Abstracts

Poster: 0041

NIOSH-Designed Adjustable Roof Bracket and Safety Rail Assembly

TG Bobick (1) presenting, DM Cantis (1), E McKenzie (1)

NIOSH, Division of Safety Research, Morgantown, WV, United States (1)

Importance of problem: Fall-related fatalities and serious injuries are still prevalent in the U.S. construction industry. The primary cause is roof-related and includes falls from roof edges, or through roof holes and skylight fixtures. Bureau of Labor Statistics data indicate that for 1992-2000, an average of 208,000 roofers were employed each year. Other construction trades also work at elevations and all are exposed to situations where they could fall, resulting in a fatality or a serious injury involving days away from work (DAFW). For 1998-2003, BLS data reveal that a yearly average of 147 workers were killed and 3,657 workers were seriously injured after falling from roof edges or through roof holes and skylights. Roof-related fall injuries are among the most severe cases, as measured by median DAFW. Compared to all types of fall-to-lower-level cases in U.S. private industry, falls from roofs and falls through roof holes and skylights were two to four times more severe than all other fall-to-lower-level cases.

Objective of study: The objective was to develop a highly adjustable, securely fastened, durable worker-support bracket and safety rail assembly to provide a guardrail system to protect workers from sliding off roof edges, or falling through unprotected roof/floor holes, stairwells, balconies, and existing skylights.

Methods: Two methods were used to evaluate the prototype design of the bracket-rail assembly. A manikin, weighing 220 pounds, was supported on a hinged metal structure that permitted it to fall onto the top rail of the guardrail system to evaluate whether the OSHA requirement of supporting a 200-lb outward/downward point-load force to the top rail would be met. Second, a unique test fixture was developed that pulled the guardrail assembly to failure to determine the maximum force the supporting bracket-rail assembly could withstand.

Findings: Iterative testing resulted in four major improvements to the adjustable bracket-safety rail assembly. The guardrail system supported a drop load from the manikin that exceeded twice the OSHA 200-lb point-load force requirement. The bracket-rail assembly was able to withstand the maximum pulling force of the hydraulic pull-to-failure fixture, which was approximately 800 pounds force. Most

importantly, the NIOSH-designed bracket-rail assembly has received "patent-pending" status. The research team is working to secure the partnership of a roofing-products manufacturer to turn the prototype design into a commercially available product.

How Findings Advance Research: Designs of other existing roof brackets include only two different roof-pitch adjustments, and are normally limited to a maximum pitch of 12:12 (45°). This new design is adjustable from flat to 24:12 (63°) pitch, with seven different roof-pitch adjustments between the two extremes. The last three pitches are greater than 45° (51°, 56°, and 63°). This prototype design will provide the construction work force with a safety product that will be easy to install and maintain, and will provide the required protection.

How Findings will Improve Safety: This design of roof protective system, if used routinely and properly, should prevent dozens of deaths and hundreds of serious injuries to construction workers who are required to work at elevations.

NORA Symposium 2006

Research Makes a Difference

April 18-20, 2006

L'Enfant Plaza Hotel

Washington, DC

NORA

CDC Workplace Safety and Health

NIOSH

National Safety Council