



## Worker struck by mobile equipment at plywood mill

At a plywood mill, a loader was carrying a load of peeled logs as it entered a large concrete tunnel called a vat. Peeled logs were being placed in the vat where the logs would be soaked with hot water for softening prior to being peeled into veneer for plywood. The load of logs struck a worker who was just inside the entrance to one of the vats. The worker received fatal crushing injuries.



### Purpose of this report

The purpose of this online incident investigation report is to identify the causes and contributing factors of this incident to help prevent similar incidents and to support preventive actions by industry and WorkSafeBC. This online version is not the official WorkSafeBC report. It has been edited to remove personal identifying information and to focus on the main causes and underlying factors contributing to this incident.

### Notice of Incident information

Number: 2005130570147

Outcome: Fatal

Core activity: Veneer or plywood manufacture

Region: Central Interior

Date: April 2005

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# 1 Factual Information

## 1.1 Work site and process

The incident occurred at a plywood mill just inside the entrance to one of the vats where logs are soaked before being peeled into veneer.

### 1.1.1 Vat pad layout

The vat pad (the area outside the vats) at the plywood mill consists of a concrete pad measuring approximately 140 feet wide, 115 feet down one side, and 90 feet down the other. Vehicles and equipment enter the pad from the shorter side (the right side in Figure 1). The logs are debarked (bark removed) and cut into lengths for the vats in the barker building. When the equipment operator enters the pad and faces the barker building, there are 8 vats down the left side and 8 vats down the right side. The vats are concrete tunnels. Each vat measures approximately 100 feet in length, 124 inches in width, and 168 inches in height. There is no lighting inside the vats. The access to the roof of the vats is via a stairway beside vat 9 but is not located on the vat pad.

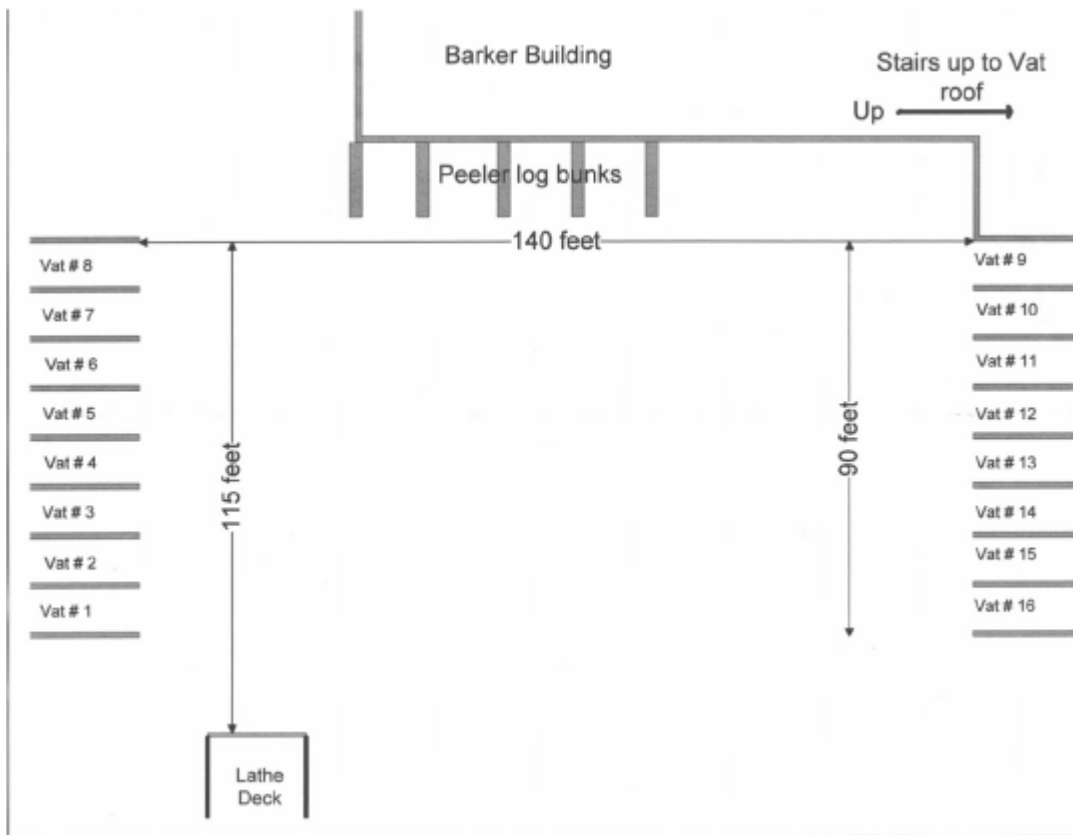


Figure 1: Layout of the vat pad at the plywood mill.

### **1.1.2 Vat operation and process**

Once the logs have been debarked and cut into lengths they are referred to as peelers. The peelers then go into a series of bunks located outside the barker building. The bunks hold the peelers to allow the front end loaders to collect them and move them into the assigned vat or transport them to a stockpile. The lengths of the peelers involved in the incident were 101 inches. However, the load width is generally wider than 101 inches because the peelers tend to be staggered when the loader picks them up from the bunks. On the day of the incident, the load width was measured to be 112 inches. With a vat width of 124 inches, there was 12 inches of clearance for the loader to manoeuvre the load of peelers into the vat.

The peelers are placed into a vat and piled to within 4 feet of the roof. Once the vat is full, the vat man climbs a set of stairs to the roof of the vat, where the controls to open and close the doors are located, and activates the controls to close the vat door. He then starts the watering system, which sprays the peelers with water that is 180°F. The peelers remain in the vat for a number of hours, depending on the species of wood and seasonal temperature. This allows the wood to soften before it is peeled into veneer.

From the vat, the peelers are transported to a lathe infeed deck (shown in Figure 1, lower left). The lathe infeed moves the peelers into the lathe, which peels them into veneer. This veneer is then used to manufacture plywood.

### **1.1.3 Equipment**

There are two loaders working in the vat area at the same time. Each loader is equipped with a grapple in order to carry the peelers (see Figure 2). The loaders are equipped with radios and the operators can communicate with each other as well as with the vat man and others in the mill.



Figure 2: This photo demonstrates the typical clearance from the tunnel walls when a log loader places peeler logs in a vat.

The machines are large and moving at a high rate of speed in a relatively small working area. A loader can take a load from the peeler bunks to a vat or from a vat to the lathe deck in about 2 minutes, a cycle that goes on for 2 or 3 hours while the machine loads or unloads a vat. Two loaders may be working at the same time; one loader could be loading a vat while the other is unloading a vat. They may both be working the same side of the vat pad or one on each side. This requires the operators to be well aware of the location of the other loader and any pedestrians on the vat pad.

The loader operator's front visibility is somewhat restricted due to the cab screening and the load being carried in front (see Figure 3). The operator's rear visibility is also limited due to the cab height and the engine compartment behind the cab. Because of the visibility restrictions, persons who walk on the vat pad during the operation of the loaders are exposed to an increased risk of being struck by a loader. Communication with the loader operators by radio or visual contact is crucial to the safety of any pedestrian traffic on the pad.



Figure 3: The photo demonstrates the typical view from the cab as a loader approaches a vat. It is not intended to show exactly what the loader operator saw at the time of the incident.

## 1.2 Incident

On the day of the incident, two loaders were operating on the pad. The incident occurred at approximately 1420 hours. The loaders were both working on the same side of the vat pad. Loader Operator 1 was loading vat 12 with peelers from the barker building. Loader Operator 2 was removing peelers from vat 11 and transporting the peelers to the lathe infeed deck.

At approximately 1400, the vat man was observed by Loader Operator 2 opening the door to vat 10 from the top of the vat roof. As vat 11 was nearly empty, vat 10 was the next vat ready to be emptied.

A moment later, Loader Operator 2 observed the vat man walking in front of vat 9 and heading towards vat 12. Loader Operator 1 was not aware of the vat man's presence. There is no record of any radio contact or other communication between the loader operators and the vat man.

Loader Operator 1 was in the early stage of loading peelers into vat 12. As Loader Operator 1 proceeded from the peeler bunks at the barker with a load of peelers, he stopped to allow Loader Operator 2 to exit vat 11 and head towards the lathe infeed deck. Loader Operator 1 then proceeded towards vat 12. It is not known exactly where the vat man was at that time, but it appears that he was just inside the vat near the tunnel wall.

As Loader Operator 1 entered vat 12, he spotted the vat man coming out of the vat entrance between the tunnel wall and the peelers carried by the loader (see Figure 4). Loader Operator 1 realized the load of logs on the loader had struck the vat man. Loader Operator 1 stopped his loader, attended briefly to the injured vat man, and then ran to get first aid assistance. The vat man died in hospital from his injuries.

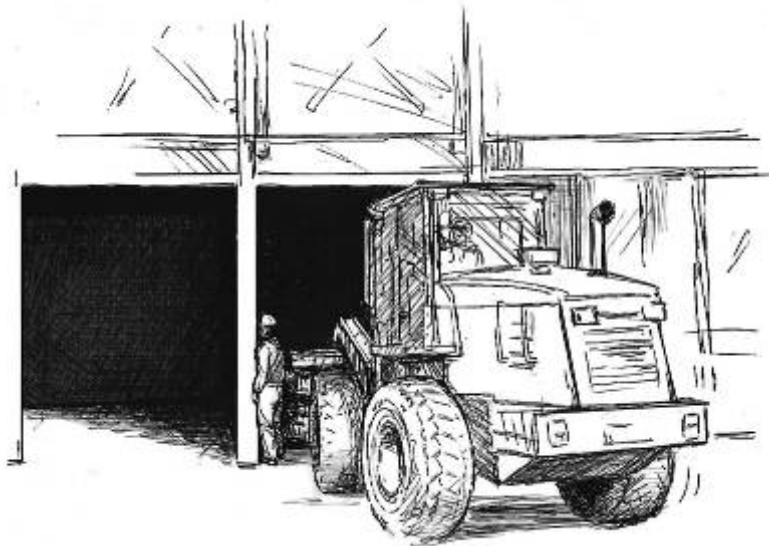


Figure 4: The drawing shows the position of the vat man when the loader operator saw him after he had been struck by the load of peeler logs.

## **1.3 The position of vat man at the mill**

### **1.3.1 Duties of the vat man**

The duties require the vat man to open and close the vat doors (located on the vat roof), turn water on and off, and record on a vat sheet which vats were being filled and emptied. (The vat man carried the vat sheet with him.) Other duties include accessing the area behind the vats to clear the water pit of the bark and wood debris that collects as the water is re-circulated during the softening process. In the winter, the vat man is required to de-ice the pad area and vat doors. The vat man would also fill in and assist in other parts of the mill. The duties do not require the vat man to enter inside the vat tunnels.

Workers could apply to be trained as a vat man and then fill in as relief so that when an opening comes they would be qualified to apply for it.

### **1.3.2 Training provided to the temporary vat man**

The deceased worker had worked in the wood products manufacturing industry for over 20 years. From his regular work he was familiar with the hazards of mobile equipment. At the time of the incident, he was assigned to the vat man position on a temporary basis to relieve the regular vat man.

The general foreman assigned the temporary vat man at approximately noon the day before the regular vat man left. The general foreman verbally reviewed the job duties and the hazards involved. The general foreman issued the vat man a radio and the required personal protective equipment, which included a high-visibility hard hat and high-visibility vest. The temporary vat man was then instructed to report to the regular vat man, who mentored him for the remaining four hours of the day preceding the incident.

The next day and the remainder of the week, the temporary vat man carried out the duties of the vat man without a mentor. Throughout the week the general foreman and another foreman had some contact with him, consisting of observations and correctional discussions. The discussions dealt with the use of personal protective equipment, mobile equipment hazards, and access locations, as well as the concern for the potential of a peeler log bouncing out of the peeler bunks and striking the vat man.

When accessing the pad, the vat man was expected to contact the loader operators by radio or make eye contact with them to ensure they were aware of his presence.

In summary, the temporary vat man's training consisted of four hours of mentoring from the regular vat man on the first day and supervisory observation and correction for the remainder of the week.

### **1.3.3 Written job procedures**

There were a number of written job procedures for the vat man position which had been developed over the years. The majority of these documents failed to deal with pad access and the hazards associated with mobile equipment. When pad access is mentioned, there is no reference to the hazards of mobile equipment.

The written job procedure documents are poorly worded and lack clarity. When methods of job steps are described, they do not explain the process of what is required to accomplish a particular job step and the wording is vague and unclear. To those who would use this document for the purpose of training a worker, the information is unclear and lacks specifics as it relates to the hazards and tasks to be performed.

## **1.4 Pedestrian traffic on the vat pad**

Workers who were not required on the vat pad as part of their duties sometimes used this area as a shortcut. It was not uncommon for supervisors, other mill workers, and contract workers to use the pad area as a shortcut to access the mill and lunch room. The pad area was used when it was cool or cold and windy. Walking close to the vat tunnels protects workers from the wind while heading to the lunch room. It was known to be routine to cut across the pad area. The loader operators were not always aware of who was on the pad.

Other incidents of near misses between pedestrian traffic and loaders had occurred prior to this fatal incident but were never properly investigated and no recommendations were made for prevention purposes.

## **2 Analysis**

Access to the vat pad exposed the vat man and other pedestrian traffic to the risk of injury from mobile equipment when on the pad.

A review of the written work procedures for this job function found the information to be lacking in clear risk identification, direction, and expectation for the vat man when entering the vat pad. The written job description failed to address the risk involved between pedestrian traffic and mobile equipment traffic and what steps must be taken to avoid being struck.

The requirement to have the vat man access the vat pad to record information on a vat sheet was a task that was not necessary. The loader operators are equipped with radio communication, and any information needed to be recorded on a vat sheet could have been relayed via radio to the vat man. The vat man could then record the information without having to enter the vat pad and be exposed to the fast-moving loaders. Other pedestrian traffic was not restricted from accessing the vat pad, and there was no clear communication process established for persons entering this area.

There was a known casual use of the vat pad area for workers at the mill as well as contract workers. The risk to pedestrian traffic choosing to use the vat pad as an access to and from the mill was significant. Allowing this area to be accessed by workers with the loaders operating indicates a lack of

appreciation for the significant risk of being struck by mobile equipment. The access to this area was not restricted to only those persons required to be there. When near miss incidents occurred, proper reporting, investigation, and corrective actions were not taken.

The evidence indicates that at the time of the incident there was no communication either visual or via radio between the vat man and the loader operator involved in the incident. This breakdown in communication along with the limited visibility from the loader cab increased the risk of an incident occurring.

Allowing pedestrian traffic in an area of high production and fast-paced mobile equipment with limited operator visibility created a significant safety concern. There was a failure to clearly identify this and eliminate or control this high risk.

## **3 Conclusions**

### **3.1 Findings as to causes**

A loader entering a vat tunnel with a load of peeler logs without the loader operator's knowledge that the vat man was located inside the vat. The vat man was struck by the load of peeled logs.

### **3.2 Findings as to underlying factors**

- The vat man was not visible to the loader operator. The loader operator's visibility was limited, and the vat entrance was dark.
- The loader operator was unaware that the vat man had accessed the vat pad area.
- The access to the vat pad area lacked clearly defined and enforced protocols. The employer had not identified who could access the vat pad or how and when the vat pad area could be accessed.
- A proper risk assessment had not been conducted for the vat man's required duties.
- The written job procedures for the vat man did not clearly identify and emphasize the hazards, particularly the degree of risk associated with fast-moving loaders and pedestrian traffic.
- Previous near misses of equipment and pedestrians on the vat pad had not been properly investigated and no corrective actions had been taken to prevent future incidents.

## **4 Orders Issued after the Investigation**

WorkSafeBC issued an order after the investigation. An order requires an employer to take steps to comply with the *Workers Compensation Act* or Occupational Health and Safety Regulation, to take measures to protect worker health and safety, or to fix a hazardous condition. An order is not intended to identify fault on the part of the employer but to ensure that unsafe conditions are identified and corrected and that the employer complies with the Act and the Regulation. An employer may ask the Review Division to review an order; the Review Division may confirm, vary, or cancel an order.

In addition to issuing orders, WorkSafeBC may recommend proceeding with an administrative penalty against an employer. In order to protect the privacy of individuals, this report does not give details of any penalty proceeding arising from this incident as that would identify the employer. Penalties are fines for health and safety violations of the *Workers Compensation Act* and/or the Occupational Health and Safety Regulation. For information on when penalties are considered and how the amount of the penalty is calculated, see the [penalty FAQs](#) on WorkSafeBC.com. [Companies that have been penalized](#) are also listed on the web site.

## 4.1 Order to the employer

This section summarizes an order to the employer. The investigation found that this employer was in contravention of the *Workers Compensation Act*, [section 115\(2\)\(e\)](#), which states that an employer must provide to the employer's workers the information, instruction, training, and supervision necessary to ensure the health and safety of those workers in carrying out their work and to ensure the health and safety of other workers at the workplace.

The employer was ordered to do the following:

- Develop a proper written job procedure for the vat man position that clearly defines when it is necessary for the vat man to enter this area and the steps required before entry. The procedure should include, but not be limited to, proper communication with mobile equipment operators, when vat tunnels can be accessed, and the steps to be taken to ensure equipment cannot enter the tunnel when workers are in the tunnel.
- Ensure that only workers required to enter the vat pad area are permitted in this area and that they are provided with all necessary instructions and communication protocols.
- Develop processes to report and investigate all serious near misses for prevention purposes.

## 5 Health and Safety Action Taken

In addition to the specific actions below, employers, workers, or others in industry may have taken measures to prevent a recurrence of this type of incident. Employers are expected to comply with any orders issued. At WorkSafeBC, the Lessons Learned committee examines recommendations from incident investigations to see what can be done to prevent similar incidents.

### 5.1 The employer

Immediately after the incident, the employer initiated a change in the vat man's written job procedure and stopped all access to the vat pad when the loaders are operating. The vats and pad area have now been officially designated as a restricted area and the following protocol has been implemented: Prior to any person entering the vat pad or the vats, operators must be contacted by radio. The operators will then stop their loaders and lower the loader log grapples and confirm by radio that their machines are stopped and grapples lowered. The loaders will not be allowed to move until the person or persons confirm by radio contact that they have left the now-restricted area.

## 5.2 WorkSafeBC

WorkSafeBC produced a hazard alert on this incident:

<http://www2.worksafebc.com/publications/posters.asp?reportID=34420>

The hazard alert refers to WorkSafeBC's video *Fields of Vision*, which shows the difficulties that operators of mobile equipment have in seeing pedestrians. A copy can be borrowed from WorkSafeBC regional offices or purchased in video (VHS) or DVD format from WorkSafeBC at 1 866 319-9704 or online at [www.worksafebcstore.com](http://www.worksafebcstore.com).

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