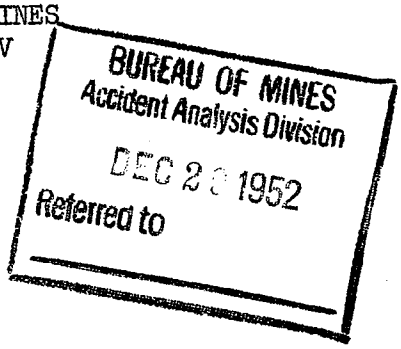
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
REGION IV



FINAL REPORT OF MAJOR COLLAPSE-OF-STRUCTURE DISASTER
PRE-CAST NO. 1 & NO. 2 CLAIMS
CHRISTENSEN CONSTRUCTION CO.
MARICOPA COUNTY, ARIZONA
(NEAR APACHE JUNCTION, PINAL COUNTY, ARIZONA)

July 24, 1952

By

Ernest R. Rodriguez
Health & Safety Engineer

M. L. Williams
Safety Representative

Originating Office - Bureau of Mines
420 Ellis Building, Phoenix, Arizona
Allen D. Look, Chief, Arizona Section
Accident Prevention and Health Division

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INTRODUCTION

At approximately 12:20 p. m. on Thursday, ~~June~~ July 24, 1952, five men were killed by suffocation as a result of the collapse of the platform, which formed the roof of a loading tunnel beneath the crushed ore stock pile, at the volcanic tuff open-cut mine on the Pre-Cast No. 1 & No. 2 claims, Maricopa County, Arizona. Besides the five men who were killed, two other men were in the tunnel at the time of the accident. One of these men received slight injuries as a result of the cave-in and the other man escaped without injury. The names of the men who were killed, their ages, occupations, and the number of dependents are shown in Appendix A of this report.

The accident was caused by faulty construction and subsequent overloading of the platform. Failure of the men to recognize the seriousness of the hazard from incidents preceding the accident resulted in the death of the five men.

GENERAL INFORMATION

The Pre-Cast No. 1 & No. 2 claims are located in Maricopa County, Arizona, just west of State Highway No. 88 (Apache Trail), approximately 11 miles from Apache Junction, Pinal County, Arizona. The nearest railroad connection is the Southern Pacific Company at Mesa, Arizona, a distance of 27 miles by paved highway from the mine. The mine is situated on claims held under location by the Arizona Pre-Cast Concrete Company, Alma School Road, P. O. Box 289, Mesa, Arizona, and was operated by the Christensen Construction Co., 510 Felt Building, P. O. Box 1165, Salt Lake City, Utah. Haulage of the crushed volcanic tuff from the mine to the Arizona Pre-Cast Concrete Company's concrete block manufacturing plant in Mesa, Arizona was subcontracted by the Christensen Construction Co. to Leo G. Bateman, truck operator, 2532 South 15th East, Salt Lake City, Utah. The names and addresses of the principal officials were as follows:

Arizona Pre-Cast Concrete Company

Darl Anderson	President	P. O. Box 289, Mesa, Arizona
Henry E. Miller	Vice president and manager	P. O. Box 289, Mesa, Arizona

Christensen Construction Co.

D. H. Christensen	President	P. O. Box 1165, Salt Lake City, Utah
Stanley W. Christensen	Vice president and manager	P. O. Box 1165, Salt Lake City, Utah
Rupert N. Thomas	Foreman	P. O. Box 34, Apache Junction, Ariz.

Trucking Company

Leo Bateman	Owner	2532 South 15th East Salt Lake City, Utah

A total of seven men was employed, five in mining and crushing operations and two in trucking the crushed material. Daily production averaged 75 tons of crushed volcanic tuff, and operations were on a single-shift basis, 6 days a week.

Mining was by the open-cut method from a cut 250 feet in length, averaging 50 feet in width, and with banks along the sides of the cut varying from 5 to 20 feet in height. The volcanic tuff formations outcropped on the surface and were of considerable thickness and lateral extent. Hercules, 65-percent Hercomite bag powder and Hercules, 40-percent Gelatin Extra dynamite in 7/8- by 8-inch cartridges were used for blasting. Explosives were detonated with No. 6 electric blasting caps by means of a 50-shot blasting machine. All of the broken material was transferred to a grizzly ahead of the crushing plant, which was located close to one end of the open cut, by means of a Diesel tractor loader equipped with a bucket of 1-cubic-yard capacity. No electricity was used at the mine except for a small electric welding machine.

Operations at the mine included crushing and screening of the volcanic tuff to minus 3/8-inch size, and stock-piling of the crushed material above a loading tunnel. Crushing and screening were accomplished

by means of a mobile crushing unit consisting of a jaw crusher and a roll crusher operating in closed circuit with a triple-deck vibrating screen. Transfer of the material from the grizzly, through the crushing plant, and to the stock pile was by means of belt conveyors. Trucks of 10-, 15-, and 25-ton capacities were used in hauling the crushed material from the mine to the plant in Mesa.

Operations were started at this mine in February, 1952.

CONDITIONS PRIOR TO ACCIDENT

Stock Pile and Loading Tunnel

To facilitate loading of the crushed volcanic tuff into trucks, a loading tunnel was provided. The crushed material was stock-piled above the tunnel so that the main mass rested directly on a platform, which formed the roof of the tunnel. The trucks were backed into the loading tunnel beneath the stock pile, and were loaded by opening of manually-operated sliding gates in the center of the roof of the tunnel.

The loading tunnel structure was 29 feet long by 11½ feet wide and 11 feet high. The tunnel was in line with the crushing plant, and was located on the downhill side on a natural slope away from the plant. A cut had been made on the slope for the loading tunnel. This cut varied from a height of 11 feet at the back end of the tunnel to 0 feet at the entrance end. Reportedly the banks at the sides of the cut were 1 to 2 feet from the walls of the tunnel at the bottom and sloped away from the walls toward the top. The toe of the bank at the back end of the tunnel was 2 feet outside the tunnel, and the bank sloped back so that at a height of 8 feet it was 7 feet beyond the end of the tunnel and at the top of the cut it was 12 feet beyond the end of the tunnel. Except for some crushed volcanic tuff lying against the toe, this bank was exposed. The floor of the tunnel was approximately level.

The loading tunnel was constructed of a steel framework on the sides and top which supported a cover of 2-inch rough lumber. With the exception of one vertical member on one side, which was a section of structural steel channel of 6-inch width and approximately 10-pounds-per-foot weight, the framework was made of used steel rails. In the absence of markings, measurements of the cross section of the rails indicated that they were of approximately 55-pound size.

The supporting framework on each of the two sides consisted of eight vertical members at intervals of 41 to 64 inches with one diagonal member placed between the bottom of the end member at the entrance end of the tunnel and the top of the next vertical member. The vertical

members on each side rested on a rail stringer, which ran the full length of the tunnel. These stringers were placed on their sides with the base of the rail toward the outside of the tunnel, and the vertical members resting on the web and the side of the ball. Attachment of each vertical member to the bottom stringer was accomplished by cutting the bottom of the member to shape to fit the stringer, and by either bolting the two together with a 3/4-inch bolt or by welding a brace around both members. At the top of the vertical members on each side a steel rail stringer, running the full length of the tunnel, was placed with the base up. The top end of the vertical members were also cut to shape to fit the top stringer, and each vertical member was bolted to the stringer by means of a 3/4-inch bolt. The sides of the tunnel were covered with 2-inch rough lumber placed outside the tunnel against the base of the vertical rails. The bottom stringers rested on solid rock and the bottom of each wall was secured by means of cables anchored to steel stakes in the rock outside the walls. The top of each wall was secured by similar means.

The supporting framework for the roof of the tunnel consisted of ten steel rails placed horizontally across the tunnel with the ends resting on the base of the rail stringers at the top of the vertical members. Each rail was placed with the base down, and the base was bolted to the base of the stringer at each end by means of a 3/4-inch bolt. On the stringers, the holes for these bolts were located at the base of the rail on the side of the web towards the inside of the tunnel. One of the ten rails was placed at each end of the roof of the tunnel. The space between the end rail and the next rail at the entrance end of the tunnel was 4 feet; the remaining eight members forming the roof framework were on approximately 3-foot centers. The ten rails were long enough to rest fully on the stringer at each end and the span within the two stringers was approximately 11½ feet. The roof of the tunnel was covered with one layer of 2- by 12-inch rough lumber placed lengthwise with the tunnel. The lumber was cut to fit between the rails and was placed to rest on the top of the base of rails with each piece butting against the web of the rail at each end. A few pieces of 2- by 12-inch rough lumber were placed at irregular intervals across the top of the one full layer. Five sliding gates were placed in the roof of the tunnel at the center of the span. The first gate was between the first two rails at the entrance end and the next three were in alternate spaces between the rails. The last gate was between the second and third rails from the back end of the tunnel. These gates operated on angle iron runners attached to the bottom of the rails by a 3/4-inch bolt at each end. For attachment of these angle irons, each of the rails forming the roof framework, with the exception of the last rail at the back end of the tunnel, had two holes in the base, which were spaced about 12 inches apart near the center of the span. These

holes as well as the holes at each end of these rails and the holes in the top wall stringer had been cut by burning and varied from slightly over 3/4 to 1 inch in diameter.

The space between the side walls of the loading tunnel and the bank of the cut outside the walls was filled with a mixture of coarse and fine rock with the fill extending to the height of the tunnel to provide a fairly flat surface on both sides for the stock pile. This fill was contained by large timbers. Walls constructed of large lumber to a height of about 6 feet above the roof of the tunnel at each end, and extending some distance out on the fill to each side, kept the stock pile from spilling into the ends of the tunnel.

The stock pile was formed by the crushed volcanic tuff falling off the end of a 24-inch belt conveyor, which was about 40 feet in length and carried the material from the crushing plant. The conveyor was inclined and the discharge end was over the loading tunnel at a point 12 feet above the roof at the center of the roof span and 10 feet from the end of the tunnel nearer the crushing plant. With the stock pile filled to capacity, the peak reached the end of the conveyor, the base measured normal to the axis of the loading tunnel extended to approximately 20 feet on each side of the center, and the base in the other direction was contained by the walls above the tunnel. As the end of the conveyor was not centered above the tunnel, a board slide from the end of the conveyor carried some of the crushed material to the side of the stock pile near the entrance end of the tunnel. The tractor loader was also used to push some of the crushed material from the sides of the stock pile to the top of the loading tunnel near the entrance end. Reportedly the tractor was not run onto the top of the loading tunnel at any time. The weight of the crushed volcanic tuff was said to be 1800 pounds per cubic yard.

Activity Prior to Disaster

At about 11:00 a. m. on ~~June~~ July 24th, while pushing some of the crushed material from the side of the stock pile to the top of the loading tunnel near the entrance end by means of the tractor-loader, the foreman, who was operating the tractor, felt a slight give under the tractor. According to the foreman, the tractor was not operating over the loading tunnel at the time. The foreman stopped the tractor immediately and went into the tunnel to see if a gate might have been left open. He found that one of the ten steel rails, which formed the supporting framework for the stock pile above the loading tunnel, had developed a crack and had opened at the bottom side, the base of the rail, to a width of about 1/8 inch. The rail was under the main portion of the stock pile, about one-third of the length of the tunnel from the

end opposite the entrance. The crack in the rail passed through one of the burned holes in the base of the rail near the center of the span where an angle-iron runner for one of the sliding gates was attached. Examination of the other rails in the roof by the men revealed no defects. With the discovery of the broken rail, it was decided that it would be too dangerous for further loading of trucks until the break could be welded. A verticle support, made up of three pieces of 2- by 8-inch rough lumber spiked together, was placed under the break in the rail for support; the bottom of this support rested on a footboard.

At this time the stock pile was filled almost to capacity and the foreman decided to stop work at noon for the remainder of the day. It was planned to call a welder from Mesa to repair the broken rail during the suspension of operations.

STORY OF THE DISASTER AND RECOVERY OPERATIONS

The Collapse of Structure

At noon the crew of five mine employees and two truck drivers all decided to eat lunch at the mine and following customary practice, went into the loading tunnel which furnished the only available shade. All seven men sat with their backs against the sides of the tunnel, four on one side and three on the other side. Rupert Thomas, the foreman who escaped injury, and John Dalzell, a laborer who received slight injuries, sat close to the entrance of the loading tunnel, one on each side. The remaining five men sat in the back two-thirds of the tunnel. Suddenly, without warning except for a loud noise that sounded like an explosion, the roof of the back two-thirds of the tunnel collapsed under the weight of the main portion of the stock pile. The five men who were under the portion of the roof that collapsed were caught by the fall and died of suffocation. The foreman was out of range of the fall under the remaining portion of the roof of the loading tunnel and escaped without injury. John Dalzell, also sitting under the remaining portion of the roof, was struck by some of the falling material and received cuts on the forehead and a lacerated finger. According to the two survivors, the loud noise and the cave-in occurred simultaneously so the men did not have a chance to move from where they were sitting. It was estimated that 75 tons of crushed rock fell into the loading tunnel in addition to some of the broken rails and the timber cover of the broken portion of the roof. Six of the rails in the roof of the loading tunnel were broken.

In addition to the seven men, there were three dogs in the loading tunnel at the time of the accident. One of these dogs was near the foreman and escaped without injury. The other two dogs were in the

back two-thirds of the loading tunnel and, like the five victims, were caught in the fall; one of these dogs was found dead and the other was rescued, apparently uninjured. The dog that was rescued was found in a hole at the bottom of one of the tunnel walls. This opening was covered by the body of one of the two men who were farthest from the entrance of the tunnel. Undoubtedly, enough air permeated through the fill outside the wall of the tunnel to keep the dog alive, and the body of the man over the opening of the hole protected the dog from the weight of the caved material.

Recovery Operations

Rescue operations were started immediately by the two employees who escaped. With the aid of several volunteers from cars passing on the nearby highway, the body of the first victim was removed at about 1:30 p. m. and the last was removed at about 3:00 p. m. All were examined immediately on removal by Dr. A. G. Salvatore, Mesa, Arizona, and pronounced dead. The doctor and an ambulance had been summoned from Mesa, Arizona.

Removal of the caved material was accomplished by shovelling by hand and by means of the Diesel tractor-loader used in mining operations. The foreman operated the loader and the caved material was dumped a short distance outside the loading tunnel. As the men were found, they were examined and placed on stretchers and carried outside the tunnel. After the bodies of the men had been removed, they were examined for identification in the presence of Jack Hunsaker, coroner, from Mesa, Arizona. The bodies were then taken to the M. L. Gibbons Mortuary in Mesa, Arizona.

Except for the material removed from the tunnel in recovering the bodies, everything was left undisturbed after the accident. Mr. Wesley R. Williamson, State deputy mine inspector, who arrived at the mine at about 3:30 p. m. issued formal orders to prevent resumption of operations until after the inquest. Mr. Williamson also requested that a watchman be posted at the property to prevent entry by unauthorized people.

Operations were resumed at the mine by the Christensen Construction Co. on July 28th. Except for taking down the broken parts of the remaining portion of the roof of the loading tunnel and the removal of crushed volcanic tuff that remained in the tunnel after recovery of the bodies of the victims, the structure was left undisturbed. Loading of the crushed material into trucks from the tunnel and from the pile outside the entrance of the tunnel was done by means of the tractor-loader. It was planned that operations might be continued by loading with a chute direct from the conveyor into trucks, pending reconstruction of

the loading tunnel. The loading tunnel structure will be rebuilt as soon as suitable materials can be obtained.

Activities of Bureau of Mines Personnel

Allen D. Look, Chief of the Arizona Section of the Accident Prevention and Health Division of the Bureau of Mines was notified of the accident by telephone about 1 p. m., July 24th, by the office of the Maricopa County Sheriff. E. R. Rodriguez, health and safety engineer, left for the scene of the disaster, arriving at the mine at 3:15 p. m., and remained at the mine until 6:15 p. m., investigating the accident. The following day the investigation was continued by M. L. Williams, safety representative, and E. R. Rodriguez. On July 31st, E. R. Rodriguez revisited the mine to obtain additional information.

INVESTIGATION OF CAUSE OF COLLAPSE OF STRUCTURE

Following completion of recovery operation on the day of the accident, an investigation of the scene was conducted by Wesley R. Williamson, Arizona deputy mine inspector, and E. R. Rodriguez, Bureau of Mines engineer, in company of Rupert Thomas, mine foreman. On the afternoon of the following day the investigation was continued at the scene of the accident by M. L. Williams and E. R. Rodriguez, Bureau of Mines employees. A. D. Look, chief, Arizona Section of the Bureau of Mines, attended the coroner's inquest held the day after the accident. Mr. T. F. McLay, safety inspector, of the Industrial Commission of Arizona, conducted a separate investigation at the scene of the accident on the mornings of July 25th and 26th.

Examination of the loading tunnel structure following the accident showed that each of six of the ten horizontal steel rails of the roof of the loading tunnel was broken into two pieces. These six rails were the 2nd through the 7th rails from the back end of the tunnel. The break in each of the rails was at approximately the center of the rail and passed through the center of one of the burnt holes in the base of the rail where the angle-iron runners had been attached. In each instance, the break ran approximately normal to the length of rail. Examination of these breaks by the Bureau investigators revealed no signs of old fractures. Most of the broken sections of these rails had broken loose from the steel rail stringers to which they had been bolted at the top of the side walls of the tunnel; the roof rails had broken loose by breaking out of a portion of the base of the rail stringer. The first three and the tenth rails of the roof of the tunnel from the entrance end, and the lumber between the first three rails, remained intact. The loading gate and the lumber on the right half of the roof (as one faced the back of the tunnel) between the third and fourth rails also remained;

the lumber was held in place by the third rail and by the broken half of the fourth rail. Although the broken end of the remaining portion of the fourth rail sagged about a foot below the normal roof height, the rail was held up partially by the bolt attachment to the top wall stringer and partially by the attachment to the third rail through the angle-iron runners of the gate.

The walls at the sides of the tunnel showed no apparent damage from the collapse of the roof and showed no indication of failure.

It was estimated that 75 tons of the crushed volcanic tuff fell into the loading tunnel. This was arrived at by estimates made by the foreman and by calculation according to the best data available of the quantity of the stock pile that rested on the roof of the tunnel prior to the time of the accident.

A few small broken pieces of 2-inch rough lumber with several spikes along their length were the only remains that could be found of what could have been the vertical support that was placed under the broken rail shortly before the roof of the loading tunnel collapsed.

SUMMARY OF EVIDENCE

1. The foreman had discovered a break in one of the steel rails supporting the loading tunnel roof and considered it sufficiently dangerous to have a timber placed under the break and to suspend truck loading operations.

2. The failure of the steel rail roof members was sudden and without warning.

3. The break in each steel rail was at a point where a hole had been burned in the base of the rail at the center of the span.

CAUSE OF COLLAPSE OF STRUCTURE

The collapse of the roof of the loading tunnel can be attributed to a combination of two causes. These were:

(1) Use of structurally weak material in the construction of the roof, considering the design of the structure and the load it was meant to sustain.

(2) Decreasing the structural strength of this material in the erection of the roof.

The value of used rails as a safe material for roof support is questionable. The factors to be considered in selection of steel for such use have been described as follows:1/

> "Owing to the nature of the stresses imposed upon members used for roof supports, it is imperative that the steel used should be (1) absolutely reliable, uniform and free from surface and internal defects, and (2) possessed of a high capacity for undergoing bending without fracture. Steel supports are subject to bending which often ultimately and inevitably exceeds the yielding point of steel. Other things being equal, the capacity for undergoing bending without fracture is at a maximum in low-carbon steel, and decreases as the carbon content rises."

Cutting of holes in the members resulted in a reduction of their effective cross sectional area.

Use of heat in making the holes in the rails used for the supporting framework of the roof, both for anchoring at the ends and for attaching the gates, resulted in decreasing the structural strength of the rails. Good practice requires proper annealing of steel, used in main supporting members, following heating.

RECOMMENDATIONS

The following recommendations relate to conditions that are believed to have been directly or indirectly responsible for the disaster and compliance therewith may prevent a recurrence:

1. Recognized structural engineering principles should be employed in the redesign of the loading tunnel.

2. In choice of materials for use in the reconstruction of the loading tunnel, a suitable factor of safety should be employed for the maximum load to which the structure is to be subjected.

3. In the reconstruction of the loading tunnel, the supporting members should not be weakened by cutting of holes or excessive heating.

1/ Crane, W. R., Abstracts of Recent Articles on Mine Support, Bureau of Mines Information Circular 6651, September 1932, p. 12.

4. Men should not enter places where a hazard exists.

ACKNOWLEDGMENT

The cooperation received from representatives of the Arizona Mine Inspector, the Arizona Pre-Cast Concrete Company, the Christensen Construction Company, and the Arizona Industrial Commission is gratefully acknowledged.

Respectfully submitted,

/s/ E. R. Rodriguez

E. R. Rodriguez
Health and Safety Engineer

/s/ M. L. Williams

M. L. Williams
Safety Representative

Approved by

E. H. Denny

E. H. Denny, Chief
Accident Prevention and
Health Division, Region IV

APPENDIX A

VICTIMS OF COLLAPSE-OF-STRUCTURE

PRE-CAST NO. 1 & NO. 2 CLAIMS

July 24, 1952

Name	Age	Occupation	Dependents
Employees of Christensen Construction Co.:			
Walter Faidley	52	Truck driver and crusher operator	4
James W. Pennington	51	Driller	5
Floyd E. Nicholson	51	Laborer	1
Employees of Leo G. Bateman trucking concern:			
Alfred Ray Cox	34	Truck driver	5
Alvin J. Cox	26	Truck driver	3

Average age of victims .....43 years

Total number of dependents 18

APPENDIX B

VERDICT OF CORONER'S JURY

Following the accident at the Pre-Cast No. 1 and No. 2 claims of the Christensen Construction Company, an inquest was held at Mesa, Arizona July 25, 1952 by Justice of the Peace Jack Hunsaker, ex-officio coroner, to determine the cause of death of the five men. The verdict of the coroner's jury was: "These five men came to their death by falling debris and suffocation."

APPENDIX C

REPORT OF ARIZONA DEPUTY MINE INSPECTOR

Globe, Arizona
July 26, 1952

Mr. Clifford J. Murdock
State Mine Inspector
Phoenix, Arizona

Dear Mr. Murdock:

A disastrous accident occurred at the Arizona Pre-Cast Open Pit Mine, 12 miles north of Apache Junction in Maricopa County and operated by Christensen Construction Company of Apache Junction, Arizona, on July 24, 1952.

The following men were killed:

Walter Faidley	-	aged 52
Floyd Nicholson	-	aged 53
James Pennington	-	aged 51
Alvin J. Cox	-	aged 27
Ray Cox	-	aged 35

The accident occurred at 12:20 P. M. on the above date. These men had gone under the loading ramp to eat lunch. According to testimony, they had been laid off for the balance of the day because one of the cross members of the loading ramp had broken. Temporary repairs had been made but what was to be a permanent job of repairs would require a welder. A stull consisting of two 2 by 10 lagging had been nailed together and put under the break with a railroad tie for a foot block. Owing to this condition, trucks were unable to load from the ramp. Approximately 100 tons of Tuff Stone (crushed) was on the ramp. According to testimony, the break came very suddenly with two men escaping. Their names are Rupert Thomas, foreman and John Dalzell, laborer. They testified that the break happened so quickly that they did not know what had happened until they were able to see each other. They tried to recover the bodies of their fellow workers immediately but realized that they must have help which was forthcoming. The first body was recovered at 1:30 and the last one at approximately 3 P. M.

The construction of this ramp was as follows:

It was 29 feet long, 11½ feet wide and 12 feet high, built of used 60 pound railroad rails. There were 8 sets of rails. These rails were used for posts and caps with 2 inch Arizona pine lagging for walls and roof. These rails were tied at each corner of the ramp with cables anchored into the ground. The 3 loading doors were in the center of the ramp and were of a sliding construction operated independently. They were fastened to the top rails by burning two 1 inch holes in each rail to which the doors were fastened. The burning of these holes weakened the rails to a point where it was beyond the point of safety. The breaks in each of five rails occurred at the point where the holes had been burned.

I feel that these men's lives could have been saved if proper construction had been done in building this loading ramp. I'm sure that the office of the State Mine Inspector would not have approved of such a piece of work if they had known such was being built. Owing to the fact that this mine was never reported to the State Mine Inspector's Office, the ramp was built without his knowledge. Furthermore, this accident was not reported to the State Mine Inspector or any of his staff. This is strictly in violation of the State Mining Code.

This mine is shut down until the Christensen Construction Company complies with the Arizona State Mining Code and has the consent of the State Mine Inspector to reopen.

An inquest was held July 25, 1952 at Mesa, Arizona. The verdict was that the men died of suffocation.

Yours truly,

Wesley R. Williamson
Deputy State Mine Inspector

cc: Christensen Con. Co.
Apache Junction, Arizona.

APPENDIX D

SAFETY INSPECTION REPORT

TO:	THE COMMISSIONERS The Industrial Commission of Arizona
FROM:	T. F. McLay, Safety Inspector
DATE:	July 25-26, 1952
SUBJECT:	CHRISTENSEN CONSTRUCTION COMPANY 510 Felt Building, Salt Lake City, Utah P. O. Box 34, Apache Junction, Arizona
INTERVIEWED:	S. W. Christensen, Vice President Rupert N. Thomas, Plant Foreman Clifford McCall, Driller

At the direction of the Commission I inspected the scene of an accident which resulted in the death of Walter Faidley, James Pennington, and Floyd E. Nicholson employees of the Christensen Construction Company of Salt Lake City, Utah and Ray Cox and Alvin J. Cox employees of Leo Bateman, a trucking concern from Salt Lake City, Utah.

The Christensen Construction Company is covered for quarrying and aggregate plant operation by general class policy #3796 A. The Leo Bateman trucking concern does not carry coverage under the Arizona State Industrial Commission.

The accident occurred about 12:20 P. M. July 24, 1952 at a quarry and aggregate plant located on the Apache Highway about nine miles north of Apache Junction and resulted when the steel rail stringers supporting the floor of the aggregate hopper broke, causing the loaded hopper to collapse, burying the men who were under it eating their lunches. John Dazell and Rupert Thomas, plant foreman, employees of the Christensen Construction Company were under the hopper near the east entrance, when it collapsed. John Dazell received slight injuries, Rupert Thomas was uninjured.

The cracked steel rail stringer was discovered by Mr. Thomas about 11:45 P. M., when he heard some aggregate falling and thinking one of the loading doors might be open he investigated and found one of the stringers near the west end of the hopper had developed a crack near the center of the span. For temporary support, until a welder to do the repair work could be procured, he installed a shoring composed of 3 2 x 8 planks nailed together under the stringer.

At lunch period, which started at 12:00 noon, he notified the men there would be no further work for the day, as the aggregate hopper was full and the truck would not be able to back into the loading position until the cracked stringer had been repaired and the shoring removed. The men decided to eat their lunches before going home and as customary sought the shade afforded by the aggregate hopper.

L. R. Williamson, Deputy State Mine Inspector reached the scene of the accident about 3:30 P. M. and immediately served a written notice on Mr. Thomas, shutting down the operation until the aggregate hopper could be remodeled in accordance with their recommendations.

I would classify this operation as a quarry and the information I have concerning the operation is as follows: The Arizona Precast Concrete Company, a concrete block manufacturing firm of Mesa owns the claims and the Christensen Construction Company, under a contract form the Arizona Precast Concrete Company, quarry, crush, screen and deliver the aggregate. The Leo Bateman trucking concern under a contract with the Christensen Construction Company transport the aggregate to the Arizona Precast Concrete plant near Mesa. The material being quarried is a lightweight volcanic rock called Tuff, averaging around 1600# per cubic yard.

The hopper is built into the side of the hill and is so constructed as to allow trucks to back under it for loading purposes. The supporting frame work of the hopper is composed of steel railroad rails which I estimate to be 60# rails. The ten steel rail stringers supporting the flooring of the hopper are set on 3' centers, with the exception of the second stringer from the east end which is set on a 4' center. The flat hopper floor is 12 feet wide by 30 feet long, the flooring consists of 2 x 12 planks 35½ inches long, cut to fit between the stringers with each end resting on the base of the rails. Six of the stringers on the west end broke when the hopper collapsed. All the stringers I examined, with the exception of one, showed a clean break and all breaks ran through a 3/4" hole in the base of the rail near the center of the span. These holes were burnt with a cutting torch and were used to bolt the frames supporting the loading doors to the stringers. There were two of these holes spaced about 18 inches apart in the base of each stringer.

On one of the broken steel stringer ends I found a rust area about one inch long in the webb of the rail and at one point it had penetrated about one half the distance through the webb which at this point is 3/4 inch thick. To me this rust area indicates an old crack, which I believe could only have been detected on close examination when the stringer was in position. Mr. Thomas was unable to identify this

stringer as the one he installed the shoring under. He was also unable to give the exact location of the stringer he installed the shoring under and after checking decided it was either the third or fourth stringer from the west end.

The passageway for the trucks to back under the hopper is formed by the upright steel rails supporting the loading hopper. This passageway is 12' high by 12' wide by 30' long, the spacing of the eight uprights on each side varies from about 68" to 42". The uprights are anchored at top and bottom by 3/4" and 1" steel wire rope to steel stakes inserted into holes drilled into the solid rock. 2 x 12 sheathing is installed behind the uprights to prevent rock falling into the passageway. This portion of the loading hopper shows no apparent damage from the collapse of the hopper floor.

In the original design of this hopper, I do not believe the concentrated load per square foot in the center of the span was taken into consideration. I questioned Mr. Christensen regarding the load per square foot the hopper was designed for and he stated he had never figured it out. Using round figures and rough calculations this load could reach 600 pounds per square foot. In my opinion another weakness in the design was the method of installing the plank flooring. A plank flooring laid at right angles to and on top of the stringers would distribute the load over a greater area than the present method in use.

I first reached the scene of the accident about 9:30 A. M. July 25th. I found Mr. McCall an employee of the Christensen Construction Company acting as watchman of the property. He informed me Mr. Christensen was in Salt Lake City and was expected to arrive by plane in the afternoon and Mr. Thomas could be contacted at the Grand View Motel 1½ miles west of Apache Junction.

Mr. McCall a regular employee of the firm was not at work the day of the accident and therefore could give me no first hand information, but his knowledge of the workings were very helpful as I inspected the entire operation.

I contacted Mr. Thomas at the motel around noontime, he informed me Mr. Christensen would arrive from Salt Lake City between 1:30 P. M. and 2:00 P. M. and a Coroner's inquest would be held in Mesa at 2:00 P. M.

I made arrangements with Mr. Thomas to visit the scene of the accident with him the following morning, as I planned to attend the inquest.

On Saturday morning July 26th, I picked up Mr. Christensen and Mr. Thomas and drove to the aggregate plant. The purpose of this visit was to obtain first hand information concerning the accident and their plans for rebuilding the loading hopper. Mr. Christensen informed me Mr. Williamson Deputy State Mine Inspector had contacted him and he had agreed to follow their recommendations in remodeling the loading hopper. I informed Mr. Christensen we would go along with the Mine Inspector's recommendations, but we would like to make an inspection of the job when it was about two thirds completed, he agreed to notify our office before the work was completed.

Mr. Christensen also informed me he would like to operate the plant while awaiting the material to be used in rebuilding the hopper. He explained, the truck would be backed into the passageway and the aggregate from the screening equipment would be loaded directly into the truck body. They had used this method when the operation was first started. I informed Mr. Christensen that in so far as I was able to ascertain the upright steel framework showed no apparent damage, I believe this method of loading the trucks could be safely carried out and we would go along with the recommendations of the Mine Inspector regarding operating the quarry and aggregate plant by this method.

RECOMMENDATIONS:

In so far as the State Mine Inspector has used his authority to shut the operations down until this firm has complied with his recommendations, any recommendation I might make at this time could be in conflict with the Mine Inspector's office. However, an inspection will be made before the rebuilding of the hopper is completed, at which time I will check the entire operation to note whether or not all known unsafe conditions have been corrected.

Respectfully submitted,

/s/ T. F. McLay

T. F. McLay, Safety Inspector.