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Subject: Blue Alert: Fork Truck Capacity Exceeded

The following lessons learned is cleared for public release. A graphic of a typical fork truck capacity plate is available on the Hanford Internet server at <http://www.hanford.gov/lessons/sitell/ll99/199909.htm>.

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Title: Fork Truck Capacity Exceeded

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Lessons Learned Statement: The total weight of a load to be handled by a fork truck must be within the capacity of the fork truck. Documented weights must account for any added weight imposed by effects such as field modifications, rigging hardware, shipping containers, and vessel or container contents. In addition, the position of the center of gravity of the load relative to the fork truck's load center must be considered when determining the fork truck's load capacity with respect to the weight of the load.

Discussion of Activities:

Summary: A fork truck was overloaded by 295 pounds while unloading a sample cask because the weight of the cask rigging gear was not included in the total calculated weight. This event caused another facility to realize that it was not factoring center-of-gravity effects into calculations of fork truck capacity.

Details: During the first week of January, a PAS-1 sludge cask weighing approximately 13,330 pounds was shipped between K-Basins and the 222-S Laboratory. While loading the cask at K-Basins, the operating crew did not recognize that the position of the cask on the forks (load centering) affected rated capacity of the fork truck. The fork truck had a rated load capacity of 15,500 pounds at a 24" load center and was not overloaded during this loading operation. After the cask arrived at the 222-S Laboratory, the Sample Custodian noted that the gross weight of 14,200 pounds listed on the cask placard was greater than the 13,000 pound maximum lifting capacity of the 222-S Laboratory fork truck. The calculated weight of the cask was 13,295 pounds. The job was stopped.

The cask had been initially offloaded on January 4, with no stability issues noted. Calculations substantiated that the fork truck had been overloaded by 295 pounds during the January 4th lift. Contributing to the overload was the weight of support rigging for the cask assembly, which was not originally included in the calculation of the load weight. The center of gravity loading on the forks had not been evaluated. Personnel at K-Basins were notified of the overload situation. They sought technical assistance from their fork truck manufacturer representative to accurately calculate and

interpret the potential for a reduced fork truck capacity because the center of gravity of the load was actually extended to 28". The actual capacity of the K-Basin fork truck for this particular lift was calculated to be 13,375 pounds. Although this capacity was reduced from the nominal 15,500 pounds by more than one ton, the weight of the cask lifted was still within a safe lifting range.

Analysis: The capacity (and stability) of a fork truck is based on the position of a load on the forks as well as lifting capacity. Even though a given load may be within the maximum load rating of a fork truck, it can cause the fork truck to become unstable if the center of gravity of the load is located beyond the point on which the rating is based. That distance is typically 24" from the heel of forks and 24" up, for most sit-down counterbalance fork trucks.

Recommended Actions:

1. Facilities with fork trucks should review this lessons learned with applicable facility employees (e.g., work planners, selected maintenance/operations personnel), particularly with fork truck operators.
2. If the weight of a planned lift will be near the maximum rated capacity of a fork truck, and the configuration of the object(s) to be moved will place the load outside the fork truck's center of gravity, the potential for fork truck overload exists.

The following general field formula for sit-down counterbalance fork trucks provides a rule-of-thumb method that can be used to obtain a conservative estimate for reduction in lifting capacity in cases where design center of gravity loading cannot be achieved. Where provided, use specific formulas/data furnished by the fork truck manufacturer. The fork truck manufacturer should be consulted in cases where exact load reduction figures are needed. (Note: Results of these calculations may identify the need to substitute with a fork truck of greater capacity).

EXAMPLE - The maximum capacity of a specific fork truck is rated at 5,000 pounds at a 24-inch load center. What is the reduced capacity when the load's center of gravity is extended to 28 inches?
 $(24/28)*5,000 = 4,285.7$ pounds.

3. Personnel who create, validate, or approve procedures or order lifting equipment must be technically qualified and have an understanding of the equipment, how capacities are determined, and applicable requirements and regulations that govern its use.
4. Review any existing work procedures involving fork trucks to ensure these factors are incorporated.

Priority Descriptor: BLUE/Information

Functional Categories (DOE): Occupational Safety and Health

Functional Categories (Hanford specific): Hoisting and Rigging

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References: Occurrence report: RL--PHMC-ANALLAB-1999-0002, Hanford Site

Hoisting & Rigging manual (DOE-RL-92-36 <http://www.hanford.gov/docs/rl9236/rl9236tc.htm>)