Worker Killed When Crushed By Multiple Granite Slabs - Massachusetts

Investigation: # 05-MA-059-01
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SUMMARY

On October 3, 2005, a 38-year-old male laborer/granite worker (the victim) was fatally injured when he became caught between five stone slabs and a stone table. At the time of the incident, the victim was retrieving a granite slab (from this point forward referred to as granite slab 2) that was stored with four other stone slabs in the first section of a slab rack. Granite slab 2 was the second slab in from the end of the rack's first storage section. To retrieve granite slab 2, the victim positioned himself with his back against the first stone slab and then removed one of the end slab rack support pins. A coworker/saw operator standing at the edge of the first stone slab removed the remaining end slab rack support pin. Next, the first stone slab was tilted towards the victim and the coworker, away from granite slab 2. As the victim and the coworker were supporting the first stone slab, another coworker went to access an overhead gantry crane to remove granite slab 2 from the rack. The remaining four slabs in the slab rack's first section, including granite slab 2, tilted towards the victim and the coworker. All five stone slabs fell crushing the victim against a stone table and pinning the coworker partially against the floor. Twelve coworkers lifted the stone slabs off of the victim and the coworker, while an office worker placed a call for Emergency Medical Services (EMS). Upon EMS arrival at the incident site, the victim was unconscious. EMS transported the victim and the injured coworker to a local hospital where the victim was pronounced dead. The coworker's injuries were not life threatening. The Massachusetts FACE Program concluded that to prevent similar occurrences in the future, employers should:

- **Use slab racks designed with fixed support pins and individual compartments for each slab;**

- **Ensure that all slab racks have been designed by registered professional engineers and that current engineering drawings and documentation of load capacities for all racks are readily available;**

- **Develop, implement, and enforce standard operating procedures (SOP) for receiving, storing, and retrieving stone slabs, which includes limiting employees' manual handling of stone slabs; and**

- **Develop, implement, and enforce a comprehensive written safety program, which includes hazard recognition and avoidance of unsafe conditions, and provide training in language(s) and literacy level(s) of workers.**

In addition, **manufacturers of slab racks** should:

- **Evaluate and consider supplying only slab racks with fixed support pins.**

INTRODUCTION

On October 4, 2005, the Massachusetts FACE Program noticed in the local media that on the day before, October 3, 2005, a Brazilian male was fatally injured when he was crushed by multiple stone slabs. An investigation was immediately initiated. On October 26, 2005, the Massachusetts FACE Program Director traveled to the incident location where several company representatives were interviewed. The police incident report, death certificate, and the OSHA fatality and catastrophe report were reviewed during the investigation. In addition, photographs of the slab rack involved in the incident were taken.

The employer is a manufacturer stone products, such as granite and marble countertops and granite roadway curbing. The company involved in the incident began conducting business approximately one and one-half years prior to the incident. The company was formed during a takeover of another stone product manufacturer, which had been located on the company's current site. At the time of the incident, the company employed approximately 40 people, most of whom had worked for the previous employer. The victim began working for the company approximately two weeks before the incident. Ten of the 40 employees held supervisory positions and the remaining 30 employees, including the victim, held laborer positions. All of the laborers, including the victim, were Brazilian. The victim arrived in the United States two and one half years before the incident. While living in Brazil, the victim had worked in the granite industry.

The company did not have a designated individual in charge of employee safety. The company provided employees with minimal health and safety training. New employees received on-the-job training that focused on basic task completion. This required new employees to be paired with more experienced employees. The victim had been paired with an employee who held the job title "saw operator" and had been employed for seven years at this location. The victim spoke Portuguese and his supervisor spoke both Portuguese and English. The company's employees were not part of a union collective bargaining unit.

One and a half years prior to the fatal incident, a planned Occupational Safety and Health Administration (OSHA) inspection took place and the company received multiple OSHA citations for violations. Six months prior to the incident, the company hired a consultant, as a result of the planned OSHA inspection, to assist in the development a health and safety program as well as compliance with relevant OSHA standards. During a follow-up OSHA inspection five months prior to the incident, the company received additional OSHA citations, including some for repeat violations of OSHA standards.

INVESTIGATION

The company, a stone product manufacturer, purchases stone blocks, including granite and marble, from quarries and cuts them into slabs. The stone slabs are then fabricated into various products, such as granite countertops. The typical dimensions of the stone slabs that are fabricated into countertops are one and one quarter inches thick, eight to ten feet long and six to eight feet wide. The company also wholesales stone slabs and will install stone countertops that they have fabricated.

Employees work ten-hour shifts Monday through Friday starting at 7:00 a.m. and a five-hour Saturday shift also starting at 7:00 a.m. At the time of the incident, the victim was helping the saw operator, with whom he was paired, retrieve a granite slab from a slab rack. The slab rack was located in the fabrication shop, next to the saw used to cut stone slabs. The fabrication shop was housed in a large building with an overhead door.

Slab racks are designed to store material in slab form. The slab rack involved in this incident was a metal vertical rack with multiple sections separated by support pins (Figures 1 and 2). The manufacturer of the slab rack could not be determined during the investigation. At the time of the incident, the slab rack was loaded with stone slabs. The first section contained five stone slabs, including the granite slab being retrieved (granite slab 2), which was the second slab in from the end support pins. Measuring approximately six feet high, ten feet long, and one and one quarter inches thick, granite slab 2 was shorter than the stone slabs stored on either side. Granite slab 2 weighed approximately 1,000 pounds.

An overhead gantry crane was used to retrieve and transport stone slabs inside the fabrication shop. The gantry crane ran the entire length and width of the shop enabling stone slabs to be moved to any location within the shop. The crane's jib was attached to a clamp/slab lifter (Figure 3). When slabs are attached to the clamp, the weight of the slab generates friction between the slab and the clamp that ensures the clamp is securely attached to the slab.

At the time of the incident, granite slab 2 was being retrieved to be fabricated into a countertop. The retrieval of granite slab 2 was problematic because the crane's clamp could not be attached to the slab due to it being shorter than the stone slabs stored on either side of it. To create space for the crane's clamp to attach to granite slab 2, the other stone slabs in the first section of the slab rack had to be tilted away from granite slab 2. Because granite slab 2 was stored with four other stone slabs in the first section of the slab rack there was not enough room inside this section of the slab rack to tilt any of the stone slabs. To enable the first stone slab to tilt away from granite slab 2, the victim positioned himself with his back up against the middle of the first stone slab. The victim then pulled out one of the two end slab rack support pins. The saw operator positioned himself at the edge of the first stone slab and pulled out the remaining support pin. The victim and the saw operator then tilted the first stone slab towards themselves resting the slab against the victims back as a second coworker went to retrieve the overhead gantry crane to attach the clamp onto granite slab 2.

While the slab rack support pins were removed, the other four stone slabs, including granite slab 2, started tilting towards the victim and saw operator. The saw operator attempted to stop the

four slabs from tilting but was unsuccessful. The victim and the saw operator could not support the weight of the stone slabs, estimated to be 5,700 pounds. All five stone slabs fell, crushing the victim against a stone table and striking the saw operator.

The coworker who was retrieving the gantry crane heard a noise, noticed the trapped victim and yelled for help. Twelve other coworkers rushed to the trapped victim and managed to lift the five stone slabs enough to free the victim and saw operator. Once the slabs were off of the victim, he fell to the concrete floor. Once the stone slabs were lifted, the saw operator was able to move himself out from underneath the slabs.

An office worker placed a call for Emergency Medical Services (EMS) after being told about the injured employees. EMS arrived within minutes of the call and transported the unconscious victim to a local hospital where he was pronounced dead. EMS also transported the injured saw operator to a hospital for non-life threatening injuries. At the time of the site visit, the company had welded the slab rack's support pins so they could not be removed.

CAUSE OF DEATH

The medical examiner listed the cause of death as crush injury to neck and chest.

RECOMMENDATIONS / DISCUSSION

Recommendation #1: Employers should use slab racks designed with fixed support pins and individual compartments for each slab.

Discussion: The hazards involved in this fatal incident, which could have been prevented, underscore the need to use slab racks designed with fixed support pins and individual compartments for each stone slab. In this case, the use of slab racks with individual compartments for each stone slab would have allowed sufficient space to attach the gantry crane clamp on to the granite slab without having to move the surrounding stone slabs. Using racks with fixed support pins would have eliminated the crushing hazard associated with this incident by ensuring that support pins are kept in place, preventing the stone slabs from tipping over.

If using slab racks that allow storage of multiple slabs within one section, employers should ensure that the racks are used in accordance with manufacturers' specifications and that the racks are never overcrowded with slabs. Leaving enough room within a section of the slab rack will allow slabs to be tilted safely providing enough space for the crane's clamp to attach to each slab. In addition, when accessing a stone slab located in a rack section that contains more than one stone slab, the slabs that are not being removed should be tied down. Tying down slabs that are remaining in the rack will ensure that these slabs will not move unexpectedly. In this case, the first stone slab located in the first section of the slab rack could have been directly accessed by the crane and should have been removed from the rack, which would have created enough space to safely access granite slab 2 with the crane.

Recommendation #2: Employers should ensure that all slab racks have been designed by registered professional engineers and that current engineering

drawings and documentation of load capacities for all racks are readily available.

Discussion: In this case, the manufacturer of the slab rack could not be determined, therefore the load capacity of the rack was unknown. Employers who build their own slab racks or have slab racks custom built should ensure that the racks are designed by registered professional engineers. For each slab rack employers should, at a minimum, maintain current engineering drawings and documentation of the rack's total load capacity and the load capacity for each section within the rack. In addition, employers should provide employees with rack capacities and stone slab weights to help prevent rack overloading.

Recommendation #3: Employers should develop, implement, and enforce standard operating procedures (SOP) for receiving, storing, and retrieving stone slabs, which includes limiting employees' manual handling of stone slabs.

Discussion: Employers can prevent similar situations from occurring by developing, implementing, and enforcing standard operating procedures (SOP) for receiving, storing, and retrieving slab materials. When developing SOPs, employers should review their equipments' owner's manuals and seek input from employees about current task procedures and hazards. SOPs should address all identified hazards. In this case, the SOP should address the proper handling and movement of heavy objects, such as stone slabs, by ensuring limited manual handling of these heavy slabs by employees and limited employee exposure to slabs that are being moved mechanically. The SOP should include, but not be limited to:

- Receiving/Retrieval – when available, always use mechanical equipment, such as a gantry crane or forklift with proper attachments, to move slabs, and always limit employee exposure to moving slabs
- Rack type – use racks with individual compartments for each slab with fixed support pins
- Storage – store slabs by height and never overcrowd a section of the rack with slabs
- Avoidance of potential hazardous situations – never disassemble any portion of a slab rack that is storing slab material.

Recommendation #4: Employers should develop, implement, and enforce a comprehensive written safety program, which includes hazard recognition and avoidance of unsafe conditions, and provide training in language(s) and literacy level(s) of workers.

Discussion: A comprehensive written safety program that includes training on hazard recognition and the avoidance of unsafe conditions should be developed, implemented, and enforced by employers. During the development of a comprehensive safety program, employers should evaluate all tasks performed by employees for potential hazards, such as the potential crushing hazard when retrieving granite slabs from the slab racks. Information about these identified hazards and their controls should be incorporated into the comprehensive safety program, the SOP (Recommendation #3) and hazard recognition training. At a minimum, hazard recognition training should include, but not be limited to, hazard identification, the abatement of these identified hazards, and the avoidance of unsafe conditions. Avoidance of unsafe

conditions should include, but not be limited to, the work practice where employees never risk physical harm to accomplish tasks.

Comprehensive health and safety programs should also address respiratory hazards. Although not a factor in this incident, when cutting and buffing granite, employees could be exposed to respirable silica without proper controls. Employers should train employees on the proper controls for any respiratory hazard and other health hazards employees are exposed. Exposure to silica can cause the lung disease silicosis. Silicosis is preventable, but once you have silicosis it is incurable, debilitating and often fatal. (For more information see the references section)

Companies should identify the languages spoken by their employees and ensure that their comprehensive safety program is multi-lingual. To the extent feasible, the comprehensive safety program should be developed at a literacy level that corresponds with the literacy level of the company's employees. Companies may need to consider providing special safety training for workers with low literacy to meet their safety responsibilities.

Employers should document all trainings. Documentation should include: who provided the training and their qualifications, the content of the training, workers who were trained, and any assessments of workers' comprehension of the training. As a reference, a summary of the Occupational Safety and Health Administration's (OSHA) draft proposed safety and health program rule, which discusses employee training, has been included at the end of this report.

Recommendation #5: Manufacturers of slab racks should evaluate and consider supplying only slab racks with fixed support pins.

Discussion: At the time of this incident, the end support pins of the slab rack were removed allowing the stone slabs to fall over. Manufacturers of slab racks should evaluate and consider supplying only slab racks designed with fixed support pins. A fixed support pin design would eliminate the hazards associated with removable support pins, such as the creation of a space large enough for stone slabs to tip and fall. In addition, manufacturers should ensure that slab racks are designed to withstand the loads and forces imposed on them from the placing, storing, and retrieving slab materials.

REFERENCES

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2. Code of Federal Regulations, 29 CFR 1910.176(b) Handling Materials – general
3. National Institute for Occupational Safety and Health, A guide to working safely with silica: If It's Silica, It's Not Just Dust (1997), www.cdc.gov/niosh/pdfs/silicax.pdf
4. National Institute for Occupational Safety and Health, Silicosis: Learn the Facts!, NIOSH Publication No. 2004-108, www.cdc.gov/niosh/docs/2004-108/default.html
5. Occupational Safety and Health Administration, Silica Advisor eTool, www.osha.gov/SLTC/etools/silica/index.html. Date accessed: September 5, 2006.

6. The Center to Protect Workers' Rights, Silica Hazard Alert, www.cpwr.com/pdfs/pubs/hazard_alerts/KFsilica.pdf. Date accessed September 5, 2006.

Figure 1 – Slab rack involved in the incident
(end support pins had been welded to the rack by the company)

Figure 2 – At time of the incident the end support pins were removed.

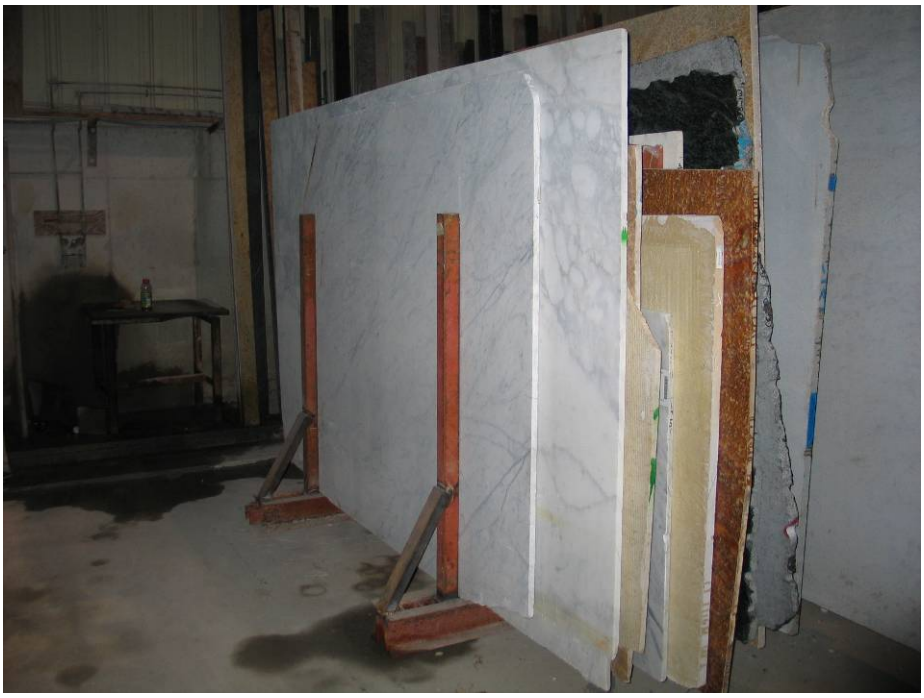
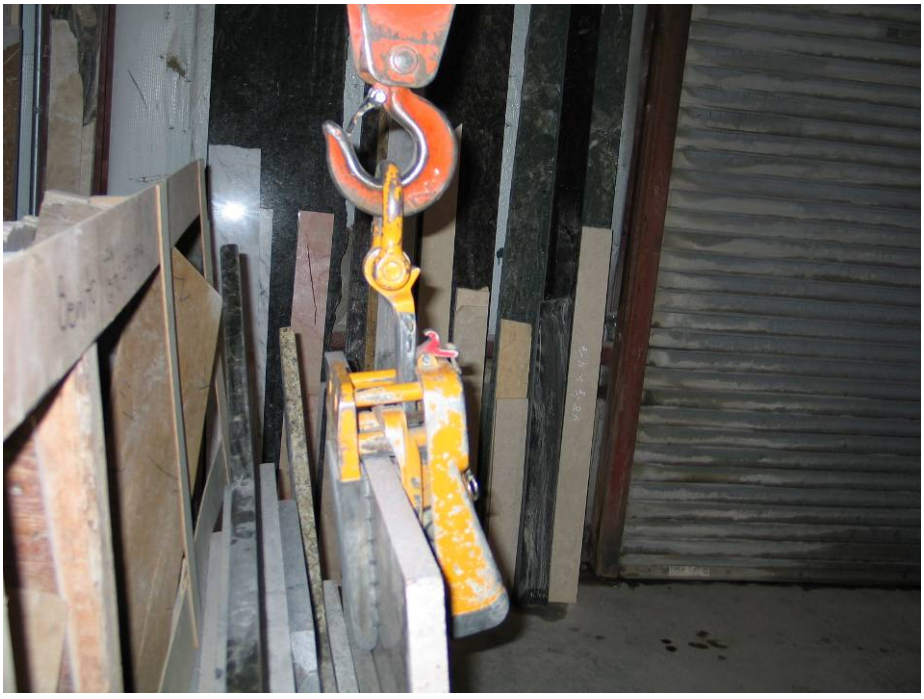


Figure 3 – Gantry crane clamp attached to a slab of granite



SUMMARY OF OSHA'S DRAFT PROPOSED SAFETY AND HEALTH PROGRAM RULE FOR EMPLOYERS

(29 CFR 1900.1 Docket No. S&H-0027)

Date issued November 23, 1998. Full text available on www.osha-slc.gov/SLTC/safetyhealth/nshp.html.

Core elements

- Management leadership and employee participation
- Hazard identification, assessment, prevention and control
- Access to information and training
- Evaluation of program effectiveness

Basic obligations

- Set up a safety and health program, with employee input, to manage workplace safety and health to reduce injuries, illnesses and fatalities.
- Ensure that the safety and health program is appropriate to workplace conditions taking into account factors such as hazards employees are exposed to and number of employees.
- Establish and assign safety and health responsibilities to an employee. The assigned person must have access to relevant information and training to carryout their safety and health responsibilities and receive safety and health concerns, questions and ideas from other employees.

Employee participation

- Regularly communicate with employees about workplace safety and health matters and involve employees in hazard identification, assessment, prioritization, training, and program evaluation.
- Establish a way and encourage employees to report job-related fatalities, injuries, illnesses, incidents, and hazards promptly and to make recommendations about appropriate ways to control those hazards.

Identify and assess hazards to which employees are exposed

- Conduct inspections of the workplace at least every two years and when safety and health information change or when a change in workplace conditions indicates that a new or increased hazard may be present.
- Evaluate new equipment, materials, and processes for hazards before introducing them into the workplace and assess the severity of identified hazards and rank those hazards that cannot be corrected immediately according to their severity.

Investigate safety and health events in the workplace

- Thoroughly investigate each work-related death, serious injury, illness, or incident (near miss).

Safety and health program record keeping

- Keep records of identified hazards, their assessment and actions taken or the plan to control these hazards.

Hazard prevention and control

- Comply with the hazard prevention and control requirements of the OSHA standards by developing a plan for coming into compliance as promptly as possible, which includes setting priorities and deadlines for controlling hazards and tracking the progress.

Information and training

- Ensure each employee is provided with safety and health information and training.
- If an employee is exposed to hazards, training must be provided on the nature of the hazards to which they are exposed to and how to recognize these hazards. Training must include what is being done to control these hazards and protective measures employees must follow to prevent or minimize their exposures.
- Safety and health training must be provided to current and new employees and before assigning a job involving exposure to a hazard. The training should be provided routinely, when safety and health information is modified or a change in workplace conditions indicates a new or increased hazard exists.

Program evaluation and maintenance

- Evaluate the safety and health program at least once every two years or as often as necessary to ensure program effectiveness.
- Revise the safety and health program in a timely manner once deficiencies have been identified.

Multi-employer workplaces

- The host employer's responsibility is to provide information about hazards and their controls, safety and health rules, and emergency procedures to all employers at the workplace. In addition, the host employer must ensure that assigned safety and health responsibilities are appropriate to other employers at the workplace.
- The contract employer responsibility is to ensure that the host employer is aware of hazards associated with the contract employer's work and how the contract employer is addressing them. In addition, the contract employer must advise the host employer of any previously unidentified hazards at the workplace.