OREGON FATALITY ASSESSMENT AND CONTROL EVALUATION
http://www.ohsu.edu/xd/research/centers-institutes/oregon-institute-occupational-health-sciences/outreach/or-face/
Oregon Institute of Occupational Health Sciences
OREGON HEALTH & SCIENCE UNIVERSITY

Fatality Investigation Report

OR 2014-42-1

Forestry worker in vehicle killed from timber falling activity

SUMMARY

On November 4, 2014 a 55-year-old log quality specialist employed by a timber leasing organization was killed when her vehicle was struck by a tree that was cut by a faller.[1] This occurred within an active logging area that included cable yarding at the southeast end of the unit, and active timber falling at the northwest end of the unit. The faller was working at the northwest end and uphill from the road (see illustration at right). A single cable flagger associated with the cable yarding at the southeast end allowed the log quality specialist to drive under the cable and proceed northwest. Shortly after she passed under the cable she was met by the owner of the logging company who was driving from the northwest end toward the southeast end of the unit. During this stop, the log quality specialist and logging company owner had a brief conversation. The owner was the only witness to the conversation, and his report of what he said was limited and ambiguous. The logging company owner then left to perform some work at the east end of the site. A witness indicated the log quality specialist waited at the location of this encounter for at least 20 minutes before proceeding to the northwest, driving toward the timber falling activity. There were no warning signs or flaggers present in advance of the

A schematic of the incident. The tree/limb density is reduced in the illustration to reveal the vehicle. At the actual site, tree/limb density was greater and the view of the road more obscured.

[1] Person who falls (cuts down) trees.

Keywords: Logging, tree falling, multi-employer worksites [NAICS=113310]
Publication Date: January 2017
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active falling area. The faller working at the northwest end cut a tree that fell downslope and into the road, 135 degrees from its intended lay. He went down to clear the tree from the road and discovered a vehicle had been struck by the tree and come to rest further down the road. He discovered the log quality specialist severely injured in her vehicle and called 911. First responders arrived within about 30 minutes but pronounced the log quality specialist dead at the scene.

RECOMMENDATIONS

- **Employers responsible for active logging operations should assure that entry into hazardous logging areas is controlled, including correct placement of flagging, road closures, and adequate and proper signage and warnings.**

- **Employers should assess tree fallers' skills for felling and bucking logs, and require that novice or inadequately performing workers are directly supervised by a qualified person until the faller demonstrates the ability to safely perform these tasks independently.**

- **Employers with employees who work in and around forests who may be exposed to production logging operations should train employees in hazard recognition and reporting, and assure reported hazards are tracked, documented, and resolved, and their resolution communicated.**

- **Incident investigations should be utilized to identify action items to be addressed, and responsibilities should be assigned to assure their completion.**

- **On multi-employer worksites, all employers with employees on site share the responsibility for protecting workers from known hazards, and thus should establish inter-employer safety communication practices involving all employers at a given site.**

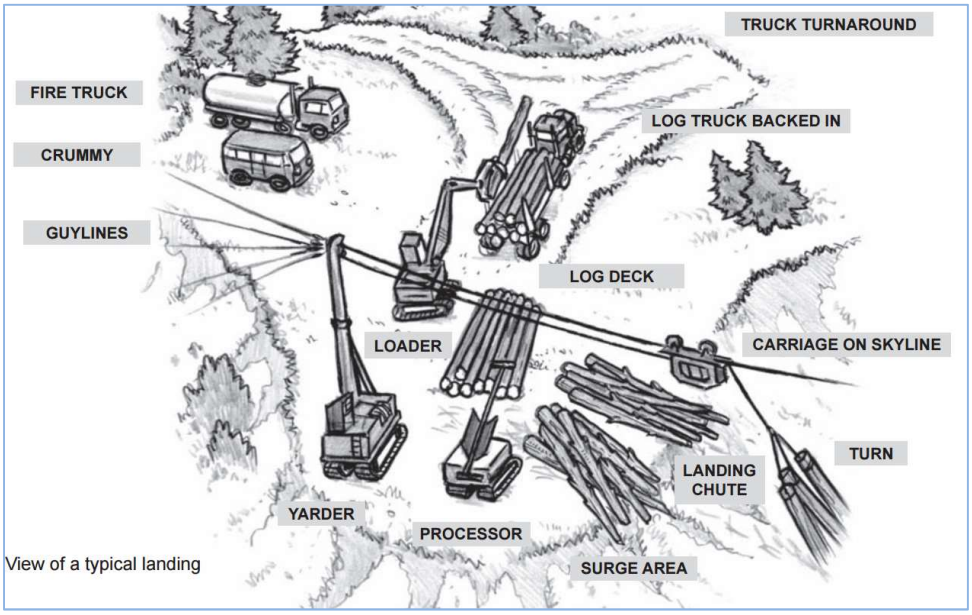
OR-FACE supports the prioritization of safety interventions using a hierarchy of safety controls, where top priorities are hazard elimination or substitution, followed by engineering controls, administrative controls (including training and work practices), and personal protective equipment.

INTRODUCTION

On November 4, 2014 a log quality specialist was killed when her vehicle was struck by a tree that was cut by a faller working uphill from the road where she was driving northwest. OR-FACE was notified of the event by OR-OSHA. This report is based on investigation documents from OR-OSHA and from the log quality specialist's employer, and through follow-up discussions with the OR-OSHA investigator and the employer.

The log quality specialist's employer leases land for timber operations. The timber rights at the site of the incident were purchased by a small logging company that provided logging services on a contract basis. This small logging company hired a sub-contractor to perform cutting and yarding for this particular timber sale. According to the OR-OSHA report and discussions with the OR-OSHA investigator, the owner of the sub-contracted logging firm stated in one conversation that the timber faller was working as an independent contractor. However, in other conversations, a reference was made to the faller being an employee of the sub-contractor. Regardless, there were multiple employers working in this active logging area, and hazards created by the operations of one employer exposed an employee of another employer working on site to risk of injury.

The leased site was a large, densely forested area. Two logging activities were taking place on the site at the time of the incident: cable yarding on the southeast end of the sale area; and active timber falling on the northwest end. The two sets of activities were approximately 0.6 mile apart and occurring north of a winding road that ran along the bottom of a valley through the harvest area. The road where the incident occurred was accessible from multiple areas, and was frequently used by recreationists.



A schematic of a typical cable logging landing area
(from "Yarding and Logging Handbook" published by OR-OSHA , 2010).

According to her employer's investigation report, the log quality specialist's safety training and other records were up to date. On the morning of the incident the log quality specialist and four other colleagues were at a location in the forest approximately an hour's drive away from the active logging area. The purpose of their meeting was for field training regarding a specific type of tree defect. The defect tree was cut and bucked by a co-worker who was a certified faller. The report also indicated that typical safety measures were followed during cutting of the defect tree including discussion of escape routes, and employees not involved in the cutting sheltered behind other trees in the immediate area. After the training, the log quality specialist departed the area alone and her colleagues departed the area in different directions for other work. It is not known why the log quality specialist took the particular route through the area where the incident took place.

The log quality specialist had worked for the employer for 30 years, including several years working around active logging operations. Her normal work activities included driving through timber sale areas, as she was doing on the day of the incident.

INVESTIGATION

On the day of the incident the log quality specialist followed her employer's standard check-in/check-out policy and procedures for conducting field work involving training. Her employer's report indicated she arrived at her office at 6:00 am then left approximately an hour and a half later for training in the forest, where she arrived and met her colleagues at the appointed time of 9:00 am. Records show she indicated an anticipated return time to the office of 2:30 pm.

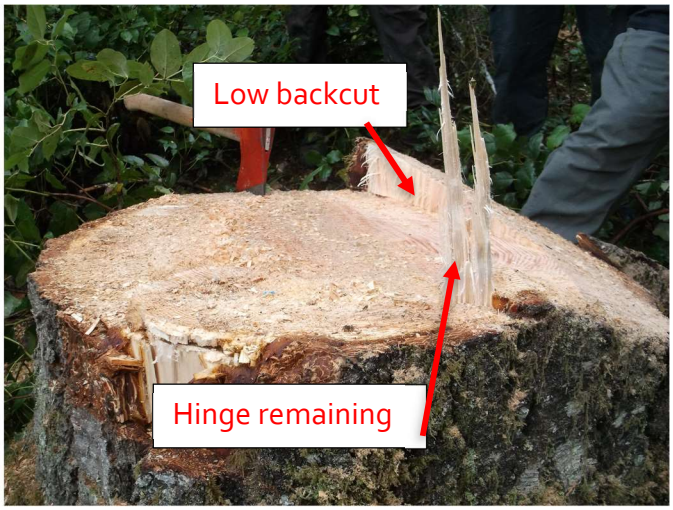
An unpaved, winding road ran along the length of the bottom valley of the harvest area. The road ran (roughly) diagonally through the unit from southeast to northwest. Yarding activity was being performed on the southeast end of the harvest area. The skyline cable from the southeast side yarding activity crossed the road, which under OR-OSHA standards requires that a flagger and warning signs be positioned on either side and in advance of the cable operation. A single watchman/flagger was incorrectly positioned under the cable. Active timber falling was taking place on the opposite, northwest end of the harvest area, uphill from the road. The log quality specialist's employer's investigation revealed that the cable watchman/flagger was not aware of tree falling operations occurring at the northwest side. Investigation documents also reported that while not a direct causal factor in the incident, the watchman/flagger was not equipped with the required high-visibility vest or "stop/slow" paddle signs. Investigation reports indicated that while some warning signs were present in some parts of the timber sale area, signage was inadequate and the specific locations and conditions of signs described in the reports varied. Most importantly, there were no signs or warnings between the cable yarding and the falling operations to warn traffic approaching from the southeast, which was the direction of travel for the log quality specialist at the time of the incident.

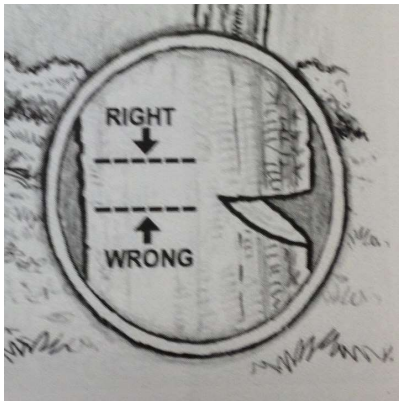
The owner of the subcontracted logging company (herein referred to as "logging company owner") reported to OR-OSHA that he was working as a flagger to control traffic entering the timber falling area from the northwest, but other evidence suggested he did not have a specific work role at the northwest end of the unit. Prior to the incident he drove southeast along the road ahead of some hunters he reported to be escorting through the active logging area toward the skyline cable (other evidence suggests he may have simply been driving ahead of the hunters).

At approximately 11:00 am on the day of the incident, the log quality specialist was driving into the area and encountered the watchman/flagger at the southeast end of the unit at the skyline cable. He waved her to pass underneath the cable to continue traveling to the northwest. The watchman/flagger reported that he saw her pull over a short distance away, presumably to allow two oncoming vehicles to pass. The driver of the first vehicle was the logging company owner; the hunters were in the second vehicle. This encounter took place approximately 0.3 mile from the timber falling area where the fatal incident ultimately occurred. During this stop, a brief conversation took place between the logging company owner and the log quality specialist, with both parties remaining in their respective vehicles. The logging company owner stated in a recorded interview with OR-OSHA that while he and the log quality specialist were pulled over he told her to "hang tough; be back in a few minutes." He then left to perform work at the landing and the hunters proceeded down the road past the cable flagger. There were no other witnesses to what was said in the conversation, and the owner's reports were limited and ambiguous.

Temporary road closures by logging contractors are normally limited to 20 minutes. Based on follow-up communications with the log quality specialist's employer, it is understood that she waited at least that amount of time before proceeding northwest down the road. From where she was parked during the brief encounter with the logging company owner it is likely she could not see or hear the cutting activity occurring over a quarter of a mile down the road to the northwest. Further, as noted earlier, there was no flagging or signage in place to warn of the presence of falling operations occurring further down the road.

According to the employer's investigation report the tree that struck the log quality specialist's vehicle measured 160 feet tall (the OR-OSHA report stated more generally the tree was over 140 feet tall), with a diameter of 36 inches. The OR-OSHA report indicated the distance from the tree stump to the center of the road was approximately 145 feet. The ground below the stump sloped downward toward the road at an approximate 30% grade. The intended lay of the tree was parallel to the road. However, the tree fell 135 degrees away from the intended lay of the tree into the road. The OR-OSHA report noted that in their examination of the tree stump, several unsafe cutting practices were apparent (shown in adjacent photo): sufficient holding wood was not maintained[2]; low backcuts[3]; and improper cleaning of the face cut. The holding wood on the uphill side of the tree was nearly completely sawn off and only a small 2-inch x 2-1/2-inch hinge remained on the downhill side of the stump. These conditions would make it more difficult to fall the tree in the intended direction, as its natural lean was toward the road. As the work was being performed the faller used three wedges in an attempt to fall the tree in its intended direction.





Schematic showing proper backcut placement (from OR-FACE publication)

According to the OR-OSHA report, interviews with the logging company owner indicated that the faller "was aware of proper cutting techniques." However, based on OR-OSHA's examination of most of the trees they surveyed in the area, the faller "did not execute that knowledge." The OR-OSHA report also indicated this cutter was not a full-time timber faller and had no production falling experience (e.g. more routine, higher volume) prior to the day of incident. The logging company owner stated to the OR-OSHA investigator that he had

[2] Section of the wood located between the face and the backcut. Its purpose is to prevent the tree from separating from the stump until it has been committed to the face. It also helps direct where the tree will fall. The holding wood must never be completely sawn off.

[3] The last of the three cuts required to fall a tree, located on the opposite side of the tree from the face and at least one inch above the horizontal cut of the face. The one inch of holding wood is referred to as the stump shot and prevents the tree from kicking back over the stump toward the faller.

confidence in the faller's abilities, and that if he had identified unsafe cutting practices he would have corrected them.

The log quality specialist's employer's investigation report indicated that as soon as the faller realized the tree hit the road he walked down to the road intending to clear it and make it passable for traffic. He first saw glass and debris, and then realized the tree had struck a vehicle further down the road. After finding the log quality specialist severely injured in the cab of the vehicle, he called 911. Additional information from the employer's investigation indicated the faller also attempted to use his radio to contact the logging company owner when he became aware of the incident; however, his radio did not work. The hunters, who had decided to turn around and return home, drove back through the area, came upon the incident, and with the cutter, attempted to provide first aid. One of the hunters then drove up toward the yarder to obtain another first aid kit and to notify the cable watchman/flagger about the incident. The watchman/flagger then tried to reach the logging company owner, but his radio also not work. The hunter then went up to the landing to notify the owner in person. First responders arrived on the scene within 30 minutes of the faller's call and included fire/emergency medical personnel and a deputy sheriff, who monitored vital signs and prepared for an ambulance to arrive, and emergency personnel in an ambulance. Ambulance emergency personnel removed the log quality specialist from the vehicle, assessed her, and pronounced her dead at the scene. The owner returned to the road below the falling activity and arrived at the scene of the incident about 10 minutes later.

The log quality specialist's employer's incident investigation report indicated that the day prior to and the day of the incident, several of their employees had conducted site visits at the timber sale area for typical monitoring work and to look at new road construction within the area. Their inspection records indicated observing hazardous timber falling activities near the road, including signage and/or flagging not being in place in advance of falling activities. However, there was no evidence that while they were on site during those visits any direct communication of these observations was made to the logging company owner. The employer's investigation also determined that employees may not have clearly understood their roles and authority for reporting and/or correcting identified unsafe practices. While their normal internal written communications channels were followed, there was no a formal protocol or tracking mechanism for addressing items identified as urgent or needing immediate action, such as stopping the operation until proper signage and/or flaggers were in place. There were also prior reports of signage that had been left behind by a logging crew for an extended period after active falling or logging had been taking place.

Subsequent communications with the log quality specialist's employer indicated that specific action items were identified as a result of the incident investigation. Also, after the incident, the log quality specialist's employer collaborated with OR-OSHA to provide employee training on logging safety hazard recognition.

CAUSE OF DEATH: Traumatic head and neck injury.
RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers responsible for active logging operations should assure that entry into hazardous logging areas is controlled, including correct placement of flagging, road closures, and adequate and proper signage and warnings.

- In an active timber falling area, when there is potential for felled trees or limbs to land on a road, the flow of traffic through the area should be controlled and protective actions taken by the employer responsible for performing the falling work. Recommendations in this regard are a top priority, as they not only protect people working in an active logging area, but also the general public who may be exposed. For example, in this case the roads in the logging area are frequently used by recreationists.

- There were several reported instances of deficiencies in signage and warnings within this logging area that were left uncorrected: 1) the log quality specialist's employer reported that their inspection records indicated no signage and/or flagging placed in advance of timber falling activities; 2) prior reports of signage that had been left behind by a logging crew for an extended period after active falling or logging had taken place; and 3) a statement by the logging company owner in an interview with OR-OSHA that "Timber Falling Ahead" signs previously posted in the area had been stolen or vandalized prior to the day of the incident.

- A number of effective guidelines and practices for site control are prescribed in OR-OSHA standards.

    - OAR 437-007-0510(1) notes that "Where there is no through traffic, such as on a dead-end road or where the property owner's permission or proper authority is granted to close a section of road, warning signs and barricades may be used instead of flagger(s)." In this case, the road was not closed to traffic. Therefore, some appropriate warning including a flagger should have been present at all entry points into the active falling area.
    - Warning signs should be placed at least 300 feet in advance of forest activities that create hazardous conditions for road traffic (OAR 437-007-0515(1)). Warning signs should be placed on both ends of the activity if traffic flows both ways.
    - Warning signs should meet these requirements: (a) be a minimum dimension of 24-inch x 24-inch diamond; (b) have an orange background; and (c) have 4-inch black letters (OA 437-007-0515(4)).
    - Sample wording for warning signs can be found in OAR 437-007-0515(3). Wording should be operation specific. Some examples are "Lines Across Road", "Timber Falling Ahead", and "Logging Operations Ahead".

- When forest activity operations are interrupted for an extended period, warning signs should be removed or covered (OAR 437-007-0515(2)), to keep warnings current and avoid confusion.

- Communication devices such as radios are important tools that supplement flagging, signage, and other means of providing notification and warning. Such equipment should always be maintained in proper working condition. In this case, it was reported that at least two logging company workers had radios that did not work.

Recommendation #2: Employers should assess tree fallers' skills for felling and bucking logs, and require that novice or inadequately performing workers are directly supervised by a qualified person until the faller demonstrates the ability to safely perform these tasks independently.

- Timber falling is an extremely hazardous occupation. Safe timber falling practices are best learned under the direction of a qualified timber faller and through repetition with feedback from regular audits (e.g. observation, inspection) of cutting practices.

    - The faller's employer stated that he had confidence in the faller's abilities and that if he had identified unsafe cutting practices he would have corrected them. However, during OR-OSHA's investigation deficiencies in safe cutting practices by this faller were observed, with improper cuts found in several trees that were surveyed at this site in addition to the tree that struck the log quality specialist's vehicle. It is important, therefore, for logging employers to regularly evaluate their fallers' work practices, correct any unsafe cutting practices observed, and ensure that all fallers have the necessary skills to perform the task at hand before they are allowed to work independently (OAR 437-007-0800(10)).

    - Before being allowed to work on their own, new or inexperienced timber fallers need to fully demonstrate their abilities to fall trees of different types and sizes, and under different ground conditions. Assessment of the cutter's skills should also consider the type of falling involved at a given site (e.g. selective logging vs. clear-cutting operations). Further, if a faller is only intermittently involved in cutting operations, employers should provide periodic (e.g. annual) refresher training. As noted in the Investigation section of this report, the faller involved in the incident was new to production falling operations (e.g. more routine, higher volume falling). A faller who is not fully experienced or competent can put not only themselves at risk, but also others within the work area, including drivers of vehicles (both workers and general public).

- This recommendation also should be addressed during the timber sale contract review, and should include evaluation of the area for potential hazards and proper training and skills of the cutting contractors for site conditions. Safety mechanisms appropriate for those conditions should be put in place.

- Tree height and slope of the ground are factors that should be taken into consideration when evaluating a timber falling activity for potential hazards. Steep slopes could allow the tree to slide down a hill for some distance, which was a relevant factor in the current case. In addition, the tree was located less than the standard minimum safe distance to the road (twice the tree height). Mitigation options (in addition to the requirement to place flaggers/warnings in advance of falling activities) for a faller under such circumstances could include seeking help from a more experienced faller. Alternatively, closing the section of road until the tree is felled would effectively control traffic, although this would likely require discussion during contract review if road closure may exceed 20 minutes. Or, if a slope is too steep for safe cutting, work should be discontinued until further hazard assessment can be made.

Recommendation #3: Employers with employees who work in and around forests who may be exposed to production logging operations should train employees in hazard recognition and reporting, and assure reported hazards are tracked, documented, and resolved, and their resolution is communicated.

- Employers should assure that employees who are directly or indirectly exposed to timber falling and logging operations are trained to assess and identify unsafe conditions and practices (e.g. poorly controlled entry into hazardous areas, inadequate or missing signage). The training should be kept current and relevant, and periodic review is recommended to assure its effectiveness. Training should also include defining roles and authority for reporting and correcting observed safety concerns.

- Roles, responsibilities, and communications and reporting channels should be clearly defined so that employees know whom to notify when unsafe conditions are observed. In the case of multi-employer worksites such as this timber sale area, the notified party needs to be someone who is authorized to correct the observed hazards, either directly (e.g., supervisor at the logging site), or through an authorized person (e.g., supervisor within the log quality specialist's organization) who knows and can communicate with the person having authority to correct hazards at the site. This should also include a method for identifying, addressing, and resolving items that need immediate attention and mitigation. A strategy should be implemented to follow up and assure hazardous conditions have been resolved and communicated to employees who may be working in the affected areas.

- Employers should periodically review policies, procedures, and associated documentation to identify any trends or other opportunities for updating or improving training.

Recommendation #4: Incident investigations should be utilized to identify action items to be addressed, and responsibilities should be assigned to assure their completion.

- Recommendation #3 above addressed practices related to hazard recognition, communication, and mitigation tracking. This same principle applies to injury investigations. In this case, it was learned from follow-up communications with the log quality specialist's employer that concerns identified during their incident investigation were used to develop and implement an action plan to resolve those findings. While this practice is likely to occur for serious and fatal incidents, it is a best practice for any incident investigation process, including near misses, as an opportunity to systematically improve the safety of the work environment and practices.

Recommendation #5: On multi-employer worksites, all employers with employees on site share the responsibility for protecting workers from known hazards, and thus should establish inter-employer safety communication practices involving all employers at a given site.

- There were multiple stakeholders for safety in the current incident. The logging company had direct responsibility for safe cutting operations at the site. However, any employer sending workers into a forest with active logging operations also has responsibility for preparing and protecting their employees from danger. Below are several recommended best practices for injury prevention at multi-employer worksites in forests:

  <u>For Logging Firms</u>
  - The ultimate responsible party for safety at a logging site is the logging firm that has control over tree falling and yarding operations. Several key practices may prevent similar future incidents on logging sites:

    - Logging firms should ensure that only individuals who are qualified by training and experience perform the tasks at hand. In this case, post-incident, the faller's cutting practices were observed to be deficient. Whether this faller was an employee of a subcontractor or an independent contractor, the firm in charge of the overall site must ensure that contractors or subcontractors are monitoring, training, and supervising fallers according to best safety practices.
    - Flagging and signage practices were deficient on the day of the incident. Responsibility for flagging and signage should be clearly assigned before

commencing operations, and monitored for adequacy for the duration of the work by the logging firm in charge of the site. All employers and workers involved at an active logging site should be aware of flagging and signage best practices so they can also monitor and report problems to supervisors.

- Contractor and sub-contractor selection process should include review of their skills, training, and safety records.

For All Employers

- Regular and standardized safety communication practices should be established among all employers involved with logging sites. A supervisor authorized to enact changes at each organization should be included. These processes should address identifying hazards, reporting them to appropriate parties (logging employer, contractor, sub-contractor, timber leasing organization, timber sale contract administrator), and for protecting employees from hazards until they are resolved. The day before the incident, hazardous or concerning conditions at the site were observed by co-workers of the log quality specialist, but were not effectively reported to responsible parties.
- Qualified persons for each employer should be designated to conduct safety inspections of the site within their own span of control. Responsibility for reporting, mitigating, and communicating resolution of identified hazards should be clearly defined and understood across all employers involved at a site.

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FOR MORE INFORMATION

OR-FACE/Oregon Institute of Occupational Health Sciences
Oregon Health & Science University
3181 SW Sam Jackson Park Rd, L606
Portland OR 97239-3098

Phone: (503) 494-2281
Email: orface@ohsu.edu
Website: http://www.ohsu.edu/or-face

Oregon Fatality Assessment and Control Evaluation (OR-FACE) is a project of the Oregon Institute of Occupational Health Sciences at Oregon Health & Science University (OHSU). OR-FACE is supported by a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH) (grant #U60OH008472) through the Occupational Public Health Program (OPHP) of the Public Health Division of the Oregon Health Authority.
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