

HOISTING AND RIGGING

1.0 Objective

The objective of this surveillance is to examine hoisting and rigging operations to ensure that safe equipment and work practices are being used. The surveillance includes verification that hoisting and rigging work is performed in accordance with DOE requirements and best practices.

2.0 References

- 2.1 DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*
- 2.2 DOE 5480.4, *Environmental Protection, Safety and Health Protection Standards*
- 2.3 29 CFR 1910, *Occupational Safety and Health Standards for General Industry*
- 2.4 29 CFR 1926, *Occupational Safety and Health Regulations for Construction*
- 2.5 DOE/ID-10500, *Hoisting and Rigging Manual*, October 1994

NOTE

The DOE Hoisting and Rigging Manual should be used as the primary reference for this surveillance.

3.0 Surveillance Activities

During this surveillance, the Facility Representative or Environmental, Safety, and Health Support Specialist observes a lift using one of the following: (1) An overhead or gantry crane, (2) a mobile crane, or (3) a hoist. Before observing the actual lift, the Facility Representative or Environmental, Safety, and Health Support Specialist should observe preparations for the lift including inspections of the crane and/or slings.

For the second surveillance activity, the Facility Representative or Environmental, Safety, and Health Support Specialist visits an area of the facility where slings are stored. Surveillance activities focus on verifying that a sample of slings stored at the laboratory are fully functional.

ACTIVITIES

1. Observe a Lift Using an Overhead or Gantry Crane.
2. Observe a Lift Using a Mobile Crane.
3. Observe a Lift Using a Hoist.

CHOOSE ONE OF THE ABOVE

4. Examine Areas Where Slings are Stored.

Surveillance Guideline HOISTING AND RIGGING

Surveillance No.: _____

Facility: _____

Date Completed: _____

YES NO N/A

Activity 1 - Observe a Lift Using An Overhead or Gantry Crane

1.	Is the crane's rated capacity marked on each side of the crane?	_____	_____	_____
2.	If the crane has more than one hoisting unit, does each hoist have its rated capacity marked on it or on its own load block?	_____	_____	_____
3.	Are markings on the bridge, trolley, and load block visible from the ground or operating floor?	_____	_____	_____
4.	For cab-operated cranes, are there at least two means of egress from the crane, remote from each other and arranged to permit departure under emergency conditions?	_____	_____	_____
5.	Are hoists equipped with holding brakes that are automatically applied when power is removed?	_____	_____	_____
6.	Is the power supply for the runway conductors controlled by a switch or circuit breaker?	_____	_____	_____
7.	Is the switch or circuit breaker accessible from the floor and capable of being locked in the open position?	_____	_____	_____
8.	On cab-operated cranes, is an enclosed switch or circuit breaker provided on the leads from the runway conductors?	_____	_____	_____
9.	Can the operator open the switch or circuit breaker on the leads from the runway conductor from the operating position?	_____	_____	_____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
10. When the operator opens the switch or circuit breaker, do the holding brakes set? (Ask the operator to visually demonstrate this)	_____	_____	_____
11. Is an enclosed disconnect device for the leads from the runway conductors mounted on the bridge, footwalk or near the runway conductors?	_____	_____	_____
12. Is the maintenance history for the crane maintained?	_____	_____	_____
13. Do operators or other designated personnel visually inspect the following before use?			
a. Controls and operating mechanisms are operable?	_____	_____	_____
b. Upper and lower limit switches are functional?	_____	_____	_____
c. Lines, valves and other parts of the hoist are not leaking?	_____	_____	_____
d. Hooks are not cracked, damaged, or deformed?	_____	_____	_____
e. The hoist rope shows no significant wear, kinking, crushing, "birdcaging", or corrosion?	_____	_____	_____
f. The hoist chain has no nicks, gouges, distortion, wear, or corrosion?	_____	_____	_____
14. Have monthly rope and chain inspections been performed and are the inspections documented in the records?	_____	_____	_____
15. Has a qualified inspector performed a complete inspection annually, semi-annually, or quarterly depending on service classification?	_____	_____	_____
16. Are dated and signed records of the periodic inspection available?	_____	_____	_____
17. Has a preventative maintenance program for the crane, consistent with manufacturer recommendations, been established?	_____	_____	_____

Surveillance Guideline HOISTING AND RIGGING (cont.)			
	<u>YES</u>	<u>NO</u>	<u>N/A</u>
18. Are records maintained documenting that preventative maintenance has been performed?	_____	_____	_____
19. Was the planned lift classified as ordinary, critical, or pre-engineered production at the initial stage of the planning process?	_____	_____	_____
20. Do training records document that operators and supervisors have completed required training and qualification activities for the lift?	_____	_____	_____
21. Are conditions under which the lift will be terminated, such as high winds, clearly understood?	_____	_____	_____
22. Is a 10BC or larger fire extinguisher installed in the cab of a cab-operated crane?	_____	_____	_____
23. Is the fire extinguisher operable as demonstrated by a tag affixed to the fire extinguisher?	_____	_____	_____
24. Are all personnel acting as signallers clearly identified to the operator?	_____	_____	_____
25. Does the operator obey signals only from the designated signaler? (except that the operator shall obey a stop signal no matter who gives it)	_____	_____	_____
26. Has the weight of the load been determined and verified to be below the rated capacity of the crane?	_____	_____	_____
27. Is the hoist rope free from kinks or twists?	_____	_____	_____
28. Does the operator or supervisor verify that the hoist rope is not wrapped around the load?	_____	_____	_____
29. Is the load attached to the load block hook using slings or other approved devices?	_____	_____	_____
30. Does the lift director verify that the load is well secured and		p	r o

perly balanced before it is lifted?

Surveillance Guideline
HOISTING AND RIGGING (cont.)

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
31. Is the hook positioned above the center of gravity of the load to minimize the potential for swinging?	_____	_____	_____
32. Are all personnel, including the qualified rigger, well clear of the load before it is lifted?	_____	_____	_____
33. Do operators and supervisors ensure that loads are not carried over people?	_____	_____	_____
34. Are tag lines used to guide, snub or otherwise control the load?	_____	_____	_____
35. Do the operator and supervisor ensure that no portion of any workers' bodies, including hands, are allowed below a suspended load at any time?	_____	_____	_____
36. Do operators and supervisors ensure that no work is performed on suspended loads without explicit approval?	_____	_____	_____
37. If work is performed on suspended loads, has it been explicitly approved by the safety organization and have guidelines for ensuring safety of the work been established?	_____	_____	_____
38. Has a lift leader been designated for the lift and is the leader present for the entire lift?	_____	_____	_____
39. Does the operator or designated person ensure that the crane is still within the inspection interval?	_____	_____	_____

Activity 2 - Observe a Lift Using a Mobile Crane

40. Do training records substantiate that operators have completed required training and achieved required qualifications?	_____	_____	_____
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41. Is a load rating chart with legible letters provided with the crane? _____

Surveillance Guideline HOISTING AND RIGGING (cont.)		<u>YES</u>	<u>NO</u>	<u>N/A</u>
42.	Is the load rating chart accessible to the operator at the controls?	_____	_____	_____
43.	Does the load rating chart include the following:			
a.	A full and complete range of manufacturer crane load ratings for all possible work conditions (radii, boom angles, work areas, etc.)?	_____	_____	_____
b.	Limitations due to structural, hydraulic, or other factors?	_____	_____	_____
c.	Areas where no load is to be handled?	_____	_____	_____
d.	Recommended reeving for the hoist line?	_____	_____	_____
44.	Is the following information on the rating chart:			
a.	Recommended parts of the hoist reeving and size and type of rope for various crane loads?	_____	_____	_____
b.	Recommended boom hoist reeving diagram showing size, type and lengths of ropes?	_____	_____	_____
c.	Tire pressures?	_____	_____	_____
d.	Cautionary or warning notes on equipment limitations or operating procedures?	_____	_____	_____
e.	Position of the gantry and requirements for intermediate boom suspension?	_____	_____	_____
f.	Instruction for boom erection and conditions under which the boom or boom and jib combination may be raised or lowered?	_____	_____	_____
g.	Whether the hoist-holding mechanism is automatically controlled or manually controlled, whether free fall is available and whether any combination of those exists?	_____	_____	_____
h.	The maximum telescopic travel length of each boom telescopic section?	_____	_____	_____
i.	Whether sections are telescoped with power or manually?	_____	_____	_____
j.	The sequence and procedure for extending and retracting telescopic boom sections?	_____	_____	_____
k.	Maximum loads permitted during the actual boom-extending operation and any limiting conditions or cautions?	_____	_____	_____
l.	Hydraulic relief valve settings specified by the manufacturer?	_____	_____	_____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

		<u>YES</u>	<u>NO</u>	<u>N/A</u>
45.	Is the maintenance history of the crane maintained and readily available?	_____	_____	_____
46.	Do operators complete the following inspections before using the crane:			
	a. Control mechanisms are in working order?	_____	_____	_____
	b. Crane hooks and locks are not deformed, cracked or worn?	_____	_____	_____
	c. The proper oil level is present in hydraulic systems?	_____	_____	_____
	d. There is no leakage from lines, tanks, valves, pumps, or other components of air and hydraulic systems?	_____	_____	_____
	e. Hoist ropes show no evidence of kinking, crushing, birdcaging, or corrosion?	_____	_____	_____
	f. There is no damage to booms or deformation of structural components?	_____	_____	_____
47.	Are records available documenting monthly inspections of the following:			
	a. Critical items such as brakes or crane hooks?	_____	_____	_____
	b. Hoist ropes?	_____	_____	_____
48.	Are records available documenting periodic inspection with a frequency of 1 to 12 months depending on severity of service?	_____	_____	_____
49.	Are periodic inspections performed by a qualified inspector?	_____	_____	_____
50.	Has a preventive maintenance program for the crane that is consistent with manufacturer recommendations been established?	_____	_____	_____
51.	Are records of preventive maintenance activities	m	a	i

ntained?

Surveillance Guideline
HOISTING AND RIGGING (cont.)

		<u>YES</u>	<u>NO</u>	<u>N/A</u>
52.	Was the planned lift classified as ordinary, critical, or pre-engineered production at the initial stage of the planning process?	_____	_____	_____
53.	Is the operating cab windshield clean and free of anything that obstructs vision?	_____	_____	_____
54.	Does the operator or supervisor ensure that the crane's engine is stopped before the crane is fueled and that smoking or open flames are not permitted within 25 feet of the crane during refueling?	_____	_____	_____
55.	Is a 10BC or larger fire extinguisher installed at all operator stations?	_____	_____	_____
56.	Is the fire extinguisher operable as indicated by a tag affixed to the fire extinguisher?	_____	_____	_____
57.	Are alternate egress routes on mobile units with operating enclosures available?	_____	_____	_____
58.	Does the operator know the radius of the load?	_____	_____	_____
59.	Does the operator know the net weight of the load?	_____	_____	_____
60.	Do operators or supervisors understand the wind conditions under which the lift would be terminated?	_____	_____	_____
61.	Does the operator test stability before lifting heavy loads by lifting the load slightly and checking the machine for movement and to verify that brakes hold with load elevated?	_____	_____	_____
62.	Does the operator ensure that nothing is hit with the boom?	_____	_____	_____
63.	Are limit switches (if supplied) checked without a load on the hook at the beginning of each work shift or the first time a crane is used during a shift?	_____	_____	_____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
64. Are all personnel acting as signalers during crane operations clearly identified to the operator?	_____	_____	_____
65. Does the operator obey signals only from the designated signaler? (Except that the operator shall obey a "Stop" signal no matter who gives it)	_____	_____	_____
66. Is the hoist rope free from kinks or twists?	_____	_____	_____
67. Does the operator or supervisor verify that the hoist rope is not wrapped around the load?	_____	_____	_____
68. Is the load attached to the load block hook using slings or other approved devices?	_____	_____	_____
69. Does the lift director verify that the load is well secured and properly balanced before it is lifted?	_____	_____	_____
70. Does the operator or supervisor verify that the hoist rope is not kinked before starting the lift?	_____	_____	_____
71. Is the hook positioned above the center of gravity of the load to minimize the potential for swinging?	_____	_____	_____
72. Are all personnel, including the qualified rigger well clear of the load before it is lifted?	_____	_____	_____
73. Do operators and supervisors ensure that loads are not carried over people?	_____	_____	_____
74. Do operators stay at the controls while the load is suspended?	_____	_____	_____
75. Do operators and supervisors ensure that no work is	p	e	r

formed on suspended loads without explicit approval?

Surveillance Guideline
HOISTING AND RIGGING (cont.)

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
76. If work is performed on suspended loads, has it been explicitly approved by the safety organization and have guidelines for ensuring safety of the work been established?	_____	_____	_____
77. Are tag lines used to guide, snub or otherwise control the load?	_____	_____	_____
78. Do the operator and supervisor ensure that no portion of any workers' bodies, including hands, are allowed below a suspended load at any time?	_____	_____	_____
79. Has a lift leader been designated for the lift and is the leader present for the entire lift?	_____	_____	_____
80. Does the operator or designated person ensure that the crane is still within the inspection interval?	_____	_____	_____
81. Does the designated leader check load lines after strain is put on them, but before the load is lifted clear of the ground to ensure lines are plumb?	_____	_____	_____
Activity 3 - Observe a Lift Using a Hoist			
82. Do training records substantiate that operators have completed required training and achieved required qualifications?	_____	_____	_____
83. Are hoists marked to show:			
a. The rated capacity on the hoist or load block?	_____	_____	_____
b. Manufacturer name?	_____	_____	_____
c. Manufacturer model or serial number?	_____	_____	_____
d. Voltage of AC or DC power supply (electric hoists)?	_____	_____	_____
e. Circuit ampacity (electric hoists)?	_____	_____	_____
f. Rated air pressure (air powered hoists)?	_____	_____	_____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
84. Do operators visually inspect the following at the beginning of each shift or before first use if the hoist has not been in regular service:			
a. Controls and operating mechanisms?	_____	_____	_____
b. Hoist upper limit switches?	_____	_____	_____
c. Lines, valves and other parts of air systems for leakage?	_____	_____	_____
d. Hooks for cracks, deformation or damage by chemicals?	_____	_____	_____
e. Hoist rope for kinking, crushing, birdcaging, and corrosion?	_____	_____	_____
f. Hoist chain for nicks, gouges, distortion, wear, cracks, and corrosion?	_____	_____	_____
g. Synthetic web straps for abrasive wear, knots, cuts, tears, broken stitching, acid or caustic burns, melting or charring, or weld spatter?	_____	_____	_____
85. Are records available documenting periodic inspection of hoists, wire ropes, welded link chain, roller chain, and synthetic web straps with a frequency of quarterly, semi-annually, or yearly depending on service?	_____	_____	_____
86. Are periodic inspections performed by a qualified inspector?	_____	_____	_____
87. Has a preventive maintenance program for the hoist been established consistent with the manufacturer recommendations?	_____	_____	_____
88. Was the planned lift classified as ordinary, critical, or pre-engineered production at the initial stage of the planning process?	_____	_____	_____
89. Does the operator know the net weight of the load?	_____	_____	_____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

		<u>YES</u>	<u>NO</u>	<u>N/A</u>
90.	Does the operator verify that the hoist rope or chain is not wrapped around the load?	_____	_____	_____
91.	Is the load attached to the hook using slings or other approved devices?	_____	_____	_____
92.	Does the operator verify that hoist ropes or chains are not kinked or twisted before initiating the lift?	_____	_____	_____
93.	Are all personnel clear of the equipment before the hoist is started?	_____	_____	_____
94.	Is the load lifted no more than a few inches until it is verified to be well-balanced in the sling or lifting device?	_____	_____	_____
95.	Do the operators ensure that the hoist is not used to lift, lower, or travel while anyone is on the load or hook?	_____	_____	_____
96.	Do operators and supervisors ensure that loads are not carried over people?	_____	_____	_____
97.	Do operators stay with a suspended load so that it is not left unattended?	_____	_____	_____
98.	Are tag lines used as required to guide, snub or otherwise control the load?	_____	_____	_____
99.	Do the operator and supervisor ensure that no portion of any workers' bodies, including hands, are allowed below a suspended load at any time?	_____	_____	_____
100.	Is the hoist load block lifted above head level for storage when equipment is not in use?	_____	_____	_____
101.	Are upper and lower limit switches tested under no-load conditions at the beginning of a shift?	_____	_____	_____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
102. Has a lift leader been designated and is the leader present at the lift site during the entire lifting operation?	_____	_____	_____
103. Are load lines checked after strain is put on them, but before the load is lifted clear of the ground to ensure the lines are plumb?	_____	_____	_____

Activity 4 - Examine Areas Where Slings are Stored

For each type of sling that is in use, examine a sample of slings and determine the following:

Wire Rope Slings

104. Are the selected slings free from the following:			
a. Ten randomly distributed broken wires in one rope lay or five broken wires in one strand in one rope lay?	_____	_____	_____
b. Wear or scraping of one third the original diameter of the outside individual wire?	_____	_____	_____
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. Corrosion of the rope or end attachments?	_____	_____	_____

NOTE

If any of these conditions are observed, the sling should immediately be removed from service.

105. Are slings stored on racks away from moisture and acids?	_____	_____	_____
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Surveillance Guideline
HOISTING AND RIGGING (cont.)

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
106. Are damaged slings rendered unusable, removed from service, and discarded?	_____	_____	_____
107. Are slings marked with the rated capacity and inspection due date?	_____	_____	_____
Steel Chain Slings			
108. Are chains stored in racks or in designated locations?	_____	_____	_____
109. Are storage locations dry and clean and isolated from weather?	_____	_____	_____
110. Are the selected slings free of the following:			
a. Bent links, stretched links, cracks in any section of any link, scores, abrasion or heat damage?	_____	_____	_____
b. Are rings and hooks free from distortion, cracks in weld areas, corrosion, scores and heat damage?	_____	_____	_____
c. Does each link hinge freely with the adjoining links?	_____	_____	_____
d. Are master links or couplings deformed in any way?	_____	_____	_____
e. Are hooks or end attachments cracked or deformed?	_____	_____	_____

NOTE

If any of these conditions are observed, the sling should immediately be removed from service.

111. Are slings marked with:			
a. Size?	_____	_____	_____
b. Manufacturer's grade?	_____	_____	_____
c. Rated load and angle on which the rating is based?	_____	_____	_____
d. Reach?	_____	_____	_____
e. Number of legs?	_____	_____	_____
f. Sling manufacturer?	_____	_____	_____
g. Inspection due date?	_____	_____	_____

Surveillance Guideline HOISTING AND RIGGING (cont.)

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
Metal Mesh Slings			
112. Are the selected slings free from the following:			
a. Broken welds or brazed joints along the sling edge?	_____	_____	_____
b. Broken wires in any part of the mesh?	_____	_____	_____
c. Reductions in wire diameter of 25% due to abrasion or 15% due to corrosion?	_____	_____	_____
d. Distortion in the mesh that reduces flexibility?	_____	_____	_____
e. Distortion of the female handle?	_____	_____	_____
f. Distortion of either end fitting?	_____	_____	_____
g. Reduction of the original cross sectional area of metal at any point around a handle eye?	_____	_____	_____
h. Distortion or twisting of either end fitting out of its plane?	_____	_____	_____
i. Cracked end fittings?	_____	_____	_____
j. Heat damage?	_____	_____	_____

NOTE

**If any of these conditions are observed, the sling
should immediately be removed from service.**

113. Are slings stored so as to prevent mechanical damage and corrosion?	_____	_____	_____
114. Do slings have permanently affixed identification tags showing the following:			
a. Manufacturer's name or trademark?	_____	_____	_____
b. Rated load in vertical basket and choker hitches?	_____	_____	_____
c. Inspection due date?	_____	_____	_____

<u>YES</u>	<u>NO</u>	<u>N/A</u>
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115. Are slings free of the following conditions:

- [illegible]

If any of these conditions are observed, the sling should immediately be removed from service.

- _____

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Surveillance Guideline
HOISTING AND RIGGING (cont.)

YES NO N/A

OTHER (cont.)

_____	_____	_____	_____

NOTES/COMMENTS:

PERSONNEL CONTACTED:

Surveillance Guideline
HOISTING AND RIGGING (cont.)

**IF MORE SPACE IS NEEDED FOR FINDINGS, OBSERVATIONS, AND FOLLOWUP
ITEMS - USE ADDITIONAL SHEETS**

FINDINGS:

Finding No.: _____

Description: _____

Finding No.: _____

Description: _____

Finding No.: _____

Description: _____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

OBSERVATIONS:

Observation No.: _____

Description: _____

Observation No.: _____

Description: _____

Observation No.: _____

Description: _____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

FOLLOWUP ITEMS:

Followup Item No.: _____

Description: _____

Followup Item No.: _____

Description: _____

Followup Item No.: _____

Description: _____

Surveillance Guideline
HOISTING AND RIGGING (cont.)

LABORATORY MANAGEMENT DEBRIEFED AND RESULTS: _____

Signature: _____ Date: _____

Facility Representative or
Environmental, Safety, and Health Support Specialist