Construction worker is crushed by steel beams when overloaded nylon slings fail.

SUMMARY

A 24-year-old male construction worker died after steel beams fell on him when the nylon slings that were carrying them failed. The decedent and a co-worker were unloading a delivery truck that contained approximately 42,000 pounds of structural steel. A 450-ton crane on site was assisting with the unloading process. The lifting procedure was discussed with the decedent and co-worker's senior supervisor on-site. The first and second lifts were done without incident. The senior supervisor then left the job site to perform other responsibilities. The construction workers rigged the rest of the steel and picked it up as one load, instead of the three separate loads as planned. No consideration was given to the rated capacity of the slings, devices to protect the nylon slings from the sharp edges of the steel, or a tag line to guide the steel being lifted. The first and second loads weighed approximately 8,700 pounds apiece. The third load was approximately 24,000 pounds. The lift was near its maximum radius when the nylon slings failed, dropping its load on top of the decedent.

The CA/FACE investigator determined that, in order to prevent future occurrences, employers, as part of their Injury and Illness Prevention Program, should:

- **Ensure that nylon slings are not overloaded.**
- **Ensure chafing material is used to protect nylon slings from sharp edges.**
- **Ensure that all elevated loads are controlled with tag lines.**
- **Ensure crane operators making lifts are aware of the rating capacity of the rigging devices used to lift the load.**

INTRODUCTION

On January 11, 2000 a 24-year-old construction worker was crushed by a load of steel beams that fell from a crane hook when the nylon slings to which they were rigged failed. The decedent was following the load after rigging it to the hook of a 450-ton crane. The CA/FACE investigator learned of this incident from a newspaper article on January 12, 2000. On February 3, 2000, the CA/FACE investigator conducted a phone interview with the crane operator of the crane involved in the incident. On February 8, 2000, the CA/FACE investigator traveled to the sub-contractor's district office (decedent's employer) and discussed the incident with their vice-president.

The employer of the decedent is a construction company that specializes in earth retention systems and drilling foundation piles for tall buildings. They were sub-contracted to a general contractor to perform these functions when this incident took place. This company has been in business for 37 years and has a written Injury and Illness Prevention Program. There were only ten employees of this company at the construction site the day this incident took place. On average, this company employs approximately 300 employees. The decedent had worked for this company for approximately 17 months and had been at this job site for two days. He was hired from the "International Laborers Union" local. The agreement the sub-contractor had with the laborers' local is that all construction workers hired will be fully qualified and trained in all relative aspects of construction that is basic to their trade.

The general contractor is a major construction company specializing in this type of building construction. This company has been in business for over 30 years and has a written Injury and Illness Prevention Program. The crane company is a major construction crane company that operates nationally. They also have a written Injury and Illness Prevention Program. The crane operator is licensed to operate the crane on the construction site and has over ten years of experience with this type of crane. He is also trained in rigging techniques and the use of rigging equipment needed to lift loads safely. The crane company agreed, as part of their contract, to take responsibility for all the rigging providing they use their own equipment. According to the crane operator, if other equipment is used, then they only assume responsibility up to the hook of the crane.

INVESTIGATION

The incident took place at a construction site where a major facility is being built in a downtown metropolitan area. The site was in the early stages of construction and work had just been completed on the earth excavation for the basement portion of the building. The dimensions of the work site were approximately 500 x 500 feet with an excavated basement approximately 80 feet deep. The entrance to the site was limited to one driveway on the eastern perimeter. Because of limited space, staging of construction material was minimal and had to be strategically placed so as not to interfere with work progression. An empty lot several blocks away was used as the major staging area. The major pieces of equipment on the construction site at the time of the incident were a 450-ton crawler crane with a 160-foot lattice boom, and a smaller mobile crane with a telescopic boom. This mobile crane was located approximately in the center of the work site and was not involved in the incident **(exhibit 1).**

On the day of the incident, two trucks loaded with steel arrived at the construction site. One truck was sent to the staging area and the other truck went into the construction site to be unloaded. It entered the east gate and pulled along the east side of the mobile crane, facing north. Two construction workers, employed by a sub-contractor were assigned the task of unloading the truck of structural steel by rigging it to the hook of the 450-ton crane.

A senior supervisor for the sub-contractor advised the construction workers of the lifting and rigging plan. Five separate picks of steel, using nylon slings to choke the load, were to be made. The crane, operated by an employee of the crane company, was to pick the load up and over the mobile crane and place the load in the staging area directly on the west side of the mobile crane. The rigging consisted of two wire rope slings already attached to the cranes load block. These wire rope slings were 15 to 20 feet long **(exhibit 2).** Shackled in series to the wire rope slings were two 30 feet long, four inch wide, double eye type nylon slings. The load was choked by encircling the load of steel with the free end of the nylon slings, then threading a shackle through the vertical and free end of the sling. The load rating on the slings indicate that they had a capacity of 6,900 pounds rigged as a choker hitch. The screw pin anchor shackles used as part of the choker hitch were both rated for 17,000 pounds. A visual inspection of the slings prior to use by one of the construction workers found them to be in near new condition. The first load of steel was approximately 8,777 pounds. The second load weighed approximately 8,000 pounds. These loads were well within the rigging capacity. The senior supervisor observed these two crane picking cycles before leaving the site to perform other responsibilities. The senior supervisor then assigned a record keeper to finish coordinating the unloading of the steel. The remaining material on the truck consisted of 12 steel channels, 60 feet long. The employees then rigged the remaining steel as one load instead of three separate loads. This load weighed approximately 24,480 pounds. The pull angle on the slings was also increased due to the longer base of the channels. As this lift progressed, nothing appeared wrong to those involved. The lift was near its maximum radius when a "panging" noise was heard. At this point, one of the slings failed. The load dropped and buried the decedent, who was beneath the load, as he followed its descent to the staging area. The load of steel beams were lifted off the construction worker as 911 was called. The paramedics arrived on the scene, examined the decedent, found he had no pulse or spontaneous respirations, and pronounced him dead. He was then transported to the coroner’s office. An examination of the slings after the incident showed major distress in the area where the slings choked the load. Numerous cuts from the load were present and there was some thread distress on the sewn eyes that had been attached to the steel slings **(exhibit 3 & 4).**

CAUSE OF DEATH

The death certificate stated the cause of death to be multiple traumatic injuries.

RECOMMENDATIONS / DISCUSSION

Recommendation #1: Employers should ensure that nylon slings are not loaded beyond their rated capacity.

Discussion: The initial investigation of this incident showed that the last load far exceeded the rated capacity of the nylon slings being used. The sub-contractor, who purchased the nylon slings in November of 1999, stated that the slings had the load rating tags on them when used for this job. When the load was lifted, the slings failed and the load crushed the decedent. Employers should ensure proper use of lifting equipment used for rigging through a closely supervised program of training, incentives, and progressive disciplinary action.

Recommendation #2: Employers should ensure that chafing material is used to protect nylon slings from sharp edges.

Discussion: Chafing gear was not used to protect the slings from damage in this incident. The first two picks most likely contributed to the failure of the slings, as chaffing material was not used to protect the slings from the sharp edges of the steel. The third pick pulled three separate stacks of steel together and compressed them randomly, causing a shock load affect. Although chafing material will not protect a sling from an overload condition, it would have protected the slings from damage from the steel. Proper use of chafing material during lifts can be ensured through a closely supervised program of training, incentives, and progressive disciplinary action.

Recommendation #3: Employers should ensure that all elevated loads are controlled with tag lines.

Discussion: In this incident, the decedent waited under the load to control its movement by hand during its descent. He was then crushed when the slings failed. A fundamental principle of crane safety is that no one should stand or move under a load and loads should not be passed over them. Various procedures and equipment have been designed to allow workers to safely accomplish tasks on raised loads. In this instance, tag lines attached to the load would have allowed the decedent the desired control while keeping him at a safe distance.

Recommendation #4: Employers should ensure crane operators making lifts are aware of the rating capacity of the rigging devices used to lift the load.

Discussion: The crane operator has the ultimate responsibility for the safe handling of all loads regardless of the contractual agreement with a general contractor. Most cranes have a measuring device that tells the operator the weight of the load being lifted. Although the weights of all the loads in this incident were well within the capacity of the crane, the rigging equipment was not. Had the operator known this and taken precautionary measures, this incident might have been prevented.

References:

California Code of Regulations, Vol. 9, Title 8, Sections 4999, 5041, 5042, 5043, 5045, 5047, 5048.

Rigging Manual, Construction Safety Association of Ontario, Eighth Printing, 1985

Training Manual, Crane Inspection & Certification Bureau, 1986

FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the California Public Health Institute, and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations on work-related fatalities. The goal of this program, known as the California Fatality Assessment and Control Evaluation (CA/FACE), is to prevent fatal work injuries in the future. CA/FACE aims to achieve this goal by studying the work environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

NIOSH funded state-based FACE programs include: Alaska, California, Iowa, Kentucky, Maryland, Massachusetts, Maryland, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Washington, West Virginia, and Wisconsin.

Additional information regarding the CA/FACE program is available from:

California FACE Program
California Department of Health Services
Occupational Health Branch
1515 Clay St. Suite 1901
Oakland, CA 94612
(510) 622-4370