Section 6
Crane Structure

Training Objective

At the completion of this section, students should have a general understanding of key structural areas to be inspected on overhead and under running cranes and monorails.

Crane Structure

Top Running Cranes

- Bridge orientation
- Bridge deflection / camber
- Structural connections (bridge and trolley)
- End Trucks / Trolley Trucks

Under Running Cranes & Monorails

- Square
- Girder / end truck connections
- Stops
- Jib cranes

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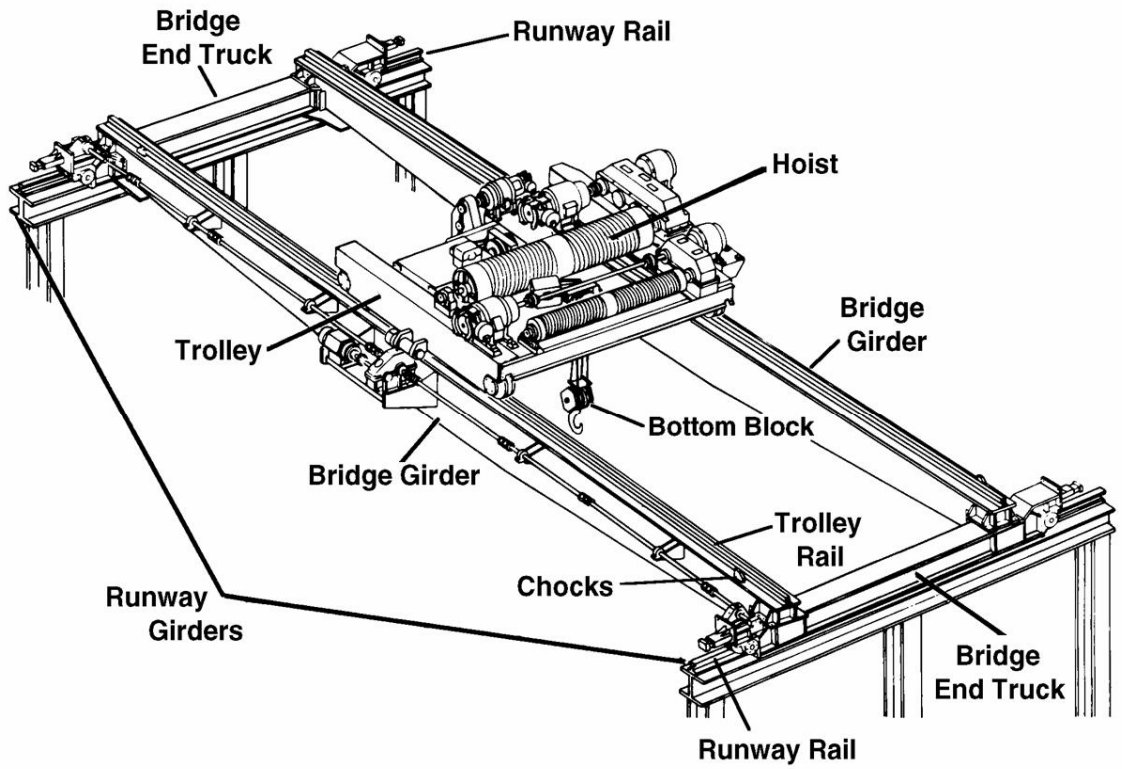
Overhead Crane Bridge

Q What type drive configuration is on this crane?



A1

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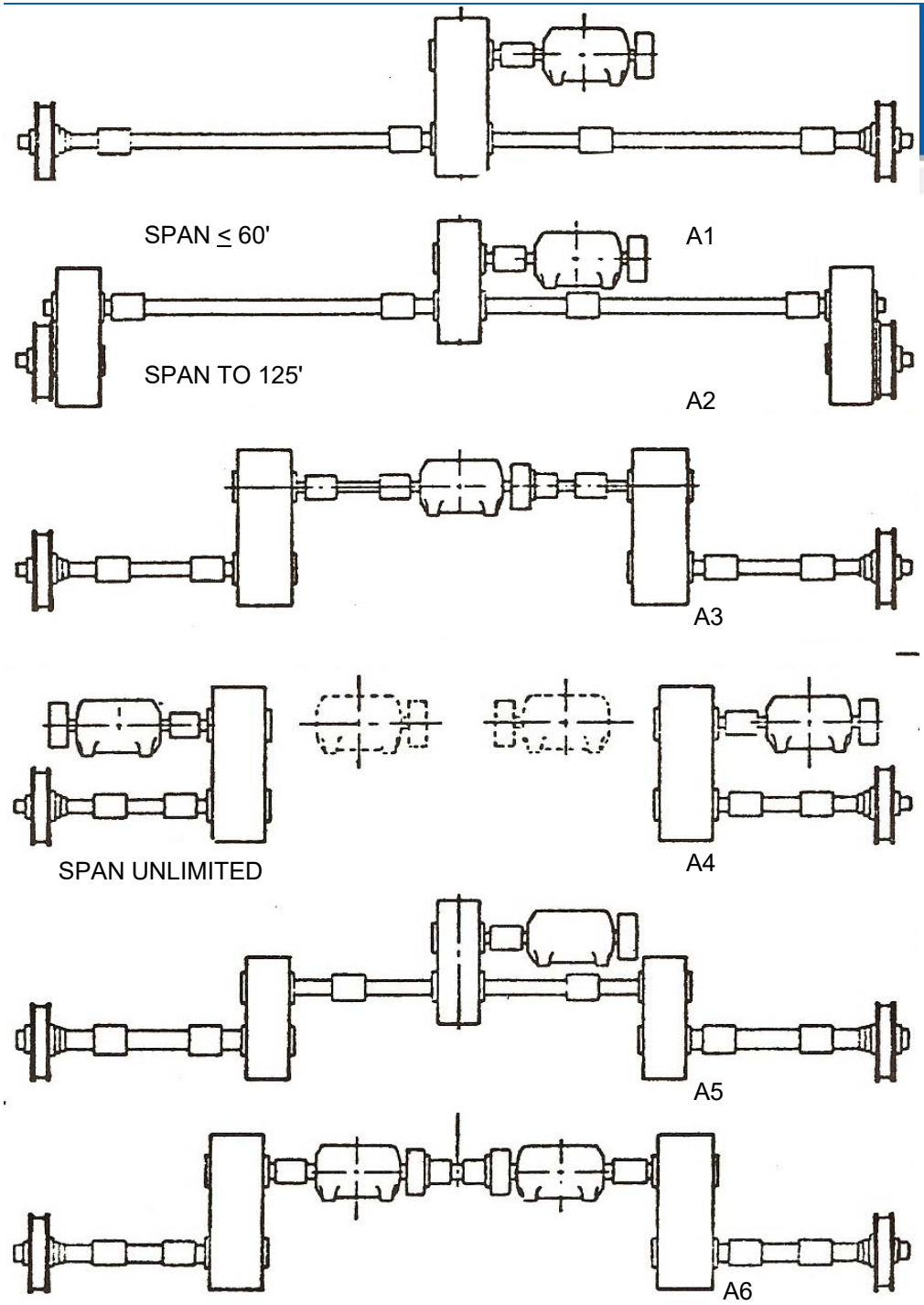

- **A1** **MOST COMMON AND LEAST EXPENSIVE**
- **A2** **GOOD TRACKING CHARACTERISTICS**
- **A3** **UNCOMMON**
- **A4** **MOST COMMON AMONG LONG SPAN HIGHER DUTY CYCLE CRANES**

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NO LOAD

50% LOAD

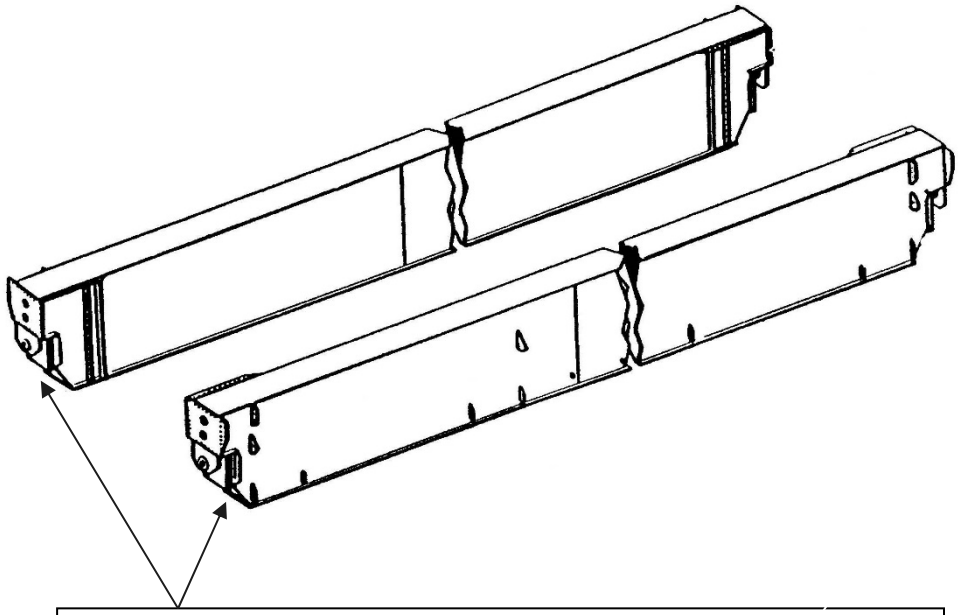
100% LOAD

- The maximum vertical deflection of the bridge girder produced by the weight of the hoist, trolley and the rated load **shall not** exceed 1/888 of the span. Vertical inertia forces shall not be considered in determining deflection. (CMAA Spec #70, pg. 29, par 3.5.5.1)
- Box girders should be cambered an amount equal to the dead load deflection plus one-half of the live load deflection. (CMAA Sec #70, pg. 29, par 3.5.5.2)

INSPECT CRANE BRIDGE DEFLECTION AS FOLLOWS

- Take a measurement with the trolley all the way to one side of the bridge and unloaded. Place a rated load on the crane hook or lifting device and take another measurement. Maximum deflection should be no greater than .001126 inches of deflection per inch of bridge span. EXAMPLE: Maximum deflection for a 70' bridge would be _____? 70 ft. × 12 inches = 840 inches × .001126 = .94584 inches .94584 inches would be the maximum allowable deflection on a crane bridge with a 70 ft. span.

Box Girders



**Rust at corner connections is a good indication of a working bridge

(Water penetration)

Reference:

- CMAA Spec #70-3.5.8
- CMAA Spec #74-3.5.7

INSPECT:

- Top Plate connection (separation)
- Side plate (distortion at welds)
- Bottom Plate (separation)
- Corner connections (girder to end truck)
- Cracks
- ***Loose or missing bolts****
- ***Rust at corner connections****

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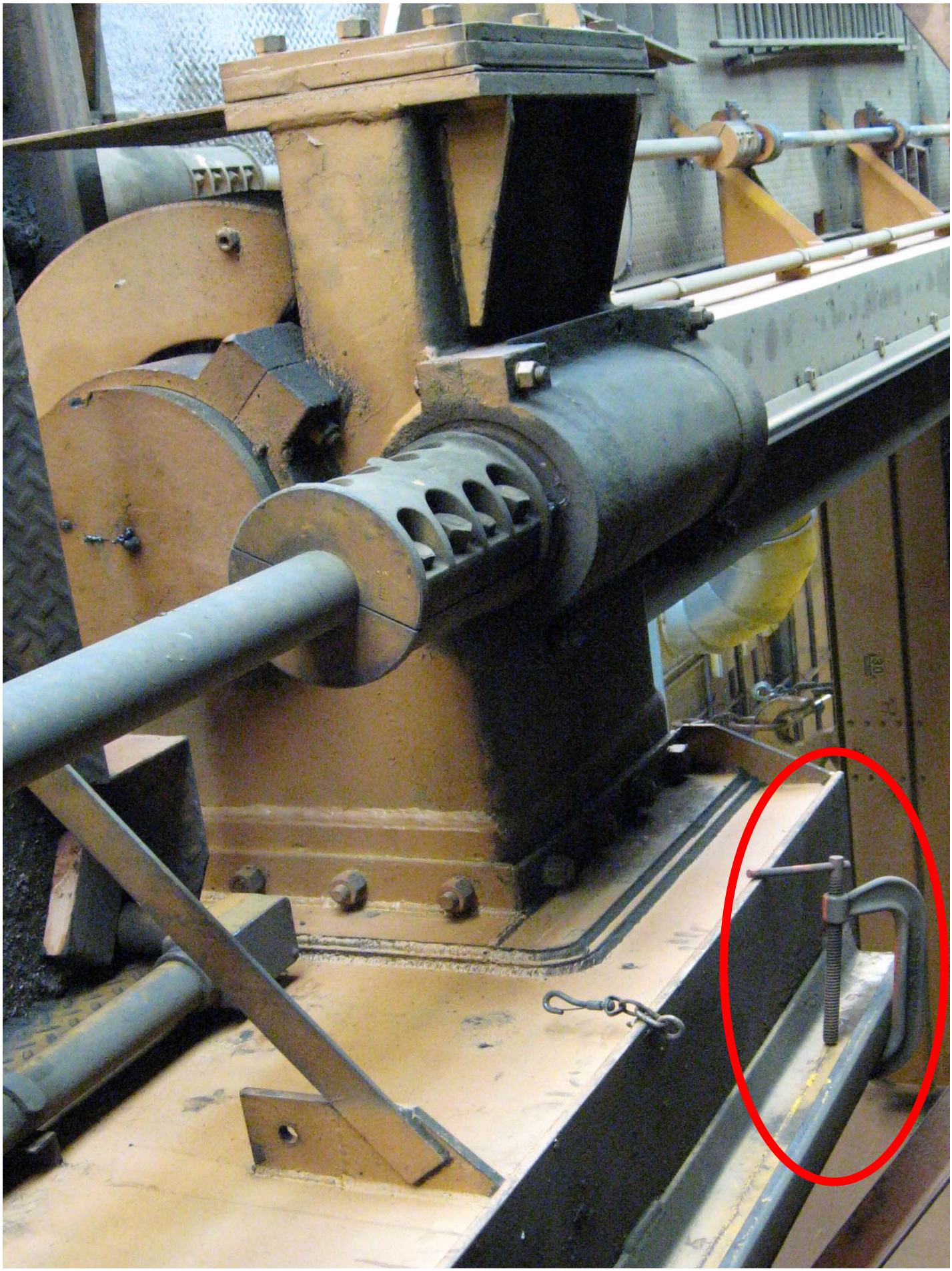
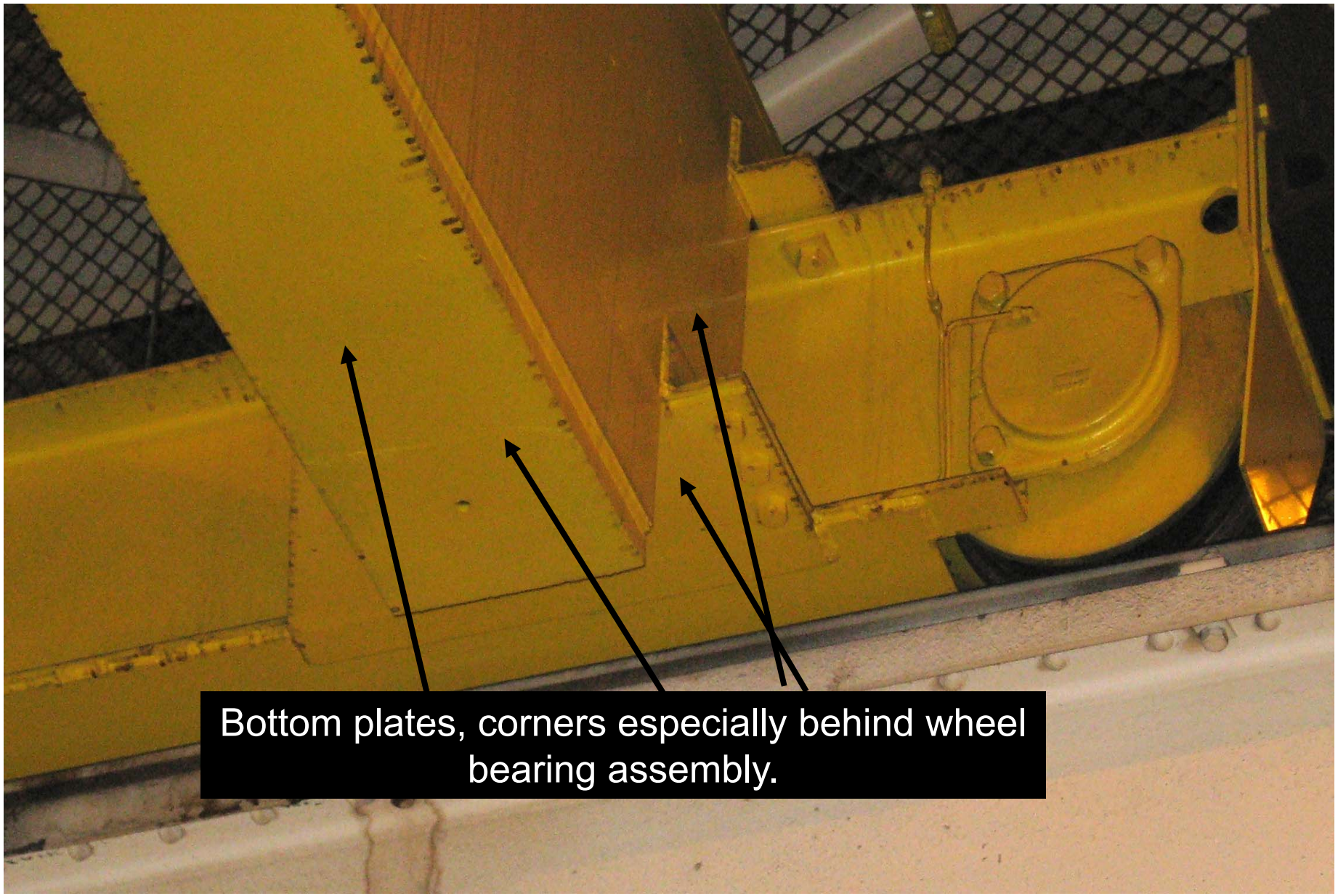
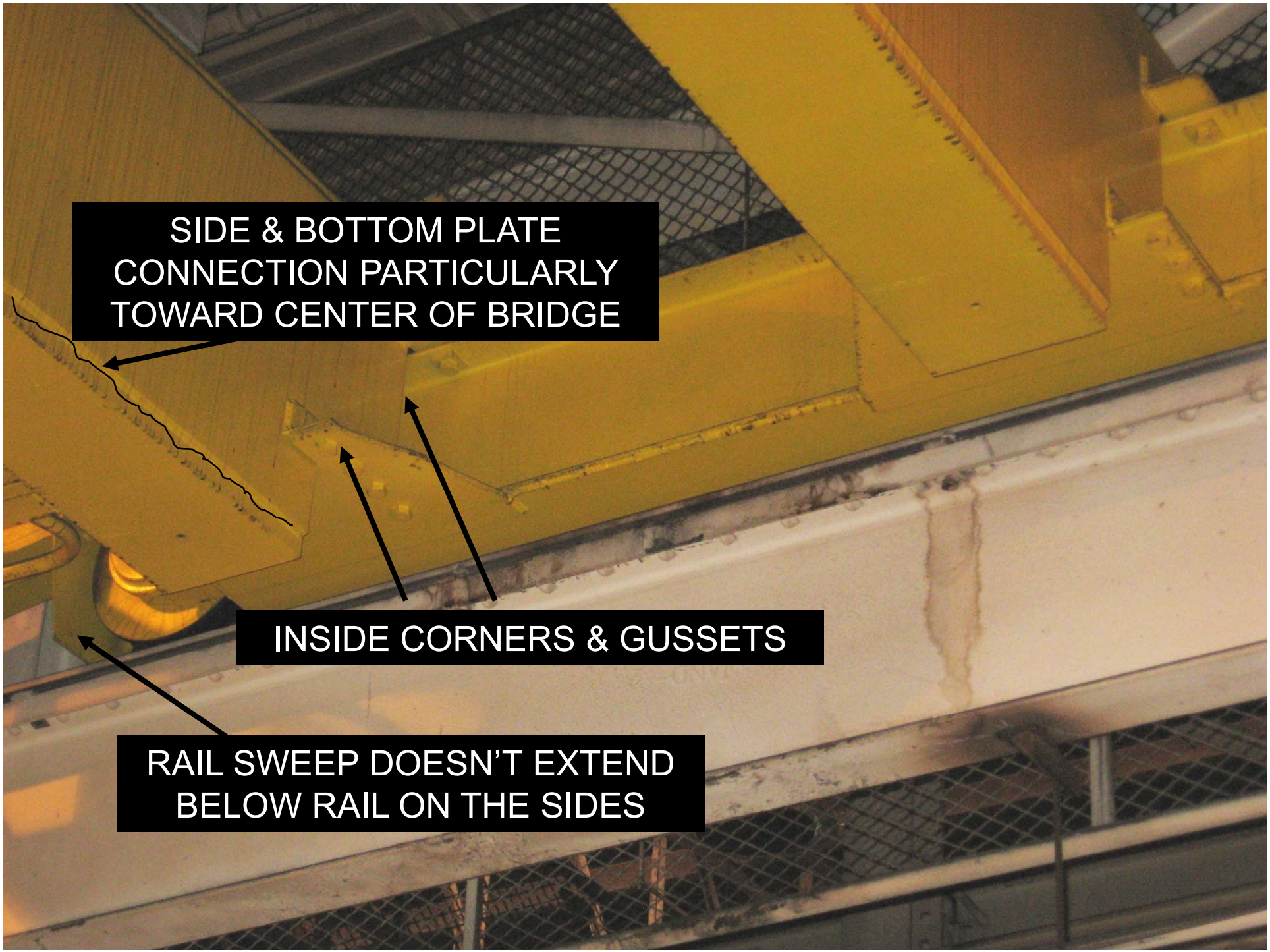
This is not good! WHY?

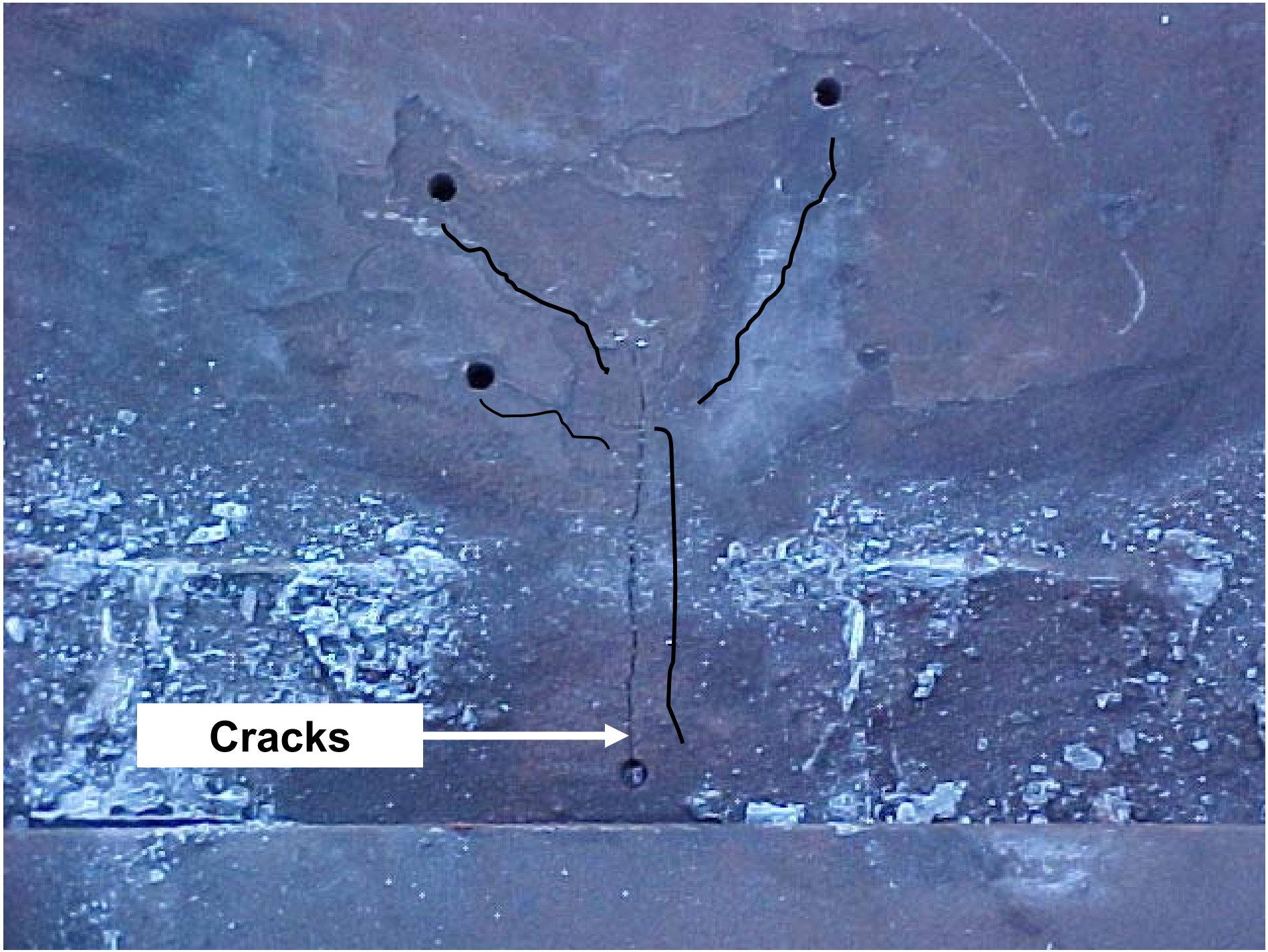



Loose or missing bolt, cracks, rust lines

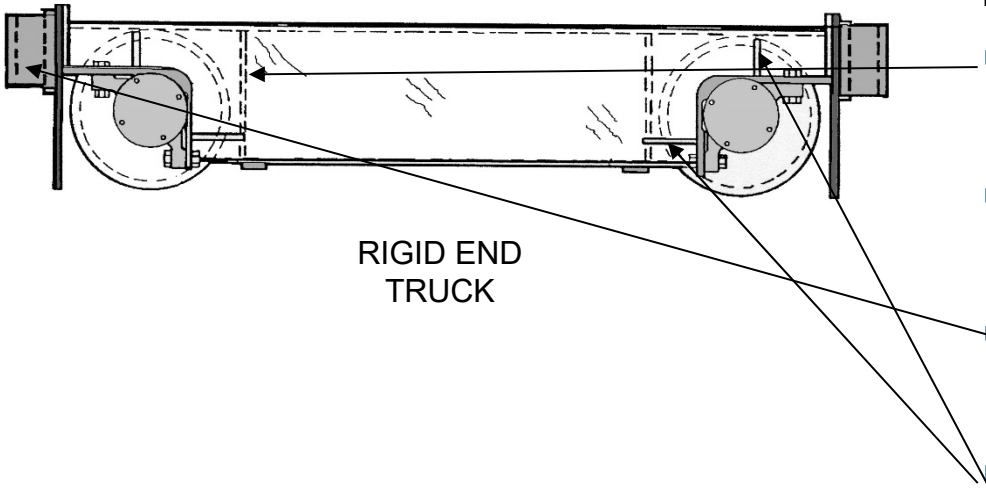

Bottom plates, corners especially behind wheel bearing assembly.


SIDE & BOTTOM PLATE CONNECTION PARTICULARLY TOWARD CENTER OF BRIDGE
INSIDE CORNERS & GUSSETS
RAIL SWEEP DOESN'T EXTEND BELOW RAIL ON THE SIDES


Top Plate
Separation


Cracks

End Trucks



Reference:

- OSHA 1910.179(e)
- CMAA Spec #70-3.6
- ASME B30.2-1

INSPECT:

- Truck side plates
  CMAA Spec #70-3.6
- Rail Sweep
  ASME B30.2-1.9
- Bumper mounting and restraint
  ASME B30.2-1.8
- Gussets
  CMAA Spec #70-3.6
- Lubrication
  ASME B30.2-1.6
- Drop Limit
  ASME B30.2-1.11

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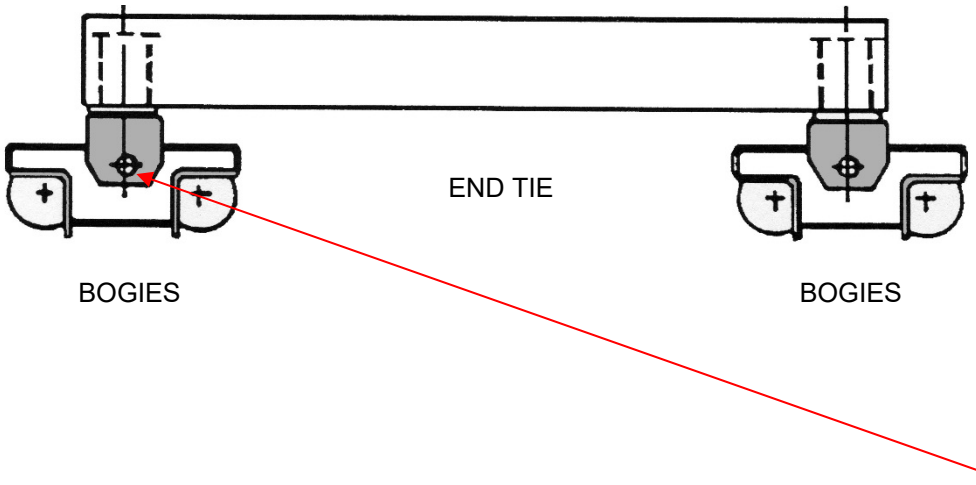
End Trucks



Reference:

- OSHA 1910.179(e)
- CMAA Spec #70-3.6
- ASME B30.2-1

INSPECT:

- Truck side plates
- Rail Sweep
- Bumper mounting and restraint
- Gussets
- **Lubrication**
- Drop Limit

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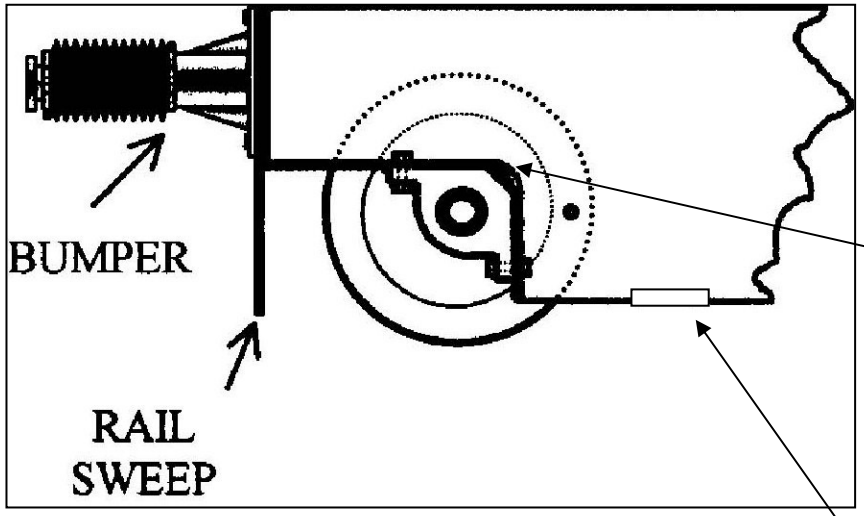
End Trucks



Reference:

- OSHA 1910.179(e)(2)
- CMAA Spec #70-3.6
- ASME B30.2-1

INSPECT:

- Truck side plates
- Rail Sweep
- Bumper mounting and restraint 1910.179(e)(2)(ii)
- Gussets
- Lubrication
- Drop Limit

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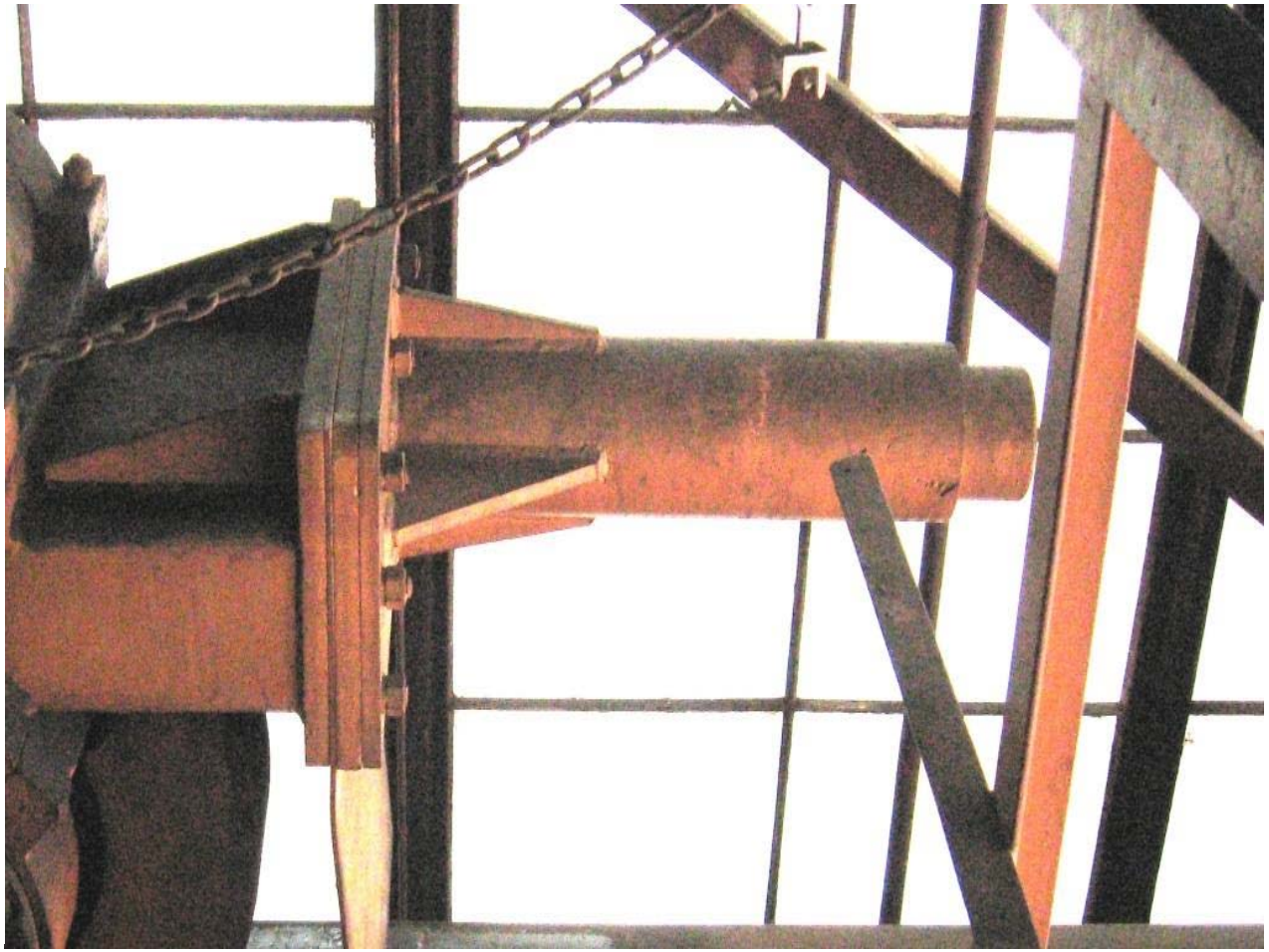
OSHA 1910.179 (e)(2)(ii)

Is this in compliance with OSHA?

Show me why…. Reference ????



OSHA 1910.179 (e)(2)(ii)

1910.179(e)(2)(ii) Bumpers shall be so designed and installed as to minimize parts falling from the crane in case of breakage.

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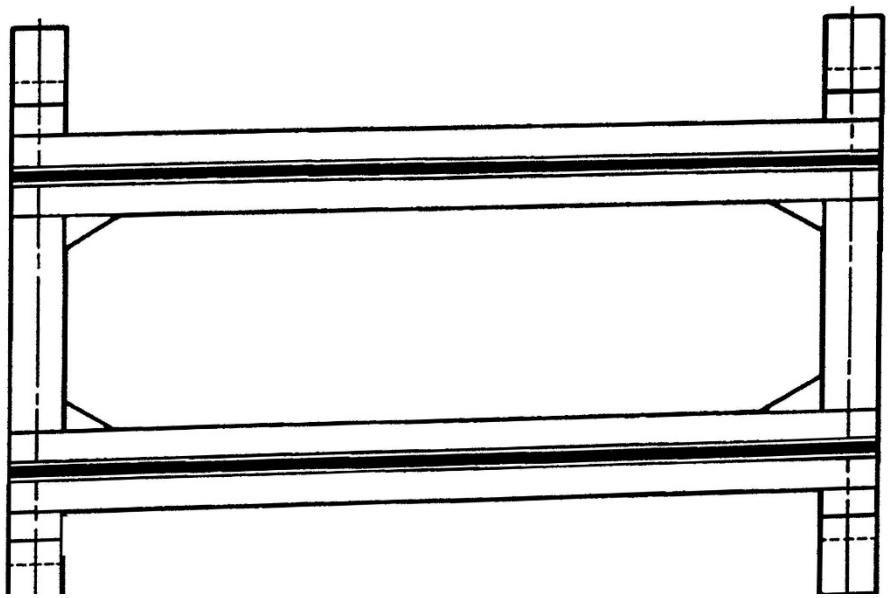
Checking Square



Poor bridge tracking can be caused by any number of reasons. ***Runway misalignment is the number one cause.*** However, surveying a runway is extremely expensive compared to checking square of the bridge structure and true parallel alignment of the bridge wheels

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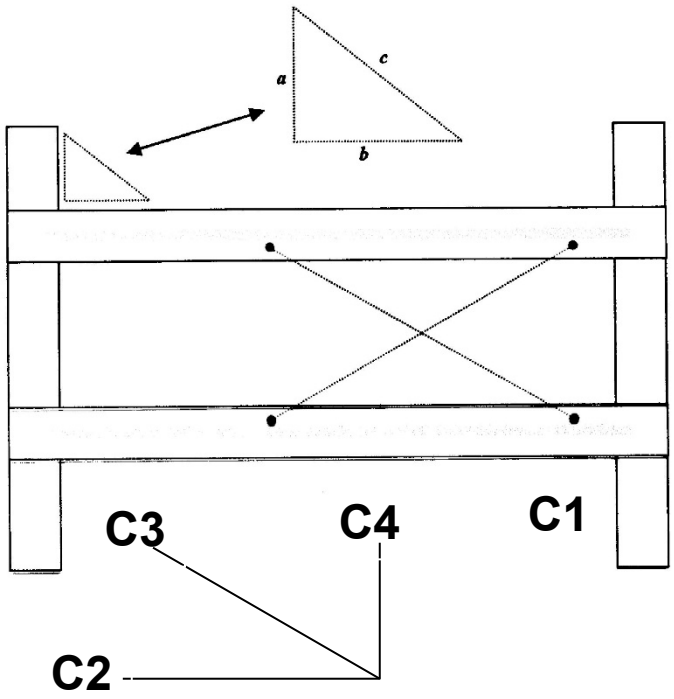
Checking Square



BRIDGE CONSIDERED SQUARE IF WITHIN 3/16" OF MANUFACTURER'S ORIGINAL DIMENSIONS

Pythagorean's theorem is one quick method of checking structural square. It is not as accurate nor is it indicative of **TRUE PARALLEL ALIGNMENT**

- Squaring marks are the most accurate way of checking for manufacturer's original squareness of the bridge relative to the wheels & end truck assemblies.
- Manufacturers using squaring marks orient them to the C1 Corner of the crane

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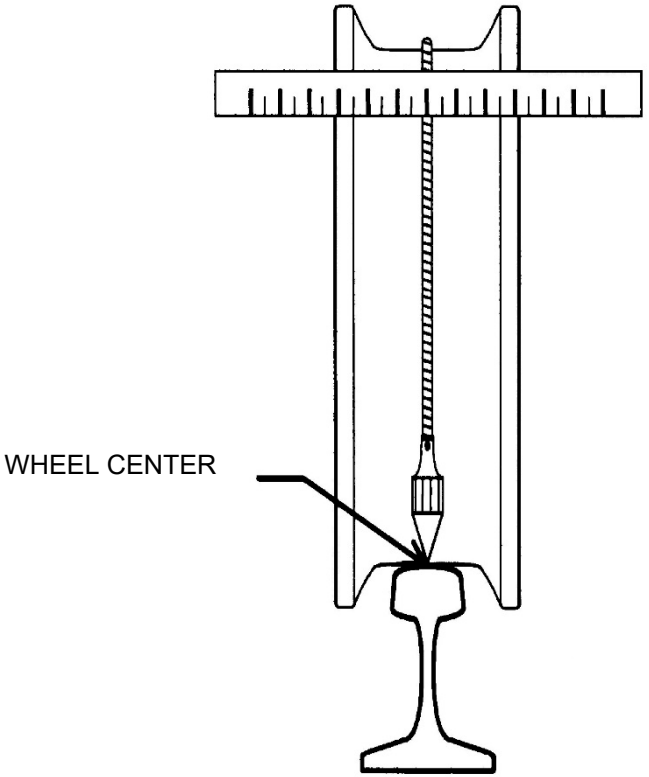
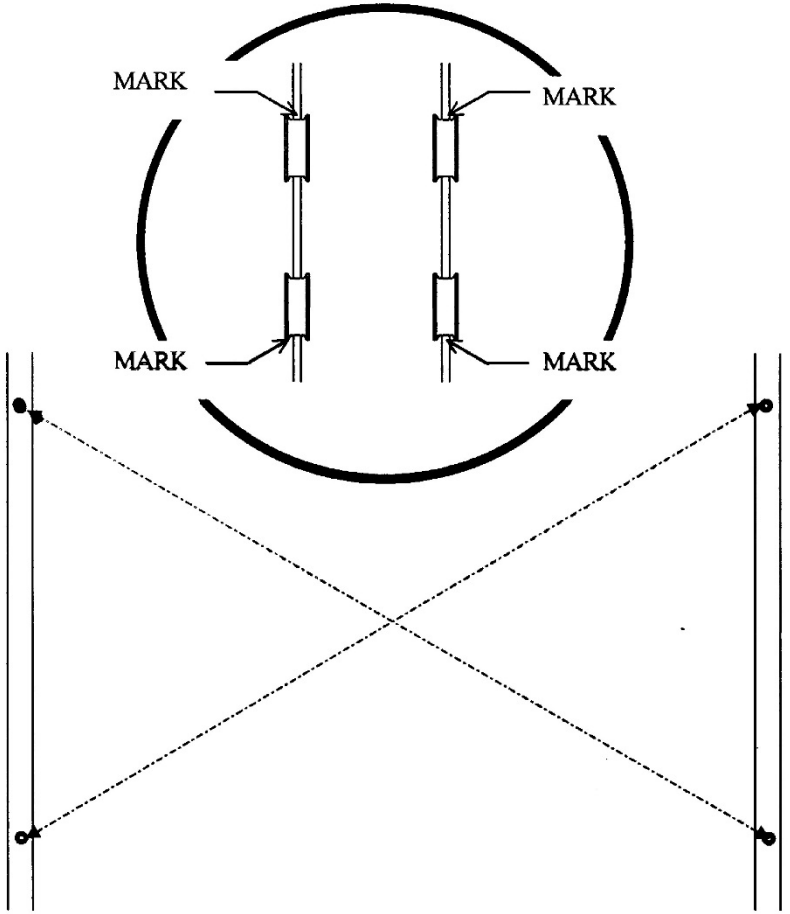
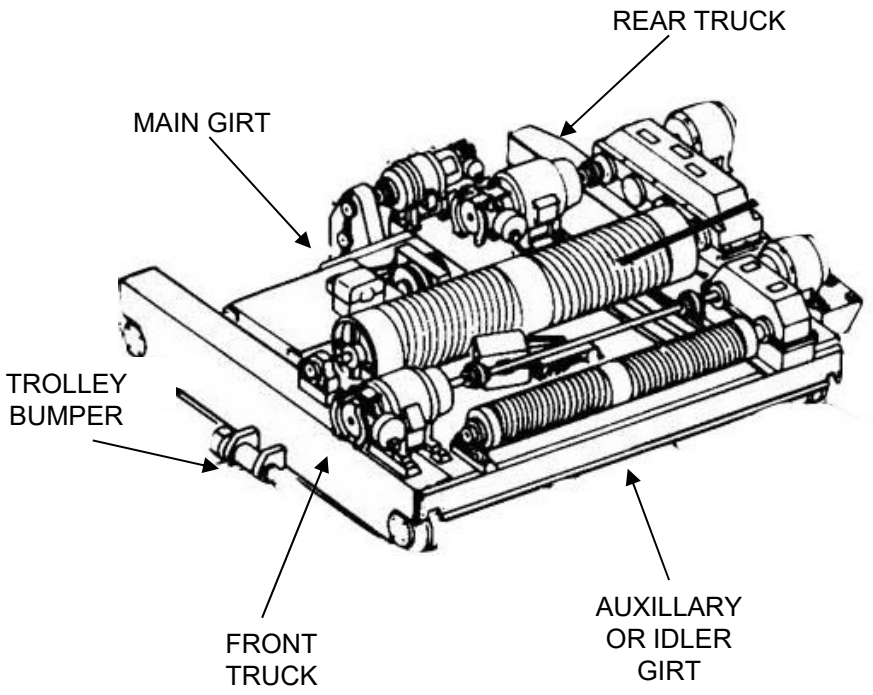
Checking Square





Trolley Structure



IF TROLLEY BUMPER IS BOLTED ON IT IS PROBALY NOT LEGAL.

ASME B30.2-1.8.3(b)(3)

Trolley bumpers shall be designed & installed with a means of retaining the bumper in the case of broken or loosened mounting connections

Reference

- OSHA 1910.179(e)
- ASME B30.2-1

INSPECT:

- Markings
- Main and Idler Girt structure
- Rail Sweep
- Trolley Bumpers and Stops
- Corner connections
- Cracks
- Loose or missing bolts
- Rust
- Lubrication
- Drop Limiter

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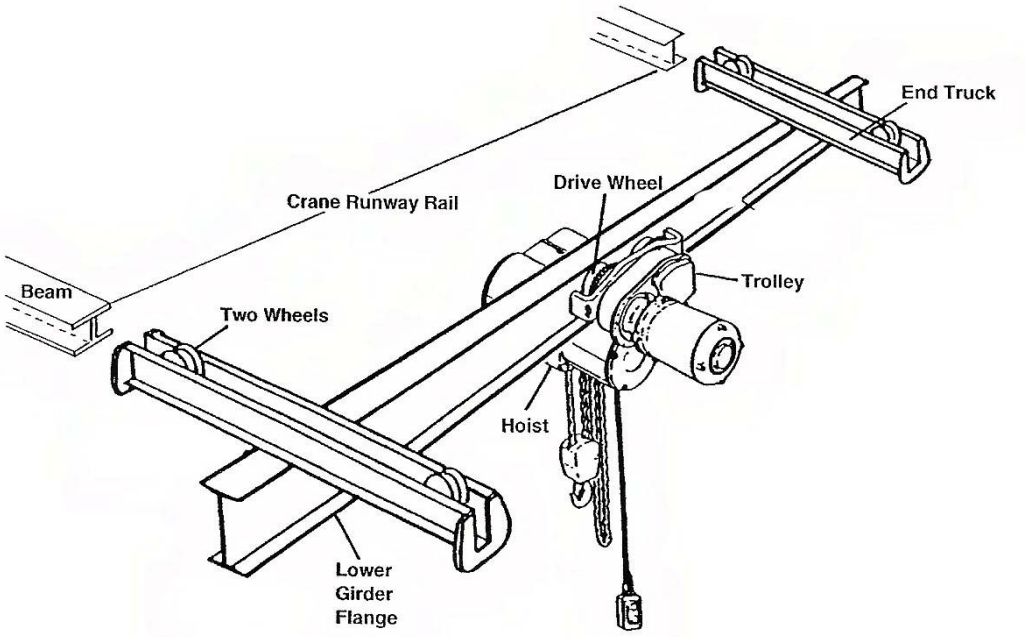
Underhung Bridge Structure



Reference

- ASME B30.17/11-1-3

INSPECT:

- Bottom Flange
- Corner connections
  (nuts, bolts, cracks, rust)
- End trucks (drop lugs)
- Bumpers and stops

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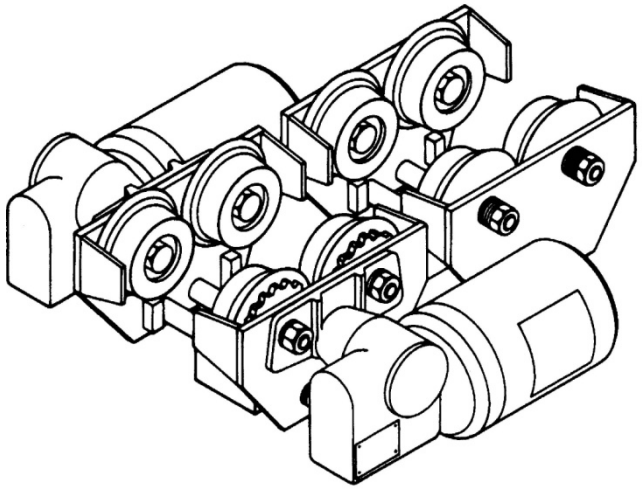
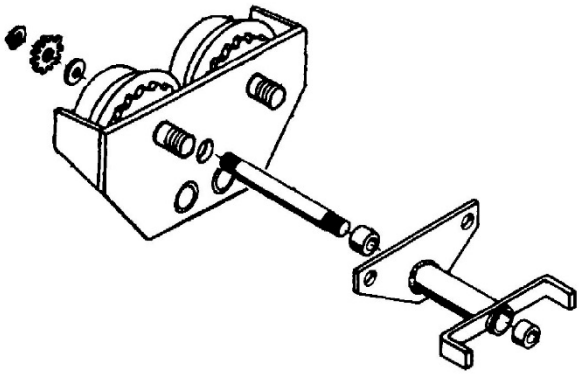
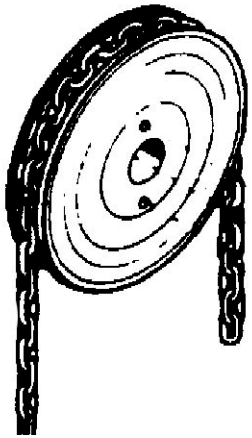
Underhung Trolley







Reference:

- ASME B30.16-2.1.4

INSPECT:

- Pins
- Bearings
- Shafts
- Bolts / Nuts
- Wheels
- Gears
- Rollers
- Bumpers
- Drop Lugs
- Hand chain & Wheel

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Jib Cranes

Reference

- ASME B30.17/11-1
- ASME B30.17/11-2

INSPECT:

- Capacity markings
- Vertical and plumb (foundation)
- Swing drive
- Beam flange, excessive deflection
- Stops
- Rollers & bearings
- Brackets, yoke, rod and pins

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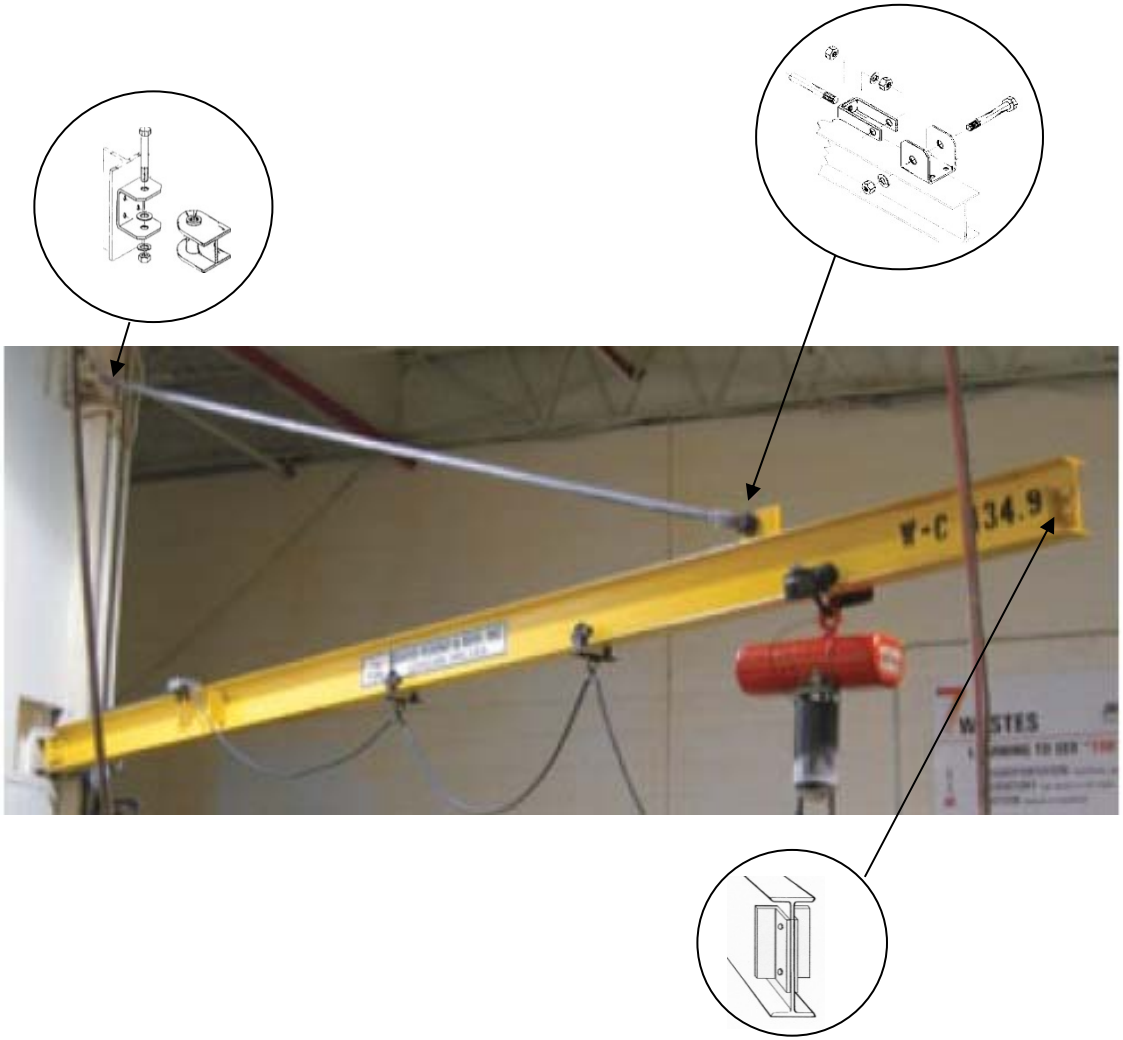
1/2

Wall Bracket Jib



Reference:

- ASME B30.17/11-1
- ASME B30.17/11-2

INSPECT:

- Capacity markings
- Beam flange, excessive deflection
- Stops
- Brackets, yoke, rod and pins
- Hinge pins

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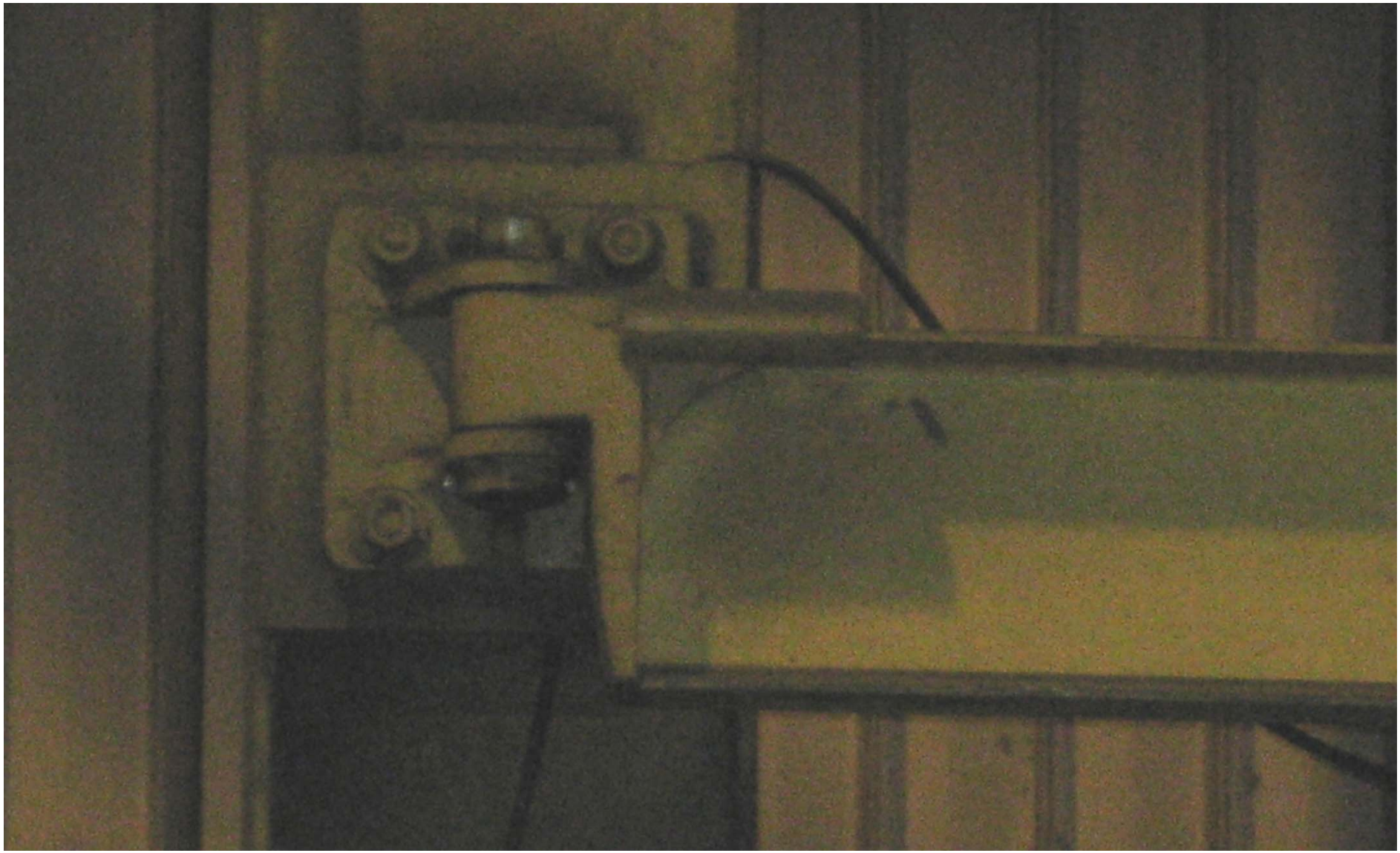
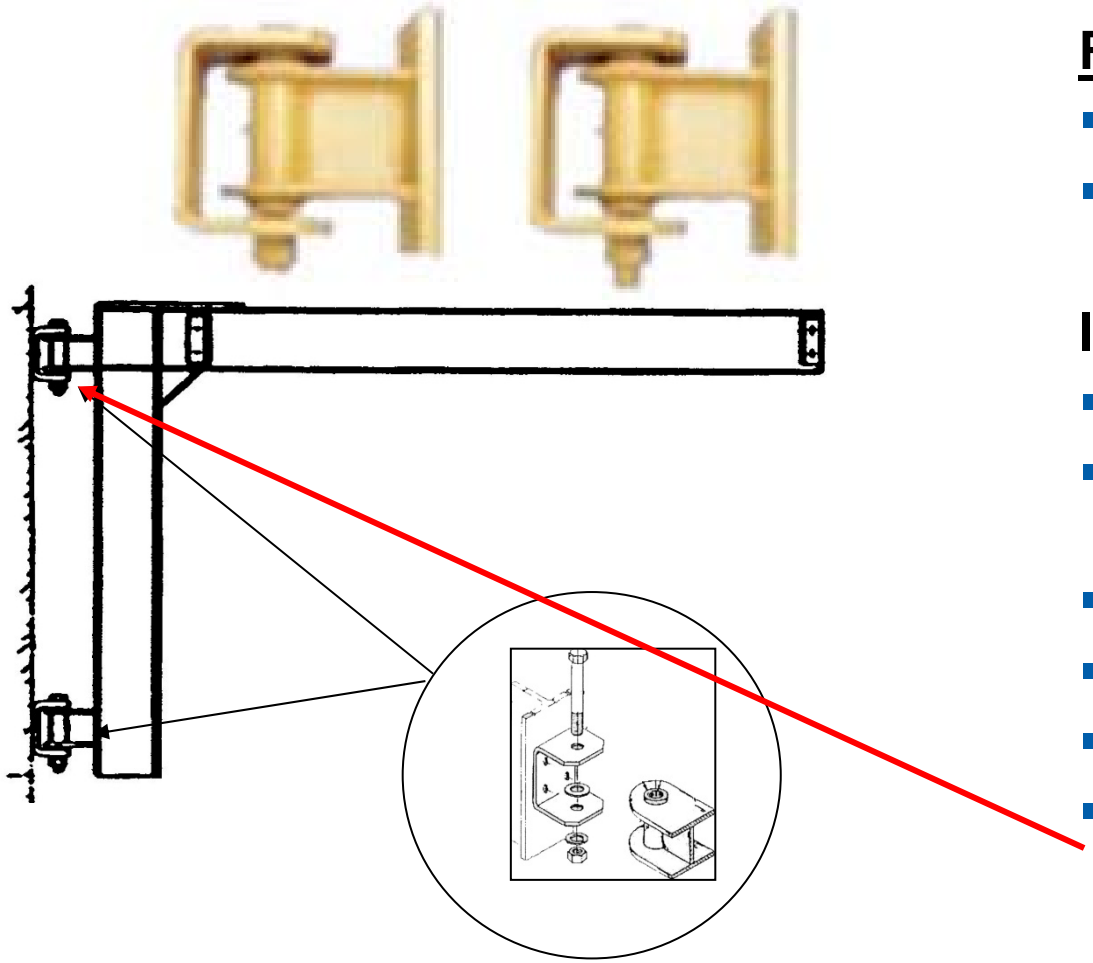
Jib Cranes



Wall Cantilever Jib



Reference

- **ASME B30.17/11-1**
- **ASME B30.17/11-2**

INSPECT:

- Capacity markings
- Beam flange, excessive deflection
- Stops
- Hinge pins
- Wall mount brackets
- Vertical т Horizontal joint

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Questions??

Thanks for your attention,
let's take a break!

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