

Collision Detection: Safety Improvements to High Bay/Low Bay Overhead Cranes

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Collision Detection: Safety Improvements to High Bay/Low Bay Overhead Cranes

Detection of collision between High Bay / Low Bay cranes minimizes:

- Snagging of upper hoist with lower crane
- Lowering hook or lifter onto lower crane
- Tandem lift concerns
- 2 cranes occupying the same area at the same time

Facilities benefit long term:

- SAFETY: Minimize safety concerns
- RELIABILITY: Reduce probability of damage to crane and production equipment
- PRODUCTIVITY: Better defined movement paths promote productivity



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Outline

Benefits of restricting crane movement

- ❖ Safety
- ❖ Reliability
- ❖ Productivity

Applications in overhead cranes:

- ❖ High Bay / Low Bay overhead cranes
- ❖ Upper crane vs lower gantries

Implemented solutions:

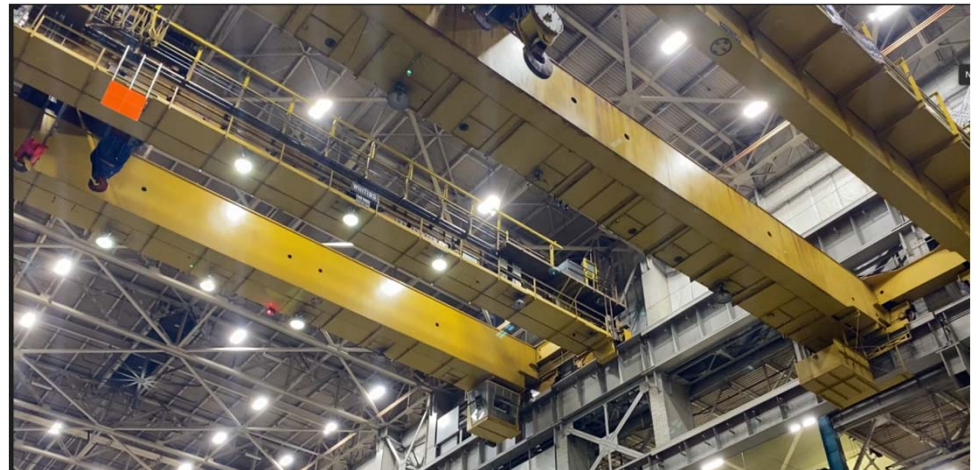
- ❖ Absolute position monitoring
- ❖ Relative position



Dual Level Crane Collision Detection

What can go wrong?

1. Collisions on same elevation
2. Snagging between hoist of upper crane and lower crane
3. Lowering load onto lower crane
4. Interfering with Tandem mode operation



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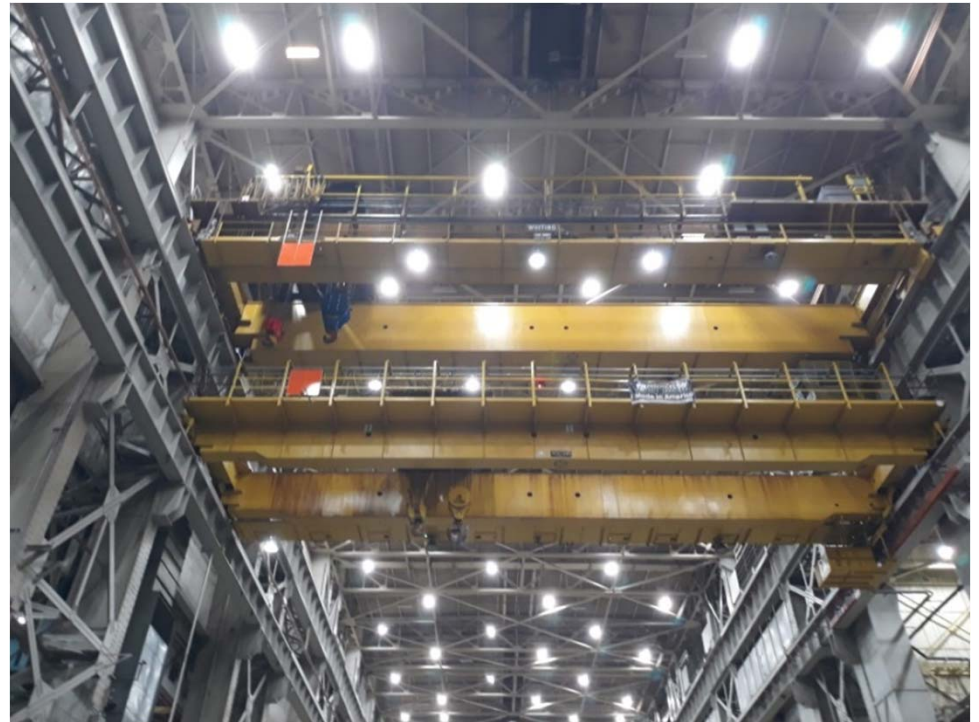
Railroad Diesel Engine Mfg

Dual Level Crane Collision Detection

Retrofit 4 cranes- 2 upper, 2 lower 1000 ft long runway

User concerns:

- Festoon , railing, and controls of lower cranes snagged and damaged by upper crane
- Little clearance between upper and lower cranes makes it hard to distinguish if movement is safe



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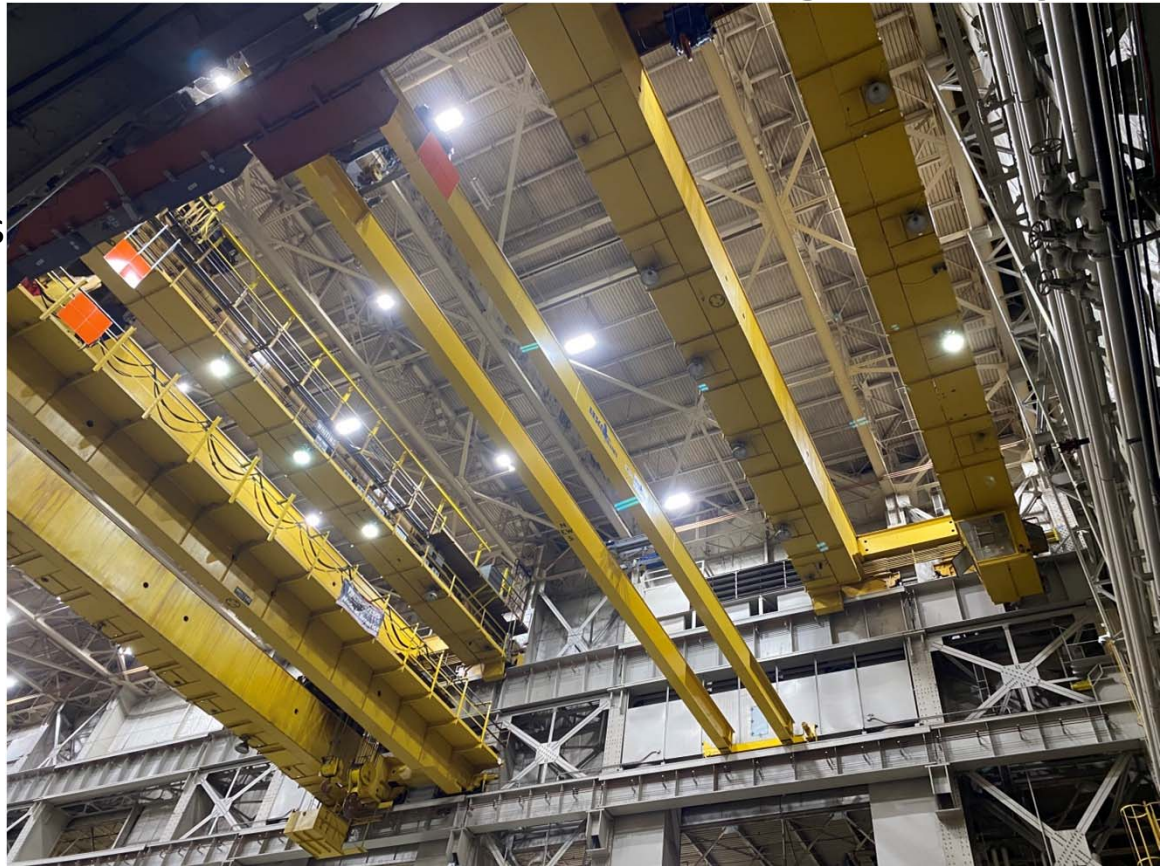
Railroad Diesel Engine Mfg

Dual Level Crane Collision Detection

Retrofit 4 cranes- 2 upper, 2 lower 1000 ft long runway

User concerns:

- Tandem load picks are critical, forcing lower cranes to be parked elsewhere
- Each crane has its one remote and they are not locked out when others are in use



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Overhead crane: Multi-elevation runway



Considerations:

- How many overhead cranes? How many elevations? Can they move the entire length of the runway?
- Can Overhead cross the lower crane if the hoist is in the upper position?
- How do the Overhead cranes interact in terms of material handling under production operations?

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Overhead crane vs lower gantry crane

Challenges:

- Gantry cranes may not all traverse the entire length of runway
- Users often want to use crane over gantry when hoist is to the side



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Overhead crane over Gantry crane

Considerations:

- Span: Is the entire span a concern or does Gantry only cover part of the span
- Are there fixed positions that Gantry and Overhead need to be in order for certain operations to be permitted?
- How many overhead cranes? How many Gantry cranes? Can they move the entire length of the runway?
- Can Overhead cross Gantry if the hoist is in the upper position?
- How do the Overhead and Gantry interact in terms of material handling under production operations?



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Keeping Upper crane and Lower crane from occupying same material handling area

Both Upper crane and lower crane service the same area and are used to hand off material between processes

Challenges:

- Crane cannot occupy the same area
- Automatic detection of the area is required



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Overhead crane: Multi-elevation runway

Implementation

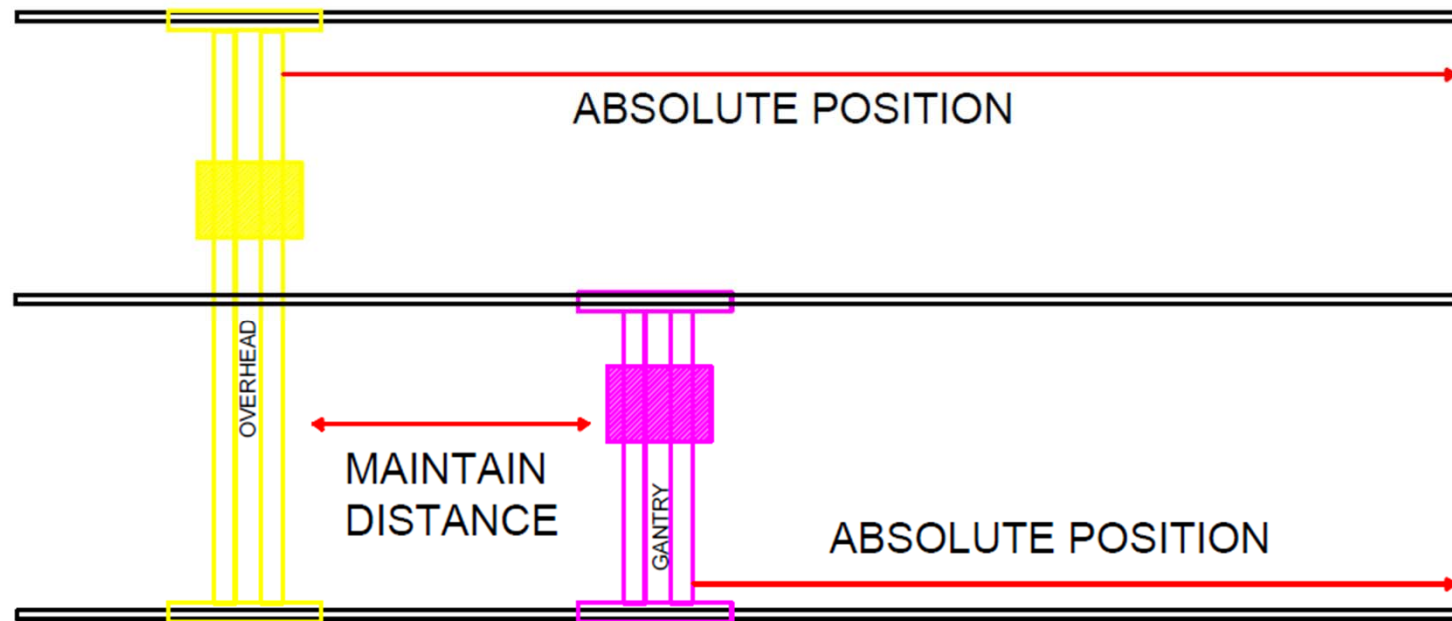
Multiple upper crane and multiple lower cranes:

1. Scan region around each crane for presence of upper or lower crane
 - Looking for the wire rope of the upper crane has not been found to be a guaranteed method of detection
 - Scanning field of view
 - Min object detection size
2. Absolute position to wall
 - Monitor both cranes to keep part when upper hook is not at safe height
 - Wireless I/O for indication of hoist height



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Types of solutions: Absolute positioning

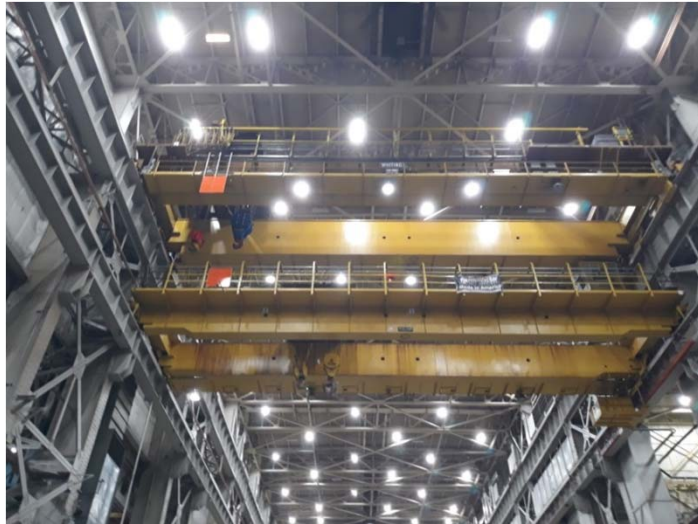


Implementation:

- Full position tracking and interfacing between all cranes keeps Overhead and Gantry a set apart away from each other

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Types of solutions: Absolute positioning



Master controls on wall



Wireless remote I/O on cranes

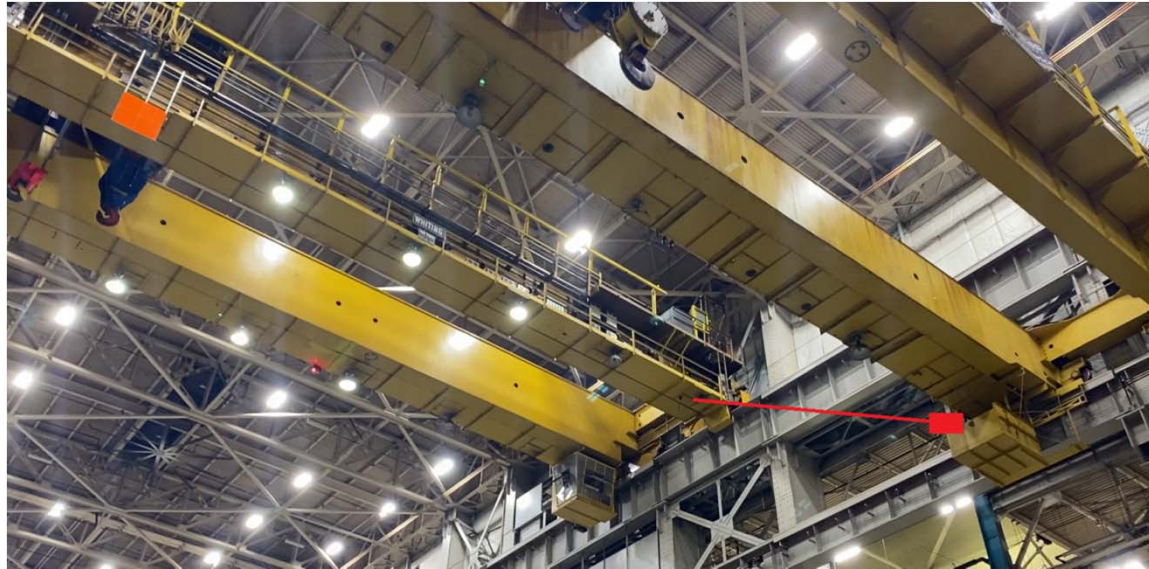
Smart collision detection system

- Collision detection crane to crane on same elevation
- Snagging between hoist of upper crane and lower crane
- Not allow upper crane to lower hoist when over lower crane
- Tandem mode operation spacing; upper cranes



Laser sensors mounted on building column

Collision Detection: Safety Improvements to High Bay/Low Bay Overhead Cranes Crane to crane directly



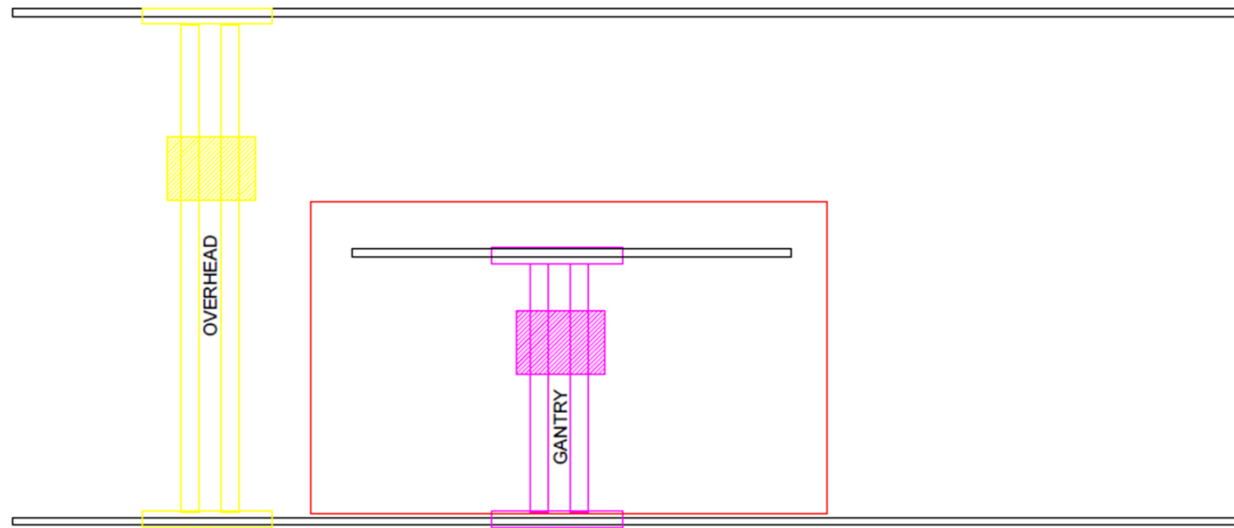
Aim sensors at angle between the 2 elevation cranes- small detection window

Challenge:

Speed of cranes critical- sensor can miss the crane it is aiming at
After passes under crane, cannot detected

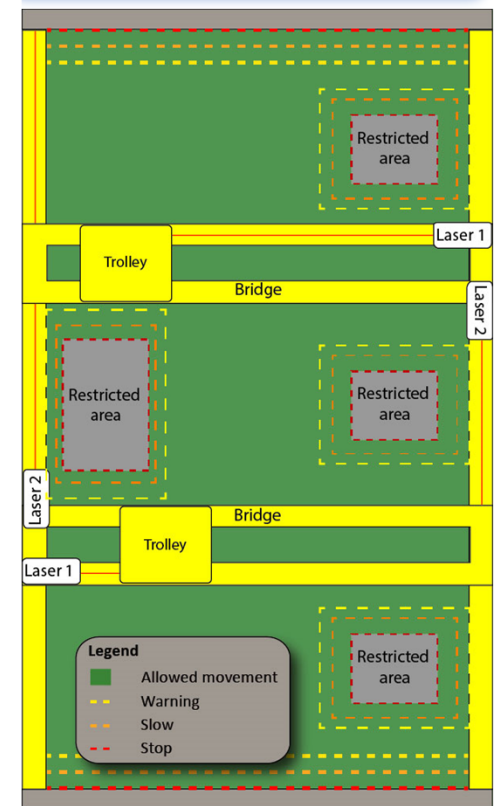
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Moving Obstacles: Overhead crane over Gantry crane Partial runway coverage



Implementation:

- Complete restriction so overhead crane cannot interfere with Gantry
- OR
- Restricted area depending on position of Gantry bridge and/or trolley

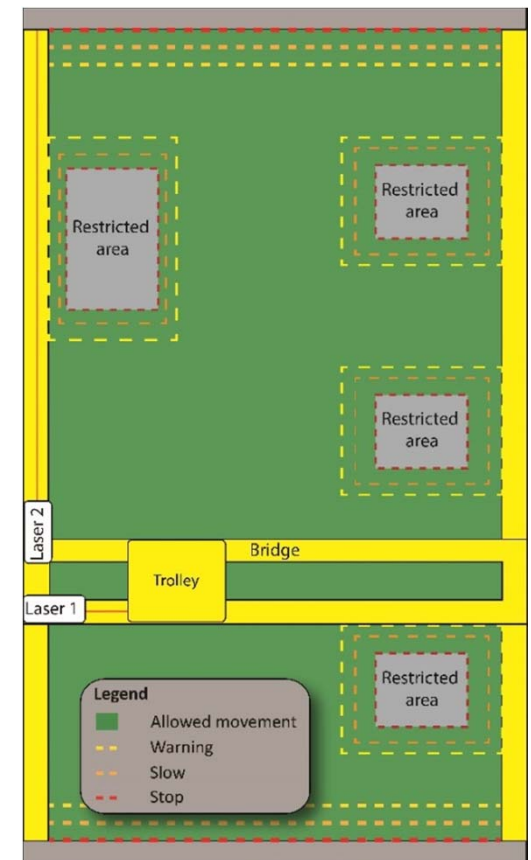


Zone-Out / Protect Gantry Crane

Advanced functionality for protecting regions

Requirements:

- Monitoring distance = full length of runway and span
 - Relay outputs for Bridge/Trolley directions and speed
 - Ability to override systems to enter zones as required in a safe manner
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- Important considerations:
 - How does system deal with faults?
 - Ease of setup, diagnostics and maintenance
 - Do you need to override system for special events?

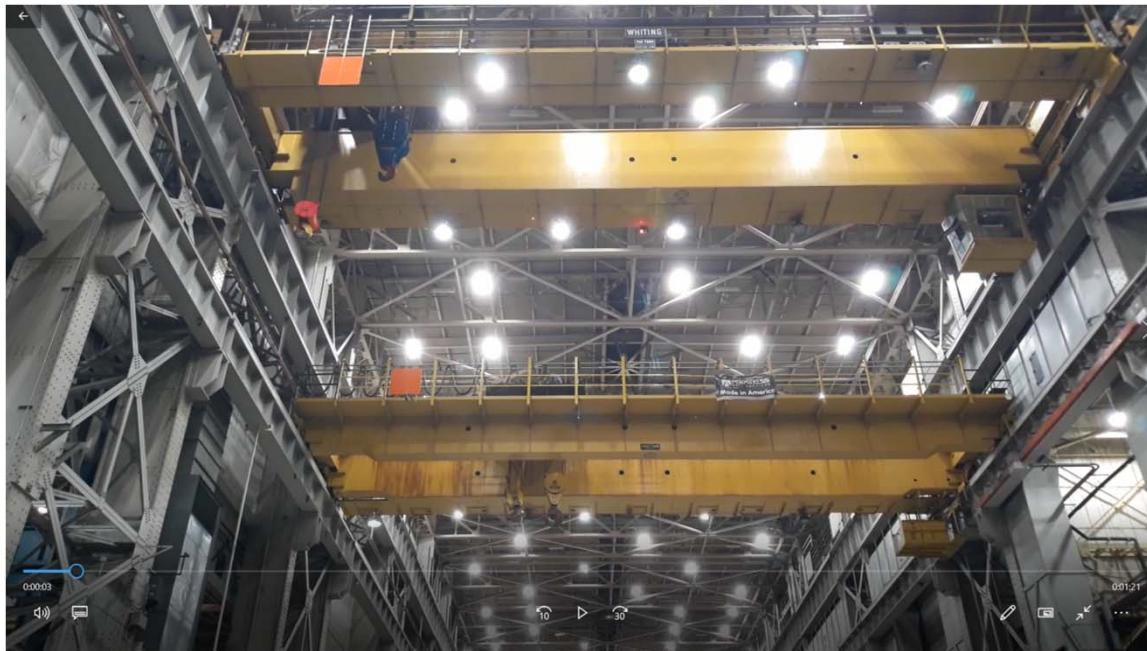


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Summary

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Summary

Your facilities will benefit with:

- SAFETY: Minimize collision minded safety concerns
- RELIABILITY: Reduce probability of damage to crane and production equipment
- PRODUCTIVITY: Better defined movement paths promote productivity

Proactively implementing measures to avoid overhead crane accidents will pay-off in the long term.



Thank you for your attention



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