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## 4.0 PERSONNEL QUALIFICATIONS AND TRAINING REQUIREMENTS

### 4.1 SCOPE

This section specifies qualification and training requirements for personnel with the following responsibilities:

1. Direct hoisting and rigging (H&R) activities
2. Supervise H&R activities
3. Perform H&R activities
4. Inspect and maintain H&R equipment
5. Provide technical approval of procedures, lift plans or work instructions for H&R activities
6. Develop lift plans
7. Provide signals for H&R activities
8. Train and evaluate personnel for H&R activities and equipment operation
9. Provide safety oversight
10. Perform H&R engineering functions

Contracting organizations shall review, verify, and document that subcontractors have an acceptable training and qualification program. The contracting organization shall ensure that the program meets the requirements of this section to ensure that personnel are qualified to perform work covered by this Manual.

**NOTE:** Refer to 29 CFR 1926, Subpart R, for special H&R requirements relating to steel erection.

### 4.2 GENERAL

#### 4.2.1 Program Requirements

Personnel shall be trained and qualified to a level of proficiency consistent with their assigned tasks. Managers responsible for work assignments shall ensure that work assignments do not exceed personnel qualifications. Posting a list of qualified operators adjacent to or on appropriate equipment is recommended.

#### 4.2.2 Qualification Prerequisites

Personnel whose work falls within the scope of this Manual shall meet the following qualifications.

1. Be at least 18 years old
2. Be able to communicate in written and spoken English
3. Be able to meet the physical requirements of the job assignment

### 4.2.3 Physical Examination and Substance Abuse Testing Requirements

#### 4.2.3.1 Physical Examination Requirements for Mobile Locomotive, and Cab- or Pulpit-Operated Overhead Crane Operators

Before operating mobile, locomotive, and cab- or pulpit-operated overhead cranes, operators, operator trainees, maintenance personnel, and inspectors shall pass a crane operator physical examination initially and at least every 36 months thereafter. The physical examination shall meet the requirements of the American Society of Mechanical Engineers (ASME) B30.2, B30.17, and B30.5. The operator shall retain evidence of successfully passing the physical examination.

A mobile crane operator who successfully passes a commercial motor vehicle (CMV) driver's physical in accordance with the requirements of 49 CFR 391 Subpart E, *Physical Qualification and Examination*, satisfies the crane operator physical exam requirements.

**NOTE:** *A company's contract, agreement, and/or memorandum of understanding regarding physical examinations will determine the medical examiner chosen to perform the physical examination. In general, the Site Occupational Medical Director will clear all medical examinations.*

#### 4.2.3.2 Substance Abuse Testing for Mobile Crane Operators

Mobile or locomotive crane operators, operator trainees, maintenance personnel, and inspectors shall pass, with a negative result, a substance abuse test initially and at least every 36 months thereafter. A recognized laboratory shall perform the test.

#### 4.2.4 Substance Abuse Testing for Commercial Motor Vehicle Drivers

The CMV definition found in 49 CFR 383.5 (see Appendix A, "commercial motor vehicle," for the definition), shall apply to truck-mounted mobile cranes and forklifts designed for highway use with a gross vehicle weight rating of 26,001 lb or more.

CMV drivers are subject to substance abuse testing independent of the mobile crane operator's substance abuse testing requirements (see Section 4.2.3.2). The same substance abuse test can meet both CMV and crane operator requirements, but the crane operator must be retested at least every 36 months.

### 4.3 TRAINING AND QUALIFICATION PROGRAMS

Contractors shall have a documented training and qualification program that includes the following elements.

1. Classroom or computer-based training
2. Written tests
3. On-the-job training (OJT) (see Section 4.3.3)
4. On-the-job evaluations (OJE) (see Section 4.3.4)
5. Established and documented pass/fail criteria (see Section 4.5)

The Hanford Hoisting and Rigging Training Program Description is located at:

[http://www.hanford.gov/files.cfm/HR\\_TPD.pdf](http://www.hanford.gov/files.cfm/HR_TPD.pdf)

### 4.3.1 Previous Training and Qualification

Documented evidence of previous training or experience may be accepted to meet training requirements.

1. Previous training or experience may include the following:
  - a. Vendor or equipment manufacturer training
  - b. Completion of an apprenticeship program
  - c. Journeyman status in an applicable trade
2. For previous training to be acceptable for Hanford Site qualification, documented evidence of the topics listed in Appendix A of this chapter shall be included, along with the type and class of equipment operated. For qualifications not related to equipment operation, personnel shall have documented evidence of training related to an activity covered by this Manual. Previous training must include a written knowledge test. As a minimum, documented evidence may be any of the following.
  - a. Certificates of training (See Note 4.1)
  - b. Journeyman card or documents issued by a trade union
  - c. A degree or accreditation from a college or trade school
3. When previous training or experience are reviewed for compliance to this manual, accepted and documented, personnel shall be considered qualified after they have satisfactorily completed an On-the-Job Evaluation (OJE) for the equipment or activity being performed. Operators of mobile locomotive and cab- or pulpit-operated overhead cranes shall have met the Physical Examination and Substance Abuse Testing requirements identified in 4.2.3.
4. When previous training or experience is reviewed for compliance to this manual and not accepted, personnel will be required to complete the applicable Hanford Site approved course, the applicable challenge examination for the approved course, or an off-site course that meets the requirements of this manual.

### 4.3.2 Training Subjects

Appendix A, *Training Subject Content by Activity and/or Equipment*, contains subjects (listed by qualification area) that should be included in the training process. All approved courses must include a written knowledge test

### 4.3.3 On-the Job Training

Contractors shall make OJT available for crane and forklift operators. If a forklift or crane operator will use attachments, the OJT shall include installation and use of approved attachments (Example: Forklift boom and barrel-handling attachments and crane jibs and boom extensions). Personnel shall satisfy training requirements (see Appendix A, *Training Subject Content by Activity and/or Equipment*) before performing OJT. The OJT shall be based on the equipment manufacturer's operating instructions, typical tasks, operating environment, and facility or contractor-specific procedures.

The OJT shall provide training and practice under the direct supervision of a qualified operator or qualified OJT instructor in the appropriate work environment, using the appropriate OJE forms of Section 4.3.4. Complexity of equipment and tasks, along with the operator's experience shall determine the need

for OJT. Management may allow previously qualified or experienced personnel to bypass the OJT and undergo an OJE (see Section 4.3.4).

#### 4.3.4 On-the-Job Evaluations

Sections 4.3.4.1 through 4.3.4.4 contain classes of cranes, forklifts, or H&R activities that require personnel to pass an OJE before being granted qualifications. The OJEs shall have pass and fail criteria, and shall require personnel to demonstrate that they have the knowledge and skills to safely operate equipment or perform the H&R function. Personnel shall be evaluated for each type and class of equipment they operate. Personnel who pass an evaluation for a type and class of equipment are considered qualified on all equipment of the same type and class. Contractors, facilities, and organizations may choose to implement additional facility-specific OJT and/or OJE requirements.

OJEs are required to be documented. As a minimum, documentation shall contain:

1. The name and signature of the person being evaluated
2. Name and signature of the qualified evaluator
3. Evaluation score
4. Instructions for the evaluator and the person being evaluated
5. Type and class of equipment or activity
6. Attachments
7. Date of the evaluation

Examples of OJE forms can be found on the Hanford Intranet at <http://apweb01.rl.gov/siteforms/>.

##### 4.3.4.1 Powered Industrial Trucks

Personnel are qualified to operate powered industrial trucks according to the following designations. See Chapter 6.0, *Forklift Trucks*, for sample views of each industrial truck class designation.

#### **Class    Powered Industrial Truck Type**

- |       |  |
|-------|--|
| 1 & 2 | Electric motor, sit-down and stand-up rider, counter balanced, and narrow-isle trucks, solid and pneumatic tires |
| 3     | Electric motor, hand trucks or hand/rider trucks, solid tires  |
| 4 & 5 | Internal combustion engine trucks, solid and pneumatic tires   |
| 6     | Electric and internal combustion engine tractors, solid and pneumatic tires                                      |
| 7     | Rough terrain vertical-mast forklift trucks.   |
| 8     | Rough terrain telescopic boom forklift trucks  |

#### 4.3.4.2 Overhead Cranes

Personnel are qualified to operate overhead cranes according to the following designations:

Class	Overhead Crane Type
1	Overhead cranes, floor-operated (Facilities may designate specific qualifications to selected cranes.)
2	Overhead cranes, cab-operated.

#### 4.3.4.3 Mobile Cranes

Personnel are qualified to operate mobile cranes according to the following designations:

Class	Mobile Crane Type
1	Lattice boom truck cranes (multiple control stations)
2	Lattice boom crawler cranes
3	Telescopic boom cranes, (single control stations)
4	Telescopic boom cranes, ((multiple control stations)
5	Commercial truck-mounted crane telescoping boom
6	Commercial truck-mounted crane non-telescoping boom
7	Telescoping boom crawler crane
8	Lattice boom wheel mounted (single control station)
9	Telescoping boom fixed control station (non-rotating operator cab)
10	Locomotive cranes

#### 4.3.4.4 Training and Evaluation

Personnel are qualified to perform H&R OJT instruction or evaluation once they are designated as an On-the-Job Training Instructor or an On-the-Job Evaluator.

#### 4.3.5 Qualification

Personnel shall be considered qualified when they accomplish the following:

1. Satisfactorily complete Hanford Site approved training, testing, and qualification or meet the requirements of previous training (see Section 4.3.1)
2. Satisfactorily complete equipment specific On-the-Job Training (OJT) for equipment operators. Management may determine that previous qualification or experience fulfills the requirement for OJT.
3. Pass an equipment specific OJE for personnel performing rigging activities and equipment operators.

### 4.3.6 Requalification

#### 4.3.6.1 Requalification Frequencies

Personnel who perform any of the following tasks shall requalify in those task areas every 60 months:

1. Use rigging or perform rigging activities
2. Function as a designated lead (DL)/lift director
3. Perform OJEs
4. Operate mobile cranes, overhead cranes, and monorails
5. Develop lift plans
6. Perform signal person duties for H&R activities
7. Perform periodic document inspections of equipment
8. Provide technical approval of lift procedures
9. Provide safety oversight of H&R operations
10. Supervise or direct H&R operations (includes DLs/lift directors)
11. Perform activities as an equipment custodian
12. Maintenance, inspection, or repair personnel who operate mobile cranes, cab- or pulpit-operated overhead cranes

Personnel who operate forklifts shall requalify every 36 months.

**NOTE:** *It is recommended that personnel who have not performed work or operated equipment, for which they were trained and qualified, for 12 continuous months be requalified.*

#### 4.3.6.2 Requalification Methods

Personnel performing the following activities may be requalified by the methods indicated. Personnel, who do not satisfactorily complete requalification by an identified method, shall complete training as listed in Sections 4.3.1.3.

Activity	Requalification Method
Powered industrial trucks (forklifts) operation.	OJE
Overhead crane and monorail operation.	OJE
Mobile crane operation (includes maintenance repair or inspection personnel who operate mobile cranes) and advanced rigging activities.	OJE
Incidental rigging (using slings, rigging hardware, hoists, and below-the-hook lifting devices).	OJE
Inspect mobile or overhead cranes (mechanical or electrical), forklifts, wire rope, rigging hardware, below-the-hook lifting devices, hooks, and hoists.	OJE or written test

Approving technical lift procedures, acting as Designated Leader for, Safety Oversight or supervision of hoisting and rigging operations. OJE or written test

Acting as equipment custodian. Written test

On-the-job training or evaluation of personnel. – Note: - On-the-job Trainers and Evaluators must maintain and demonstrate both their instructional proficiency and technical proficiency. Written test or OJE.

#### 4.4 RETRAINING

Retraining shall consist of satisfactorily completing training requirements for that activity or equipment (see note in paragraph 4.3.6). Personnel shall be retrained when any of the following occurs:

1. Equipment with new operating characteristics is acquired
2. Existing equipment is modified, changing the operation characteristics
3. Personnel receive an unsatisfactory performance evaluation
4. Changes in standards or requirements occur that could affect safety
5. Personnel are directly involved in a documented incident that compromises safety of personnel, equipment, or the environment in the performance of H&R activities
6. Personnel performance is determined to be unsatisfactory or diminished skill level is observed

#### 4.5 WRITTEN AND PERFORMANCE TESTS

Written, oral, and performance tests shall have established pass/fail criteria, be developed using the guidance in DOE-HDBK-1205-97, *Guide to Good Practices for Design Development and Implementation of Examinations*, and DOE-HDBK-1206-98, *Guide to Good Practices for on-the-Job Training*, and require students to demonstrate knowledge and skills identified by training objectives.

#### 4.6 TRAINING AND QUALIFICATION RECORDS

##### 4.6.1 Training Completion Records

Training completion records (TCR) shall:

1. Be maintained by the issuing organization or employer for the duration of qualification
2. Contain written examinations and performance evaluation of knowledge and skills
3. Contain documentation supporting evaluation of previous training and qualifications, when applicable
4. Indicate the activity and/or equipment type and class for which qualification was issued
5. Contain the name of the qualified individual and the date the qualification was issued
6. Contain the name and signatures of instructors and students, and the date instruction was given
7. Contain the name and signature of the evaluator, the person evaluated, and the date the evaluation was conducted

#### **4.6.2 Course Records**

The following documents are considered course records:

1. Course description
2. Current lesson plans
3. Student handouts, if applicable
4. Performance evaluations
5. Written examinations or the bank of test questions

#### **4.6.3 Qualification Cards**

Qualified personnel may be issued cards identifying their equipment/activity qualifications. Information on these cards shall be derived from and supported by training and qualification records (see Section 4.6.1). If used, these cards shall contain the following information:

1. Activity covered by the qualification
2. Type of equipment or activity
3. Class of equipment
4. Date of training and/or evaluation
5. Name of qualified individual
6. Signature of qualified individual
7. Name and signature of the OJT instructor
8. Name and signature of the OJT evaluator

## Appendix A Training Subject Content by Activity and/or Equipment

### A. Powered Industrial Truck (Forklift) Operation

Training for operation of powered industrial trucks (forklifts) is divided into three categories and should cover the following:

#### 1. Fundamentals

- a. Inspection and maintenance
- b. Responsibilities
- c. Standards
- d. Operating instructions, warnings, precautions, etc.
- e. Braking methods and characteristics
- f. Visibility with and without a load
- g. Stability characteristics to include center of gravity, stability triangle (with and without a load or attachments), requirement and approvals for using attachments
- h. Controls: location, function, methods of operation, identification of symbols
- i. Load-handling capabilities of forks and attachments
- j. Fueling and battery charging
- k. Guards and protective devices
- l. Difference between industrial trucks and automobiles
- m. Engine or motor operation
- n. Steering and maneuvering
- o. Other characteristics

#### 2. Operating Environment

- a. Floor or ground conditions, including temporary conditions
- b. Ramps and inclines, with and without a load
- c. Trailers, railcars, and dock boards, including the use of wheel chocks, jacks, or other securing devices
- d. Fueling and battery-charging facilities
- e. Use of "classified" trucks in areas classified as hazardous because of a risk of fire or explosion, as defined in ANSI/NFPA 505
- f. Narrow aisles, doorways, overhead wires, piping, and other areas of limited clearance
- g. Areas where the truck may be operated near other powered industrial trucks or vehicles
- h. Operation near pedestrians
- i. Use and capacities of elevators
- j. Operation near the edge of a dock or improved surface
- k. LP gas bottle change-out
- l. Other special operating conditions and hazards that could be encountered.

#### 3. Operation

- a. Proper pre-shift inspection and the approved method for removing a truck in need of repair from service
- b. Fork/tine adjustments
- c. Load-handling techniques (lifting, lowering, picking up, placing, and tilting)

- d. Traveling with a load, without a load, and turning corners
- e. Parking and shutdown procedures
- f. Other special operating conditions for the specific application
- g. Operating safety rules and practices (e.g. Designated Leader [DL]/lift director assignment)
- h. Other rules, regulations, or practices required by the employer at the location where the powered truck will be used
- i. LP gas bottle change-out
- j. Lessons learned
- k. Hand Signals
- l. Operating near power lines

### **B. Forklift Inspection and Maintenance**

Training for forklift inspection and maintenance should cover the following:

1. Inspection criteria
2. Determining who can make repairs
3. Fork inspection criteria
4. Forklift testing criteria
5. Hydraulic systems
6. Capacity, operational, maintenance, and name plate requirements
7. Rated capacity
8. Stability criteria
9. Maintenance and rebuilding practices
10. Forklift type
11. Controls
12. Operating mechanism
13. Components and attachments
14. Safety and warning devices
15. Operating instructions
16. Modifications requirements
17. Replacement parts and suspect counterfeit items.

### C. Wire Rope and Rigging Hardware Inspection and Maintenance

Training for wire rope and rigging hardware inspection and maintenance is divided into four categories and should cover the following:

#### 1. Wire Ropes

- |  |                               |
|--|-------------------------------|
| a. Manufacturer recommendations                        | l. Terminal end               |
| b. Standards   | m. Installation               |
| c. Lift service return inspections                     | n. Before initial load cycle  |
| d. Wire rope replacement criteria                      | o. Initial load cycle         |
| e. Work site receipt                                   | p. New rope stretch           |
| f. Rope storage  | q. Fastener verification      |
| g. Unreeling, cutting, seizing                         | r. Replacement documentation  |
| h. Lubrication type and frequency                      | s. Rope qualification         |
| i. Replacement   | t. Lessons learned            |
| j. Extra-long rope                                     | u. Suspect counterfeit items. |
| k. Frequent, monthly, and periodic inspection criteria |                               |

#### 2. Slings

- |   |                              |
|---|------------------------------|
| a. Documentation                              | o. End attachments           |
| b. Standards                                  | p. Replacement               |
| c. Defective slings                           | q. Cautions and prohibitions |
| d. Rated loads                                | r. Fabrication               |
| e. Sling identification                       | s. Coatings                  |
| f. Effects of environment                     | t. Design factors            |
| g. Attachments                                | u. Removal criteria          |
| h. Operating practices                        | v. Construction              |
| i. Proof test                                 | w. Webbing                   |
| j. Repairs                                    | x. Fittings                  |
| k. Minimum lengths                            | y. Marking                   |
| l. Rope grades                                | z. Suspect counterfeit items |
| m. Rope properties                            | aa. Lessons learned          |
| n. General guidelines and inspection criteria |                              |

#### 3. Hooks

- |   |   |
|---|---|
| a. New hooks                                  | h. Rigging Hardware                           |
| b. Standards                                  | i. Marking and tagging                        |
| c. Throat latches                             | j. Inspection criteria                        |
| d. Frequent inspection criteria and intervals | k. Periodic inspection criteria and intervals |
| e. Proof load testing and tagging             | l. Qualification standards                    |
| f. Inspection records                         | m. Lessons learned                            |
| g. Nondestructive testing                     | n. Suspect counterfeit items                  |

**4. Below-the-Hook Lifting Devices**

- |   |   |
|---|---|
| a. Design factors                             | l. Suspect counterfeit items                              |
| b. Standards                                  | m. Inspection records                                     |
| c. Welding                                    | n. Repairs  |
| d. Guarding                                   | o. Preventive maintenance                                 |
| e. Electrical                                 | p. Replacement parts                                      |
| f. Analysis                                   | q. Testing  |
| g. Marking                                    | r. Operational tests                                      |
| h. Modifications                              | s. Rated load test  |
| i. Initial inspection                         | t. Manufacturers certification in lieu of rated load test |
| j. Frequent inspection criteria and intervals | u. Periodic inspection criteria and intervals             |
| k. Service classifications                    | v. Lessons learned  |

**D. Overhead Crane Operation**

Training for overhead crane operation should cover the following:

- |   |   |
|---|---|
| 1. Load and capacity  | 11. Suspect counterfeit items             |
| 2. Math skills  | 12. Operator conduct and responsibilities |
| 3. Crane-specific information                                 | 13. Operating practices                   |
| 4. Standards  | 14. Attaching the load                    |
| 5. Operational characteristics                                | 15. Holding the load                      |
| 6. Crane performance  | 16. Moving the load                       |
| 7. Prestart and post-start inspections                        | 17. Personnel lifting                     |
| 8. Maneuvering and maneuvering skills                         | 18. Signaling and signals                 |
| 9. Shutdown and securing procedures                           | 19. Lessons learned                       |
| 10. Crane manufacturer operation and maintenance instructions | 20. DL/lift director assignment           |

**E. Overhead Crane Inspection and Maintenance**

Training for overhead crane inspection and maintenance should cover the following:

1. Inspection classification
2. Standards
3. Frequent inspection criteria and intervals
4. Periodic inspection criteria and intervals
5. Determination of conditional hazards
6. Operating mechanisms (including remote operating systems, if applicable)
7. Upper-limit devices
8. Tanks, valves, pumps, lines, and other parts of air or hydraulic systems
9. Hooks and hook latches
10. Hoist ropes and end connections
11. Spooling of rope on drums and sheaves
12. Deformed, cracked, or corroded members
13. Bolts, nuts, pins, or rivets
14. Suspect counterfeit items

15. Sheaves and drums
16. Pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices
17. Bumpers and stops
18. Brake system parts
19. Drive sprockets and excessive drive chain stretch
20. Controllers, master switches, contacts, limit switches, and push-button stations
21. Wind indicators
22. Gasoline, diesel, electric, or other power plants
23. Motion limit devices
24. Rope reeving
25. Function, instruction, caution, and warning labels or plates
26. Cranes not in regular service
27. Inspection records
28. Operational tests for new, reinstalled, altered, repaired, or modified cranes
29. Rated load test
30. Preventive maintenance
31. Maintenance procedure(s)
32. Adjustments, repairs, and replacements
33. Lubrication
34. Rope inspection (see Section C)
35. Lessons learned

#### **F. Overhead Mechanical and Electrical Hoist Maintenance**

Training for overhead mechanical and electrical hoist maintenance should cover the following:

- |  |  |
|--|--|
| 1. Inspection classification                             | 9. Preventive maintenance                                      |
| 2. Standards   | 10. Maintenance procedure                                      |
| 3. Hoists not in regular service                         | 11. Adjustments, repairs, and replacements                     |
| 4. Periodic inspection criteria and intervals            | 12. Lubrication  |
| 5. Roller chain inspection, maintenance, and replacement | 13. Rope inspection and maintenance (see Section C)            |
| 6. Frequent inspection criteria and intervals            | 14. Welded-link chain inspection, maintenance, and replacement |
| 7. Operational tests                                     | 15. Suspect counterfeit items                                  |
| 8. Load test   | 16. Lessons learned  |

#### **G. Riggers/Signal Persons**

Training for rigging activities should cover the following:

- |   |  |
|---|--|
| 1. Capacities                           | 17. Emergency response   |
| 2. Math skills                          | 18. Critical lift requirements   |
| 3. Design factors                       | 19. Standards  |
| 4. Sling angles and effects on capacity | 20. Signaling and signals  |
| 5. Load weight calculations             | 21. Lessons learned  |
| 6. Definitions                          | 22. Calculating sling loading using load angle factors, D/d ratios, and multi-leg slings |

- |  |  |
|--|--|
| 7. Load center of gravity, effects and determination       | 23. Calculating the center of gravity and determining pick points for symmetrically and unsymmetrically shaped loads |
| 8. Inspections   | 24. Performing flagging, setup, and working with mobile cranes   |
| 9. Slings, types and applications                          | 25. Working from suspended platforms   |
| 10. Rigging hardware, types and applications               | 26. Working near energized sources and power lines   |
| 11. Below-the-hook lifting devices, types and applications | 27. Assembling and disassembling lattice boom cranes and box-boom extensions and jibs                                |
| 12. Safety requirements                                    | 28. Performing critical lifts and two-crane lifts  |
| 13. Safe H&R practices                                     | 29. Performing H&R in hostile environments.  |
| 14. Attaching the load                                     | 30. DL/lift director assignment  |
| 15. Moving the load  | 31. Crush/pinch points/struck-by hazards   |
| 16. Rigger responsibilities                                |  |

## H. Mobile Crane Operation

Training for mobile crane operation should cover the following:

- |  |   |
|--|---|
| 1. Mobile crane operation and setup                                      | 15. Operating practices                 |
| 2. Load and capacity chart calculations in various configurations        | 16. Attaching the load                  |
| 3. Load moment indicators (LMI)  | 17. Holding the load                    |
| 4. Math skills   | 18. Moving the load                     |
| 5. Crane-specific and cab information                                    | 19. Personnel lifting                   |
| 6. Standards   | 20. Signaling and signals               |
| 7. Operational characteristics   | 21. Operating near power lines          |
| 8. Controls and emergency control skills for fire and power-line contact | 22. Traveling with and without a load   |
| 9. Crane performance and stability                                       | 23. Suspect counterfeit items           |
| 10. Prestart and post-start inspections                                  | 24. Footing                             |
| 11. Maneuvering and maneuvering skills                                   | 25. DL/lift director assignment         |
| 12. Shutdown and securing procedures                                     | 26. Refueling procedure                 |
| 13. Crane manufacturer operation and maintenance instructions            | 27. Lessons learned                     |
| 14. Operator conduct and responsibility                                  | 28. Operator aids.                      |
|  | 29. Crush/pinch points/struck-by hazard |

**NOTE:** For other crane types see Chapter 1.0, Introduction.

## I. Mobile Crane Inspection and Maintenance

Training for mobile crane inspection and maintenance shall include requirements and applicable subjects of Section H, "Mobile Crane Operation," if inspection and maintenance personnel operate mobile cranes in performance of their duties. Training for mobile crane inspection and maintenance should cover the following subjects:

- |                              |   |
|------------------------------|---|
| 1. Inspection classification | 23. Travel steering, braking, and locking devices |
|------------------------------|---|

- |   |   |
|---|---|
| 2. Standards  | 24. Hydraulic and pneumatic hose fittings and tubing inspection |
| 3. Control mechanisms adjustments   | 25. Excessive abrasion or scrubbing of the outer surfaces       |
| 4. Control mechanisms for excessive wear of components                    | 26. Hydraulic and pneumatic pumps, valves, and motors           |
| 5. Control mechanisms contamination by lubricants or other foreign matter | 27. Hydraulic filters   |
| 6. Safety mechanisms for malfunction                                      | 28. Cranes not in regular use                                   |
| 7. Hydraulic hoses  | 29. Inspection records  |
| 8. Hooks and latches  | 30. Operator aids   |
| 9. Rope reeving   | 31. Operational tests   |
| 10. Electrical apparatus  | 32. Crush/pinch points/struck-by hazards                        |
| 11. Hydraulic system  | 33. Rated load test   |
| 12. Tires   | 34. Preventive maintenance                                      |
| 13. Crane structure and boom  | 35. Maintenance procedure                                       |
| 14. Suspect counterfeit items   | 36. Adjustments and repairs                                     |
| 15. Bolts or rivets   | 37. Functional operating mechanisms                             |
| 16. Sheaves and drums   | 38. Safety devices  |
| 17. Pins, bearings, shafts, gears, rollers, and locking devices           | 39. Control systems   |
| 18. Brake and clutch system, parts, linings, pawls, and ratchets          | 40. Braking systems   |
| 19. Load, boom angle, and other indicators                                | 41. Lubrication   |
| 20. Gasoline, diesel, electric, or other power plants                     | 42. Rope inspection (see Section C)                             |
| 21. Chain drive sprockets and chain                                       | 43. Lessons learned   |
| 22. Crane hooks   |   |

### J. Equipment Custodian

Training for equipment custodians should cover the following:

- |  |   |
|--|---|
| 1. Verification of current maintenance | 5. Record keeping   |
| 2. Standards                           | 6. Proper tagging and removal from service                |
| 3. Verification of current inspection  | 7. Elements of this manual for the assigned equipment     |
| 4. Verification of current testing     | 8. Manufacturer's operating and maintenance instructions. |

### K. Designated Leader (DL)/Lift Director

Training for DLs/lift directors should cover the following:

- |  |   |
|--|---|
| 1. Preparation of critical lift procedures     | 7. Equipment selection                                      |
| 2. Standards                                   | 8. Equipment setup and positioning                          |
| 3. Proper approval of critical lift procedures | 9. Work area overview                                       |
| 4. Documented pre-lift meeting                 | 10. Directing operations                                    |
| 5. Flagger assignment and identification       | 11. Elements of this Manual for the work and equipment used |
| 6. Personnel qualification                     |   |

**L. Supervisor**

Training for supervisors should cover the following:

1. Qualified personnel for equipment operation
2. Standards
3. Safe operation of equipment
4. Preplanned and approved H&R instructions
5. Proper tagging of unsafe or restricted-use equipment
6. Custodian notifications
7. DL/lift director assignments
8. Elements of this Manual for work assignments of the assigned crew

**M. Lift Procedure Technical Approver/Lift Plan Developer**

Training for technical approvers/lift plan developers should cover the following:

1. Chapter 3, *Critical and Special Lifts*, of this Manual
2. Elements of this Manual for the work to be done and equipment to be used. For subjects refer to each category of equipment and activity listed in Appendix A, *Training Subject Content by Activity and/or Equipment*, of this Chapter.

**N. On-the-Job Training Instructor**

OJT instructors shall have the technical information in the subject area of training assignments and should be trained in the following:

1. OJT techniques
2. Demonstrations
3. Hands-on exercises
4. Performance evaluation
5. Use of OJT forms
6. Records management

**O. On-the-Job Evaluator**

On-the-job evaluators shall have the technical information on the subject area of evaluations, be qualified to perform OJEs of proper operator actions, and should be trained in the following:

1. Evaluation techniques
2. Test administration
3. Performance evaluation
4. Use of OJE forms
5. Records management

**P. Classroom Instructors**

Classroom instructors presenting training on subjects identified in Appendix A, *Training Subject Content by Activity and/or Equipment*, of this chapter shall be technically competent and trained in the following instructional areas

1. Standards
2. Instructional techniques
3. Test administration
4. Instructional materials and media
5. Learning Objectives
6. Lesson plans
7. Lessons learned in subject area
8. Concepts of systematic approach to training
9. Principles of learning
10. Records Management

### Q. Safety Oversight

Training for personnel responsible for safety oversight of hoisting and rigging activities should cover the following:

1. General safety standards related to H&R activities.
2. The DOE/RL-92-36 Hanford Site Hoisting and Rigging Manual content overview and pertinent safety requirements for personnel and equipment.

### R. Rigging Engineer

Candidates for rigging engineers should have a minimum of two years experience in H&R related work. **(NOTE: Designation as a rigging engineer does not qualify personnel to perform design calculations. A Registered Professional Engineer (RPE) typically performs design calculations of hoisting and rigging equipment.)**

Training for Rigging Engineers shall cover the following:

1. The contents of this Manual
2. The OSHA and ASME standards referenced in Chapter 21, *References and Bibliography*, of this Manual
3. Reviewing structural calculations of lift points or lifting devices to determine compliance to applicable standards
4. Personnel assignments and responsibilities
5. Critical and special lift criteria
6. Slings, rigging hardware, and below-the-hook lifting devices characteristics and design factors
7. Slings, rigging hardware, and below-the-hook lifting devices removal from service criteria
8. Mobile cranes, hoists, overhead cranes, and forklift operational characteristics, setup, and operation
9. Mobile cranes, hoists, overhead cranes, and forklift testing and inspection requirements and removal from service criteria
10. Mobile cranes, hoists, overhead cranes, and forklift attachments and effects on capacities
11. Mobile crane load chart calculations and capacities for specific configurations
12. Rope re-reeving
13. Suspended platform use and requirements
14. Working around electrical energized sources requirements
15. Crane, forklift, and rigging rated/proof load testing requirements
16. Calculating slings and rigging hardware loading and effects on capacity
17. Load weight calculations
18. Determining pick points
19. Calculating load center of gravity
20. Safe H&R practices

**S. Assembly / Disassembly Director**

Training for personnel responsible for Assembly/Disassembly of cranes activities shall cover the following:

1. Assembly/Disassembly procedures
2. Reviewing procedures
3. Blocking material
4. Crew instructions
5. Proper location of blocking
6. Verifying assist crane loads
7. Tasks, assignments, and associated hazards
8. Boom and jib pick points
9. Hazardous positions/locations during assembly and disassembly
10. Center of gravity
11. Protecting assembly/disassembly crew members out of operator view
12. Snagging
13. Working under the boom, jib, or other components
14. Stability upon pin removal
15. Capacity limits
16. Struck by counterweights
17. Addressing specific hazards
18. Boom hoist brake failure
19. Site and ground bearing conditions
20. Loss of backward stability
21. Wind speed and weather
22. Weight of components
23. Components and configuration
24. Manufacturer instructions
25. Post-assembly inspection
26. Shipping pins
27. Outriggers and Stabilizers
28. Rigging
29. Dismantling (including dismantling for changing the length of booms and jibs)
30. Assembly/Disassembly—employer procedures
31. Power line safety during assembly/disassembly operations

**T. Mobile Crane Operator and Personnel Assigned to Work Around and with Mobile Cranes**

Mobile Crane Operators and personnel assigned to work around and with mobile cranes shall receive training for working around power lines that, as a minimum, includes the following:

1. The procedure to be followed in the event of electrical contact with a power line. Such training must include:
  - a. Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.
  - b. The importance to the operator's safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.
  - c. The safest means of evacuating from equipment that may be energized.
  - d. The danger of the potentially energized zone around the equipment (step potential).
  - e. The need for crew in the area to avoid approaching or touching the equipment and the load.
2. Safe clearance distance from power lines.
3. Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been, and continues to be, de-energized and visibly grounded at the worksite.
4. Power lines are presumed to be un-insulated unless the utility owner/operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.
5. The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.
6. The procedures to be followed to properly ground equipment and the limitations of grounding.

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