

La Porte Crane Near Miss October 30, 2010

Updated Nov 3, 2010

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Liebherr 200 Ton Model 1160-2



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Near Miss Description

- **No injuries, no property damage to plant equipment.**

At approximately 9:20 AM October 30, 2010, the La Porte plant experienced a HIPO near miss when the counterweight assembly fell from a crane being used for the planned flare tip replacement project.

The crane was undergoing pre-use inspections/checks when the 110,000 lb counterweight assembly detached from the crane and fell approximately 8 ft to the ground. The crane load (a personnel basket without personnel aboard) was at rest such that the crane was not loaded at the time of incident. The crane boom was fully extended 200+ ft at 76 degree angle. When the counterweight fell, the crane experienced several seconds of shaking and noise but stayed in position.

The crane is a Liebherr 200 Metric Ton Model 1160-2 that has been on site and in use at La Porte for the past month during the project. The crane is owned by General Crane Company.

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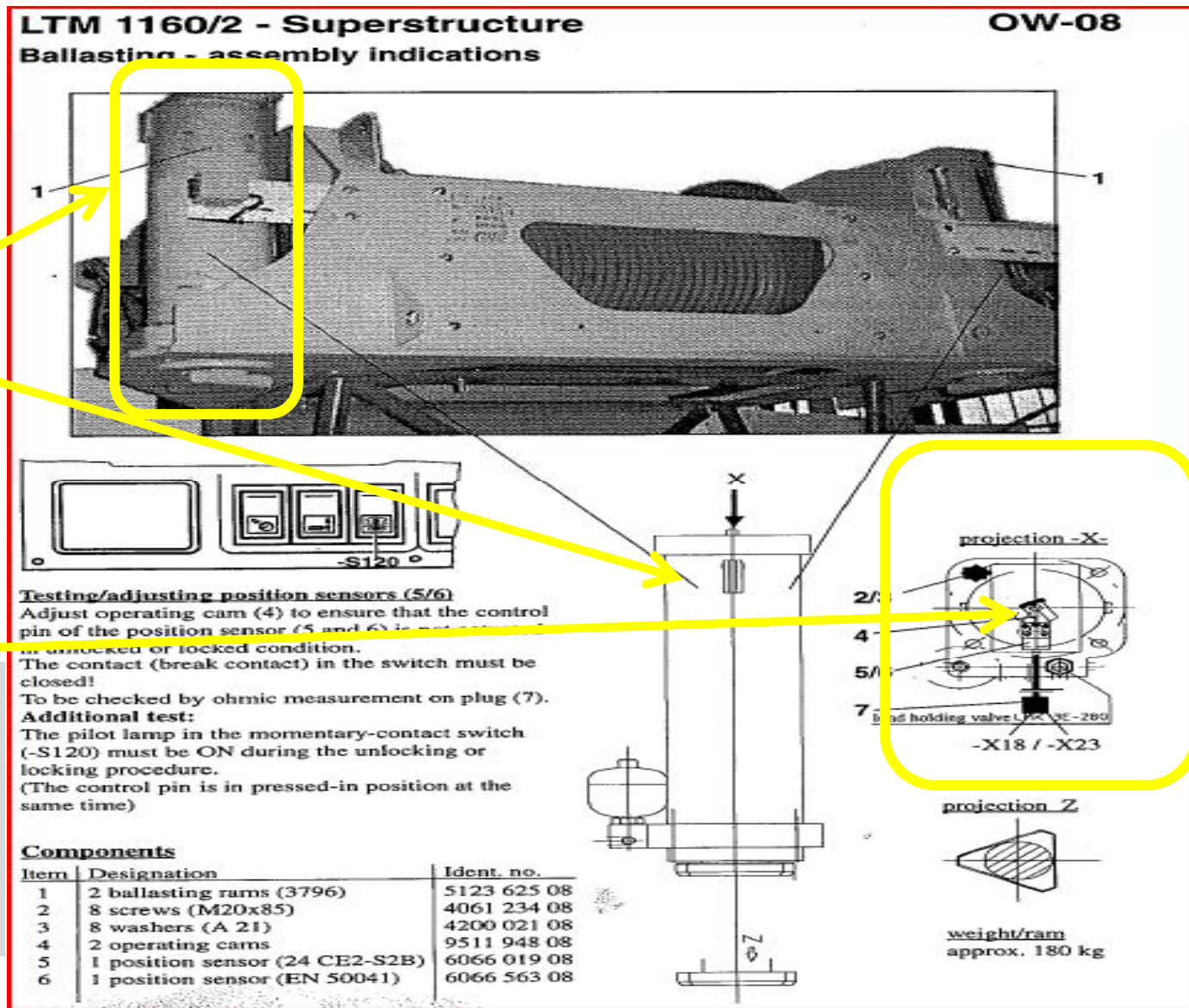
Counterweight locking mechanism

This triangular cylinder end piece extends into counterweight when cylinder ram is extended. When rotated, it locks into place in the counterweight

This view looks downward into top of hole in counterweight used to accept locking ram depicted on left side of the page



Investigation concludes that the counterweight dropped from the left locking mechanism, the entire weight of assembly then rested on the right hydraulic ram/locking assembly which bent that shaft and broke end piece/locking mechanism off



This cylinder (two on machine, one each side of counterweight) lowers and raised the cylinder ram that has triangular locking end action.

One hydraulic action actuates axially on the ram to Raise & lower counterweight.

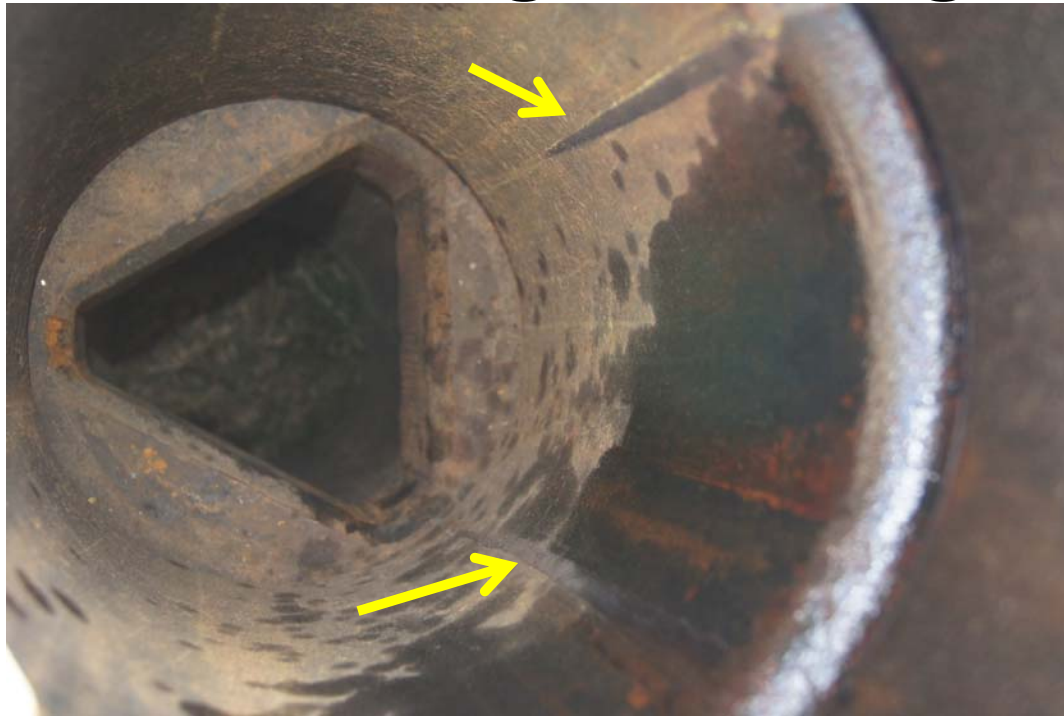
A separate hydraulic action actuates radially on the ram to rotate the triangular locking arm that locks into counterweight.

Cams (on each of two cylinders) are attached to cylinder top to deflect positions sensor indicating lock/unlock of cylinder to counterweight.

Cams had been removed at some point in history, so positive locking or unlocking is not evident. Red light indicates when cam is not locked (if cam is installed), but if cam is missing, no light illuminates

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Drag marks in South end of counterweight locking chamber



This hole in the counterweight allows cylinder insert triangle to insert then rotate which locks counterweight in place.

Drag marks indicate that cylinder ram triangular insert was not fully in "locked" position such that it dragged out on the south locking mechanism inside the counterweight.



Close up view of hydraulic ram at north side of crane. End triangular locking piece has broken off



Close up view of hydraulic ram at south side of crane. End triangular locking piece intact



Piece of counterweight broke from main assembly during incident

Immediate Cause of Incident

- Safety device Bypass by Crane Company offsite

Based on interview with crane company employee:

- Removal of part of cam mechanism occurred at some point before job at TPI La Porte. One part failed, other was removed to send out to machine shop to “reverse engineer” the broken part for reinstall...rather than wait on delay for parts from Europe.
- Cam assembly was not reinstalled, and crane was obviously returned to service
- Results is failure of warning light to indicate common alarm of locking mechanism in travel or unlocked. Without cam in place, locking mechanism appears properly engaged.

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Immediate Actions

- Job shutdown indefinitely
- Personnel removed from area
- Investigation area secured
- Crane “safed”
- Investigation initiated
- Third party crane forensic investigator called to site hours after incident
- Incident Flash issued to TPI US Sites and TPI EU HSE

Corrective Action

Immediate:

- Add counterweight “secured” inspection to pre-use crane inspection
- Removed General Crane from approved vendor list
- Held a meeting with Turner Brothers crane company, Flares and Stacks, Austin, Total in order to discuss additional safety checks before crane use

Action items:

- Collect and review “best in class” pre-use crane inspection documents from within Total and from external companies. Incorporate improvements in to the Total La Porte inspection procedure and form.
 - Before first use of crane on-site: require crane company representative(s) to demonstrate proper functioning of all safety systems necessary for safe operation of the specific crane on-site. This will be specific to the planned lift(s). Total crane inspector will witness.
 - Require crane company representative(s) to sign documentation that affirms that the crane is in safe working order with all applicable safety devices and systems functional and in-service.

Corrective Action

Action items (continued):

- Evaluate vendor approval process (proposed change to current system)
 - Define a subset of vendors as “critical services and equipment “
 - Use in-house and/or 3rd party verification of information submitted by vendor
 - Perform audits at the vendor to review documentation, interview personnel, and evaluate the systems in-place for ensuring safe and reliable services/equipment are provided to Total.
 - Maintenance records for cranes
 - Training program for mechanics and operators
 - OEM repair/replace components versus 3rd party or “reverse engineered” components