1. Crane Load Path Protection

1.1 Suspended Loads

1.1.1 No employees are to work or pass under any suspended loads.

1.1.2 Tag lines will be attached to all suspended loads and will be used for guiding and landing loads.

1.1.3 In the event a suspended load is to be swung over a work area, employees will leave the area at the warning sound, and then return to work when the load has passed and the employee has verified that the swing path is clear.

1.2 Suspended Load Warning System

1.2.1 Before any load is lifted, the crane operator, or other designated person who is in direct communication with the operator, will sound a horn-type of warning system.

1.2.2 Upon hearing the warning, all employees in the affected area will immediately vacate that area. A spotter assigned to watch the affected area will ensure that the area which will be under the suspended load swing radius is clear of personnel. Upon seeing that the area is clear, the spotter will signal to the crane operator, visually or by radio, that the area is clear and that the pick can be made.

1.2.3 Once the load has cleared the affected work area, the signal will be given to indicate that it is safe to return to the area and resume work.

1.2.4 Any employee, who hears either of these signals and is not sure if their area of work is affected, will immediately leave the area and determine if their area is clear of work. Usually, the spotter will be a source of that information. If not, then the employee should make contact with an area supervisor. In most cases, these swing areas will be clearly marked and all employees working in those area will be informed that they will be required to leave as loads are swung overhead.

1.3 Restricted Access Areas

1.3.1 Barricades, walkways and sign posting will be established prior to any operations taking place.

1.3.2 Certain areas may be marked with barricade tape to indicate that access is restricted. Those areas are not to be entered by any employee, for any reason, without clearance from the area supervisor, safety representative or other individual with authority to control those areas.

1.3.3 Fenced areas will be accessed or exited by all employees only through the established entrances or exits.
1.3.4 Counterweight travel and other swing areas of equipment will be marked with “Caution” barricade tapes. These areas are not to be entered while the equipment is in operation (engines running mean the equipment is operating, even if not in motion) without the consent and knowledge of the equipment operator.

2. Wire Rope

2.1 All hoisting ropes must have be recommended by the manufacturer for the applied service. Non-rotating rope is not to be used for multiple-part reeving. The replacement rope for cranes must be the same size, grade and construction as the rope originally recommended. All live and running ropes that wind on drums must have a safety factor of at least 3.5, and no less than two full turns of rope must remain on the boom or hoist drums when the boom or load hook is at its lowest position. Non-rotating rope must have a minimum safety factor of 5.

2.2 Running or hoist ropes will be replaced when any of the following conditions are detected.

2.2.1 When there are six or more randomly distributed broken wires in any one lay or when there are three or more broken wires in any one strand of any one lay.

2.2.2 When one third of an individual outside wire’s diameter is worn.

2.2.3 When there is kinking, crushing, bird caging or any other damage or distortion of the wire rope structure.

2.2.4 When there is evidence of heat damage.

2.2.5 When the rope’s diameter is reduced by more than 3/64-inch in a rope with a diameter up to an including ¾-inch, 1/16-inch in a rope with a diameter from 7/8 to 1-1/8-inch, 3/32-inch in a rope with a diameter from 1-1/4 to 1-1/2-inch.

2.2.6 When there are two or more broken wires in any one lay in those sections beyond the end connections or when broken wires at the end connection.

3. Wire Rope Shock Loads

3.1 Shock loads shorten wire rope life.

3.1.1 Shock loads that obviously over-stress the rope should be avoided.

3.1.2 Make sure that there is no slack and no jerking of the rope at the start of loading.
3.1.3 Check the hoisted loads carefully to see that they are not beyond the rope’s proper working load.

3.1.4 Do not allow rope to become folded or jammed, either on the drum or by jumping off of a sheave.

4. Slings

4.1 The following guide should help in determining the proper sling selection:

4.1.1 Wire rope slings must be stored off the ground when they are not being used, preferably on a choker rack.

4.1.2 Slings should be kept lubricated to avoid rusting.

4.1.3 At no time will a safety factor of less than 5 be used.

4.1.4 Slings made from other than Independent Wire Rope Core (IWRC) are not recommended.

4.1.5 Slings that are 1-1/2-inch in diameter and larger should be proof-tested double the safe working load. This testing should be done by the supplier before the sling is accepted.

4.1.6 Use suitable wood or rubber protectors where slings go around sharp corners.

4.1.7 Use suitable softeners to prevent chokers from slipping during a lift.

4.1.8 Sling angles greater than 30 degrees from the vertical are not recommended.

4.1.9 The pressed sleeve eye has certain disadvantages in that it does not work well as a choker around structural members and small diameter pipe.

5. Turnbuckles

5.1 Use only hot dip galvanized forged steel turnbuckles, certified for lifting and rigging.

5.2 Use locknuts or other locking devices when turnbuckles are used with one part of wire rope to prevent turnbuckles from unwinding.

6. Shackles

6.1 Use only forged alloy steel shackles; preferably, use only those shackles that have the safe working load stamped on their bales.

6.2 A shackle one size greater than the sling with which it is used is recommended.
6.3 Shackles rated at 100 tons or more must be magnetic-particle tested before each lift approaching their rated capacities.

7. Cable Clips

7.1 U-bolt cable clips must have U-bolt section on the dead or short end and the saddle on the live or long end of the rope. The number and spacing of the clips must be in accordance with the clip chart. All clips must be drop-forged steel. The clip nuts must be re-tightened after newly installed rope has been in use for an hour and the nuts shall be rechecked for tightness from time to time.

8. Eye Bolts

8.1 Only drop-forged steel eye bolts shall be used for lifting. Field fabricated eye bolts are to be designed by a competent structural engineer.

9. Wedge Sockets

9.1 Wedge sockets are to have the live or running end in line with the pinhole.

9.2 After pulling the wedge tight, at least one cable clip should be installed on the tail.

10. Lifting Lugs

10.1 Field fabricated lifting lugs are to be designed by a competent structural engineer.

11. Spreader Bars

11.1 Field fabricated spreader bars are to be designed by competent structural engineer.

OSHA Reference: OSHA 29 CFR 1926.251
PRE-LIFT CHECKLIST

This document shall be used whenever any of the following conditions exists:

1. The total weight of the lift exceeds 50 tons.
2. Multiple cranes are uses.
3. The lift will occur over “live” process(es) of “live” pipeline(s).
4. The ground upon which the crane(s) is (are) positioned is unstable or has recently been “spoiled.”
5. There are electrical power lines in the immediate area of the lift.
6. There are excavation (open on recently filled) in the immediate area of the lift.
7. Suspended Personnel Platforms are involved in the lift.

**NOTE:** This form is to be used to verify that all considerations for a safe lift have been met. Any variations to this plan must be submitted for “approvals” prior to lift.

Review of Lift Preparations.

<table>
<thead>
<tr>
<th>Lift Crane</th>
<th>Tail Crane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify Weight of Item: ______________</td>
<td>Crane Model: _________</td>
</tr>
<tr>
<td>Verify Lift and Trailing Lug: __________</td>
<td>Boom Length: _________</td>
</tr>
<tr>
<td>Size, Location, Orientation: __________</td>
<td>Crane Radius: _________</td>
</tr>
<tr>
<td>Verify Equipment Support: __________</td>
<td>Crane Radius: _________</td>
</tr>
<tr>
<td>Installation is Correct: __________</td>
<td>Crane Radius: _________</td>
</tr>
<tr>
<td>Verify Foundation Anchor Number Parts Cable</td>
<td>Belt Layout with Bolt Pattern</td>
</tr>
<tr>
<td>On Equipment Capacity on Main Block _________</td>
<td>Capacity on Main Block _________</td>
</tr>
<tr>
<td>Verify Total Weight of Lift Including Spreaders, Blocks</td>
<td>Are Crane Mates Required? Yes _____ No _____</td>
</tr>
<tr>
<td>Shackles, Chokers, etc: __________</td>
<td>(See page 4 of this document)</td>
</tr>
<tr>
<td>Lifting of item (if any): __________</td>
<td>Is the Crane Level?: Yes _____</td>
</tr>
<tr>
<td>(Note on other sheet)</td>
<td></td>
</tr>
<tr>
<td>Capacity of Spreader: __________</td>
<td>Are Load Lines Plumb?: Yes _____</td>
</tr>
<tr>
<td>Sling / Chain Size: __________</td>
<td>Outriggers Fully Extended?: Yes _____ N/A _____</td>
</tr>
<tr>
<td>Shackle Capacity: __________</td>
<td>Traveling Path for Tailing</td>
</tr>
<tr>
<td>Crane Level and Solid?: Yes _____</td>
<td></td>
</tr>
<tr>
<td>Total Weight of Load vs. % Weight to Overall Safe Access to Disconnect</td>
<td></td>
</tr>
<tr>
<td>Crane Capacity: __________</td>
<td>Rigging from the Load?: Yes _____</td>
</tr>
</tbody>
</table>
Performing Pre-Lift Checklist

The pre-lift checklist is to review the lift with regard to actual job-site conditions and verify that the lift conforms with either the Rigging Studies or the Lift Plan. Mandatory review must be made of the provisions of Safety Regulations prior to crane usage. The following items are to be included as considerations with performing the Pre-Lift inspection and the preparation of the pre-lift checklist (see page 31):

**Equipment**

- Verify the equipment weight with the vendor’s (engineer’s) drawing.
- Inspect lifting/tailing lugs to verify that shackles will fit.
- Verify that orientation of those lifting/tailing lugs.
- Verify that equipment supports conform with positioning on foundation or support steel.

**Rigging**

- Verify the lift crane spec’s: (Make/model/boom type/boom length/number of parts on load lines/capacity of load block.)
- Verify the tailing crane spec’s: (Make/model/boom type/boom length/number of parts on load lines/capacity of load block.)
- Verify the capacity and type of spreader/lifting beam.
- Check the condition of the spreader beam.
- Check the wall thickness of pipe strut (if applicable)
- Verify the correct type and capacity of all shackles and the diameter of the pin(s).
- When applicable, verify the equipment number of shackles against the Proof Load Certificates.
- Verify the type, diameter, length, identification tags, and number of slings.

Verify Proof Load Certificates. Check equipment numbers against the Proof Load Certificates.
Crane Placement

All of the following should be checked to ensure correct placement:

- Verify that the lift crane is positioned on a solid foundation and that the Ground Bearing Capacity is sufficient to take the anticipated load of the tracks/outriggers/ring supports. Use matting where called for in the Rigging Study(ies) and/or Lift Plan(s).

- Verify that “underground(s)” are checked for impact on the crane’s stability.

- Verify that adjacent excavations will not undercut or affect the stability of crane(s).

- Verify that the crane(s) is/are level and that the load lines are plumb.

- Verify that the outriggers are fully extended for any truck crane used and that the tires are not in weight-bearing contact with the ground.

- Ensure that the travel path for tailing crane is unobstructed and solid foundation for travel.

- Check surrounding area for obstructions, which might interfere with upended and swing operations.

- Check surrounding areas, particularly overhead, for electrical power lines which might influence the lift. Check 29 CFR 1910 and 29 CFR 1926 for distance requirements.

- Ensure that barricades are in place to protect the crane’s swing.

- Verify that the crane’s radius has been checked.

- Verify that the Load Testing has been completed.
Lifting Over “Live” Processes or Pipelines

The following additional items shall occur whenever the lift is to be made over a “live” process or over “live” process pipelines:

Must initial:

_____ All of the individuals signing the lift document must agree that there are not other alternatives for making the lift. If alternatives exist, they must each be considered, and eliminated, prior to making this lift.

_____ All verifications and checks on pages 1 through 3 of this document shall be completed.

_____ All isolation valves shall be identified for the process(es) or pipelines(s) being lifted over.

_____ The lift should not exceed 75% of the crane rated capacity. If a rare exception is necessary, a test lift shall be made, prior to the actual lift, which is identical to the actual lift excepting swing. Under no circumstances shall a crane exceed 90% of it's rated capacity.

_____ All slings, one inch or smaller in diameter, shall be individually inspected by the Rigger(s) or the Foreman in charge of the lift and all swings, with more than one inch diameter, shall have documented (written) inspection or certification on site.

_____ All cranes shall be matted for extra stability

_____ The Crane Operator’s training shall specifically demonstrate that they are qualified to operate that crane.

_____ There shall be a least one additional Rigger/spotter, assisting the Signal Person, watching the process(es) and/or pipeline(s) being lifted over.

NOTE: Rigger/spotter(s) shall communicate only with the Signal Person.

_____ The Project Foreman, Construction Superintendent, Crane Foreman, Rigging Foreman, or their specifically identified designate, will actively participate in each lift.

_____ Lifts with wind speeds in excess of twenty-five (25) miles per hour (MPH) should not usually be “approved.” Only after careful evaluation of all potential hazards, by all signatories to the lift document, should such lifts be allowed. When allowed, close monitoring of wind speeds and direction will occur during such lifts.
LIFT DOCUMENT

Total Weight of Lift: ____________________________________________________________

Crane Capacity (Obtained from Manufacturer’s Chart): ________________________________

Ratio of Lifted Load to Chart Capacity: _____________________________________________

Date of Lift: ___________________________________________________________________

Weather Conditions: Wind (Speed & Direction): ___________ Temperature: ___________

Soil Conditions: ________________________________________________________________

Cardinal Rule = The Problem will be with the Ground Preparation

Electrical Hazards: __________________________________________________________________

Excavation Near Lift: __________________________________________________________________

Review of Underground Installation: __________________________________________________________________

Rigging Components Evaluated: __________________________________________________________________

Description of Weakest Point in Rigging Configuration: ________________________________

Crane Barricaded: _____ Yes Operator’s Certification Checked: _____ Yes

Pre-Lift Meeting Conducted: _____ Yes Date: _______ By: ______________________

If Suspended Personnel Platforms are to be used, attach proper checklist: _____ Yes _____ N/A

Operator’s Signature: ____________________________ Badge #: ______________________

Signal Person’s Signature: ______________________ Badge #: ______________________

APPROVALS:

Rigging Foreman: ____________________________ Date: ______________________

Crane Foreman: ______________________________ Date: ______________________

Construction Superintendent: __________________ Date: ______________________

Safety Supervisor: ____________________________ Date: ______________________

Project/Plant Foreman: ________________________ Date: ______________________

(If applicable)

ONE SHEET FOR EACH CRANE USED IN EACH LIFT
Standard Hand Signals
For Controlling Mobile Crane Operation

- **Hoist**: With forearm vertical, forefinger pointing up, move hand in small horizontal circle.
- **Lower**: With arm extended downward, forefinger pointing down, move hand in small horizontal circle.
- **Use Main Hoist**: Tap flat on head, then use regular hand signals.
- **Use Whip Line (Auxiliary Hoist)**: Tap elbow with one hand, then use regular hand signals.
- **Raise the Boom**: Arm extended, fingers closed, thumb pointing upward.
- **Lower the Boom**: Arm extended, fingers closed, thumb pointing downward.
- **Move Slowly**: Use one hand to give any motion signal & place other hand motionless in front of hand giving the motion signal. (Hand slowly shown as example)
- **Raise Boom/Lower Load**: Arm extended, fingers closed, thumb pointing up, flex fingers in & out as long as load/movement is desired.
- **Lower Boom/Raise Load**: Arm extended, fingers closed, thumb pointing down, flex fingers in & out as long as load/movement is desired.
- **Swing**: Arm extended, point with finger in direction of swing of boom.
- **Stop**: Arm extended, palm down, move arm back & forth horizontally.
- **Emergency Stop**: Both arms extended, palm down, move arm back & forth horizontally.
- **Travel (Both Tracks)**: Use both fists in front of body & make circular motion in same direction, indicating direction of travel forward or backward.
- **Travel (One Track)**: Lock track on side of raised flat. Travel opposite track in direction indicated by circular motion of other flat, rotated vertically on flat.
- **Dog Everything**: Cross hands in front of body.
- **Extend Boom (Telescoping Boom)**: Both fists in front of body with thumbs pointing backward.
- **Retract Boom (Telescoping Boom)**: Both fists in front of body with thumbs pointing forward.
- **Extend Boom (Telescoping Boom)**: One-hand signal. One fist in front of chest, thumb pointing down.
- **Retract Boom (Telescoping Boom)**: One-hand signal. One fist in front of chest, thumb pointing out and fore of fist tapping chest.

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