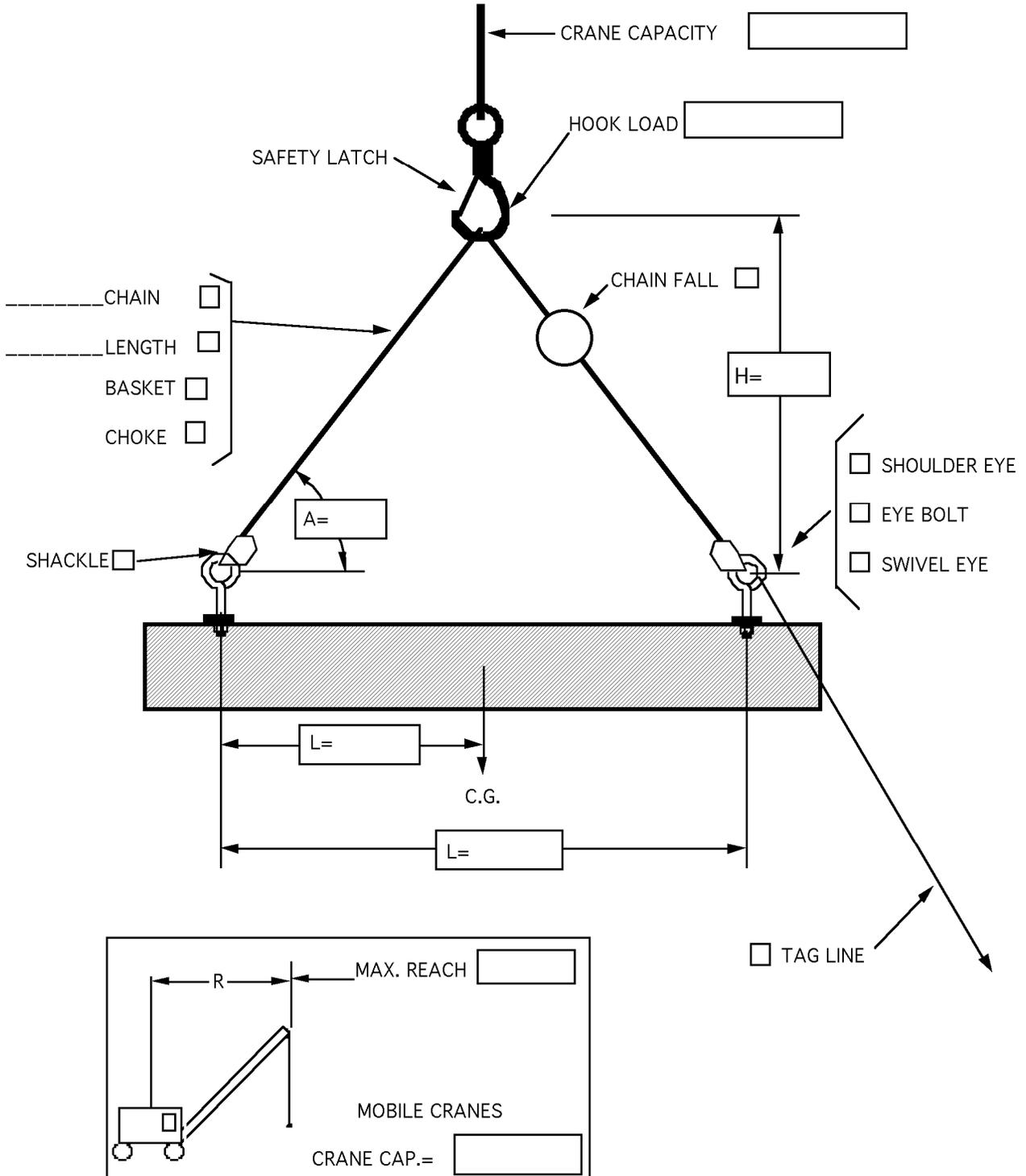
- 5.1 Show rigging configuration on views as required for clarity.
- 5.2 Show components of rigging with serial numbers, size, or capacities listed (i.e.. slings, shackles, clevises, wire rope, etc.).
- 5.3 Show special design tools and tested capacity when appropriate.
- 5.4 Show floor plan with path of intended travel. Note lift points and travel (by cart/fork lift) path.
- 5.5 If the rigging team is an outside contractor, provide the names and copies of qualification of team members when requested by the Lift Engineer.

6.0 PROCEDURE

Assures all prerequisites have been completed. Indicates the technical requirements to protect the equipment during the lift.

CRANE SKETCH/DATA EXAMPLE

USE THIS AS AN EXAMPLE ONLY YOUR SKETCH MAY BE DIFFERENT



Lift Data Sheet

Attachment 6

LIFT TITLE: _____	Effective Date: _____	Date Performed: _____
LIFT PROCEDURE NO. L - _____	Repetitive Lift Expiration Date: _____	Approved: _____
AREA: _____		LIFT MANAGER

DISASSEMBLY PROCESS COMPLETED (Print and Initial)

PIC: _____

PROCEDURE PREREQUISITES COMPLETED (Print and Initial)

QC: _____

DESCRIPTION: WEIGHT: _____ DETERMINED BY: _____

Sketch of rigging shall include: Crane Capacity, Hook Load, All Rigging, Lift Height, Flight Plan
Sketch of equipment shall include: Dimensions, Bolts Removed, Allowable Tilt

CRANE OPERATOR _____

RIGGING TEAM (print) _____

(print)

APPROVED: _____

(Print & initial)

QRS

(Rigged per sketch)

PIC

(Equipment ready to lift)

LIFT ENGINEER

(Qualification/inspection complete)

... PERFORM LIFT PERFORM LIFT PERFORM LIFT ...

Equipment is secure and rigging may be removed: _____

PIC: _____

Date Performed: _____

LIFT DATA SHEET AND ALL DATA TO BE RETURNED TO PPPL/ TFTR OPERATIONS CENTER.

Lift Data Sheet

Attachment 6

LIFT TITLE: HEAVY BOX LIFT LIFT PROCEDURE NO. <u>L - TFTR - XXX</u> AREA: <u>TEST CELL</u>	Effective Date:	Date Performed:
	Repetitive Lift Expiration Date:	Approved: LIFT MANAGER

DISASSEMBLY PROCESS COMPLETED (Print and Initial)	PIC: _____
PROCEDURE PREREQUISITES COMPLETED (Print and Initial)	QC: _____

25 TON HOOK

(2) 10 ft. slings
1 ton min.

(2) 10 ft. chain fa
1 ton min.

(2) shackles
1 ton min.

(2) 1/2" swivel
1 ton min.

L = 10.5 ft
H = 7

7.5 FT.

C.G.

3 FT.

15 FT.

Fastened by two bolts each corner

< 5° tilt

DOOR

TEST CELL

START

END

NORTH

L/H = Load Angle Factor (LAF) = 10.5/7 = 1.5
 WEIGHT x LAF = Total Stress = 2000 x 1.5 = 3000
 Total Stress/Number of Slings = Stress per Sling
 3000/4 = 750 lbs. ... 1 ton minimum

DESCRIPTION: WEIGHT: 2000 lbs. DETERMINED BY: ESTIMATE
 Sketch of rigging shall include: Crane Capacity, Hook Load, All Rigging, Lift Height, Flight Plan
 Sketch of equipment shall include: Dimensions, Bolts Removed, Allowable Tilt

CRANE OPERATOR (print)	RIGGING TEAM (print)		
APPROVED: (Print and Initial)	QRS (Rigged per sketch)	PIC (Equipment ready to lift)	LIFT ENGINEER (Certification/inspection complete)

... PERFORM LIFT PERFORM LIFT PERFORM LIFT ...

Equipment is secure and rigging may be removed:	PIC: _____	Date Performed: _____
---	------------	-----------------------

LIFT DATA SHEET AND ALL DATA TO BE RETURNED TO PPPL/ TFTR OPERATIONS CENTER.
PARTIALLY FILLED IN SAMPLE - - PARTIALLY FILLED IN SAMPLE

Lift Data Sheet

Attachment 6

COMPLETED SAMPLE

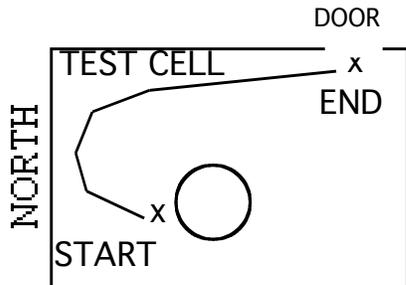
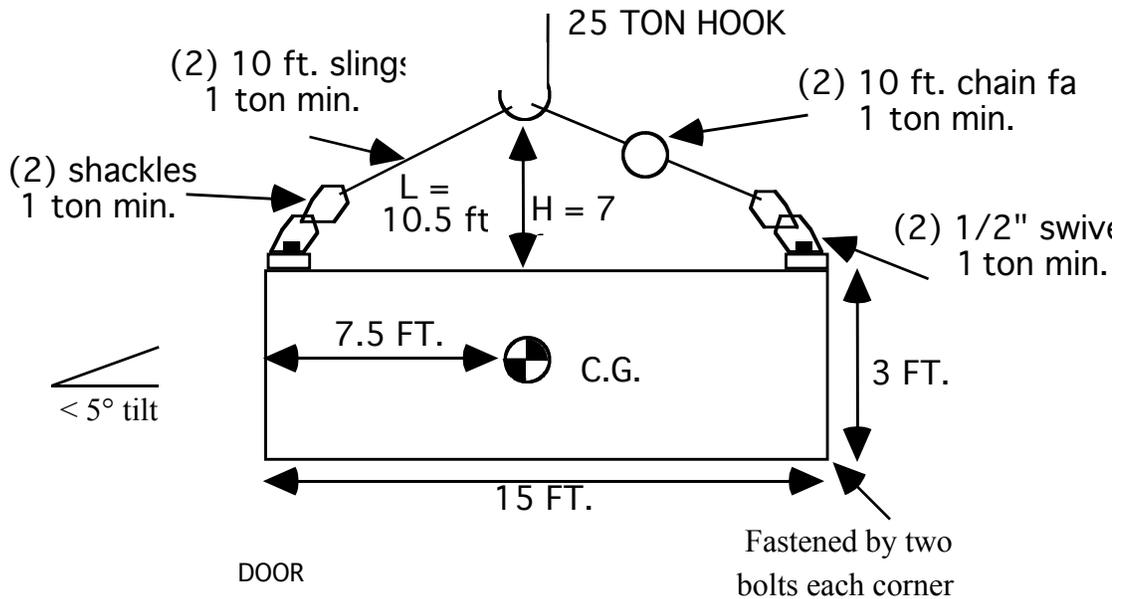
LIFT TITLE: HEAVY BOX LIFT	Effective Date:	Date Performed:
LIFT PROCEDURE NO. <u>L - XXXX</u>	Repetitive Lift Expiration Date:	Approved:
AREA: <u>TEST CELL</u>		<u>LIFT MANAGER</u>

DISASSEMBLY PROCESS COMPLETED (Print and Initial)

PIC: G. Labik(S)

PROCEDURE PREREQUISITES COMPLETED (Print and Initial)

QC: I. Boscoe(S)



$L/H = \text{Load Angle Factor (LAF)} = 10.5/7 = 1.5$
 $\text{WEIGHT} \times \text{LAF} = \text{Total Stress} = 2000 \times 1.5 = 3000$
 $\text{Total Stress} / \text{Number of Slings} = \text{Stress per Sling}$
 $3000/4 = 750 \text{ lbs.} \dots 1 \text{ ton minimum}$

DESCRIPTION: WEIGHT: 2000 lbs. DETERMINED BY: ESTIMATE

Sketch of rigging shall include: Crane Capacity, Hook Load, All Rigging, Lift Height, Flight Plan
 Sketch of equipment shall include: Dimensions, Bolts Removed, Allowable Tilt

<u>K Gilton</u>	<u>T. Holoman</u>	<u>C. Bunting</u>	
CRANE OPERATOR (print)	RIGGING TEAM (print)		
APPROVED: (Print and Initial)	<u>R. Snead ()</u> QRS (Rigged per sketch)	<u>G. Labik ()</u> PIC (Equipment ready to lift)	<u>R. Parsells ()</u> LIFT ENGINEER (Certification/inspection complete)

... PERFORM LIFT PERFORM LIFT PERFORM LIFT ...

Equipment is secure and rigging may be removed: PIC: _____ Date Performed: _____

LIFT DATA SHEET AND ALL DATA TO BE RETURNED TO PPPL/ TFTR OPERATIONS CENTER.

PARTIALLY FILLED IN SAMPLE - - PARTIALLY FILLED IN SAMPLE

Procedure No. _____

Show sketch of load test configuration with all relevant data such as: component capacities, load weight, crane rating etc.

PREPARED BY: _____ QUALIFIED RIGGING SPECIALIST	_____ DATE
--	----------------------

DATA (I.E. TEST WEIGHT, LIFT ANGLE, RADIUS):

--

WITNESSES:**QUALITY CONTROL:** _____ **DATE:** _____

Operator's Daily Checklist [ODCL]

Attachment 8

CRANE NO.		CAPACITY		TYPE		LOCATION		SHIFT 1 2 3			
OPERATORS NAME:				<i>INSTRUCTIONS: Check all items. Inspect and indicate as: satisfactory - S, unsatisfactory - U, or not applicable - NA</i>							
1. WALK AROUND INSPECTION		S/U/NA	2. MACHINERY INSPECTION		S/U/NA	3. OPERATOR CAB INSPECTION		S/U/NA	4. OPERATION INSPECTION		S/U/NA
a	Foundations		a	Holding Brake *		a	Housekeeping		a	Power Supply Relay *	
b	Access		b	Load Control Brake		b	Warning Tags *		b	Manual Reset	
c	Secured Items		c	Covers Secure		c	Cab Door(s)		c	Stop Button/Control *	
d	Walkways/Handrails		d	Upper Sheaves *		d	Fire Extinguisher		d	Pendant Buttons *	
e	Bridge, Drive Motor		e	Wire Rope *		e	Controls Identification		e	Upper Limit/Main *	
f	Bridge Brake *		f	Hooks: Cracks, wear, deformation, throat opening, latch operation *		f	Electrical Enclosures		f	Upper Limit/Auxiliary *	
g	Hydraulics		g	Fluid Leaks		g	Pendant Strain Relief		g	Lower Limit/Main	
h	Couplers/Connecting Rods		h	Batteries		h	Visibility/Windows		h	Lower Limit/Auxiliary	
i	End Trucks *		i	Electric Motors		i	Safety Devices *		i	Bridge Controls *	
j	Rail Sweeps		j	Electrical Panels		j	Warning/Indicator Light		j	Bridge Brake *	
k	Windlocks/Chocks/Stops		k	Runway/Bridge Conductors		k	Alarms		k	Trolley Control *	
l	Housekeeping		l	Runway/Bridge Collectors					l	Main Hook *	
			m	Electrical Guards					m	Auxiliary Hook *	
			n	Festoon System					n	Work Area	
			o	Warning Tags/Signs					o	Runway Stops *	
			p	Exposed Electrical Hazards					p	Travel Limit Relays *	
			q	Trolley Stops *							
<p>INSTRUCTIONS - Inspect all applicable items each shift of operations. Suspend all operations immediately when observing an unsatisfactory condition for asterisked (*) items. In addition, suspend operation when any unsafe condition is observed and immediately notify supervisor. Other conditions not affecting safety shall be noted under "Remarks" and reported to supervisor.</p> <p>Call area QRS to perform Wire Rope Inspection if not current. (within the last 30 days) ☞☞☞☞☞☞☞☞☞☞</p>									<p>OPERATOR'S NAME: PRINT: SIGN: DATE:</p>		
REMARKS:						<p>MONTHLY WIRE ROPE INSPECTION</p>		<p>QRS Inspector (Signature): DATE:</p>			

Inspection, Testing, And Maintenance

INTRODUCTION 1

LIFT EQUIPMENT REQUIREMENTS 1

REQUIRED INSPECTION STANDARDS PRIOR TO EACH USE: 2

OVERHEAD CRANE PERIODIC INSPECTION CRITERIA 3

MOBILE CRANE PERIODIC INSPECTION CRITERIA 3

HOIST AND CHAINFALLS PERIODIC INSPECTION CRITERIA 5

SYNTHETIC SLING INSPECTION CRITERIA 5

WIRE ROPE SLING PERIODIC INSPECTION CRITERIA 8

HOOK PERIODIC INSPECTION CRITERIA 9

RUNNING WIRE ROPE PERIODIC INSPECTION CRITERIA 8

ROPE REPLACEMENT CRITERIA -- OVERHEAD CRANES, HOISTS, AND CHAINFALLS 11

INTRODUCTION

All PPPL cranes fall into the standby and normal service category as stipulated in the following list of requirements. Frequent and/or monthly Inspections are performed per the following and manufacturer’s recommendations and use the ODCL (Attachment 8) as a checklist. Periodic Inspections are also performed per the following and manufacturer’s recommendations and use one of the Crane Inspection Report (attachments 10, 11, or 12)) as the checklist. Checklists are the official PPPL records of inspections and are maintained for 3 years

LIFT EQUIPMENT REQUIREMENTS

EQUIPMENT	PREVENTATIVE MAINTENANCE (PM) AND INSPECTION RECORDS
Cranes	OPS CTR.
Hoists	OPS CTR.
Chainfalls	OPS CTR.
Fixtures	Area QRS
Slings	Area QRS
Hardware	Area QRS
Wire Rope	Area QRS

REQUIRED INSPECTIONS (MUST BE ENSURED PRIOR TO EACH USE):

ITEM	Time from last use (IDLE)			FAILURE
	<1 mo.	> 1 mo. & < 1yr.	> 1 yr.	
Cranes	ODCL Rope/mo. for = 10 ton	ODCL & CIR* & Rope Insp.	ODCL & CIR* & Rope Insp.	MFG. Rec. & ODCL & CIR*
Hoists		Rope	Hoist Insp. Rpt. & Rope	Rope Insp. & Load Test
MFG. Recommended Maintenance/Repair (Normally Semiannually or Annually)				
Hooks	VISUAL		NDE/yr. - > 10 ton & > normal service. Annual Inspection with records	Replace
Slings, Shackles, & Fixtures	VISUAL		Annual Inspection with records	Replace

ODCL -- Operator's Daily Checklist (Attachment 8)

CIR* ----- Crane Inspection Report is indicated by a current inspection sticker

OVERHEAD CRANE PERIODIC INSPECTION CRITERIA**PERIODIC INSPECTIONS**

PERIODICITY: ANNUALLY
DOCUMENTATION: RECORDS REQUIRED -- ARCHIVED IN OPS CTR.

INSPECTION CHECK LIST:

An ODCL shall be performed before any movement of the crane takes place.

1. All functional operating mechanisms shall be checked for maladjustment interfering with proper operation.
2. All limit switches should be checked without a load on the hook. Care should be exercised. Each motion should be inched into its limit switch or run in at slow speeds.
3. Deterioration or leakage in lines, tanks, valves, drain pumps and other parts of air or hydraulic systems.
4. Hooks shall be visually checked for deformation and cracks prior to each use (see Hook Inspection Criteria).
5. Hoist or load attachment chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations. The trip setting of hoist limit switches shall be determined by tests with an empty hook traveling in increasing speeds up to the maximum speed. The actuating mechanism of the limit switch shall be located so that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley.
6. All functional operating mechanisms for excessive wear of components.
7. Rope reeving for non-compliance with manufacturer's recommendations (see Wire Rope Inspection Criteria).
8. Deformed, cracked or corroded members.
9. Loose bolts or rivets.
10. Cracked or worn sheaves and drums.
11. Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices.
12. Excessive wear on brake system parts, linings, pawls and ratchets.
13. Load, wind and other indicators over their full range, for any significant inaccuracies.
14. Gasoline, diesel, electric or their power plants for improper performance or non-compliance with applicable safety requirements.
15. Excessive wear of chain drive sprockets and excessive chain stretch.
16. Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations.

MOBILE CRANE PERIODIC INSPECTION CRITERIA**PERIODIC INSPECTIONS**

PERIODICITY: Six Months, Monthly for Wire Rope

DOCUMENTATION: RECORDS REQUIRED -- ARCHIVED IN OPS CTR.

WIRE ROPE ARCHIVED AT CRANE

INSPECTION CHECK LIST:

An ODCL shall be performed before any movement of the crane takes place (this satisfies the monthly and pre-operational check). Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard.

1. All control mechanisms for maladjustment interfering with proper operation.
2. All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.
3. All safety devices for malfunction.
4. Deterioration or leakage in air or hydraulic systems.
5. Inspect crane hooks for deformations or cracks (see Hook Inspection Criteria).
6. Rope reeving for non-compliance with crane manufacturer's recommendations (see Wire Rope Inspection Criteria).
7. Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.
8. Deformed, cracked, or corroded members, in the crane structure and boom.
9. Loose bolts or rivets.
10. Fasteners identified by DOE as "suspect" (Check QA web page <<http://www-local.pppl.gov/qa/SCI/SCI.shtml>> or contact QA for further information).
11. Cracked or worn sheaves and drums.
12. Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers and locking devices.
13. Excessive wear on brake and clutch system parts, linings, pawls, and ratchets.
14. Load, boom angle, and other indicators over their full range, for any significant inaccuracies.
15. Gasoline, diesel, electric, or other power plants for improper performance or non-compliance with safety requirements.
16. Excessive wear of chain-drive sprockets and excessive chain stretch.
17. Travel steering, braking, and locking devices, for malfunction.

HOIST AND CHAINFALLS PERIODIC INSPECTION CRITERIA**PERIODIC INSPECTIONS**

PERIODICITY: ANNUALLY
DOCUMENTATION: RECORDS REQUIRED -- ARCHIVED IN OPS CTR.

INSPECTION CHECK LIST:

The following should be used in conjunction with the manufacturer's recommendations for hoist and chainfall inspections. The manufacturers recommended inspections may require a load test after the inspection. The manufacturer's recommendations take precedence, if available over the following checklist. Inspection stickers shall be attached to the equipment listing the inspection and expiration date.

1. Annual maintenance should be carried out prior to or during the major inspection.
2. Loose bolts or rivets.
3. Fasteners identified by DOE as "suspect" (Check QA web page <<http://www-local.pppl.gov/qa/SCI/SCI.shtml>> or contact QA for further information).
4. Cracked or worn drums or sheaves.
5. Worn, corroded, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices.
6. Excessive wear on motors or load brakes.
7. Excessive wear of chains, ropes, load sprockets, drums, sheaves, and chain stretch.
8. Hooks: Inspect crane hooks for deformations or cracks (see Hook Inspection Criteria).
9. Electrical apparatus for signs of pitting or any deterioration of controller components, limit switches, and push button switches.
10. Hook retaining nuts or collars and pins, welds, or riveting used to secure the retaining members.
11. Supporting structures and trolleys, if used shall be inspected for continued ability to support the imposed loads.
12. Warning labels for absence or illegibility.
13. Running Ropes -- see Wire Rope Inspection Criteria.
14. Chain
 - a. Test the hoist under load in hoisting and lowering directions, and observe the operation of the chain and sprockets. The chain should feed smoothly into and away from the sprockets.
 - b. If the chain binds, jumps, or is noisy, first see that it is clean and properly lubricated. If the trouble persists, inspect the chain and mating parts for wear, distortion, or their damage.

- c. Chain should be cleaned for inspection. Examine visually for gouges, nicks weld splatter, corrosion, and distorted links. Slacken the chain and move adjacent links to one side to inspect for wear at the contact points, If wear is observed or stretching is suspected, the chain should be measured according to the hoist manufacturer's instructions. If instructions are not available, proceed as follows:
 - i. Select an unworn, unstretched length of the chain (e.g., at the slack end).
 - ii. Suspend the chain vertically under tension and, using a caliper-type gauge, measure the outside length of any convenient number of links approximately 12 to 14 inches overall.
 - iii. Measure the same number of links in the used sections and calculate the percentage increase in length.

15 Chain Replacement

- a. If the used chain exceeds a hoist manufacturer's recommended length, or in the absence of such a recommendation, if the used chain is 1-1/2 % longer than unused chain, replace the chain. Repairing the load chain by welding or any other means shall not be attempted by anyone other than the chain manufacturer.
- b. The existence of gouges, nicks, corrosion, weld splatter, or distorted links in sufficient reason for questioning chain safety and considering chain replacement. Safety in this respect depends largely upon the use of good judgment by an appointed or designated person in evaluating the degree of damage.
- c. Replacement chain shall be the same size, grade, and construction as the original chain furnished by the hoist manufacturer, unless otherwise recommended by the hoist manufacturer due to actual working condition.
- d. Load-chain links which pass over the hoist-load sprocket on edge (alternate to those which lie flat in the pockets) should be installed with the welds away from the center of the sprocket. This precaution is not required on idler sprockets, which change the direction but not the tension in the chain.
- e. The chain shall be installed without any twist between the hoist and an anchored and on either the loaded side or the slack side.
- f. When a chain is replaced, disassemble and inspect the mating parts (sprockets, guides, stripper) for wear, and replace if necessary.

SYNTHETIC SLING INSPECTION CRITERIA**PERIODIC INSPECTIONS**

PERIODICITY:	ANNUALLY
DOCUMENTATION:	RECORDS REQUIRED -- ARCHIVED IN QRS SITE RIGGING INVENTORY/TESTING LOG

INSPECTION CHECK LIST:

1. All slings shall be visually inspected before each use by the person handling the sling.
2. Annual inspection shall be made by a certified inspector whose qualification to perform specific inspection activities has been determined, verified and attested to in writing and inspection records shall be kept on file and readily available.
3. A sling shall be removed from service if any defects, such as the following, are visible:
 - a. Acid or caustic burns.
 - b. Melting or charring of any part of the surface.
 - c. Snags, punctures, tears, or cuts.
 - d. Broken or worn stitches.
 - e. Wear or elongation exceeding the amount recommended by manufacturers.
 - f. Distortion of fittings.
 - g. Other apparent defects which cause doubt as to the strength of the sling should be referred to the manufacturer for determination.
4. Written inspection records, utilizing the identification for each sling as established by the user, should be kept on all slings. These records should show a description of the new sling and its condition on each subsequent annual inspection.

SYNTHETIC SLING MAINTENANCE AND STORAGE

1. Synthetic slings shall not be stored where the temperature exceeds 200⁰F.
2. Synthetic slings shall not be stored in direct sunlight.
3. Slings should be kept clean and free of dirt and abrasive grit.
4. Slings can be cleaned with mild soap and water. Allow sling to dry properly before placing back in storage or service.

WIRE ROPE SLING PERIODIC INSPECTION CRITERIA**PERIODIC INSPECTIONS**

PERIODICITY: ANNUALLY

DOCUMENTATION: RECORDS REQUIRED -- ARCHIVED IN QRS SITE RIGGING
INVENTORY/TESTING LOG**INSPECTION CHECK LIST:**

1. All slings shall be visually inspected each day they are used. In addition, an annual inspection shall also be performed. Annual inspections shall be performed by a certified inspector whose qualification to perform specific inspection activities has been determined, verified and attested to in writing. Any deterioration which could result in a appreciable loss of original strength shall be carefully noted, and determination made whether further use of the sling would constitute a safety hazard. Inspection records shall be kept on file and readily available.
2. Conditions, such as the following, shall be sufficient reason for questioning sling safety and for consideration of replacement:
 - a. Six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay.
 - b. Wear or scraping of one-third the original diameter of outside individual wires.
 - c. Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.
 - d. Evidence of heat damage.
 - e. End attachments that are cracked, deformed, or worn.
 - f. Hooks that have been opened, cracked, or bent.
 - g. Corrosion of the rope or end attachments.

WIRE ROPE SLING MAINTENANCE AND STORAGE

- a. Slings shall be stored in racks or in designated locations when not in use.
- b. Slings should be wiped clean periodically to remove as much dirt and abrasive grit as possible, and be relubricated to extend their useful life. Chains should not be lubricated when in use.
- c. Slings should never be stored in damp or dirty places, or in places exposed to corrosive materials or weather. For long-term storage, they should be cleaned and lubricated.
- d. Slings may require segregated storage, as determined on a case basis.

HOOK PERIODIC INSPECTION CRITERIA**PERIODIC INSPECTIONS**

PERIODICITY:	ANNUALLY
DOCUMENTATION:	RECORDS REQUIRED -- ARCHIVED IN OPS CTR. as part of periodic inspection

INSPECTION CHECK LIST:

1. Visual inspection – Daily or prior to use and recorded annually by a qualified inspector.
2. NDE (dye penetrant or magnetic particle) in accordance with applicable ASTM standards, ANNUALLY, if greater than 10 ton and greater than normal service. (Typically not applicable at PPPL.)
3. Hooks showing signs of wear or deformation will generally be replaced unless a qualified person approves their continued limited use. Hooks having any of the following deficiencies shall be removed from service and documented on a nonconformance report:
 - a. Cracks.
 - b. Wear exceeding 10% of the original dimension.
 - c. A bend or twist exceeding 10 degrees from the plane of the unbent hook.
 - d. Increase in throat opening exceeding 15% from the new condition.
 - e. If a latch is provided, and it becomes inoperative because of wear or deformation, or fails to fully bridge the throat opening, the hook shall be removed from service until the device has been repaired or replaced; or the throat opening has been assessed per (d) above.
 - f. If hooks are painted, a visual inspection should take the coating into consideration. Surface variations can disclose evidence of heavy or severe service. The surface condition may then call for stripping the paint in such instances.

RUNNING WIRE ROPE PERIODIC INSPECTION CRITERIA**PERIODIC INSPECTIONS**

PERIODICITY:	MONTHLY - FOR CRANES OVER 5 TON CAPACITY
DOCUMENTATION:	RECORDS REQUIRED -- ARCHIVED AT CRANE LOCATION. as part of ODCL

INSPECTION CHECK LIST:

All Running ropes in continuous service should be visually inspected once every working day. Inspection of ropes in service shall be made once a month or prior to use and a written, dated and signed record of inspection kept on file. As part of the periodic inspection, any deterioration, resulting in appreciable loss of original strength, such as described below, shall be carefully noted and determination made as to whether further use of the rope would constitute a safety hazard:

1. Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion or wear of outside wires.
2. A number of broken outside wires and the degree of distribution or concentration of such broken wires.
3. Worn outside wires.
4. Sections of rope which are normally hidden during inspection or maintenance procedures, such as parts passing over sheaves, should have given close inspection as these are points most likely to fail.
5. Corroded or broken wires at end connections.
6. Corroded, cracked, bent, worn or improperly applied end connections.
7. Severe kinking, crushing, cutting or unstranding.

WIRE ROPE MAINTENANCE

1. Rope shall be stored to prevent damage or deterioration.
2. Unreeling or uncoiling of rope shall be done as recommended by the rope manufacturer and with extreme care to avoid kinking or inducing a twist.
3. Before cutting a rope, seizings shall be placed on each side of the place where the rope is to be cut to prevent unlaying of the strands. On pre-formed rope, one seizing on each side of the cut is required. On non-preformed ropes of 7/8 inch diameter or smaller, two seizings on each side of the cut are required, and for non-preformed rope of 1-inch diameter or larger, three seizings on each side of the cut are required.
4. During installation care shall be observed to avoid dragging of the rope in dirt or around objects which will scrape, nick crush or induce sharp bends in it.
5. Rope should be maintained in a well lubricated condition. It is important that lubricant applied as part of a maintenance program shall be compatible with the original lubricant and to this end the rope manufacturer should be consulted. Those sections of rope which are located over sheaves or otherwise hidden during inspection and maintenance procedures require special attention when lubricating rope. The object of rope lubrication is to reduce internal friction and to prevent corrosion.

6. When an operating rope shows greater wear at well defined localized areas than on the remainder of the rope, rope life can be extended in some cases, where a reduced rope length is adequate, by cutting off a section at one end, and thus shifting the wear to different areas on the rope.

ROPE REPLACEMENT CRITERIA -- OVERHEAD CRANES, HOISTS, AND HOISTS

No precise rules can be given for determination of the exact time for replacement of rope, since many variable factors are involved, safety in this respect depends largely upon the use of good judgment by an appointed or authorized person in evaluating remaining strength in a used rope after allowance for deterioration disclosed by inspection. Safety of rope operation depends upon this remaining strength.

1. In hoist (overhead cranes, hoists, block and tackle) ropes, twelve randomly distributed broken wires in one rope lay, or four broken wires in one strand in one rope lay.
2. Mobile Cranes
 - a. In mobile cranes, 6 or more randomly distributed broken wires in one rope lay or 3 or more broken wires in one strand in one rope lay.
 - b. In pendants or standing ropes on mobile cranes, if there are 3 or more broken wires in one rope lay.
 - c. In mobile cranes in any rope there are one or more broken wires near an attached fitting. Breaks that occur near attached fittings, such, as sockets are usually the result of fatigue stresses concentrated in these localized sections. Wire breaks of this type should be cause for replacement of the rope or renewal of the attachment to eliminate the locally fatigued area. Six (6) to eight (8) feet should be cropped off the rope below socket.
 - d. In mobile cranes, on running ropes if there is any evidence of wire breaks in the valleys between strands. Breaks occurring on crowns of outside wires indicate normal deterioration. Breaks in valleys between strands indicate an abnormal condition, possibly fatigue or breakage of other wires not readily visible. More than one of these valley breaks in one rope lay should be cause for replacement.
3. Wear of one-third the original diameter of outside individual wires.
4. Kinking, crushing, bird caging or any other damage resulting in distortion of the rope structure.
5. Evidence of any heat damage from any cause.
6. Reductions from nominal diameter of more than:

DIAMETER REDUCTION

ROPE DIA. SIZE

1/64 in.	up to 5/16 in.
1/32 in.	3/8 in.-to- 1/2 in.
3/64 in.	9/16 in.-to- 3/4 in.
1/16 in.	7/8 in.-to- 1-1/8 in.
3/32 in.	1-1/4 in-to-1-1/2 in

Overhead Building Crane/Hoist Periodic Inspection Report

Attachment 10

CRANE/HOIST Mechanical Inspection Report & Maintenance Checklist

CRANE/HOIST #: _____ CAPACITY: _____ MAKE: _____ LOCATION: _____

STATUS CODE: Ö – OK Ö R – Repaired/Adjusted NR – Needs Repair NA – Not Applicable

All items shall be inspected and lubricated annually.

ITEM	CODE	COMMENT	ITEM	CODE	COMMENT
Bridge			Trolley drive		
Alignment			Wheels, driver		
Girders (camber)			Wheels, idler		
Rails			Wheel bearings		
Walks, ladders, railings			Axles and couplings		
Truck to girder connection			Motor coupling		
Trucks			Gear reducer		
Wheels, driver			Gear reducer oil seals		
Wheels, idler			Axle pinion		
Wheel bearings			Axle gear		
Axles and couplings			Cam followers/guides		
Squaring shaft			Energy absorbing bumpers		
Squaring shaft bearings			End stops		
Squaring shaft couplings			Hoist(s)		
Motor coupling			Hook		
Gear reducer			Hook bearing		
Gear reducer oil seals			Sheaves		
Axle pinion			Sheave bearings		
Axle gear			Equalizer sheave		
Runway alignment			Rope/chain		
Cam followers/guide			Rope anchors		
Runway end-stops			Drum grooving		
Railway sweeps/safety lugs			Drum shafts		
Energy absorbing bumpers			Motor pinion		
Monorail			Motor gear		
Girder			Intermediate pinion		
Girder supports			Intermediate gear		
Sway braces			Drum pinion		
End stops			Drum gear		
Misc.			Hoist case bearing		
Clearances overhead 3"			Mechanical load brake		
Clearances lateral 2"			Friction discs		
Rated load markings:			Pawl		
Each side of crane bridge			Pawl shifter		
Each hoist/load block			Ratchet or band		
Fasteners-no suspects found			Motor coupling		
			Hoist case coupling		

Needs Immediate Action:

Notes:

Check One: (PASS – SATISFACTORY TO USE with new sticker) (FAIL – TAGGED OUT)

INSPECTOR (PRINT): _____ SIGNATURE: _____ DATE: _____

Overhead Building Crane/Hoist Periodic Inspection Report

Attachment 10

CRANE/HOIST Brake and Electrical Inspection Report

CRANE/HOIST #: _____ CAPACITY: _____ MAKE: _____ LOCATION: _____

STATUS CODE: 0 – OK 0 R – Repaired/Adjusted NR – Needs Repair N/A -Not Applicable

All items shall be inspected and lubricated annually.

ITEM	CODE	COMMENT	ITEM	CODE	COMMENT
Brakes			Controls		
M.H. brake shoes and discs			<i>For Magnetic Control</i>		
M.H. brake linings			Master switches		
M.H. brake linkage			Pushbutton station		
M.H. brake coil			M.H. contactors		
A.H. brake shoes or discs			A.H. contactors		
A.H. brake lining			Trolley contactors		
A.H. brake linkage			Bridge contactors		
A.H. brake coil			M.H. overhead relays		
Trolley brake shoes or discs			A.H. overhead relays		
Trolley brake lining			Trolley overhead relays		
Trolley brake linkage			Bridge overhead relays		
Trolley brake coils			M.H. limit switch contacts		
Bridge brake shoes or discs			A.H. limit switch contacts		
Bridge brake lining			<i>For Manual Drum Control</i>		
Bridge brake linkage			M.H. finger tips		
Bridge brake coils			M.H. segments		
Hydraulic brake bleeder			A.H. finger tips		
Motors			A.H. segments		
Bridge motor bearings			Trolley finger tips		
Bridge motor brushes			Trolley segments		
Bridge motor rings			Bridge finger tips		
Trolley motor bearings			Bridge segments		
Trolley motor brushes			Resistors		
Trolley motor rings			M.H. resistors		
M.H. motor bearings			A.H. resistors		
M.H. motor brushes			Trolley resistors		
M.H. motor rings			Bridge resistors		
A.H. motor bearings			Mainline		
A.H. motor brushes			Mainline switch		
A.H. motor rings			Fuses (Sizes.....)		
Misc.			Power wiring		
			Control wiring		
			Trolley collectors		
			Runway collectors		
			Bridge conductors		
			Runway conductors		

Needs Immediate Action:

Notes:

Check One: (PASS – SATISFACTORY TO USE with new sticker) (FAIL – TAGGED OUT)

INSPECTOR (PRINT): _____ SIGNATURE: _____ DATE: _____

Mobile Crane Inspection Report

Attachment 11

Grove Mobile Crane Operator Daily Checklist Inspection Report

Crane# 119 MAKE/MODEL: GROVE RT65S (35 TON) SERIAL #: 38022 HOUR METER: _____

STATUS CODE: **Ö – OK** **Ö R – Repaired/Adjusted** **NR – Needs Repair** **N/A -Not Applicable**

	CODE	COMMENT		CODE	COMMENT
EXTERNAL					
Appearance/Paint			Auto Transmission Oil Level		
Check Fuel Cap			Air Compressor Oil Level		
Crankcase Oil Level			Outriggers and Boxes		
Cold Weather Starting Aid			Outrigger Float Pads		
Radiator			Tire Condition and Pressure		
Antifreeze and Coolant			Wheel Lugs		
Cleaner			Hoists		
Fan Belts			Boom Sections, Attachments		
Pumps and Motors			Boom Stops		
Battery			Lubrication/Grease or Oil Leaks		
Muffler			All Sheaves Lubed		
Brake and Air System (Bleed)			Wire Rope Kinks or Breaks		
Hydraulic Reservoir			Wire Rope Dirt and Lube		
Hydraulic Oil Filter			Hook and Hook Block		
All Hydraulic Hoses & Fittings			Counterweight & Torque		
Hydraulic Leaks			Handrails		
Lamps: Turn Signals, Headlamps, Flashers, Cab, Boom, Backup			Welds & Cracks: Hoists, Boom, Sheaves, Hook, Block, Motor, Valves, Cylinders		
INSIDE CAB					
Fire Extinguisher Pressure			Boom Angle Indicator		
Operator Manual & Load Chart			Load Moment Indicator (PAT)		
Hand Signal Chart			Anti Two Block & Boom Stops		
Glass			Gearshift Control		
Windshield Wiper			Foot and Parking Brakes		
Gauges: Oil, Fuel, Amp			Swing Brake		
Lights and Horn			Control Lever Linkage		
Backup Alarm			Throttle Linkage		
Heater			Engine RPM		

REMARKS:

MONTHLY WIRE ROPE INSPECTION	Monthly Wire Rope Inspection must be done by a QRS or a qualified Wire Rope Inspector unless a record such as a log entry shows performance within the last 30 days:	Inspector (Signature):
		DATE:

Check One: (PASS – SATISFACTORY TO USE) (FAIL – TAGGED OUT)

INSPECTOR (PRINT): _____ SIGNATURE: _____ DATE: _____

Mobile Crane Inspection Report

Attachment 11

Grove Mobile Crane Periodic Inspection Report

Crane# 119 MAKE/MODEL: GROVE RT65S (35 TON) SERIAL #: 38022 HOUR METER: _____

STATUS CODE: \ddot{O} – OK		\ddot{O} R – Repaired/Adjusted		NR – Needs Repair		N/A -Not Applicable	
SEMI-ANNUALLY	CODE	COMMENT	ANNUALLY	CODE	COMMENT		
Check Bolt Torque:			Paint				
– Transmission Mount			Cracks or Leaks:				
– Turntable			– Swing Gearbox Case				
– Engine Mount			– Transmission Case				
– Hoist Mount			– Pump Drive Box				
– Gearbox Mount			– Engine Intake				
– Axle Mount			– Axle Differential				
Engine RPM			Boom Wear Pads				
Muffler Connections			Brake Lines				
Wiring Harness			Axle Planetary Hubs				
Battery Cables			Cleaner				
Battery Water Level			Clutch Release Bearing				
Master Cylinders			Gearshift Control				
Pump Drive Gearbox			Steering System Oil				
Swing Gearbox			Crankcase Breather				
Axle Lockout			Wheel Lugs				
Axle Differential			Tie Rod Balljoints				
Axle Planetary Oil			Steering Knuckles				
Boom Sheaves			Drag Link U-joint				
Boom Alignment			Drag Link Ends				
Jib Alignment			Windshield Wiper				
Machine Structure			Level Indicator				
Clean/Change:			Emergency Brake				
– Differential Breather			Gauges: Oil, Fuel, Amp				
– Fuel Filter Screen							
– Compressor Strainer							
– Transmission Filter							
Drum							
Wire Rope Dirt/lube/Size/Kinks							
Hook & Latch							
Block & Sheaves							
Guards in position							
Emergency Stop							
Welds & Cracks: Hoists, Boom, Sheaves, Hook, Block, Motor, Valves, Cylinders							
Lamps: Turn Signals, Headlamps, Flashers, Cab, Boom, Backup							
Fasteners-no suspects found							

Comments: Note any potential hazards or malfunctions:

Check One: (PASS – SATISFACTORY TO USE with new sticker) (FAIL – TAGGED OUT)

INSPECTOR (PRINT): _____ SIGNATURE: _____ DATE: _____

Mobile Crane Inspection Report

Attachment 11

Broderson Mobile Crane Periodic Inspection Report

Crane# 146 MODEL: Broderson IC200C (15 Ton) SERIAL #: 103851 HOUR METER: _____

STATUS CODE: **Ö – OK** **Ö R – Repaired/Adjusted** **NR – Needs Repair** **N/A -Not Applicable**

	CODE		CODE
Check levels of engine oil, coolant and transmission fluid.		Check tire pressure: 130 PSI (radial tires).	
Drain water from diesel filter.		Check for loose wheel nuts. (500 foot-pounds torque required)	
Check air cleaner intake system for cracks or looseness.		Check lights and turn signals.	
Check general condition of tires.		Check power steering lines for damage.	
Visually inspect for loose pins, bolts, physical damage & leaks.		Check brake lines for damage.	
Check hydraulic oil level.		Check operation of horn.	
Check fuel level.		Check operation of hoist brake for smoothness.	
Check hydraulic filter indicator gauge after running at least twenty minutes.		Check outrigger holding valves for operation.	
Check engine oil pressure.		Check boom topping holding valves for operation.	
Check engine coolant temperature.		Check rotation gears for looseness or backlash.	
Check battery charging amperage.		Check boom extension cylinder holding valve for operation	
Check transmission temperature.		Check operation of windshield wipers (if equipped).	
Check hydraulic brake operation.		Boom extension (if equipped) properly pinned with retainers in place.	
Check parking brake operation.			
Check power steering operation.			
Observe chassis for normal driving operation.			
Observe boom operation for normal power and speed.		Check for suspect fasteners	
Check load line and hooks for damage.			
Check condition of sheaves and load line retainers.			
Check anti-two-block system for proper operation.			
Check back-up alarm for proper operation.			
Check operation of all transmission gears, forward and reverse.			
Clean all glass (if equipped) and check for cracks.			
Check operation of all warning and safety devices.			

REMARKS:

MONTHLY WIRE ROPE INSPECTION	Monthly Wire Rope Inspection must be done by the area QRS unless a record such as a log entry shows performance within the last 30 days:	QRS Inspector (Signature):
		DATE:

Check One: (PASS – SATISFACTORY TO USE) (FAIL – TAGGED OUT)

INSPECTOR (PRINT): _____ SIGNATURE: _____ DATE: _____

OPERATOR AIDCRANE OPERATOR CHECK LIST

- 1) Check previous ODCL for any unusual entries;
 - 2) Verify annual inspection sticker;
 - 3) Perform ODCL;
 - 4) Perform monthly hook and wire rope inspection by the area QRS if the previous ODCL does not show it has been done in the last 30 days.
-

APPENDIX A

PROCUREMENT GUIDELINES

This appendix provides guidance in preparing purchase requisitions for hoisting and rigging materials and equipment. Nationally recognized standards and specifications are referenced for listed items. However, caution should be used prior to procurement of special items in order to verify appropriate specification or standard reference and requirements. Some specific requirements listed in this appendix are more restrictive than consensus standard requirements, but are recommended to ensure materials of adequate quality and workmanship are provided.

The Cognizant Engineer/Physicist must ensure that receipt inspections are performed for all received materials in order to verify compliance of all requirements stated on the purchase order.

This appendix primarily contains procurement criteria for off-the-shelf type items. If the information provided in this appendix is used in the development of specifications for purchase of cranes or other special handling equipment, the Lift Manager must be consulted.

Since this appendix contains only a partial listing of commonly used rigging hardware, the requisitioner shall review applicable standards or specifications and identify requirements to which the manufacturer shall adhere.

More specific information or requirements may be obtained by consulting DOE Standard 1090 and/or an equipment manufacturer.

The manufacturer shall provide requested documentation as appropriate (e.g., rated load certification, proof-load test certification, material certification). The documentation shall be signed by the manufacturer's authorized representative.

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1.0 MANUAL, ELECTRIC AND AIR OPERATED HOISTS

a. Requirements include but are not limited to the following:

1. Manual, electric and air operated hoists shall meet or exceed the requirements of ASME/ANSI B30.16.

2. The rated load shall be marked on the hoist or load block.

3. Hoists shall be marked with identification as follows:

- a) Hand Chain Operated
 - 1) Name of manufacturer
 - 2) Manufacturer's model or serial number
- b) Electric-Powered Hoist
 - 1) Name of manufacturer
 - 2) Manufacturer's model or serial number
 - 3) Voltage of AC or DC power supply and phase and frequency of AC power supply.
 - 4) Circuit ampacity
- c) Air Powered Hoist
 - 1) Name of manufacturer
 - 2) Manufacturer's model and serial number
 - 3) Rated air pressure

b. All manual, electric, or air operated hoists shall have affixed to the hoist or load block a label or labels displaying precautionary information concerning operating procedures

c. Load sprockets shall have teeth or pockets to allow engagement of the load chain, shall be guarded, and provisions shall be made to guard against jamming of the load chain within the hoist mechanism under normal operating conditions.

d. Manufacturer shall supply instruction manual for each hoist. The manual shall include the following information and instructions:

- 1. Installation
- 2. Operation
- 3. Inspection and Testing
- 4. Lubrication, maintenance, and repair
- 5. Wiring diagram (electric powered only; maybe supplied separately)

1.1 Load Chain

a. Load chain may be either roller or welded link chain.

b. Load chain shall be pitched so as to pass over all load sprockets without binding.

c. Load chain shall be proof tested by the chain or hoist manufacturer with a load test of 1-1/2 times the hoist rated load divided by the number of chain parts supporting the load.

1.2 Hoist Hooks

If hooks are of the swiveling type, they shall rotate freely. Hooks shall be equipped with latches unless the application makes the use of the latch impractical. When required, a latch shall be provided to bridge the throat opening of the hook and retain, under slack conditions such items as, but not limited to slings, chains, etc. Refer to ASME/ANSI B30.10.

1.3 Load Blocks

- a. On hand chain operated hoists, a means shall be provided to guard against load chain jamming in the load block under normal operating conditions.
- b. On electric - or air-powered hoists, load blocks shall be of the enclosed type, and means shall be provided to guard against rope or load chain jamming in the load block under normal operating conditions.

1.4 Hoist Brakes

a. Hand chain operated hoist(s) shall be so designed that, when the actuating force is removed, it will automatically stop and hold any test load up to 125% of the rated load.

b. Electric -powered hoist, under normal operating conditions with rated load and test conditions with test loads up to 125% of rated load, the braking system shall perform the following functions:

1. stop and hold the load hook when controls are released;
2. limit the speed of load during lowering, with or without power, to a maximum speed of 120% of rated lowering speed for the load being handled;
3. stop and hold the load hook in the event of a complete power failure.

c. The braking system shall have thermal capacity for the frequency of operation required by the service.

d. The braking system shall have provision for adjustments where necessary to compensate for wear.

e. Air-powered hoist, under normal operating conditions with rated load and test conditions with test loads up to 125% of rated load, the braking system shall perform the following functions:

1. Stop and hold the load hook when controls are released;
2. prevent an uncontrolled lowering of the load in the event of a loss of air pressure
3. The braking system shall have thermal capacity for the frequency of operation required by the service.
4. The braking system shall have provision for adjustments where necessary to compensate for wear.

2.0 MANUALLY OPERATED LEVER HOIST

a. Requirements include but are not limited to the following:

1. Manually operated lever hoists shall meet or exceed the requirements of ASME/ANSI B30.21.
2. Shall have the rated load marked on the hoist or load block
3. Shall be tested by the manufacturer with a test load of at least 125% of the rated load
4. Shall have identifications for controls to indicate function or direction of motion.
5. Shall be marked with identification as follows:
 - a) Name of Manufacturer
 - b) Manufacturer's model or serial number
6. Shall have affixed to the hoist or load block in a readable position, a label or labels displaying precautionary information concerning operating procedures.

2.1 Construction

Load sprockets shall have pockets or teeth to allow engagement of the load chain, shall be guarded, and provisions shall be made to guard against jamming of the load chain with the hoist mechanism under normal operating conditions.

2.2 Load Chain

a. Load chain may be either roller or welded link type and shall be pitched so as to pass over all sprockets without binding.

b. Load chain shall be proof tested by the chain or hoist manufacturer with a load test of 1-1/2 times the hoist rated load divided by the number of chain parts supporting the load.

c. If a load is supported by more than one part of load chain, the tension on the parts shall be equalized.

2.3 Load Blocks

Shall have means to guard against load chain jamming in the load block under normal operating conditions.

2.4 Load Controlling Mechanism

a. Shall be equipped with a load controlling mechanism, which shall perform the following functions under normal operating conditions with test loads up to 125% of the rated load.

1. Stop and hold the load when the lever force is removed and the lever stroke completed.

2. Provide for incidental movement of the load when lifting or lowering.

3. Friction brake shall have provision for adjustment where necessary to compensate for wear

b. Manufacturer shall supply instruction manual for each hoist, the manual shall include the following information and instructions:

1. Operation
2. Inspection and Testing
3. Lubrication, maintenance, and repair

3.0 SHOP/FLOOR CRANES

a. Requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of ASME PALD.
2. Operating controls shall be designed in such a manner that they are readily visible and accessible to the operator and so that the operator will not be subjected to pinch points, sharp edges, or snagging hazards. The operation of controls should be clear to the operator either by position, function, labeling or combination thereof.
3. The release system shall require intentional positive action by the operator for release to prevent accidental lowering.
4. Shall have a positive means to prevent the load from being lowered or raised beyond the design limit of travel.
5. Shop/floor cranes not equipped with internal load limit devices shall be capable of performing a proof test of 150% of the rated capacity.

6. Shop cranes equipped with internal load limiting devices shall, when the load limiting device is deactivated, be capable of performing a proof load test of 125% of rated capacity.

7. Because of the potential hazards associated with the misuse of equipment of this type, no alterations shall be made to the product.

8. Shop/floor cranes shall be provided with a load hook and/or chain at the end of the boom extension that has a capacity capable of sustaining the proof load of the unit. The load hook shall be provided with a latching mechanism.

9. Shall have required product warnings and markings

4.0 BELOW THE HOOK STRUCTURAL AND MECHANICAL LIFTING DEVICES

a. Requirements include but are not limited to the following:

1. Shall conform to requirements of ASME/ANSI B30.20.

NOTE: Special lifting devices for shipping containers weighing 10,000 lbs or more that are used for radioactive materials maybe governed by ANSI N14.6 (Standard for Shipping Containers Weighing 10,000 Pounds or More for Nuclear Materials).

2. Shall have the rated load capacity marked on the main structure where it is visible. If the lifter is made up of several lifters, each detachable from the group, these lifters shall also be marked with their individual rated loads.
3. A load test, not to exceed 125% of the rated load unless otherwise recommended by a manufacturer shall be provided.
4. A load test certificate indicating the date of load test, amount of load applied, and confirmation of lifting device load rating shall be supplied.
5. Rated load should not be more than 80% of the maximum load sustained during the test.

6. Shall have a complete permanent marking affixed to the lifter displaying the following:

- a) Manufacturer's Name
- b) Serial Number/Identification Number
- c) Lifter Weight if over 100 lbs. (45KG)
- d) Rated load Capacity

4.1 General Construction

- a. Shall be designed to withstand the forces imposed by the rated load.
- b. Shall have a minimum design factor of 3 based on yield strength for all load bearing structural components.
- c. Welding shall be in accordance with ANSI/AWS D1.
- d. Guards for exposed moving parts such as, but not limited to gearing, projecting shafts, and chain drives that constitute a hazard under normal operating conditions should be guarded.
- e. Electrical equipment and wiring shall comply with Article 610 of ANSI/NFPA 70.

5.0 WIRE ROPE

a. Requirements include but are not limited to the following:

1. Wire rope shall meet or exceed the requirements of Federal Specification RR-W-410D or Mil Specification MIL-2-83420.
2. Wire rope shall be made in the United States by a member of the Wire Rope Technical Board¹ (except stainless steel, and unless recommended otherwise by a crane or hoist manufacturer). Stainless steel wire rope shall be made in the United States and shall be 302 or 304 grade stainless steel unless otherwise recommended by a crane or hoist manufacturer.

3. Wire rope shall have documentation from the manufacturer traceable to the material furnished and signed by the manufacturer's authorized representative. Documentation should reference as a minimum: purchase order number, diameter, number of strands, core, lay, grade, manufacturer's lot/run number, material number, and the nominal breaking strength of a sample.

4. Wire rope shall be shipped lubricated and with a protective covering, i.e. plastic or cardboard.

¹Union Wire Rope, The Rochester Company, Williamsport Wire Rope, Macwhyte Company, Paulsen Wire Rope Corporation, Wire Rope Corp. Of America, Broderick & Bascom Rope Co., Bridon American Corporation.

Note: This list is not all inclusive and may not include subsidiary companies

6.0 CHAIN SLINGS

a. Requirements include but are not limited to the following:

1. Shall meet or exceed requirements of ASME/ANSI B30.9 and 29 CFR 1910.184.
2. Alloy steel chain slings shall have permanently affixed durable identification stating size, manufacturer's grade, rated load and angle upon which the rating is based, reach, number of legs, and sling manufacturer.
3. Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links or other attachments shall have a rated load of at least equal to that of alloy steel chain with which they are used.
4. All welded components in the sling assembly shall be proof load tested as components or as part of the sling assembly.

5. Hooks attached to chain slings shall meet the requirements of ASME/ANSI B30.10.

6. The welded components of all new slings shall be proof tested by the component or sling manufacturer to twice the rated load.

7. The proof load for multiple leg slings shall be applied to the individual legs and shall be twice the rated load of a single leg sling.

8. A certificate of proof test shall be provided by the manufacturer or supplier referencing the specific sling identification number, date of test, and amount of load applied. (Employer shall retain a certificate of the proof test and shall make it available for examination.)

7.0 SYNTHETIC SLINGS

a. Requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of 29 CFR 1910.184 and ASME/ANSI B30.9.
2. Single leg and endless synthetic -web slings shall be proof tested to 200% of the rated load.
3. Multiple leg bridle slings shall have the proof load applied to the individual legs. The proof load shall be two times the vertical rated load of a single leg sling.
4. A load test certificate (LTC) shall be provided for each lot of slings supplied. The LTC shall reference as a minimum the PO number, date of proof test, amount of load applied, sling capacity, and lot/run number. The LTC shall be signed by the manufacturers authorized representative.
5. Shall be manufactured from webbing specifically constructed for overhead lifting, featuring red core yarns.
6. Webbing shall have the following characteristics:
 - a) Sufficient certified tensile strength to meet the sling manufacturer's requirements;
 - b) Uniform thickness and width;
 - c) Full woven width, including selvage edges;
 - d) Webbing ends shall be sealed by heat, or other suitable means, to prevent raveling
7. Thread used in the manufacture of synthetic web slings shall be the same generic type yarn as the sling webbing.

8. Stitches shall be lock-stitched and preferably continuous. When not continuous, it shall be back-stitched at the ends to prevent raveling.

9. The load-carrying splice shall be sewn with a pattern of sufficient strength to justify the manufacturer's rated capacities.

10. Shall have a minimum design factor of 5.

11. End fittings shall have sufficient strength to sustain twice the rated load of the sling without permanent deformation.

12. Each sling shall be permanently marked with the following:

- a) Manufacturer's name or trademark.
- b) Manufacturer's code or stock number.
- c) Type of synthetic web material.
- d) Rated loads for the type of hitches used.

NOTE: Hand written, or ink embossed markings are not acceptable.

13. The manufacturer shall have on file a written system of sling traceability as well as a quality control procedure. Traceability shall be to specific mill lots.

14. Fabric wear pads should be sewn into the bearing points of the sling eye's. Leather wear pads are not recommended.

15. Product warnings relative to the proper use, care, and maintenance shall accompany the shipment.

8.0 SYNTHETIC POLYESTER ROUND SLINGS

a. Requirements include but are not limited to the following:

1. Slings should meet or exceed requirements of the Web Sling and Tiedown Association, Inc. recommended specification for roundslings made of polyester fibers used for general lifting purposes and shall meet or exceed requirements of ASME B30.9-6.

2. Polyester roundslings including those incorporating welded fittings shall be proof tested to two (2) times the rated capacity.

3. A load test certificate (LTC) shall be provided for each lot of slings supplied. The LTC shall reference as a minimum the PO number, date of proof test, amount of load applied, sling capacity and lot/run number. The LTC shall be signed by the manufacturer's authorized representative.

4. The core(s) shall be formed from one or more ends of yarn, wound together on a plurality of turns. The core(s) should be uniformly wound to ensure even distribution of the load.

PPPL NOTE: Knots or other inclusions which could cause localized stresses or uneven load distribution when placed around a load or on an attachment point shall be avoided. Such inclusions also cause doubt as to the continued use of the roundsling during inspections.

5. The cover(s) should be of the same fiber type as the load bearing core(s). When the cover is a different fiber type than the load-bearing core, follow the manufacturer's recommendations for use.

6. The cover shall be made from one length of material. When the core and cover are of the same fiber, the thread shall also be of that fiber type. When the core and

cover are of different fiber types, the thread should be of the same fiber type as the cover.

8. All stitching shall be lock-stitched type and should be continuous. When not continuous, they shall be backstitched or overstitched to prevent raveling.

9. The design factor for new polyester roundslings and polyester roundslings incorporating fittings shall be a minimum of five (5).

10. Each polyester roundsling shall be permanently marked or labeled showing:

- Name or trademark of manufacturer.
- Manufacturer's code or stock number.
- Rated capacities for the three basic hitches. (vertical, choker, vertical basket)
- Core fiber type - if cover(s) is of a different fiber type, both fiber types shall be identified.
- Length (reach) - bearing point to bearing point.
- A unique identification or serial number

NOTE: "Permanent" means the printing on the label shall be embossed or imprinted such that it shall survive wear and abrasion while in service and remain clear and legible for the life of the sling.

11. Each manufacturer shall internally identify their product with name or trademark for traceability.

12. Endless and eye & eye slings shall be made with a length tolerance of $\pm 1\%$ of the specified length unless "matched length" is specified in which case $1/4"$ is the maximum allowed difference.

9.0 WIRE ROPE SLINGS

a. Requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of 29 CFR 1910.184 and ASME/ANSI B30.9.
2. Wire rope purchased to fabricate slings shall be made in the United States by a member of Wire Rope Technical Board (Except stainless steel). Stainless steel wire rope shall be made in the United States and shall be 302 or 304 Grade stainless steel.
3. Wire rope shall meet the requirements of Federal Specification RR-W-410D or Military Specification MIL-W-83420.
4. Slings shall be either 6 x 19 or 6 x 37 classification.
5. Slings should be made of wire rope produced from EXIPS (Extra Improved Plow Steel) with an IWRC (Independent Wire Rope Center). Consideration may be given to other grades or types of wire rope, dependent upon the type of expected service due to the type of load, hitch, or environment with PPPL approval.
6. Shall have a minimum of 5 to 1 safety factor.
7. Wire rope shall be individually tagged with a durable tag including the following information:
 - a) WLL (Working Load Limit)
 - b) Purchase order number or serial number
 - c) Manufacturer's name or ID
8. Wire rope shall have documentation from the manufacturer traceable to the material furnished and signed by the manufacturer's authorized representative. Documentation shall reference, as a minimum, the PO number, diameter, number of strands, core, lay, grade, manufacturing lot/run number,

master reel number and nominal breaking strength of sample.

9. Wire rope shall have a load test certificate (LTC) for each lot of slings supplied. The LTC shall reference as a minimum the PO number, date of proof test, amount of load applied, sling capacity, & lot/run number, LTC shall be signed by the manufacturer's authorized representative.
10. Mechanical spliced single leg and endless wire rope slings, and swaged socket or poured socket assemblies shall be load tested to two times the rated vertical load.
11. Single leg hand tucked slings shall have a proof load equal to the rated load but shall not exceed 125% of the rated load.
12. The proof load for multiple leg bridle slings shall be applied to the individual legs and shall be either 1.25 for hand tucked splice or 2 for mechanical splice, times the vertical rated load of a single leg sling of the same size, grade, and construction of rope. Any master link to which multiple leg slings are connected shall be proof loaded to 2 times the force applied by the combined legs.
13. Multiple leg bridle slings shall be tagged with a durable tag on the master link indicating the working load limit for the total combined legs for each individual sling in a vertical configuration. The purchase order number or serial number and the manufacturer's ID should be supplied.
14. Wire rope shall be shipped lubricated and with a protective covering, i.e. plastic or cardboard.

10.0 WIRE ROPE CLIPS (Clamps)

a. Requirements include but are not limited to the following:

1. Shall meet or exceed requirements of Federal Specification FF-C-450D.
2. Shall be permanently and legibly marked

with the size and manufacturer's identifying mark.

3. Wire rope clips shall be shipped with application instructions and product warnings for each type or size clip.

11.0 EYE BOLTS

a. Requirements include but are not limited to the following:

1. Eye bolts shall be fabricated from forged carbon or alloy steel and shall meet or exceed the requirements of ASTM specification A489 for "Carbon Steel Eye Bolts" or ASTM F541 "Standard Specification for Alloy Steel Eyebolts." and ANSI/ASME B18.15 "Forged Eye Bolts".

2. Eye bolts used for lifting service shall have the manufacturer's name or identification mark forged in raised characters on the surface of the eyebolt. Alloy steel eye bolts shall have the symbol "A" (denoting alloy) and the manufacturer's name or identification forged in raised letters on the surface of the eyebolt.

3. The safe working load shall have a safety factor of 5.

12.0 HOOKS

a. Requirements include but are not limited to the following:

1. Hooks used for lifting service shall meet or exceed the requirements of ANSI/ASME B30.10.
2. Manufacturer's identification shall be forged cast, or die stamped on a low stress non-wearing area of the hook.

3. When proof tests are used to verify manufacturing process, material, or configuration, hooks shall be able to withstand proof load application, without permanent deformation when a load is applied for a minimum of 15 seconds. Proof loads for hooks up to 50 ton capacity shall be 200% of rated load.

4. Performance testing of hooks shall not be required except where necessary to conform to requirements for the equipment of which they are a part.

13.0 SWIVEL HOIST RINGS

a. Requirements include but are not limited to the following:

1. All hoist rings shall be individually proof load tested to a minimum of 2 times the working load limit, but no more than 2 1/2 times.
2. Shall have a proof load certificate supplied from the manufacturer with each swivel hoist ring.

3. Shall have the manufacturer's name or trademark permanently marked on the swivel hoist ring.

4. Shall have a minimum safety factor of 4, based on ultimate breaking strength.

5. Shall be permanently marked by the manufacturer with the WLL and recommended torque value.

6. Shall be packaged with proper application instructions and warning information.

14.0 HOIST RINGS, PEAR SHAPED LINKS

a. Requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of RR-C-271-D.

Welded rings or links shall be subjected to a nondestructive mag particle test (NDT) and have documentation provided. Note: NDT is not required for forged rings or links.

2. Shall have a minimum safety factor of 5 based on ultimate breaking strength.

3. Rings shall be forged or welded from low alloy steel.

4. Should be marked by the manufacturer with the manufacturer's name or trademark and ring or link size.

15.0 SHACKLES

a. Requirements include but are not limited to the following:

1. Shackles shall meet or exceed the requirements of Federal Specification RR-C-271D.
2. Type of shackles covered by this specification include: Class 1, Round Pin Anchor; Class 2, Screw Pin Anchor; Class 3, Safety Anchor; Class 1, Round Pin Chain; Class 2, Screw Pin Chain; and Class 3, Safety Chain shackles.
3. Shackles shall have minimum 5 to 1 safety factor.
4. Shackle samples shall be subjected to proof loads of two times the working load limit.
5. Grade A shackles (Regular Strength), together with their pins and bolts shall be forged from carbon steel. Grade B shackles (High Strength) together with their pins and bolts shall be forged from alloy steel.

6. Shackle pins shall fit freely without binding and seat properly.

7. Shackles shall be sufficiently ductile so that, when fractured, the fractured member shall show a permanent distortion before breaking.
8. Each shackle body shall be permanently and legibly marked in raised or stamped letters on the side of the shackle bow with the identifying manufacturer's name or trademark, shackle size, and the recommended safe working load.

a) Grade A regular strength shackle pins and bolts shall be unmarked;

b) Grade B high strength shackle pins and bolts shall be marked by the raised or stamped letters "HS" on the head.

c) Shackle markings shall be raised or stamped letters of the maximum height permitted by the size of the shackle component being marked.

16.0 TURNBUCKLES - Type III Rigging

a. Requirements include but are not limited to the following:

1. Turnbuckles used for rigging applications shall meet or exceed the requirements of Federal Specification FF-T-791B, Section 3.9.3.
2. Shall be fabricated from forged alloy steel.
3. Shall be provided with a jam nut of a type that does not depend upon deformation of the threads for security.

4. Certificate of proof test shall be provided by the manufacturer for samples from each lot. Certificate shall indicate as a minimum the size, WLL, test weight, and date of test.

5. Proof test loads shall be a minimum of 200% of the rated capacity.

6. Turnbuckles shall have a minimum safety factor of 5 based on ultimate breaking strength.

7. Manufacturer's name or trademark and turnbuckle size shall be permanently marked on the body of the turnbuckle.

Suspect/Counterfeit Items (S/CI) include both new items deliberately identified as something (quality, brand, class, grade, etc.) other than they are and used or refurbished items represented as new items.

Among the commonly counterfeited items are:

High-strength fasteners of SAE Grades 5, 5.2, 8, 8.2 or ASTM A-325 that do not meet the grade specification indicated by their headmark. U.S. Customs has identified some specific manufacturers and published a Headmark List (Figure 1) identifying these suspect carbon steel bolts. They are all to be considered unacceptable for high-strength applications.

Counterfeit High-strength stainless steel bolts have been identified at DOE sites. In these cases, bolts had raised grade markings of either 18-8 or 304 plus hand-stamped markings of B8 (indicating heat treatment for higher strength). It turned out these had only been stamped, not heat-treated. While hand-stamping of the B8 designation is acceptable, it is unusual and should be cause to consider the bolt suspect unless it has otherwise been authenticated. All high strength bolts should be purchased with certified test results.

Overstamped ratings on slings, hooks, flanges, fittings, and other hardware - In these cases hardware, often used, has a new rating stamped over the old rating and re-sold. Sometimes the old rating is ground first and sometimes simply stamped over. Consider all re-stamped ratings as indications of suspect items.

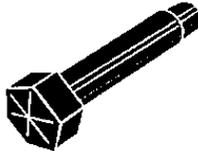
Manufactured counterfeits – Items manufactured to look like a brand-name component such as a strut painted a similar green to that used by a well-known manufacturer, but not bearing that manufacturer’s logo and, on close inspection, not of the same quality.

Molded case circuit breakers and other electrical components - Typically, used items are cosmetically refurbished and sold as new. The marked rating may differ from the original rating. Familiarity with good breakers is the best way to identify fraudulent ones.

More information about suspect parts is available by contacting PPPL QA or on the web page at: <http://www-local.pppl.gov/qa/SCI/SCI.shtml>

DOE Headmark List

ANY BOLT ON THIS LIST SHOULD BE TREATED AS DEFECTIVE WITHOUT FURTHER TESTING.



ALL GRADE 5 AND GRADE 8 FASTENERS OF FOREIGN ORIGIN WHICH DO NOT BEAR ANY MANUFACTURERS' HEADMARKS:



GRADE 5



GRADE 8

GRADE 5 FASTENERS WITH THE FOLLOWING MANUFACTURERS' HEADMARKS:

<u>MARK</u>	<u>MANUFACTURER</u>	<u>MARK</u>	<u>MANUFACTURER</u>
 J	Jinn Her (TW)	 KS	Kosaka Kogyo (JP)

GRADE 8 FASTENERS WITH THE FOLLOWING MANUFACTURERS' HEADMARKS:

<u>MARK</u>	<u>MANUFACTURER</u>	<u>MARK</u>	<u>MANUFACTURER</u>
 A	Asahi Mfg (JP)	 KS	Kosaka Kogyo (JP)
 NF	Nippon Fasteners (JP)	 RT	Takai Ltd (JP)
 H	Hinomoto Metal (JP)	 FM	Fastener Co of Japan (JP)
 M	Minamida Sleybo (JP)	 KY	Kyoel Mfg (JP)
 MS	Minato Kogyo (JP)	 J	Jinn Her (TW)
 Hollow Triangle	Infasca (CA TW JP YU) (Greater than 1/2 inch dia.)		
 E	Dalai (JP)	 UNV	Unytite (JP)

GRADE 8.2 FASTENERS WITH THE FOLLOWING HEADMARKS:

<u>MARK</u>	<u>MANUFACTURER</u>
 KS	Kosaka Kogyo (JP)

GRADE A325 FASTENERS (BENNETT DENVER TARGET ONLY) WITH THE FOLLOWING HEADMARKS:

	<u>MARK</u>	<u>MANUFACTURER</u>
Type 1	 A325 KS	Kosaka Kogyo (JP)
Type 2	 A325 KS	
Type 3	 A325 KS	

Key: CA-Canada, JP-Japan, TW-Taiwan, YU-Yugoslavia

