



NIOSH • 1000 Frederick Lane, Morgantown, WV 26508 • 304-285-5916

INCIDENT HIGHLIGHTS



DATE:
January 25, 2019



TIME:
1:00 p.m.



VICTIM:
32-year-old processor operator



INDUSTRY/NAICS CODE:
Logging/113310



EMPLOYER:
Logging



SAFETY & TRAINING:
Verbal and hands on safety training program



SCENE:
Forest/Logging Spur Road



LOCATION:
Idaho



EVENT TYPE:
Roll-over



REPORT#: 2020-01 **REPORT DATE:** April 28, 2022

Logging processor lost traction and rolled down hillside fatally injuring operator - Idaho

SUMMARY

On January 25, 2019, a 32-year-old processor operator was fatally injured when his equipment rolled down a previously logged (clear-cut) hillside. The processor operator was driving the equipment from a spur road to a main logging road. As the processor operator approached a narrow inside corner in the road near a log deck, the tracks on the equipment slipped laterally on the outsloped road. The equipment slid off the road and temporary stopped on logs that had been decked. [READ THE FULL REPORT> \(p.3\)](#)

CONTRIBUTING FACTORS

Key contributing factors...

- Road design and maintenance
- Road hazard assessment
- Operator training
- Position of equipment and boom during travel
- Operator protection design did not include Falling Object Protection Structure (FOPS) Tip Over Protection Structures (TOPS) and Roll Over Protection Structures (ROPS)
- Processing head attachment stowing or stabilization
- [LEARN MORE> \(p.9\)](#)

RECOMMENDATIONS

NIOSH investigators concluded that, to help prevent similar occurrences:

- road designers should limit outsloping on forest roads with potential winter travel
- employers should conduct a hazard assessment when working with forestry equipment in areas of steep terrain and provide worker training on hazard recognition as part of a comprehensive and site-specific safety plan [LEARN MORE> \(p.10\)](#)

FACE IT: [2020-01 REPORT SLIDES](#)



Fatality Assessment and Control Evaluation (FACE) Program

The National Institute for Occupational Safety and Health (NIOSH), an institute within the Centers for Disease Control and Prevention (CDC), is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. In 1982, NIOSH initiated the Fatality Assessment and Control Evaluation (FACE) Program. FACE examines the circumstances of targeted causes of traumatic occupational so that safety professionals, researchers, employers, trainers, and workers can learn from these incidents. The primary goal of these investigations is for NIOSH to make recommendations to prevent similar occurrences. These NIOSH investigations are intended to reduce or prevent occupational deaths and are completely separate from the rule making, enforcement and inspection activities of any other federal or state agency. Under the FACE program, NIOSH investigators interview persons with knowledge of the incident and review available records to develop a description of the conditions and circumstances leading to the deaths in order to provide a context for the agency's recommendations. The NIOSH summary of these conditions and circumstances in its reports is not intended as a legal statement of facts. This summary, as well as the conclusions and recommendations made by NIOSH, should not be used for the purpose of litigation or the adjudication of any claim. For further information, visit the program website at www.cdc.gov/niosh/face/ or call toll free at 1-800-CDC-INFO (1-800-232-4636).



Centers for Disease Control
and Prevention
National Institute for Occupational
Safety and Health

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SUMMARY

On January 25, 2019, around 1 pm, a 32-year-old processor operator was fatally injured when his equipment rolled down a previously logged (clear-cut) hillside. The employer was subcontracted to clear-cut over 50 acres of fir, pine, and spruce. The location of the incident was on a large tract of privately owned and managed timberland approximately 10 miles out on a logging road. The road was a single lane logging road that varied between 13 to 16 feet in width. The road grade varied but was approximately 4 percent with an approximate 9 percent outward slope at the site of the rollover incident. The surrounding hillside terrain had an approximate 20 percent slope. At the time of the incident, the logging road was covered with 2 inches of ice and lined with snow on both sides. There were six employees onsite at a cable logging operation. The processor operator was driving the equipment from a spur road to a main logging road to harvest some fringe trees on the lower section of road, then the equipment was to be loaded on a lowboy and transported to a new timber harvesting location. As the processor operator approached a narrow inside corner in the road near a log deck (a stack of logs near a roadway), the tracks on the equipment slipped laterally on the outsloped road. The equipment slid off the road and temporarily stopped on logs that had been decked. The processor operator swung the boom and placed the processor head on the uphill side of the road attempting to transfer the center of gravity. The yarder operator saw the equipment slipping down the slope, communicated over the radio for the processor operator to "get the boom down and get out of there!" While the processor operator was attempting to exit the cab, the equipment tumbled down the hillside, shearing the operator cab off the equipment and fatally crushing the processor operator before coming to a rest in the creek near the road below. EMS arrived on scene and declared the processor operator deceased.

INTRODUCTION

On January 28 and 29, 2020, a health scientist and an occupational health and safety specialist from the National Institute for Occupational Safety and Health (NIOSH) Division of Safety Research met with and interviewed the company owner, employees, Associated Logging Contractors officials, Idaho State Logging Safety representatives, and employees of the State of Idaho Division of Safety. Photos from the incident site, witness statements, and the medical examiner's report were provided to NIOSH.

EMPLOYER

The employer was subcontracting for a logging company who was contracted by the landowner to clear cut over 50 acres of fir, pine, and spruce. The employer had 5 years of experience logging as a subcontractor and 20 years of experience as a trucking subcontractor. The employer had 20 employees distributed into 3 crews including, a ground skidding crew and 2-line crews. Work typically occurred on site between 7 am and 5 pm. The employees typically met in town and would ride up to the jobsite together. This jobsite was located 45 minutes from town.

WRITTEN SAFETY PROGRAMS and TRAINING

The employer had an established written, classroom training, and verbal safety programs to protect the safety and health of the workers. The safety plan included first aid, hazard communication, hearing conservation, bloodborne pathogen exposure prevention, emergency action plans, hazard identification, and lockout tagout. Before hiring employees, the employer would interview them to determine their logging understanding and expertise. The employer trained employees on the elements of their job to ensure tasks were completed safely. Employee competencies evaluated included timber felling, tractor skidding, line skidding, bucking/limbing, loading, and transportation. Additionally, the employer had prevention policies on smoking, drug, alcohol, and substance abuse. The employer was not a member of the [Idaho Associated Logging Contractors](#) (ALC) prior to the incident but enrolled after the incident to strengthen the company safety and health program.



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WORKER INFORMATION

The 32-year-old processor operator started working in the logging industry at age 18 and had worked for other logging companies in the local area. The processor operator had worked for the current employer for 2 years. The processor operator was trained as a sawyer on felling, bucking, and bumping, as a hooktender on setting and removing chokers, and as an operator of a feller buncher and processor. The processor operator worked as a feller, choker setter, and skidder operator before working as a processor operator.

EQUIPMENT

Equipment on the jobsite included a LS-98 Link-Belt yarder and a D6C CAT dozer as a tie back for the link belt, a 240LX Link-Belt shovel loader, a [Doosan/Daewoo 225LL](#) shovel loader, and a 2013 [Doosan/Daewoo DX300LL](#) log loader with a 2013 [HTH623C](#) Waratah dangle head processor [[Diagram 1](#)]. The decedent was operating the DX300LL processor at the time of the incident. The Doosan/Daewoo DX300LL logging processor was equipped with a fixed riser, which raised the operator cab an additional 4 feet. The processor was also equipped with a forestry cab with side entry and falling object guard (FOG) which is intended to provide protection for the operator from falling objects. The equipment measured 11'10"(L) wide and 16'6"(K) long, with track grouser (track cleats which provide ice traction) heights from $\frac{1}{2}$ " to 2" tall, 5" between each grouser, and a circular track clean out. Forestry equipment with 360-degree rotation is required to have falling object protection structures (FOPS). The equipment had a FOG and a forestry cab and was not equipped with a falling object protection structures (FOPS), roll over protection structure (ROPS) or tip over protection structure (TOPS) based on the [Doosan log loaders brochure](#) on page 21. The Doosan was outfitted with a 2013 Waratah Processor [HTH623C](#) Harvester Head (CTM10021) which weighed approximately 6,700 pounds [[Photo 1](#)]. The processor head has a stationary heel wrap or thumb to help position the logs. Employer fabricated ice bits were installed for winter equipment operation to increase traction on ice covered surfaces. There were 2 ice bits on each pad and approximately 50 pads per track placed

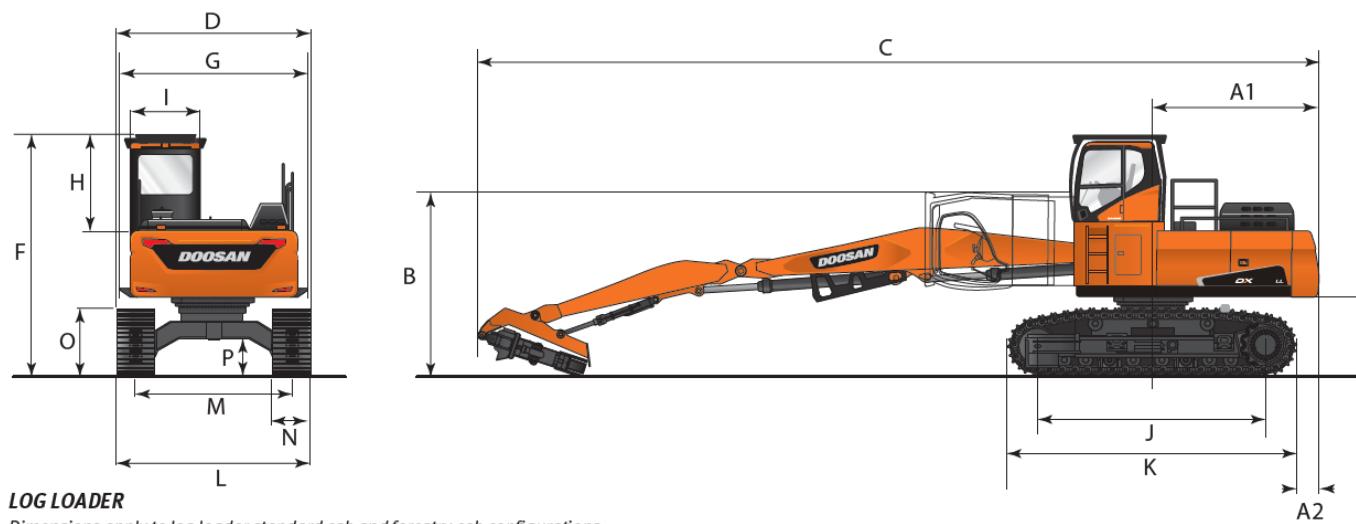


Diagram 1. Doosan DX300LL. Source: [Doosan log loaders brochure](#)



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Photo 1. Waratah Processor head HTH623C, NIOSH Photo

in a diagonal pattern (inside, middle, outside). The ice bits were made from $\frac{1}{2}$ " thick stock approximately $1\frac{1}{2}$ " tall installed on the track/grouser. The ice bits are typically installed on the equipment around November 1st and are removed in the spring. Ice bits are installed by the welder, in a parallel orientation, step pattern on the tracks creating a diagonal pattern across the track.

INCIDENT SCENE

The location of the incident was on a large tract of privately owned and managed timberland approximately 10 miles out on a logging road from the entrance to the property [[Diagram 2](#)]. At the time of incident, there were six employees onsite at a cable logging operation: a yarder operator, processor operator, two log loader operators, and two choker/ setters. The subcontracting owner was not onsite. The crew had been onsite since early December and much of the timber had been cleared. Throughout the job, the crew had safety concerns about the construction and maintenance of the road. The landowner was responsible for building and maintaining the road. The road was a single lane with base made of stone and sand. There were wide spots in the road throughout the jobsite to allow equipment and vehicles to pass each other on the one lane logging road system. The road was approximately 13 feet in width at the incident location [[Photo 2](#)]. The road grade varied but was approximately 4 percent with an approximate 9 percent outward slope at the site of the incident as measured with an inclinometer [[Photo 3](#)]. The surrounding hillside terrain had an approximate 20 percent slope [[Photo 4](#)]. At the time of the incident, the logging road was covered with 2 inches of ice and lined with snow on both sides.



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Photo 2. Road draw and grouse groves, *photo courtesy of USDOL*



Photo 3. Road percent grade measured with an inclinometer, *photo courtesy of USDOL*



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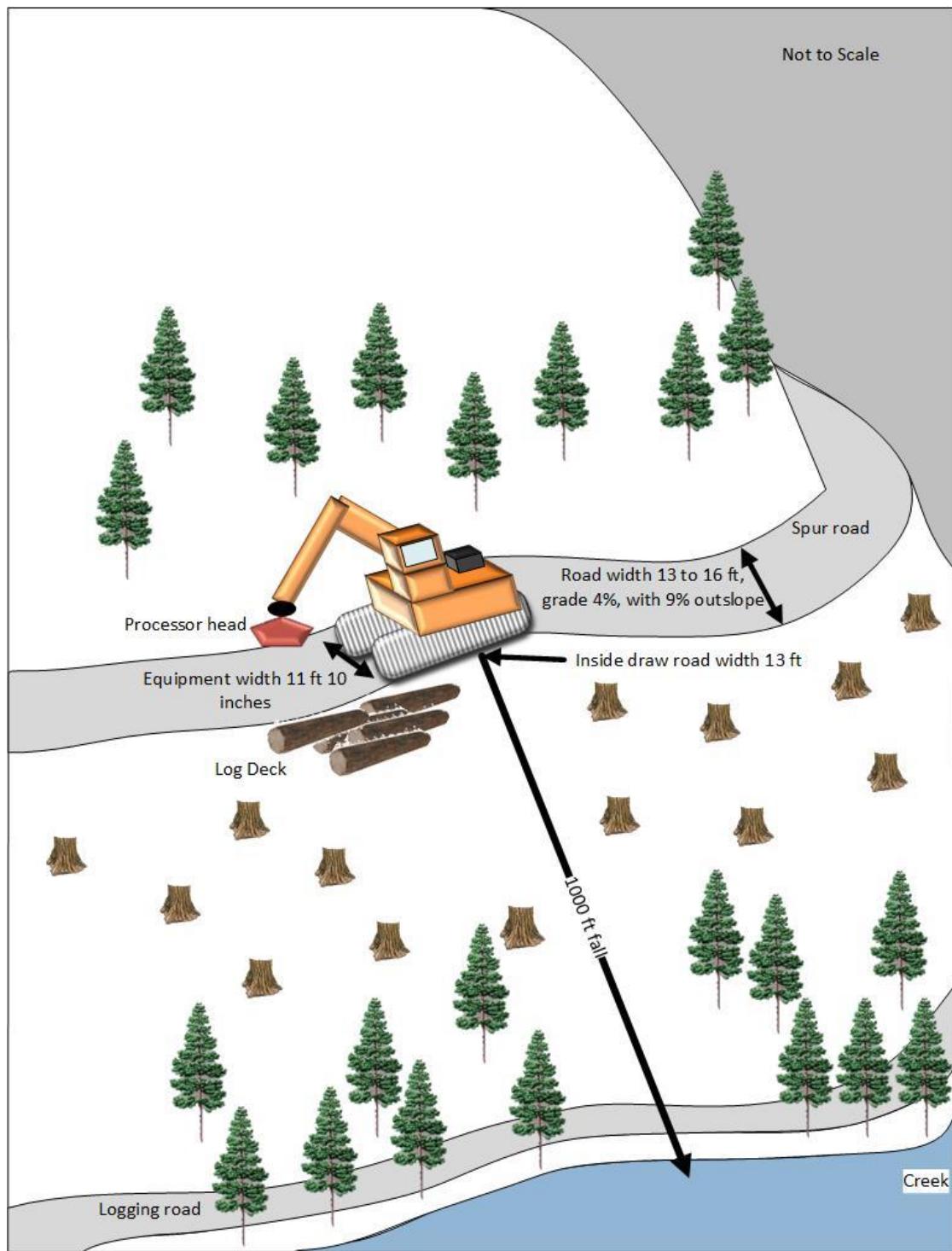


Diagram 2. Clear-cut logging site



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WEATHER

On the day of the incident the weather was overcast, and the temperature varied from 32 to 36 degrees Fahrenheit with wind speeds of 13 mph. It had snowed a couple inches earlier in the week and the previous days had high temperatures between 32 and 42 and lows between 28 and 32. There was an ongoing freeze-thaw cycle in which the road would freeze up overnight and continue to be frozen over during the morning, but thaw as the day warmed, causing water to flow over the ice and the ice to break down [[Weather Underground 2020](#)].

INVESTIGATION

The crew started logging operations on this site in December of 2018. On January 25, 2019, the crew started the day around 7 am and planned to finish at 5 pm. The logging site was located approximately 10 miles from the main road on a spur road. The spur road was frozen at the beginning of the day, but the ice was beginning to melt as the daytime temperature increased. The spur road was narrow, outsloped, and the inside corners posed more challenges to navigate compared to the remainder of the spur road. Logging operations were complete on the spur road and the equipment was being moved to harvest some fringe trees on the lower section of the timber sale. The yarder operator and the processor operator were communicating over the radio as they traveled on the spur road. The yarder operator led the way down the spur road and was at a corner in the road and could see the processor operator on the road across the ridge.

At approximately 1 pm, the processor operator was traveling along the narrow outsloped spur road toward the main logging road where the equipment was to be loaded on a lowboy and transported to a new timber harvesting location. As the processor operator traversed the road, the equipment boom was up, and the 6,000-pound dangle processor head would swing and rock freely as the equipment traveled the road over rocks and around corners. The equipment slipped



Photo 4. Clear-cut hillside showing dirt pathway from rolling equipment, *photo courtesy of USDOL*



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Photo 5. Processor Equipment, *photo courtesy of USDOL*

laterally on the ice covered outsloped road and temporarily stopped on logs that had been decked. The processor operator swung the boom to the right and placed the processor head down on the road attempting to stabilize the equipment, placing the equipment counterweight slightly over the hillside. The yarder operator saw the equipment slipping down the slope, and he yelled over the radio, "Get the boom down and get out of there!" While the processor operator was attempting to exit the cab, the equipment rolled down the hillside, shearing the operator cab off the equipment, and fatally crushing the processor operator before coming to a rest in the creek near the road below [[Photo 5](#)]. The yarder operator called emergency response over the emergency radio and the employer from a previously established cell phone reception location. Emergency response arrived by land and declared the processor operator deceased at the time of their arrival.

CAUSE OF DEATH

The medical examiner listed the cause of death as crushing injuries.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. NIOSH investigators identified the following as key contributing factors in this incident:

- *Road design and maintenance*
- *Road hazard assessment*
- *Operator training*
- *Position of equipment and boom during travel*
- *Operator protection design did not include Falling Object Protection Structure (FOPS), Tip Over Protection Structures (TOPS) and Roll Over Protection Structures (ROPS)*
- *Processing head attachment stowing or stabilization*



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RECOMMENDATIONS/DISCUSSION

Recommendation #1: Road designers should limit outsloping on forest roads with potential winter travel.

Discussion: Land owners have a responsibility to ensure forest roads are built safely [[WSDLI 2017a](#)]. Landowners should hire qualified, trained, and licensed professionals to design forest roads and ensure these road designers limit outsloping on forest roads with the potential for winter travel. Forest roads used for logging operations typically have a 12 ft to 16 ft surface width and grades vary between 0 percent and 10 percent [[Diagram 3](#)]. Spur roads are secondary side roads and tend to be challenging to navigate as the change in grades affect the center of gravity of the equipment. Newer spur roads tend to have less compaction because they are built with a track hoe instead of a dozer. Forest roads may deteriorate due to factors including the logging activities and weather. Logging activity may deteriorate the outside edge of the road due to factors including the skidding of logs/tree lengths, processing of trees into log lengths, and the loading of logging trucks. Inside draws or corners are challenging to navigate for large equipment due to the combination of angles, narrowness, and out-slopes for drainage and turns which affect the track pressure and overall center of gravity of the equipment.

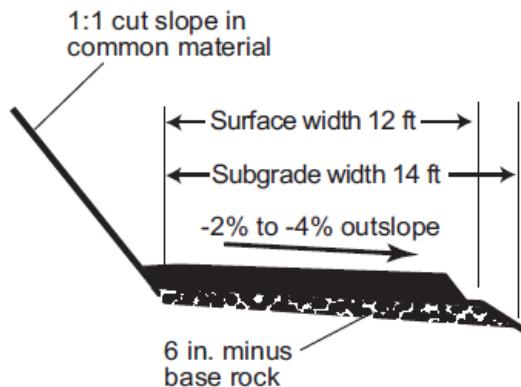


Diagram 3. Outsloped forest road, Source: [Kramer 2001, Oregon State University](#)

Outsloped roads are used by private landowners because they provide adequate drainage and are less expensive to construct and maintain [[Kramer 2001](#)]. Outsloped road surfaces typically have no more than 6 percent road grade and a negative 2 percent to negative 4 percent outslope to provide adequate drainage [[BC 2002](#); [Bowers 2012](#); [Kramer 2001](#); [US Forest Service n.d.](#); [Wiest 1998](#)]. The combination of grade and outward sloping of the road surface can cause a compounding effect on stability and lateral sliding of machinery [[Kramer 2001](#)]. Outsloped roads should not be used when adjacent terrain grades are 20 percent or more, road grade is more than 3 percent, on high traffic roads, and where safety concerns exist, such as winter travel during ice or snow conditions, in order to keep logging equipment and logging trucks on the road surface during logging operations [[BC 2002](#); [Kramer 2001](#); [Washington State 2013](#); [Wiest 1998](#)]. If road surface slopes exceed 20 percent, specialized equipment should be used and additional safety measures should be implemented [[WSDLI 2017a](#)]. The location of the incident was a large logging tract on privately managed land. The road was a single lane logging spur road with a base made of stone and sand with adjacent terrain grades of more than 20 percent. During this incident, the logging road was covered with 2 inches of ice and lined with snow on both sides. The road at the site of the incident width was 16 feet wide, the grade was 4 percent, and the outslope was approximately negative 9 percent compounding the slope effect on the road.



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Recommendation #2: Employers should conduct a hazard assessment when working with forestry equipment in areas of steep terrain and provide worker training on hazard recognition as part of a comprehensive and site-specific safety plan.

Discussion: Before beginning logging operations, employers should conduct a risk assessment as part of a site-specific safety and health plan and review this with all workers. Areas with steep terrain should be assessed, mitigation strategies should be developed for selection and operation of appropriate forestry equipment, and worker training should be conducted on hazard recognition and mitigation strategies. Employers should conduct daily pre-work assessments to determine if conditions have changed and mitigation strategies should be implemented to address areas of concern [[Kentucky FACE 1995](#)]. Additional safety measures are necessary when weather or other extreme conditions create hazards [[WDSL 2017b](#)]. Western Australia regulation 4.44 covers equipment such as tractors, forklift trucks, earthmoving machinery, and timber harvesting machinery, that have a history of rollovers and operators being injured by falling objects or by the intrusion of foreign bodies, such as tree branches. Regulation 4.44 requires a specific risk assessment be carried out in respect of the equipment to determine whether there is any risk the equipment could overturn, an object could contact the operator of the equipment, or whether the operator could be ejected from the seat. [[WorkSafe WA 2004](#)] If there is a risk that equipment could collide with a person or any other piece of equipment at the workplace, that risk must be reduced as far as practical [[WorkSafe WA 2014](#)]. Once the plan and hazard assessment are completed, the mitigation strategies should be conveyed to all employees working at the site and updated as site conditions change over time. If the operation cannot be made safe, the work must be discontinued until safe to resume.

Operators should be trained to recognize hazards due to seasonal conditions (e.g., ditches along roads frozen and covered with snow, culverts hidden by snow, and hidden areas of concerns such as recently planted areas and hidden rock outcrops/cliffs). Weather conditions change the hazards presented on steep terrain. Ground conditions should be monitored as they can change due to wear and weather conditions. Winter conditions hide changes in road stability conditions and increase traveling and operating hazards. Employers and workers should be alert to changing road conditions throughout the day due to precipitation, temperatures, and sun exposure [[Workplace Safety North 2008](#)]. Operators should be trained to check the condition of a road to ensure equipment stability. Operators should also be trained to recognize additional hazards presented by operating on steep terrain and know the operating limitations of their equipment in these conditions. On the day of the incident the weather was in a freeze thaw cycle causing ice build-up on the roadway.

Recommendation #3: Employers should develop, implement, and train operators on strategies for traveling forestry equipment over forest roads.

Discussion: Employers should train and evaluate operators on operating forestry equipment and traveling forestry equipment over forest roads. In this incident the employer had established written training, classroom training, and verbal on the job training programs to protect the safety and health of the workers. These trainings included first aid, hazard communication, hearing conservation, bloodborne pathogen exposure prevention, emergency action plans, hazard identification, lockout tagout, job task safety and competency evaluations on timber felling, tractor skidding, line skidding, bucking/limbing, loading, and transportation. OSHA [1910.266\(i\)\(3\)\(ii\)](#) requires employers to provide training on the “safe use, operation and maintenance of tools, machines and vehicles the employee uses or operates, including emphasis on understanding and following the manufacturer's operating and maintenance instructions, warnings and precautions.”



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This training for operators on strategies for traveling forestry equipment over forest roads should include:

- *hazard recognition, assessment, and control*
- *physical and mental requirements of the job and the working environment*
- *personal protective equipment*
- *seatbelt use*
- *equipment maintenance*
- *refueling safety*
- *daily inspections to identify missing, defective, or inadequate equipment*
- *work planning*
- *practices for safe machine operation*
- *identifying equipment components and terminology*
- *verifying zero energy state and lockout tagout*
- *shutting down and immobilizing equipment*
- *recognizing ground conditions*
- *equipment positioning*
- *equipment limitations*
- *traveling the equipment*
- *circle check*
- *danger zones*
- *basic rigging*
- *hoisting and towing safety on a logging operation*
[Southern Logging Times 2013; Workplace Safety North 2008; Workplace Safety North 2020; WorkSafe BC 2007]

Operators should be trained to assess hazards and travel with equipment according to manufacturers' specifications to protect themselves and others and prevent damage to the equipment. Operators should be trained to ensure the boom and attachments are in a travel position, close to the ground, and at its balance point to ensure control and to reduce movement of equipment attachments while traveling. Operators should be trained to operate the equipment at an appropriate speed for the terrain, road, and weather conditions to maintain control of the equipment. Operators should be trained to identify the safest route on forest roads and when practical travel on the inside edge of forest roads. Operators should be trained to avoid sidehill travel and travel on hills in the direction of the slope, when working conditions allow, to reduce the potential of rollover. Operators should be trained to travel straight up and down hills to reduce the potential for rollovers and avoid high stumps, rocks, and fallen trees. Operators should discuss ground condition concerns with their supervisor or other trained operators throughout their shift [\[Workplace Safety North 2008\]](#). Supervisors should spot check operators to ensure operators are following the provided training. Operators can use a signal person for areas of concern or obstructed travel [\[WSDLI 2017c\]](#). In this incident the forest roads were snow and ice covered, the boom on the equipment was extended, the equipment was fitted with a dangle processing head weighing 6,700 pounds with a knuckle attachment causing the processor head to sway as the equipment traveled.

Recommendation #4: Employers should select forestry equipment equipped with a falling object protection structure (FOPS) or falling object guard (FOG) and rollover protective structure (ROPS)

Discussion: Employers should select forestry equipment with a roll over protection structure (ROPS) and falling object protection structure (FOP) or falling object guard (FOG) to reduce operator hazards. Mobile equipment should be equipped with adequate ROPS and operator restraint systems [\[Kentucky FACE 1995\]](#). The equipment in this incident was equipped with a forestry cab, cab riser, and FOG, and operating on a frozen gravel road adjacent to slopes of 20 percent. Equipment used in forestry operations are sometimes modified and adapted earth moving equipment. Non-forestry equipment may need to be modified to provide the necessary operator and equipment safety features for the forestry environment. Earth moving equipment can possibly be modified to accept retrofits of forestry cabs and attachments that are specifically manufactured for the forestry industry. Employers should not make changes to equipment that affect the capacity or operation of the equipment [\[WSDLI 2017d\]](#). Manufacturers build forestry equipment that is specifically designed for logging with ROPS and FOPS. Forestry cabs are designed to improve visibility, ergonomics and safety. Forestry



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cabs increase visibility by adding windows in the cab top and bottom, can withstand impact of falling branches to protect the operator, position the operator forward for improved ergonomics, reduce equipment noise, and provide two paths of egress. Forestry equipment can be outfitted with equipment mounted fixed cab risers or hydraulic elevating cab risers to improve operator visibility designed by the manufacturer. Employers need to understand the intended manufactured use of the equipment to understand the manufacturer safety features of each piece of equipment.

Operator protection structures (OPS) are designed to protect the operator from injury hazards such as trees, branches, spear-like objects and snapping winch lines while assuring operator visibility, comfort, and protection from other hazards. [ISO 8084:2003](#) provides structural characteristics and performance requirements for OPS on forestry equipment. A FOPS is a structure that is mounted on the equipment cab and is intended to provide protection for the cab and operator from being struck by falling objects. [ISO 8083:2006](#) provides the structural characteristics and performance requirements for FOPS on forestry equipment. A FOG is intended to provide protection for the cab and operator from being struck by falling objects. The guard is bolted directly to the operator cab in two places a roof and a front FOG. [SAE J1356](#) provides the minimum performance criteria for FOG on excavators. A TOPS is intended to protect the cab and operator from lateral and longitudinal energy forces during an equipment tip over event. [ISO 12117:1997](#) provides minimum performance standards for TOPS for excavators. A ROPS is intended to protect the cab and operator from injuries caused by equipment rollovers. [ISO 12117-2:2008](#) applies to ROPS for excavators including excavators over 6 tons but less than 50 tons used in object or material handling, demolition, or with attachments such as in log-handling and forestry applications. The standard excludes excavators with elevating cab risers. [ISO 8082-1:2009](#) applies to ROPS on forestry equipment without 360-degree rotation. [ISO 8082-2:2011](#) applies to ROPS on forestry equipment with the cab and boom on a rotating platform capable of 360-degree rotation with or without a fixed cab riser, although it excludes forestry equipment with elevating cabs. WorkSafe BC also provides structural characteristics and performance requirements for forestry equipment including operator protective structures ([G 602](#)), window guards ([G 603](#), [G 604](#)), and roof structures ([G 608](#), [G 609](#)) [[WorkSafe BC 1990a;b;c;d;e](#)].

The equipment in this incident was exempt from OSHA [1910.266\(f\)\(3\)\(i\)](#) because it was capable of 360-degree rotation. OSHA [1910.266\(f\)\(3\)\(i\)](#) states “each tractor, skidder, swing yarder, log stacker, log loader and mechanical felling device, such as tree shears or feller-buncher, placed into initial service after February 9, 1995, shall be equipped with FOPS and/or rollover protective structure (ROPS). This requirement does not apply to machines which are capable of 360-degree rotation” [[OSHA 2014](#)]. Oregon OSHA provides regulations on loaders, shovels, processors, feller-bunchers and delimiters manufactured on or after July 1, 2004. Oregon OSHA recognized machines with 360-degree rotation are frequently used in forestry operations. Oregon OSHA requires that machines with 360-degree rotation without ROPS, manufactured on or after July 1, 2004, must be limited to use on surfaces that are prepared, excavated, or constructed of solid material with a slope of less than 20 percent unless the operator cab is equipped with a certified TOPS, an Off-Boom Side Cab Guard, and a fully enclosed cab that meets the requirements of [ISO 12117-2:2008](#), [Oregon OSHA 437-007-0775\(14\)](#) and [SAE J1356](#) [[Oregon OSHA 2014a](#); [Oregon OSHA 2014b](#)]. Employers should consider utilizing manufacturer design-built forest equipment that is ROPS/FOPS capable or purchasing optional upgrades for earth moving equipment to increase the level of protection to ROPS/FOPS.

Recommendation #5: Employers should consider participating in professional safety organizations to strengthen safety and health programs

Discussion: Although it was not considered a contributing factor for this incident, employers should consider participating in professional safety organizations to strengthen safety and health programs and keep abreast of health and safety



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guidance and regulations. At the time of the incident, the employer was not a member of the [Idaho Associated Logging Contractors](#) (ALC) but has since enrolled to strengthen their safety and health program. Many states have contractor associations or groups that offer membership in professional organizations provide training and best practice guidance for employers. Loggers participating in the ALC are encouraged to take [Logger Education to Advance Professionalism \(LEAP\)](#) training on forest ecology, silviculture, and water quality [[Idaho Sustainable Forest Initiative Implementation Committee Inc. 2022a](#)]. The ALC provides services such as Idaho [Pro-Logger](#) training, first aid training, logging safety and loss control consulting, workers' compensation insurance, and business and health insurance [[Idaho Sustainable Forest Initiative Implementation Committee Inc. 2022b](#)]. The ALC tracks Pro-Logger training for members, and 12 credits are required to maintain the certification. Some logging sites require that two Pro-Logger certified personnel are present during logging operations. ALC has a Red Book, an association handbook, which suggests weekly toolbox talks with written toolbox talks monthly and a spring refresher training. They also suggest that employers establish a landing zone for a helicopter for EMS response.

Recommendation #6: Employers should develop a comprehensive health and safety program for manual and mechanical logging operations

Discussion: Although it was not considered a contributing factor for this incident, employers engaged in manual or mechanical logging should develop and train employees in a comprehensive safety and health program before beginning manual or mechanical logging operations. OSHA requires logging employers to provide employees with training on assigned work tasks; safe use, operation and maintenance of tools; machines and vehicles the employee uses or operates; recognition of safety and health hazards associated with the employee's specific work tasks; recognition, prevention and control of other safety and health hazards in the logging industry; procedures, practices, and requirements of the employer's work site; and the requirements of the logging standard [[OSHA 2014](#)]. OSHA has a Logging eTool which outlines required and recommended work practices for manual and mechanical logging operations [[OSHA 2020](#)]. Washington state requires employers to have an accident prevention program [[WSDLI 2017e](#)]. In this incident, the employer had many elements of a safety and health program and a site-specific emergency response plan. The safety program included first aid, hazard communication, hearing conservation, bloodborne pathogens, emergency action plans, hazard identification, lockout tagout, job task safety and competency evaluations on timber felling, tractor skidding, line skidding, bucking/limbing, loading, and transportation. The employer was engaged in both manual and mechanical logging.

Topics in a comprehensive safety and health program for mechanical logging may include:

- *tree harvesting plan*
- *site preparation*
- *terrain assessment (steep terrain are slopes greater than 20 percent slope)*
- *equipment selection*
- *PPE program (high-visibility personal protective equipment, head and face protection, hearing protection, chaps, and safety footwear)*
- *chain saws and manual felling*
- *cutter training*
- *mechanical felling and processing*
- *equipment operator*
- *skidding and forwarding*
- *loading and landings*
- *transportation safety*
- *woodyard safety*
- *danger zones*
- *blind spots of machinery*
- *a stop-work procedure*
- *hazard recognition and mitigation*
- *daily inspections to identify missing, defective, or inadequate equipment*
- *weather safety*
- *communications and check in procedures*
- *daily safety checks and surveys*



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- *fatigue management*
- *emergency planning*
- *equipment maintenance program*
- *training and training records*
- *hazard communication program*
- *assignment of responsibilities for carrying out the safety plan*
- *lockout/Tagout*
- *bloodborne Pathogens*
- *hearing Conservation*
- *accident Investigation* [[OSHA 2020](#); [Timber Harvesting and Transportation Safety 2020](#); [WSDLI 2017f](#); [WSDLI 2017g](#); [WSDLI 2019](#); [Workplace Safety North 2015](#); [WorkSafe Victoria 2004](#); [WorkSafe Victoria 2007](#)]

In this incident, as part of the site emergency action plan, there were signs at the heliport with GPS coordinates before the job began. Cell service areas were clearly designated as part of the emergency action plan. Radios were the communication method throughout the jobsite within and between crews. There were two radios with different frequencies used onsite. One was for local communication between equipment operators, as these radios did not have enough strength to travel any distance. The other radio was used to communicate throughout the site and offsite as these radios had 16 channels, including 3 for logging and a channel for communications with emergency response. All personnel onsite had the authority and training to request air medical services.

MANUFACTURER RECOMMENDATIONS/DISCUSSION

Recommendation #7: Manufacturers should design stowing or sway control features for forestry attachments such as dangle head processors.

Discussion: Manufacturers of forestry equipment should design forestry attachment stowing or sway control features for dangle head processors to increase equipment stability. As equipment travels on forest roads, attachments can swing and change the center of gravity for equipment with knuckle attachments like the dangle head processor attachment involved in this incident. As forestry equipment is transported from one location to another, either on transport equipment or by its own propulsion, the equipment should not create a hazard to any employee. Forestry equipment is sometimes equipped with a loading heel that can be used to stabilize attachments. Manufacturers should integrate operator control features that allow equipment attachments to be stabilized through sway controls or stowing. Employers and operators should review the operator's manual for guidance on safe positioning of booms while traveling or consult with the equipment manufacturer if sufficient guidance is not provided.

Recommendation #8: Manufacturers should provide engineer designed ice bits for forestry equipment operating during winter snow and ice conditions to reduce lateral slipping.

Discussion: Although it was not considered a contributing factor for this incident, manufacturers should provide engineer designed ice bits for forestry equipment operating during snow and ice conditions to reduce slipping. Logging employers typically install employer fabricated ice bits to improve forestry equipment safety. Ice bits increase stability, traction, and grip by puncturing the ice and penetrating the snow to prevent lateral sliding of the equipment tracks in icy and snowy road conditions throughout the winter months. Employers can purchase and install commercially available ice bits in preparation for winter weather [[Dura tuff 2020](#); [Montana track claw 2020](#); [Woodbridge equipment 2020](#)]. Engineer designed ice bits are currently unavailable for purchase. Manufacturers should work with standards organizations and engineers to develop industry standards, design elements and evaluation criteria for ice bits to be installed on forestry equipment operating on the ice and snow. Evaluations should include stability, traction, and grip in all directions of potential equipment movement, structural integrity, and equipment performance of the ice bits during winter operating



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conditions. In this incident, the non-commercial ice bits were fabricated short pieces 1 ½" tall, with a grouser bar (typically 2"– 6" long) welded on top of the existing grouser in a parallel orientation to the track grouser [Photo 6]. Commercial ice bits should be installed according to manufacturer's instructions and removed at the end of the winter season.



Photo 6. Ice bit and grouser heights, spacing, and orientation, *photo courtesy of USDOL*

DISCLAIMER

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ADDITIONAL RESOURCES

[Forestry Resources Association](#)

[Idaho Associated Logging Contractors](#)

[Logging Safety Publications](#), SHARP Program, WSDLI

[Danger Tree Mitigation Guidelines for Managers, Mechanical Felling](#) United States Department of Agriculture, United States Forest Service

[Operator Killed When Bulldozer Slides Off Logging Road](#), Oregon FACE 03-OR-029-01

[Logger Dies After a Log Skidder Rolled Downhill and Struck Him as He was Felling a Tree](#), Wisconsin FACE 97WI110

[Skidder Operator Thrown From Vehicle During Rollover](#), Kentucky FACE 97KY110

[Operator Dies in Skidder Rollover](#), WorkSafe BC NI Number 2007136900128

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