

# Information Bulletin

## Modifications Cause Shelving Failure

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Tracking No: 726

**Summary:** Shelving collapsed while being loaded with boxes of soil samples. When performing skill-based activities, it is important to fully understand the potential impacts associated with subtle changes in configuration, design, or assembly, especially when it deals with structural components. All equipment is designed to be installed and used in a specified manner. Seemingly innocuous changes in assembly can have dramatic impact on structural integrity and normal loading.

**Discussion of Activities:** On July 19, 2007, during relocation of historical soil samples free-standing shelving collapsed when a box of samples was placed on the top shelf.

**Analysis:** The shelves, as assembled (without using assembly instructions), were poorly braced. The bottom tier and top tier of shelves were not cross braced and as such the shelving was vulnerable to failure due to side loading while carrying the normal vertical load. In addition, fasteners used to connect the individual sections of the shelving were not checked to ensure they were present and tightened. An engineering analysis determined the load presented by the soil samples did not exceed the capacity of the free-standing shelves and did not contribute to the failure.



Shelving assembly in other facilities contained cross bracing between the shelves and the wall of the facilities. It was determined during this reassembly that this type of cross bracing would be installed after the soil samples were placed on the shelves. This decision was based on the fact that while the shelves were spaced adequately to allow a fork truck to traverse between the shelves, the cross bracing would be too low for the fork truck which would necessitate more manual handling of these very heavy samples. So the cross bracing was left off for loading of the shelves.

### Recommended Actions:

1. Always obtain and use manufacturer's assembly instructions.
2. Never make modifications which may degrade structural integrity without an engineering analysis and approval.
3. Inspect and verify free-standing shelving fasteners used to connect sections are present and tightened, ensure adequate cross-bracing is present in each section, is adequate for the loads they contain, and attached to the facility structure in some fashion (bolted to the floor, fastened directly to the wall and/or, utilizing a grid system of bracing fastening one section to another).

**Cost Savings/Avoidance:** Not Evaluated

**Work Function:** Material Storage

**Hazards:** Personnel Injury

**ISM Core Functions:** Analyze Hazards

**Keywords:**

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**References:** Occurrence Report EM-RL--PHMC-GENERAL-2007-0004