The Barn Raiser

Mid-South Engineering Company

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Fall Protection in Construction & Industry

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The subject of Fall Protection too often receives low priority until an on-the-job injury or fatality occurs…even falls from as low as 10 feet can prove fatal. Compliance with OSHA 29CFR 1910 (general industry) and 29CFR 1926 (construction) have been mandated since the 1970's, and failure to comply can result in substantial monetary penalties. OSHA historically has imposed the severest penalties for Fall Protection violations, followed by Lock Out-Tag Out, Machinery, Confined Space, and Press Safety violations. Added to costs of worker injuries are insurance claims, legal actions, lost time and personnel replacement ---- all reason enough for every organization involved in construction and maintenance activities to implement a formal safety program. One which ideally is monitored and controlled by a certified safety professional (CSP).

DEFINITIONS:

- **At-Risk-Worker:** Personnel operating at heights above 6ft or at any distance where serious injury or potential for a fatality exists.
- **Competent Person:** Personnel with ability to identify existing and predictable hazards, and having authority to take prompt, corrective action to eliminate the hazards.
- **Qualified Person:** Those having extensive knowledge and experience in the subject field; in possession of a professional degree, and capable of design, analysis, evaluation, and specification of the subject work.

PRIORITIZATION:

The "HEIRACHY OF CONTROL" in fall protection addresses the most to least effective methods of preventing fall events.

- **Elimination / Substitution** – use extremely reliable equipment thus reducing need for periodic, on going servicing, adjustment, etc.
- **Engineering Control** – use of restraints, barriers, guard railings.
- **Warnings** – flashing lights, alarms, personnel monitoring worker activities.
- **Administrative Control** – safety signs, training, policy manuals.
- **Personal Protective Equipment (PPE)** – harnesses, belts, lanyards, life lines.

In other words, fall prevention by means of PPE should only be elected as "last resort". It is usually the most expensive choice by virtue of both initial investment and the on going need for inspection and replacement of components.

HORIZONTAL LIFE LINES (HLL)

For construction and maintenance functions where access to work areas is not easily achieved by ladders, scaffolding, scissor lifts, or lift trucks, the HLL is a popular choice for engineered personal fall arrest (PFA) systems. HLL consist of a minimum 3/8" dia. wire rope cable (bright carbon, stainless or galvanized steel), turnbuckle, clipped eye end connection (with at least (2) Crosby type clips), and certified anchor points. Synthetic rope materials such as nylon, polyester, and polypropylene are also available but may need periodic examination for UV degradation if used outdoors. HLL spans can range from 10ft to 100ft (single), and 20ft to 200ft (double). Preferably each span should support one (1) worker; however, up to three (3) users are acceptable so long as the system is designed for this condition. Each at-risk person is is outfitted with an approved body harness, fixed 6ft lanyard or a self retracting lanyard (SRL). The fixed lanyard may also incorporate an in-line shock absorber.

IMPORTANT: all components in the PFA system must be supplied from the same manufacturer in order to insure operational compatibility. The CSP should examine and approve parts and supplier selection.

"The Barn" built in the 1930's to house Welsh ponies, serves as Mid-South's offices.

Fall Protection - Continued

LOAD RATINGS

Variables such as initial cable sag, cable tension, above work surface obstructions, and tie off anchor height must be considered in PFA design.

OSHA requires the following for a properly designed PFA system:

- maximum fall arrest force of 900 lbs allowed for a body belt used in vertical installation of rebar or similar construction.
- maximum fall arrest force of 1800 lbs for body harnesses. free fall be limited to 6ft with no contact possible on lower surfaces.
- snap hooks and carabiners to withstand a tensile load of 5000 lb.
- body harness straps should not break at less than 5000 lb tensile.
- lanyards should not break at less than 8500 lb tensile. anchor point connections must support a 5000 lb load for each at-risk user of the system.

FORCES

Standard body harnesses are designed for body weights of 135 to 310 pounds. Impact from a free fall is related to total system energy. This is comprised of the strain energy of components, kinetic energy of the falling worker (including attached tools), and potential energy relative to a datum plane. This potential energy is not a constant due to the inelastic nature of the systems components (shock absorbers, friction, etc). Non linear formulas require solution by trial and error iteration.

OSHA requires a free fall be limited to 6 feet. If an SRL is employed, a stopping distance of 24 inches maximum is allowed. Impact tends to lessen with longer stopping distances.

A quick (albeit oversimplified) order-of-magnitude impact calculation is to multiply the falling weight by a ratio of free fall distance to stopping distance. For example, a 300lb weight falling freely for 6ft and stopping in 2ft can generate about 900lb impact, which is within listed SRL load ratings.

RESCUE & RETRIEVAL

Prior to a projects initiation, formal safety plans are submitted to the CSP for review and approval. Included in the plans are means of rescue should a fall incident occur. Prompt rescue is critical, and should take place in 3 to 5 minutes. Even workers in very good condition can lose consciousness in 15 minutes from lack of circulation as body harness straps tighten.

SUMMARY

Formal Fall Protection programs need to be an integral, dynamic part of all construction and maintenance organizations. OSHA is continually reviewing and upgrading these guidelines to insure at risk-worker safety. Conformance to 29 CFR 1926 and 29 CFR 1910 are as important as meeting other design codes such as IBC, NEC, ACI and AISC.

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What makes Wood Pellets stick together without glue?

By: Gary Cedzidlo

Most of you are aware Mid-South is involved in helping to design plants that manufacture pellets or briquettes. As most of the world becomes increasingly aggressive in reducing green house gas emissions, and leaving a “carbon neutral” footprint, wood pellets are becoming an attractive alternative fuel for both home heating and for replacing some of the coal used for electrical generation.

The pelletizing process of wood is conceptually simple. Take wood, dry it if it’s not already dried, grind it up, and squeeze it back together into pellets under intense pressure. Pretty simple, except… without using any glue, what holds them together in such a solid, compact form?

Wood is primarily composed of two materials, cellulose and lignin. About 75% is cellulose, the stuff that makes up the wood cells or fibers. The other 25% is where the “magic” comes in, the lignin. Lignin is the “cement” that bonds the wood fibers together.

When wood is compressed in the pelletizing operation, it heats up from the huge amount of mechanical energy being applied to it. This heat turns whatever small amount of moisture is left in the wood into steam. Lignin is a bit like a plastic. When heated, especially under moist condition, it softens and flows. When it cools, it hardens again, keeping the pellets in their new solid shape.

So, while we don’t add glue to pellets, wood actually has its own built-in adhesive, lignin.

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