Massachusetts Iron Worker Dies in Fall From Structural Steel Framework

Investigation: # 95-MA-014-01
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SUMMARY

On May 30, 1995, a 31 year old male iron worker fell approximately twenty-four and one-half feet from the structural steel framework of a 113,000 square foot shopping complex construction site. At the time of the incident, the victim and a co-worker were standing on an outer perimeter steel beam in an attempt to land several bundles of steel bar joists suspended overhead by crane. During this task, the middle bundle of eight bar joists broke free and fell upon the victim knocking him from the framework to the ground below, showering him with the bar joists weighing approximately 450 pounds each. Suffering catastrophic injuries, the victim was soon transported to the regional medical center where he was officially pronounced dead approximately one hour following the incident. To prevent future similar occurrences, the FACE Program concluded that employers should:

- **ensure that rigging slings are the sufficient size, strength and material to prevent failure.**
- **avoid the practice of lifting multiple loads known as "Christmas treeing."**
- **design, develop and implement a comprehensive safety program that includes, but is not limited to, training in recognition and control of hazards in steel erection**

INTRODUCTION

On May 31, 1995, the MA FACE Program was notified by the U.S. Department of Labor - OSHA office of the death of a male ironworker the previous day. An investigation was immediately initiated.

On June 6, 1995, the MA FACE Program Field Investigator traveled to the incident scene and interviewed the project superintendent and a company vice president. The police report, death certificate, OSHA data, witness statements and multiple photographs were obtained during the course of the investigation.

The employer was a regional steel erection construction company in business for approximately four years at the time of the incident. The company employed eighteen persons in various steel construction occupations. Five of these employees were on the jobsite at the

time of the incident. Safety responsibilities were assigned to one of the employees onsite and written company safety policies and procedures were in place at the time of the incident.

The victim was employed by the company for approximately one year and one month at the time of his death. He was on this jobsite less than one day when the incident occurred.

INVESTIGATION

On May 30, 1995, a crew of five iron workers were in their third day of erecting the structural steel framework of a 113,000 square foot building which was to become part of a national department store chain. The crew consisted of a foreman, a rigger, a crane operator and two connectors, one of whom was the victim. The framework was approximately twenty five percent completed.

Following lunch, the crew planned to stock the bays of the framework with bundles of joists. This task consisted of elevating bundles of joists by crane and resting them across the perimeter framework for installation one by one at a later time. A "bay" is a four sided configuration of steel beams on which the bar joists are fastened. Each bar joist, configured like a small truss, was approximately 25 feet long and weighed 450 pounds. The joists, when welded to the perimeter steel framework, strengthen the structure and create the foundation on which metal decking is placed to construct the roof.

In lifting the bundles of joists earlier in the day, the rigger had been using 1-3/8" diameter wire rope, wrapped twice around the center of the bundles and fastened to a hook of the crane in a choker hitch. Typically, two or more bundles would be fastened to two or more crane hooks and lifted simultaneously. In the steel erection industry, this is referred to as a "Christmas Treeing" or lifting tandem loads. According to the rigger, several of the wire ropes used to elevate bundled joists had been damaged by the sharp edges of the bundles. Therefore, the rigger decided that it would be less wear on the rigging, and easier to hook up and disconnect, if synthetic web slings (nylon straps) were used instead of the wire rope chokers. New synthetic web slings were substituted for the next five or six subsequent picks (lifts).

After five or six picks of multiple bundles or "trees", the rigger rigged a "tree" consisting of three bundles of bar joists. Each bundle was rigged onto separate crane hooks using the synthetic web slings. The first bundle contained four joists, followed by a bundle of eight joists and a bundle of two joists for a total of fourteen joists to be lifted in one pick. All the bundles were lifted together to a point above the steel framed bay on which the connectors were waiting. The connectors were approximately 24 - 25 feet above ground level.

As the crane operator made his pick and lowered the load over the connector's outstretched arms, the strap on the middle bundle of eight joists tore and the joists fell. The crane operator saw the joists strike the victim causing him to fall to the ground. Several joists struck the victim a second time while on the ground. The other connector escaped injury.

Emergency medical services were immediately summoned while co-workers removed fallen joists from on top of the victim. He was soon transported to a regional medical center, where he was officially pronounced dead approximately one hour following the incident.

CAUSE OF DEATH

The medical examiner listed the cause of death as multiple traumatic injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that rigging slings are the sufficient size, strength and material to prevent failure.

Discussion: The rigger had already discarded the wire ropes because they had been damaged by the sharp edges of the bar joists. Wire rope is also difficult to wrap tightly around loads because of its stiffness. Synthetic web slings are more flexible and conform to the load better than wire rope. Slings should be selected using available charts matching the weight of the load to the size, material and configuration of the slings. Even if the slings are the correct capacity for the weight of the load, consideration should also be given to the particular characteristics of the load. In this case the edges of the bar joists were particularly sharp and padding should have been used to protect the slings.

Recommendation #2: Employers should avoid the practice of lifting multiple loads known as "Christmas treeing."

Discussion: US Department of Labor - OSHA Standard 29 CFR 1926.550(a)(19) requires that all employees be kept clear of suspended loads or those about to be lifted. During steel erection, it is often very difficult if not impossible, for connectors to avoid standing under the load they are about to land from the crane. However, the practice of multiple load lifting exposes the connector to working under additional loads overhead. This practice has been prohibited by many crane manufacturers and construction safety associations. It should be considered dangerous and used only with special precautions.

The hazards of multiple load lifting include, but are not limited to: the crane operator being unable to watch all loads; loads getting caught up or striking objects and falling; and the possibility of exceeding the weight capacity of the crane and/or the rigging. Multiple load lifting is safest when it is possible to avoid lifting over the heads of workers, such as in moving steel into and out of storage.

Special precautions should be taken to correctly and sufficiently secure the load in the rigging; to maintain load weight within the safe limits of the crane and rigging; and to know and follow the recommendations of the crane manufacturer. Crane operators, riggers and iron workers involved in multiple load lifting should be specially trained in the procedures and hazards of this practice.

Recommendation #3: Employers should design, develop and implement a comprehensive safety program that includes, but is not limited to, training in recognition and control of hazards in steel erection

Discussion: U.S. Department of Labor - OSHA Standard 29 CFR 1926.21(b)(2) requires that employers instruct employees in the recognition and avoidance of unsafe conditions and the regulations applicable to his/her work environment to control or eliminate any hazards or other

exposure to illness or injury. In this incident, employees were not made aware of the hazards involved in the use of nylon slings placed across sharp edged bar joists and the rigging of multiple loads of bundled bar joists.

In addition, the US Department of Labor - OSHA Standard 29 CFR 1926.20(b)(2) requires that an accident prevention program provide for frequent and regular inspections of jobsites, materials and equipment to be made by a competent person or persons designated by the employer. A competent person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has the authorization to take prompt corrective measures to eliminate them. In this incident, if the employer had performed frequent and regular jobsite inspections to observe and correct the hazards previously mentioned, the incident may have been prevented.

REFERENCES

Office of the Federal Register: Code of Federal Regulations, Labor 29 Parts 1926.20(b)(2); 1926.21(b)(2); 1926.550(a)(19)

Construction Safety Association of Ontario, Rigging Manual, Toronto, 1975

Construction Safety Association of Ontario, Crane Handbook, Toronto, 1975