HOOK FAILURE SUMMARY REPORT

A lower 3-ton hook from a CM Series 653 Lever Hoist (come-a-long) failed at the Dynegy Baldwin worksite December 8, 2008. The failure occurred at the swivel joint area where the hook necks down to connect to the swivel. The hoist was one of 7 used to fit the cone section to Ring C-4. The applied load was in a straight line hook to hook. The hoist had been satisfactorily load tested in the Nooter Construction warehouse November 24, 2008.

Upon investigation of other lever hoists in the Nooter Construction warehouse it was discovered that another 3-ton hook had a visual crack in the same failure location. The newly discovered hook was bent 90° to the hook (See Figure 1).

Figure 1 Cracked Hook

Detection of a bent knob is difficult as this portion of the hook is located inside a connecting swivel piece. In order for the knob to be visible the connecting piece has to be destroyed and therefore invalidate the hoist. Some level of visual detection can be made as long as the knob is bent severely like that shown in Figure 1. The swivel piece will have limited movement to one side indicating a bent knob.

The cracked hook was successfully load tested at Nooter Construction and without any additional visible crack propagation.

The failed hook, the cracked hook which was bent, a used hook without any visible cracks but was bent to one side, and a new hook were sent to St Louis Testing Laboratories for further evaluation.

The evaluation determined that the failed hook had a crack approximately 50% through the diameter prior to the load in which it failed. The fracture surface indicated a combination brittle and ductile fracture. The fracture surface would be characteristic of this type of material. It was also noted that the piece had been loaded to the side causing it to be bent prior to failure.

The cracked hook was loaded to failure. The failure load was 40500 lbs. which is over 6 times the rated capacity. The fracture surface indicated that it was cracked approximately 17% through the diameter prior to loading. As seen in Figure 1, it too had been loaded to the side prior to loading.

The testing concluded that the failure of the hook was neither due to material deficiency nor fatigue but rather to pre-cracking prior to loading. The cracking occurred when the hook was loaded to the side. Side loading of such devises can cause injury or death either at that loading or sequential loadings.

The full laboratory report is attached.

Recommendations:

- Inform field personnel of proper usage of lifting devises (See Section 11 "Rigging Safety" of the Nooter Construction Company Safety Manual)
- Prior to using a lever hoist the operator is to read the manual to be re-familiarized with its proper usage
    - The manual has a list of operational "do's" and "don'ts". One of which is "…the operator shall **NOT** operate a hoist when it is restricted from forming a straight line from hook to hook in the direction of loading."
- Prior to using a hoist in the field, an inspection of the hoist is to be performed to detect any defective areas
- Enforce the penalty of improper usage of lifting devices
- Continue test program of the hoists when the hoist is returned to the warehouse from the jobsite
- Continue to perform a visual inspection of the hoist prior to load testing
- Investigate the possibility of using strain gauge equipment to determine if equal loading can be observed on both sides of the hook and implement if it is successful