EFCOG BEST PRACTICE #155

Best Practice Title: Preventing Use of Suspect/Counterfeit Bolt Fasteners in DOT Ratchet Type Tie-Down Assemblies

Facility: CH2M Hill Plateau Remediation Company (CHPRC) Hanford and other DOE locations

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Brief Description of Best Practice:

The Headquarters DOE Office of Transportation (EM-33) requested that the Energy Facility Contractors Group (EFCOG) Packaging and Transportation (P&T) Sub-Group assist them with the resolution of a problem with suspect counterfeit bolts/fasteners, which are an integral part of the Department of Transportation (DOT) ratchet strap load tie-down devices. These devices are utilized DOE "Complex-wide" to secure loads, including hazardous wastes and radioactive materials transported on trucks in commerce. The genesis of this request was in response to an Environmental, Safety and Health Alert issued by DOE's Office of Health, Safety and Security (HSS) which alerted DOE sites of the potential for Suspect/Counterfeit Item (S/CI) bolts/fasteners being part of ratcheting type tie-down assemblies in use at the Oak Ridge, Y12 National Security Complex. After HSS sent out their "Alert", personnel at other DOE locations Complex-wide began conducting their own investigations on the ratchet tie-down devices. It was subsequently determined that this problem was pervasive throughout the DOE Complex. The EFCOG P&T Group formed a "working team" in March of 2012 to review the problem and provide HQ DOE Office of Packaging & Transportation with some determinations to assist in the resolution of this problem.

The EFCOG P&T DOE Suspect/Counterfeit Ratchet Strap Tie-down Team determined that the best "path forward" was to clarify the necessary specifications for future procurement of these load tie-down devices.

Contractors need to provide more detailed specifications in their purchase orders for the ratchet strap tie-down assemblies, as well as specify the desired "breaking strength" of the straps. The "breaking strength" of the straps should be the primary defining criterion for the straps, and Quality Assurance (QA) Quality Control (QC) acceptance should be primarily based on this factor. Additionally, if a contractor elects to also detail the particular size and grade markings needed on the bolts which make up and are an essential part of the tie-down assembly, then this information also needs to be clearly detailed in the procurement specifications. The manufacturers of these ratchet strap load tie-down assemblies need to be informed to mark all fasteners above a Grade 5 with the specific grade on the head of the bolts. Also contractors need to identify qualified vendors when procuring these materials, and these pre-qualified vendors need to be placed on an "approved vendor list". Furthermore, it is suggested that transportation management personnel at the site work closely with their respective site QA/QC personnel up front in the procurement process and, finally, that these Ratchet Strap Tie-down assemblies go through a receipt inspection process prior to being sent to the field for use.

Why the best practice was used:

In recent years there have been several recent Occurrence Reporting and Processing System (ORPS) occurrence reports written on the subject of suspect or counterfeit items or materials found in DOT tie-down ratchet assemblies. These tie-down assemblies contained materials (e.g., bolts) could be determined to be part of a safety class or safety significant structure, system or component whose failure could result in a loss of safety function, or present a hazard to the public or worker health and safety. Most discrepancies were discovered during the QC inspection process of the ratchet strap assemblies. The QC inspectors identified the bolts on the ratchet assemblies as

being "potentially" suspect/counterfeit based on the absence of manufacturer codes or the head markings on those bolts which are an integral part of the tie-down ratchet strap assembly. The straps were consequently put into a "hold status".

The DOE's HSS sent out Alert #09-03 on February 29, 2012. The primary purpose of this HSS Alert was to advise users that numerous DOT ratchet strap load tie-down devices were found to have bolts that lacked the essential manufacturer identification markings that are required for all high strength fasteners, grade 5 and above. Therefore within the DOE Complex, high strength fasteners that do not contain a "Manufacturers Identification number (ID)" are called "Suspect Counterfeit" bolts. Additionally, HSS issued a supplemental second bulletin (DCS 1705) on June 12, 2012, to clarify some information from the initial bulletin.

It is also highly recommended that all DOT load tie down straps be procured from an approved vendor who is on the organization's Acquisition Verification Service (AVS) list and that a receipt inspection by the QA group be made upon delivery of the straps at a central receiving location, prior to the straps being deployed to the field organizations for use.

What are the benefits of the best practice:

Neither DOT nor the commercial tie-down industry standards prescribe the use of and identification of high strength fasteners, but the U.S. Customs Service S/CI head mark list does. The requirements for all materials used in ratchet construction, including the bolts, are based on the proof test and strength test performance requirements (ref: Web Sling and Tie-down Association [WSTDA] T1 Standard for Synthetic Web Tie-downs). Consequently, bolt types are not specified in the procurement specifications in many cases. The manufactures most often base the specifications of the ratchet tie-down assemblies on the on the Working Load Limit (WLL) of the synthetic webbing to which the ratchet is attached.

The essential factor is that the tie-down straps must meet the DOT Federal Motor Carrier Safety Regulations (FMCSR) working load limit requirements as promulgated in 49 CFR 393.108. Although the DOT regulations do not require a particular WLL per inch of width of a particular strap, there is a WLL default listed in the tables in 49 CFR 393.108.

- Straps are tested to their "breaking point". This breaking strength must be certified by the manufacturer of the straps and clearly marked or stenciled on the strap. Tests of straps have shown that, in most instances, it is the webbing that fails and not the ratchet device itself.
- The design factor for tie-downs shall be a minimum of 3 to 1.
- The DOT regulations, as promulgated in the FMCSR in 49 CFR, Subpart I, 393.100-136 details the tie-down design requirements for load securement devices. The FMCSR, details the requirements for load securement when utilizing chains, straps, wire rope and other mechanisms. For straps, the breaking strength of the webbing dictates the specifications for the straps based on the width of the straps.
- The DOE S/CI guidelines (e.g. S/CI Handbook, formally known as the DOE S/CI Training Awareness Manual) for such securement devices appear to be above and beyond what is necessary since the design/use aspects are already covered under a separate federal program (e.g., DOT regulations).

What problems/issues were associated with the use of the best practice"

- The DOE S/CI guidance focuses principally on high strength fasteners. The S/CI Handbook makes it clear that high strength fasteners below Grade 5 do not require Head Mark manufacturer's symbols. To determine if a metric fastener is below a US Grade 5, you would have to reference the International Standards Organization 898-1 document to calculate if the metric fastener meets the definition of a high strength fastener. If this information is not available, then whether or not a fastener would qualify as a "high

strength fastener" would be have to be based on engineering calculations. If it was determined that "high strength fasteners" are not required, the S/CI requirements would not apply.

- Neither the United States DOT nor the Tie-down Straps Manufacturing Industry prescribes the use of graded fasteners/bolts for ratchet straps. The requirements for all materials used in the ratchet strap construction and assembly, including the fasteners/bolts, are based on the proof test and breaking strength test performance requirements (ref WSTDA T1 Standard for Synthetic Web Tie-Downs).
- Review of the DOT Federal Motor Carrier Regulations in 49 CFR Part 383 showed that the working load limit of a tie-down assembly and associated connector or attachment mechanism is the lowest working load limit of any of its components (including the tensioner), or the working load limit of the anchor points to which it is attached, whichever is less.
- The working load limit of the tie-downs may be determined by using either the tie-down manufacturer markings on the straps or using the default values in 49 CFR 393.108 tables.
- Getting the various DOE sites to understand the importance of suspect counterfeit bolts issue and the importance of having straps go through a QA inspection process prior to usage at a site.

Description of process experience using the best practice

The following are recommended steps that DOE and its contractors could take to address this issue based on the input, evaluation, and discussions described above:

1. Use trailers that have either fixed or movable winches installed on the sides. When trailers with either the fixed or the moveable "floating" winches are utilized, the DOT straps without the integral ratchet devices can be utilized. The winches on the trailers are then used to secure the load to the trailer. These winches are built to the trailer manufacturer recommendations and are fully DOT compliant. Trailers that do not have these "floating" winches installed can be modified with aftermarket winches.
2. Specify only the "breaking strength" of the straps per the DOT regulations in 49 CFR 393.108 in the procurement specifications. The breaking strength of the straps will also need to be "certified" and marked or stenciled on the tie-down straps by the manufacturer. If the "breaking strength" of the straps is specified in the procurement document specifications, then any QA inspection would involve verifying this information. The size and or identification of a grade of the bolts used in the ratchet devices would not be relevant if the bolts used in the assembly were below Grade 5.
3. Another option is to specify that the size and grade of the bolts in the ratchet devices. Additionally, the manufacturer of the straps would be instructed to ensure the bolts are properly marked. Also include in the procurement specification that the fasteners be American made, where possible. Additionally, require that the fasteners that are Grade 5 or above be marked with a manufacturer's symbol on the head of the bolt.
4. Qualify vendors of the straps and place them on an Approved Vendor List (AVL) prior to the procurement of the straps. Specify that the straps be made in the U.S. It should be noted however, that a majority of the DOT tie-down straps are made overseas in countries like China. However, there are manufacturers and suppliers that have straps that are manufactured domestically.
5. Have all newly procured DOT straps go through a receipt inspection upon arrival at the site and prior to be sent to the field for use.

How the success of the Best Practice can be measured:

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Reduced incidences reported in the DOE Occurrence Reporting and Processing System (ORPS). Reduced incidences of site having to return or dispose of DOT tie down straps that container suspect/counterfeit bolts in the tie-down assemblies.