ARTICULATED BOOM TRUCK OPERATOR SAFETY TRAINING

SAMPLE TYPES OF MOBILE CRANE
STABILIZER SECTION

Rotation Cylinder

Suspension Beam

Stabilizer Extension Cylinder

Stabilizer Pad

Suspension Beam

Stabilizer Cylinder

Stabilizer

BOOM & TURRET INSPECTION

Worn pins

Damaged cylinder rods

Cracked Welds

Damaged Hydraulic Hoses

Worn pins

Damaged cylinder rods
CRACKED WELDS

Inspect Welds For Cracks

BOOM & TURRET INSPECTION

SAMPLE
Rotation Resistant wire rope require very careful handling prior to, during and after installation. When a non-rotating rope is cut, bent around a thimble or wedge socket, or is attached to any fitting, care must be taken to prevent core slippage.

Core slippage can happen quite easily. When the rope is twisted in one direction, one layer of strands will tighten up and shorten, while the other layer of strands loosens or becomes longer. As a result, the shorter layers of strands carry the majority of the load.

To ensure that core slippage does not take place, always apply wire seizings to bind the inner and outer cores together before the rope is cut or attached to any fitting.
INSPECTING SHEAVES

- Check flanges for chips, cracks, wear
- Check bearings for wobble, grease, ease of rotation
- Measure groove
- Check groove wear
- Inspecting sheaves

CHECK FOR:
- Safety latch & spring
- Cracks & twisting
- "Opening up"
- Wear & cracks
- Wear & deformation
- Swivel wear & lubrication
- Hook shackle housing
- Modifications
- Safety latches
- Cracks & twisting
- Wear & deformation
- Swivel wear & lubrication
- Hook shackle housing
- Modifications
- Safety latches
- Cracks & twisting
- "Opening up"
- Wear & cracks
BOOM TRUCK SETUP

Selecting a Suitable Site

Avoid recent fill areas

Do not set up over buried objects that could collapse

Avoid slopes

NEVER block under stabilizer

Shortened Radius

Wrong

Right

Wrong

Wrong

RIGHT
ESTIMATED OUT OF LEVEL CAPACITY REDUCTIONS

<table>
<thead>
<tr>
<th>BOOM LENGTH AND RADIUS</th>
<th>CAPACITY REDUCTION WHEN OUT OF LEVEL (Deg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Short Boom, Minimum Radius</td>
<td>10%</td>
</tr>
<tr>
<td>Short Boom, Maximum Radius</td>
<td>8%</td>
</tr>
<tr>
<td>Long Boom, Minimum Radius</td>
<td>30%</td>
</tr>
<tr>
<td>Long Boom, Maximum Radius</td>
<td>5%</td>
</tr>
</tbody>
</table>

The principle of leverage is used to determine the boom truck’s rated capacities.

Rated capacity is 85% of the tipping load.

Tipping Axis
Crane’s Leverage
Load’s Leverage
STABILITY

STABILITY INCREASED
TIPPING POINT IS FARTHER FROM CENTER OF ROTATION

LIFT REQUIREMENTS

• The Big Picture
  • Assessing the Load
  • Rigging Requirements
  • Assessing the Pick Area
  • Assessing the Placement Area
GROSS LOAD

Gross Load =
Net Load +
Rigging +
Wire Rope +
Block +
Boom Attachments

AVOID SIDE LOADING FROM TILTING

Tilting up objects can place significant side loads on the boom.
As the boom truck begins to tip, the load’s leverage increases and the boom truck’s leverage decrease. The rate of tipping increases to a point where recovery is not possible.

CRANE SAFETY

Avoid two-blocking the crane, use an anti-two blocking device

Do not leave the crane with a suspended load

Rig the crane with sufficient parts of line for the load

Always have a minimum of three wraps of cable on the drum

Monitor the winch to make sure that it is spooling correctly

Do not lift loads over personnel

Lift one load at a time

Maintain correct electrical clearance

Never use the hoist line as a sling
HAND SIGNALS

- DOG EVERYTHING
- EXTEND BOOM
- EMERGENCY STOP
- LOWER THE LOAD
- RAISE THE BOOM
- LOWER THE LOAD
- RAISE THE BOOM
- RETRACT BOOM

POWER LINE CONTACT

Required Clearances

<table>
<thead>
<tr>
<th>Voltage Range</th>
<th>Clearances</th>
</tr>
</thead>
<tbody>
<tr>
<td>50kV</td>
<td>10 ft</td>
</tr>
<tr>
<td>50 to 200kV</td>
<td>15 ft</td>
</tr>
<tr>
<td>200 to 350kV</td>
<td>20 ft</td>
</tr>
</tbody>
</table>
WIRE ROPE SLING INSPECTION

KINKING
CRUSHING
UNSTRANDING
BIRDCAGING
STRAND DISPLACEMENT
CORE PROTRUSION
CORROSION
BROKEN OR CUT
STRANDS
BROKEN WIRES

LENGTH

EYE

BODY

SLEEVE

DEFORMATION

BOLT SUBSTITUTION

WEAR

TWO TYPES OF SHACKLES USED FOR LIFTING.
## Eye Bolts

**Wrong!**

Do not reeve slings one eye bolt to another. Load on bolt is altered.

**Caution!**

Structure may buckle from compression forces.

### Direction of Pull vs. Adjusted Working Load

<table>
<thead>
<tr>
<th>Direction of Pull</th>
<th>Adjusted Working Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Line</td>
<td>Full Rated Working Load</td>
</tr>
<tr>
<td>45 Degrees</td>
<td>30% of Rated Working Load</td>
</tr>
<tr>
<td>60 Degrees</td>
<td>60% of Rated Working Load</td>
</tr>
</tbody>
</table>

### Synthetic Sling Inspection

- **Scuffing**
- **Red Threads**
- **Nicks**

**Manufacturer Tag**

- Lift-It En-902 4ft Nylon Choker Vertical Basket
- Do not exceed rated capacity

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**Hard Hat Training Series**

**Articulated Boom Truck**
Acceptable methods of determining weight

You may find the weight from:

- Data on manufacturing label plates.
- Manufacturer documentation.
- Blueprints or drawings.
- Shipping receipts.
- Weigh the item.
- Bill of lading (be careful)
- Stamped or written on the load
- Approved calculations

*Never use word of mouth to establish the weight of an item!*
### ESTIMATING WEIGHTS

#### METALS
- Aluminum: 165 lbs/ft³
- Brass: 535 lbs/ft³
- Bronze: 500 lbs/ft³
- Copper: 560 lbs/ft³
- Iron: 480 lbs/ft³
- Lead: 710 lbs/ft³
- Steel: 490 lbs/ft³
- Tin: 460 lbs/ft³

#### TIMBER
- Cedar: 34 lbs/ft³
- Cherry: 36 lbs/ft³
- Fir, seasoned: 34 lbs/ft³
- Fir, wet: 50 lbs/ft³
- Hemlock: 30 lbs/ft³
- Maple: 53 lbs/ft³
- Oak: 62 lbs/ft³
- Pine: 30 lbs/ft³
- Poplar: 30 lbs/ft³

#### MASONARY
- Ashlar masonry: 160 lbs/ft³
- Brick, soft: 110 lbs/ft³
- Brick, pressed: 140 lbs/ft³
- Clay tile: 60 lbs/ft³
- Rubble masonry: 155 lbs/ft³
- Concrete, cinder, haydite: 110 lbs/ft³
- Concrete, slag: 130 lbs/ft³
- Concrete, stone: 144 lbs/ft³
- Concrete, reinforced: 150 lbs/ft³

#### LIQUIDS
- Diesel: 80 lbs/ft³
- Gasoline: 60 lbs/ft³
- Water: 155 lbs/ft³

#### EARTH
- Earth, wet: 120 lbs/ft³
- Earth, dry: 105 lbs/ft³

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### ESTIMATING VOLUMES

**Volume of a cylinder**

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\[ 3.14 \times 1^2 \text{ ft} \times 10 \text{ ft} = 31.4 \text{ cubic ft} \]

If the material was reinforced concrete, then all we would have to do to determine its weight would be to multiply the unit weight of reinforced concrete by 31.4.

150 lbs/ft³ x 31.4 cubic ft = 4,710 lbs.
**CALCULATING VOLUME**

For thin pipe a quick way to estimate the volume is to split the pipe open and calculate the volume like a cube. The formula would be:

\[ \pi \times \text{diameter} = \text{width}, \text{so:} \]

\[ \pi \times \text{diameter} \times \text{length} \times \text{thickness} \times \text{unit weight} = \text{weight of object} \]

\[ 3.14 \times 3 \text{ ft} \times 8 \text{ ft} \times 1/12 \text{ ft (or .08 ft)} \times 490 \text{ lbs} = *3,077.2 \text{ lbs} \]

**WEIGHT TABLES**

Weight tables are an excellent way to calculate load weight. If you are handling certain materials often, then having a chart that gives you the weight per cubic foot, cubic yard, square foot, linear foot or per gallon. Here are a few examples:

**METAL PLATES**

STEEL PLATES weigh approximately 40 lbs per sq. ft. at 1 inch thick. 1/2 inch thick would then be about 20 lbs per sq. ft.

A steel plate measuring 8 ft. x 10 ft. x 1/2 inch would then weigh about 3,200 lbs. (8 x 10 x 40 lbs = 3,200 lbs.)

**BEAMS**

Beams come in all kinds of materials and shapes and lengths. STEEL I-BEAMS weigh approximately 40 lbs a linear ft. at 1/2 inch thick and 8 inches x 8 inches. If it were 1 inch thick then it would be 80 lbs a linear ft. If it were 20 feet long at 1 inch thick then it would weigh about 1,600 lbs. (20 ft. x 80 lbs = 1,600 lbs.)