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## 4.0 PERSONNEL QUALIFICATIONS AND TRAINING REQUIREMENTS

### 4.1 SCOPE

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

1. Direct hoisting and rigging activities
2. Supervise hoisting and rigging activities
3. Perform hoisting and rigging activities
4. Inspect and maintain hoisting and rigging equipment
5. Provide technical approval of procedures for hoisting and rigging activities.
6. Train and evaluate personnel for hoisting and rigging activities and equipment operation.
7. Provide safety oversight.

**NOTE:** 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 hoisting and rigging 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 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 consensus standards 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. Pass/fail criteria established and documented in accordance with Section 4.5.

### 4.3.1 Previous Training and Qualification

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

1. Previous training may include any of 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 must include type and class of equipment and hours of experience. For qualifications not related to equipment operation, personnel must have documented evidence of training and experience related to an activity covered by this manual. 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 and experience are reviewed for compliance to this manual, accepted and documented, personnel shall be considered qualified after they have accomplished the following:
  - a. Passed a written/oral examination (Section 4.3.5)
  - b. For on-the-job evaluators, operators of cranes and forklifts, and personnel performing rigging activities satisfactorily completed an OJE.
  - c. Operators of mobile locomotive and cab- or pulpit-operated overhead cranes, met Physical Examination and Substance Abuse Testing Requirements identified in 4.2.3.

### 4.3.2 Training Subjects

Appendix A contains subjects that should be included in the training process listed by qualification area

### 4.3.3 On-the Job Training

Contractors will make OJT available for crane and forklift operators. If a forklift or crane operator will use attachments, the OJT will include installation and use of approved attachments (example: forklift boom and barrel-handling attachments and crane jibs and boom extensions). Personnel must satisfy training requirements (see Appendix A) 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 hoisting and rigging activities that require personnel to pass an on-the-job evaluation (OJE) before being granted qualifications. The OJEs shall have pass and failure criteria, and shall require personnel to demonstrate that they have the knowledge and skills to safely operate equipment or perform the hoisting and rigging function. Personnel must 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. The name and signature of the qualified evaluator
3. The 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 on-the-job evaluation forms can be found on the Hanford Intranet at <http://apweb01.rl.gov/siteforms/>. The Hanford Site Evaluation Form numbers for the forms related to various categories are identified in the following table:

<b>Equipment Category</b>	<b>Form Numbers</b>
Floor-Operated Overhead Crane	Site Forms A-6002-747, 751, and 752
Floor-Operated Overhead Crane–A	Site Forms A-6002-748, 751, and 752
Floor-Operated Overhead Crane–B	Site Forms A-6002-749, 751, and 752
Floor Operated Overhead Crane–C	Site Forms A-6002-750, 751, and 752
Cab-Operated Overhead Cranes	Site Forms A-6002-753, 754, and 755
Class 1 & 2 Powered Industrial Trucks	Site Forms A-6002-756, 763, and 764
Class 3 Powered Industrial Trucks	Site Forms A-6002-758, 763, and 764
Class 4 & 5 Powered Industrial Trucks	Site Forms A-6002-759, 763, and 764
Class 6 Powered Industrial Trucks	Site Forms A-6002-761, 763, and 764
Class 7 Powered Industrial Trucks	Site Forms A-6002-762, 763, and 764
Class 8 Powered Industrial Trucks	Site Forms A-6004-377, 378, and 379

Equipment Attachment OJE Addendum	Site Form A-6004-380
Class 1 Lattice Boom Truck Mobile Cranes	Site Forms A-6002-940, 941, and 942
Class 2 Lattice Boom Crawler Mobile Cranes	Site Forms A-6002-943, 944, and 945
Class 3 Telescopic Bm Single Control Station Mobile Cranes	Site Forms A-6002-946, 947, and 948
Class 4 Telescopic Bm Multi. Control Station Mobile Cranes	Site Forms A-6002-949, 950, and 951
Class 5 Commercial Truck Mounted Telescopic Bm Cranes	Site Forms A-6004- 386, 388, and 389
Class 6 Mobile Cranes	Site Forms TBD
Class 7 Mobile Cranes	Site Forms TBD
Class 8 Mobile Cranes	Site Forms TBD
Class 9 Telescoping Boom Fixed Control Station Cranes	Site Forms A-6004-390, 391, and 392
Class 10 Mobile Cranes	Site Forms TBD
Incidental Rigging	Site Forms A-6002-903, 904, and 905
Advanced Rigging	Site Forms A-6002-906, 907, and 908
On-the-Job Training Instructors	Site Form A-6002-557
On-the-Job Evaluators	Site Form A-6002-557 and Site Forms A-6004-091 through 097 as appropriate.

#### 4.3.4.1 Powered Industrial Trucks

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

- Class 1 & 2 Electric motor, sit-down and stand-up rider, counter balanced, and narrow-isle trucks, solid and pneumatic tires
- Class 3 Electric motor, hand trucks or hand/rider trucks, solid tires
- Class 4 & 5 Internal combustion engine trucks, solid and pneumatic tires
- Class 6 Electric and internal combustion engine tractors, solid and pneumatic tires
- Class 7 Rough terrain vertical-mast forklift trucks.
- Class 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 1 Overhead cranes, floor-operated (Facilities may designate specific qualifications to selected cranes.)
- Class 2 Overhead cranes, cab-operated.

#### 4.3.4.3 Mobile Cranes

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

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

#### 4.3.4.4 Training and Evaluation

Personnel are qualified to perform hoisting & rigging on-the-job training instruction or evaluation according to the following designations:

- On-the-Job Training Instructor
- On-the-job Evaluator

#### 4.3.5 Qualification

Personnel shall be considered qualified when they accomplish the following:

1. Satisfactorily complete Hanford on-site approved training and qualification or meet the requirements of previous training (see Section 4.3.1)
2. Pass a written examination of the knowledge requirements for the applicable activity identified in this manual.
3. Satisfactorily complete equipment specific OJT for equipment operators. Management may determine that previous qualification or experience fulfills the requirement for on-the-job training.
4. Pass an equipment specific OJE for evaluators, 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 36 months:

1. Use rigging or perform rigging activities
2. Function as a DL
3. Perform OJEs
4. Operate mobile, overhead cranes, and monorails
5. Operate forklifts
6. Perform periodic documented inspections of equipment
7. Provide technical approval of lift procedures
8. Provide safety oversight of hoisting and rigging operations
9. Supervise or direct hoisting and rigging operations (includes DLs)
10. Perform activities as an equipment custodian.
11. Maintenance, inspection or repair personnel who operate mobile cranes, cab- or pulpit-operated overhead cranes

**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:

- |  |     |
|--|-----|
| 1. Powered industrial trucks (forklifts) operation.  | OJE |
| 2. Overhead crane and monorail operation.  | OJE |
| 3. Mobile crane operation (includes maintenance repair or inspection personnel who operate mobile cranes) and advanced rigging activities. | OJE |

- |   |                      |
|---|----------------------|
| 4. Incidental rigging (using slings, rigging hardware, hoists, and below-the-hook lifting devices).   | OJE or written test  |
| 5. 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  |
| 6. Approving technical lift procedures, acting as Designated Leader for, Safety Oversight or supervision of hoisting and rigging operations.  | OJE or written test  |
| 7. Acting as equipment custodian.   | Written test         |
| 8. 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 operating 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 hoisting and rigging 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. When applicable, contain documentation supporting evaluation of previous training and qualifications.
4. Indicate 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 must 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 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 on-the-job 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 difference between industrial trucks and automobiles
- l. Engine or motor operation
- m. Steering and maneuvering
- n. 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 preshift inspection and 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 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. Designated Leader 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, 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
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
2. Standards
3. Hoists not in regular service
4. Periodic inspection criteria and intervals
5. Roller chain inspection, maintenance and replacement
6. Frequent inspection criteria and intervals
7. Operational tests
8. Load test
9. Preventive maintenance
10. Maintenance procedure
11. Adjustments, repairs, and replacements
12. Lubrication
13. Rope inspection and maintenance (see Section C)
14. Welded-link chain inspection, maintenance and replacement
15. Suspect counterfeit items
16. Lessons learned.

#### **G. Rigging**

Training for rigging activities should cover the following:

1. Capacities
2. Math skills
3. Design factors
4. Sling angles and effects on capacity
5. Load weight calculations
16. Rigger responsibilities
17. Emergency response
18. Critical lift requirements
19. Standards
20. Signaling and signals

6. Definitions
7. Load center of gravity, effects and determination
8. Inspections
9. Slings, types and applications
10. Rigging hardware, types and applications
11. Below-the-hook lifting devices, types and applications
12. Safety requirements
13. Safe hoisting and rigging practices
14. Attaching the load
15. Moving the load
21. Lessons learned
22. Calculating sling loading using load angle factors, D/d ratios, and multi-leg slings
23. Calculating the center of gravity and determining pick points for symmetrically and unsymmetrically shaped loads
24. Performing flagging, setup, and working with mobile cranes
25. Working from suspended platforms
26. Working near energized sources and power lines
27. Assembling and disassembling lattice boom cranes and box-boom extensions and jibs
28. Performing critical lifts and two-crane lifts
29. Performing hoisting and rigging in hostile environments.
30. Designated Leader assignment

#### **H. Mobile Crane Operation**

Training for mobile crane operation should cover the following:

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

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

**J. Equipment Custodian**

Training for equipment custodians should cover the following:

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

**K. Designated Leader**

Training for designated leaders (DL) should cover the following:

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

**L. Supervisor**

Training for supervisors should cover the following:

1. Qualified personnel, equipment operation
2. Standards
3. Safe operation of equipment
4. Preplanned and approved hoisting and rigging instructions
5. Proper tagging of unsafe or restricted-use equipment
6. Custodian notifications
7. Designated leader assignments
8. Elements of this manual for work assignments of the assigned crew.

**M. Lift Procedure Technical Approver**

Training for technical approvers should cover the following:

1. This manual, Chapter 3, "Critical and Special Lifts"
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 of this Chapter.

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

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

1. On-the-job training 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 on-the-job evaluations 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 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 hoisting and rigging activities.
2. The DOE/RL-92-36 Hoisting and Rigging manual content overview and pertinent safety requirements for personnel and equipment.