MIFACE INVESTIGATION: #01MI008

SUBJECT: Welder Struck By Falling Steel Frame

Summary

On February 16, 2001, a 40-year old male died from injuries sustained when he was struck by a freestanding steel frame (Frame 1) that fell, pinning him against a steel frame (Frame 2) held in position by a forklift. Each was composed of 4 – 12" I-Beams weighing 50#/foot and measuring 17'4" wide and 6'3" tall. Each frame section weighed about 10,000 pounds. Frame sections 1 and 2 were sub-assembled on the floor and moved into position by a forklift.

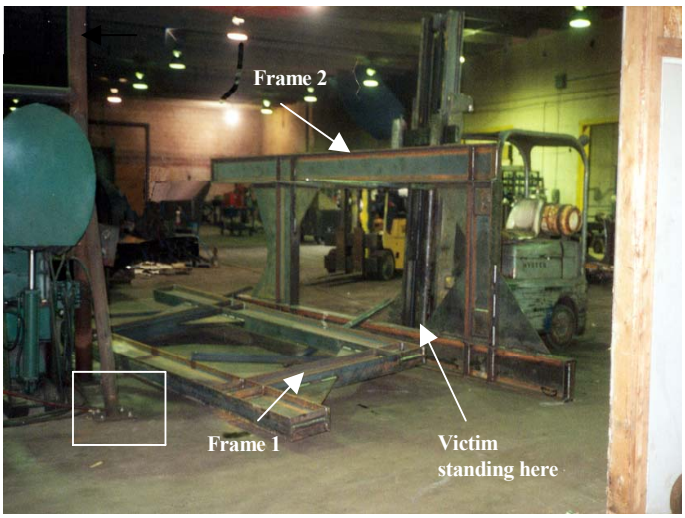

Figure 1

Frame 1 was moved to an upright, vertical position next to a hoist's vertical support pole, and left in an unrestrained, freestanding position. Two three-inch steel channel bars were tack- welded to the base of Frame 1. The channel bars were thought to provide upright support as well as a positioning aid for Frame 2. Frame 2 was moved into position by the forklift, and the channel bars from the base of Frame 1 were positioned on the top of the I-beam base of Frame 2. The forklift was supporting the top I-beam of Frame 2, and the victim was facing the forklift and standing between the unsecured Frame 1 and the forklift supported Frame 2. The victim was directing the forklift driver to properly position Frame 2. He was also helping with minor position adjustments of Frame 1. When Frame 2 was in the proper position, the victim was going to tack-weld the channel bars from Frame 1 to Frame 2's base I-beam. During the positioning of Frame 2, the forklift driver observed Frame 1 begin to fall. The driver yelled to the victim to get out of the way. The victim could not react quickly enough, and the top I-beam of Frame 1 struck the victim, and he fell against Frame 2. Fellow workers called 911 and lifted Frame 1 from the victim. Paramedics arrived and took the victim to the hospital where he died a short time later.

RECOMMENDATIONS

- Heavy objects subject to tipping should not be stored in a freestanding, unsupported position - always brace or tie off the object to support it and protect it from potential movement.
- Employers should develop, implement and enforce a comprehensive health and safety program that includes, but is not limited to, training in hazard recognition and avoidance and job hazard analysis.

INTRODUCTION

On February 16, 2001, a 40 -year old male died from injuries sustained when he was struck by a falling steel frame and pinned against another steel frame being moved into position by a forklift truck. On February 20, 2001, MIFACE investigators were informed by the Michigan Occupational Safety and Health Administration (MIOSHA) 24-hour fatality report system that a work-related fatal injury occurred on February 16, 2001. On April 16, 2001, MIFACE conducted an investigation at the site of the fatality. The death certificate, police and medical examiner reports were requested and obtained as a part of this investigation. The company owner and an eyewitness were interviewed.

INVESTIGATION

The victim worked for a company contracted to build 3 gravel/dirt sifters for another company. The company had employed the victim for less than one week. The first few days were spent with another employee directing the victim on specific welding procedures. The victim had to demonstrate welding proficiency before being permitted to work alone as a welder.

The gravel/dirt sifter had four frame sides. Each side frame was constructed with 5 ½ " by 12" I-beams, and was 17'4" inches x 6' 3". Two other gravel/dirt sifters had been built previously using the following build process: a "build up", i.e., each frame side was assembled from the floor up. The base frame was built on the floor, and then other frame I-beams were attached vertically to this base frame.

Because of problems encountered in the previous two gravel/dirt sifter builds, a different build process was developed. The frame sides were sub-assembled on the floor. The victim assembled and welded each I-beam in this build process, for a total of four frame sides. Each frame side was then to be moved into an upright position, tacked–welded into position, and full moment welds used to finish assemble the frame outline of the gravel/dirt sifter.

Frame 1 was the first section to be moved into position. A forklift moved frame 1 to an upright, vertical position next to a hoist's vertical support pole, in an unrestrained, freestanding position, standing approximately 6 feet in height. Two three-inch steel channel bars were tack- welded to the base of Frame 1 to provide both upright support and to act as a positioning aid for Frame 2. Frame 2 was moved into position by the forklift, and the channel bars from Frame 1 were positioned on the base of the I-beam of Frame 2. The forklift was supporting the top I-beam of Frame 2, and the victim was facing the forklift and standing between Frame 1 and Frame 2. He was directing the forklift driver to properly position side 2. He was also assisting in minor position adjustments of Frame 2. When Frame 2 was in the proper position, the victim was to tack-weld the channel bars from Frame 1 to the Frame 2's base I-beam. During the positioning of Frame 2, the forklift driver observed Frame 1 begin to fall. The driver yelled to the victim to get out of the way. The victim could not react quickly enough, and the top I-beam of Frame 1 struck the victim and he fell against Frame 2. Fellow workers called 911 and lifted Frame 1 from the victim. Paramedics arrived and took the victim to the hospital where he died a short time later.

CAUSE OF DEATH

The cause of death as listed on the death certificate is exsanguation due to blunt chest trauma.

RECOMMENDATIONS/DISCUSSION

- Heavy objects subject to tipping should not be stored in a freestanding, unsupported position - always brace or tie off the object to support it and protect it from potential movement.

After determining the previous method of building the gravel/dirt sifter was not practical, the company experimented with another method of building the equipment. After the individual sides were built, they were to be raised independently, and tack welded together. The first side (Frame 1) was raised with the forklift, and placed near a hoist's support beam. The victim tack-welded a 3" channel section to each side of the base of Frame 1. (See picture below). Frame 1 was left in an unsupported, freestanding position while the next side (Frame 2) was positioned.

The unsupported, freestanding Frame 1 should have been supported to prevent its potential for movement, which could result in tipping and subsequently falling to the ground. Several methods could be used to support the freestanding frame. Below are two alternative suggestions:

- **BRACE:** Tack-weld at least a 3" channel brace (or "L" or "W" flange) at a 30-45 degree angle from each end of the top I-beam, and secure the brace to the floor via brackets, plates, etc. In Figure 2, this concept is demonstrated with Frame 2. The white arrows pointing to the floor represent the location of channel braces that should be tack welded to the top of the I-beam and appropriately secured to the floor.

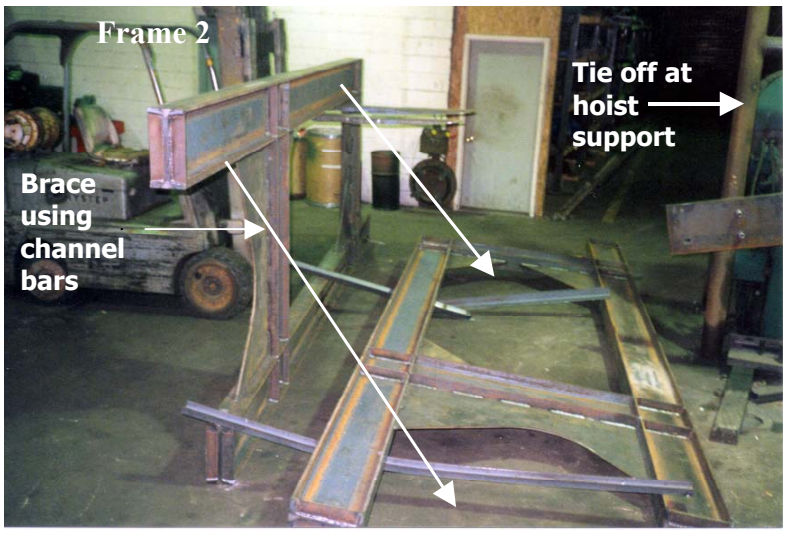

Figure 2

- **TIE OFF:** Tie off any unsupported I-beams using a chain or "C" clamp to a secure mounting area. The secure mounting area should be properly secured at both top and bottom. Although not used, the hoist vertical support was properly secured and supported at ground level via a plate with bolts. (See Figure 1, white box). The type of support at the top of the hoist pole is unknown. Before using this method of securing a freestanding piece, ensure that the structure used for support is capable of supporting the additional weight of the structure being tied off.

The forklift was supporting Frame 2 during the incident. After properly positioning Frame 2, and tack welding the 3- inch channel sections from Frame 1, Frame 2 should not be left unsupported while retrieving Frame 3. The tack welded channel sections from Frame 1 should not be considered as an adequate support for Frame 2. Frame 2 should be supported as suggested above, either by bracing or tying off to a structure.

- Employers should develop, implement and enforce a comprehensive health and safety program that includes, but is not limited to, training in hazard recognition and avoidance.

The employer did not have a comprehensive safety program, nor did the employer provide employee safety education and training that included hazard recognition. Employee education and training is one of the important elements of a safety program. The victim had been on the job less than one week. The first few days, the victim was under the supervision of a more experienced operator, learning proper welding procedures, but not instructed on the proper procedures for building the gravel/sand sifter.

There are many resources available to employers to access in the development of a health and safety program. The MIOSHA Comprehensive Education and Training (CET) Division provides free guidance and assists employers in the development of their company specific health and safety program. Other health and safety resources available to employers to assist them in developing a company health and safety program are: health and safety consulting firms, insurance company health and safety representatives, and the Internet. The internet can provide sample health and safety manuals that can be used as a template for customizing a company program, and other health and safety resources, such as industry-specific health and safety issues, how to perform a risk (hazard) analysis, OSHA resources, health and safety training ideas, etc.

MIOSHA requires that employers must provide training to each newly assigned employee regarding the operating procedures, hazards and safeguards of the job. The safety program should include, but not be limited to, training workers in the proper selection and use of personal protection equipment along with the recognition and avoidance of hazards in the work environment. Employers should take advantage of training materials offered by the safety organizations to inform and teach employees about safety issues at work.

The company did not have a written procedure in place for a safe method of assembly of the gravel/sand sifter. A job hazard analysis is a procedure used to review each job, identify potential hazards, and design actions and procedures to eliminate or control the hazards. Input from workers who usually perform the tasks is important. Of primary importance is the recognition that hazards exist. Company policies and training should be implemented based upon the findings of the job hazard analysis.

The company health and safety program should have a section about conducting a job hazard analysis for existing and new work procedures, and for providing employee job hazard analysis training. Especially in a “job” shop, which accepts orders from many different clients, job hazard analysis training should be conducted so employees can recognize unsafe work practices and potentially hazardous work conditions when setting up the job. The employer (or outside consultant) can provide hazard analysis training as part of the development and implementation of the company health and safety program.

A copy of the OSHA Job Hazard Analysis publication is included with this report. This document may also be found and downloaded from the OSHA website: http://www.osha.gov/Publications. A job hazard analysis may have identified the potential for employee injury working within the fall zone of an freestanding, unsupported frame side and led to a revised method of frame side support.

Resources

1. William H. Treharne, P.E., Director of Engineering & Administration, Midwest Steel Incorporated, Detroit, MI. Mr. Treharne is a Structural Engineer and has performed the following functions: Chief Engineer, Erection Manager, General Manager-Fabrication Division, General Manager-Construction Division, Chief Estimator and Vice-President-Operations. His experience includes structural steel erection, steel and aluminum mill building, design and build projects, structural alterations to industrial plants, bridge erection and repairs, material handling system installation, including extensive experience in crane runway repairs and alterations.

2. Occupational Safety and Health Administration (OSHA) website: htpp://www.osha.gov

3. MIOSHA Standards cited in this report can be found at the Consumer and Industry Services, Bureau of Safety and Regulation Standards Division website at <http://www.cis.state.mi.us/bsr/divisions/std/std_rule.htm>. The Standards can also be obtained for a fee by writing to the following address: Department of Consumer and Industry Services, MIOSHA Standards Division, P.O. Box 30643, Lansing, MI 48909-8143. MIOSHA phone number is (517) 322-1845.

MIFACE

Investigation Report # 01 MI 008

Evaluation

To improve the quality of the MIFACE program and our investigation reports, we would like to ask you a few questions regarding this report.

Please rate the following on a scale of:

Excellent	Good	Fair	Poor
1	2	3	4

What was your general impression of this MIFACE investigation report?

1 2 3 4

Was the report…

Objective?	1	2	3	4
Clearly written?	1	2	3	4
Useful?	1	2	3	4

Were the recommendations …

Clearly written?	1	2	3	4
Practical?	1	2	3	4
Useful?	1	2	3	4

How will you use this report? (Check all that apply)

- o Distribute to employees/family members
- o Post on bulletin board
- o Use in employee training
- o File for future reference
- o Will not use it
- o Other (specify) _____

Thank You!

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