ACCIDENT ON THE UNION PACIFIC RAILROAD CHARD, WASH.
FEBRUARY 15, 1939
INVESTIGATION NO. 2331

SUMMARY
Railroad: Union Pacific
Date: February 15, 1939
Location: Chard, Wash.
Kind of accident: Derailment
Train involved: Freight
Train number: 356
Engine number: 706
Consist: 7 cars, caboose
Speed: 10-15 m.p.h.
Operation: Timetable and train orders
Track: Single; tangent; 0.75 percent ascending grade eastward
Time: 6:15 a.m.
Weather: Cloudy
Casualties: 2 injured
Cause: Bridge collapsed under engine, having been weakened because of high water.

March 22, 1939.
To the Commission:
On February 15, 1939, there was a derailment of a freight train on the Union Pacific Railroad near Chard, Wash., which resulted in the injury of two employees.

Location and method of operation
This accident occurred on that part of the Washington Division designated as the Pomeroy Branch which extends between Starbuck and Pomeroy, Wash., a distance of 28.9 miles; this is a single-track line over which trains are operated by timetable and train orders, no form of block system being in use. The accident occurred at bridge 13.03 which is located 1.5 miles west of Chard. Approaching from the west there is a 3 degree curve to the right 1,778 feet long, followed by 364 feet of tangent to the bridge and a considerable distance beyond. The grade is 0.75 percent ascending eastward.
From Pomeroy to a point about 16 miles west thereof the railroad closely follows the course of Pataha Creek. Bridge 13.03 spans Pataha Creek at a point about 13 miles east of Starbuck; this bridge was a common standard pile trestle for light traffic lines, 104.8 feet long, with a maximum height of about 23.7 feet from the base of the rail to the ground line. It consisted of 7 spans, supported on 8 frame bents of 5 cedar piles each which varied from 22 to 32 feet in length and measured 14 to 16 inches in diameter at the ground line, driven to penetration that varied from 5 to 23 feet; all bents were provided with 4 by 8-inch sway braces, and in addition bents 4, 5 and 6, numbered from the west, were provided with two 6 by 8-inch horizontal sash braces. The caps were 12 by 14 Inches by 12 feet, laid on the 14-inch surface; there were six 8 by 17-inch stringers, three under each rail. The ties were 8 by 8 inches by 9 feet, laid on 12-inch centers. The two bents at each end of the bridge were spaced 14.5 feet, and the others were 15 feet apart. The bridge was designed to carry safely four engine driving-wheel axle-loads of 47,000 pounds each, with engine-wheel centers 5 feet apart, corresponding to Cooper's E-47 rating. That portion of

the bridge consisting of the second to seventh bents was built in 1925; in 1930 the seventh bent was redriven and the eighth bent added; in 1933 the first bent was installed.
Pataha Creek varies in width from 25 to 60 feet and at some places it is 20 feet deep. It flows southward and has a drainage area of about 175 square miles from its headwaters to the point of accident.

The track structure on the bridge consists of 56-pound rail, 30 feet In length, laid on 30 ties to the rail length. The maximum authorized speed on tangent track is 20 miles per hour.

Rules 1657 and 1732 of the maintenance-of-way department provide a follows:
1657. During threatening or prevailing storms or high water, wherein track or any portion of the railroad's property is liable to suffer damage, foremen and trackmen must be on duty, whether by day or night, and must not await instructions from the train dispatcher or roadmaster, but must carefully patrol their entire sections to make sure that the track is safe, taking necessary signals with them.
1732. During severe storms or extraordinary freshets, bridge foremen must be on duty, and when possible, must place themselves in communication with telegraph stations, ready to go at once with their men to repair any damaged structures. They must assure themselves that the structures in their vicinity are not being damaged and must take all necessary precautions for the safety of trains. In case of damage by storm or fire which may endanger or prevent the passage of trains, they must promptly notify the train dispatcher, division engineer and, supervisor of bridges and buildings, and at once take measures to stop trains if necessary, and to repair the damage.

The engine involved was of the Schenectady Consolidation or 2-8-0 type, with a total engine weight of 155,000 pounds, distributed on the axles as follows: engine truck, 18,000 pounds; each pair of drivers, 34,250 pounds. The distance between centers of the first and second pair of drivers was 5 feet 4 inches, and of the others, 5 feet; the length of the driving-wheel base was 15 feet 4 inches, and the total wheel base of the engine was 23 feet 8 inches. The length of the wheel base of the tender was 16 feet 3 inches. The over-all length of the engine and tender was 60 feet 11-inches, The loaded weight of tender was 121,250 pounds, and the total weight of engine and tender in working order was 276,250 pounds.
Heavy rain had fallen in this locality during the evening of February 14, but the rain had stopped and it was dark and cloudy at the time of the accident, which occurred about 6:15 a.m.

Description
No. 356, an east-bound freight train, consisted of eight cars and a caboose, hauled by engine 706, and was in charge of Conductor Lingow and Engineman Yenter. This train left Starbuck at 5:10 a.m., according to the train sheet, 3 hours 10 minutes late, set out one car at Delaney, 8 miles distant, then proceeded about 5 miles beyond and while crossing bridge 13.03 at a speed estimated to have been between 10 and 15 miles per hour, the trestle collapsed under the engine.
The engine stopped upright on the east bank of Pataha Creek, with its forward end headed upward and projecting above the bank; bridge ties, stringers and rails were under the engine; the tender and the first two cars were in the streambed. The employees injured were the engineman and the fireman.

Summary of evidence
Engineman Yenter stated that the air brakes were tested at Starbuck and they functioned properly en route. It had been raining at Starbuck on February 14, and on this trip he received a slow order that read, "Account soft weather conditions watch carefully for mud and rock slides, falling rocks and excessive water flowing in ditches or flowing over track. Lose time necessary for safety. Safety is first consideration." En route the speed was from 10 to 14 miles per hour, and after having passed over about four bridges and having checked in each case for debris, driftwood and high water he began to feel that everything was fairly safe. The headlight was burning and daylight was just breaking. He did not make any air-brake application while ascending the grade at bridge 13.03. The cab window was open and he looked at the creek and there seemed to be only about 3 feet of water. The bridge appeared intact in every respect and there was no sag or dip thereon; he started across it carefully, and after entering about the length of the engine the bridge collapsed. He said that on previous occasions he had seen it rain much harder than it did in this instance, and that he had crossed this bridge when the water under it was 8 or 9 feet deep.
Fireman Shaw substantiated the statement of Engineman Yenter, but estimated the speed to have been 10 or 12 miles per hour when the bridge collapsed under the engine.
Head Brakeman Tehan, who was also on the engine, practically corroborated the statement of the engineman; he was not alarmed or unduly concerned about weather conditions, or the possibility that high water would cause any dangerous condition; he saw no debris in streams en route and when the reflection from the headlight shown on the rails as the engine approached the bridge involved it appeared intact and there was no unevenness of track. He thought that one or more of the bents of the bridge had gone out before the engine reached it, and estimated the speed to have been not over 15 miles per hour when the accident occurred.
Conductor Lingow stated that it rained hard during the afternoon of February 14, but when he went on duty at Starbuck at 10:30 p.m. it was only drizzling, then it cleared up and did not rain any more. There was no water of consequence in any of the streams en route, and no cause for alarm about weather conditions. The speed was about 13 to 15 miles per hour and he had no thought but that the bridge was safe. He was in the caboose cupola and was not aware of anything wrong until the train stopped suddenly. After the accident he looked at the water in the creek and it was about 3 feet deep; ordinarily the water is about 2 feet deep. On previous occasions he had seen it much higher, and for a considerable portion of the year the creek bed is dry.
Flagman Dagget was also in the caboose cupola when the accident occurred; his statement corroborated that of the conductor.
Section Foreman Bowman, located at Pomeroy, stated that he was assigned to the territory involved in February, 1923. Since last fall his force consisted of himself and one laborer. His section is about 20 miles long and he does not cover the entire section every day. During the morning of February 14 he was working at the west end of the section. It started to sprinkle before noon, but about noon while he and the section laborer were at Dodge, 1.8 miles east of Chard, it started to rain moderately and continued in varying intensity. About 4:30 p.m. the roadmaster inquired about weather conditions and instructed him not to take any chances. It then began to rain harder and the section foreman watched Pataha Creek very closely; at 7 p.m. he called his man and they patrolled the track by section motor-car; it was still raining when they started out. All bridges were carefully inspected to determine that every pile was in place; after reaching the west end of the

section they returned eastward to Jackson, 1.6 miles west of the point of accident, arriving there shortly after 10 p.m. They remained at Jackson until about 11:15 p.m., then continued eastward toward Pomeroy, again carefully inspecting all bridges en route and found all clear and the water flowing freely under them. The water at bridge 13.03 had receded about one foot, there being about 3 to 3 1/2 feet of water flowing under it, about 11:30 p.m.; this was slightly above normal; there was no accumulation of debris and he was satisfied that the bridge was all right. They found bridge 23.96 located 10.88 miles east of bridge 13.03, blocked with debris and driftwood; this was the only bridge on the line where such a condition was seen to exist. He instructed the section man to protect this bridge by placing torpedoes and he, alone, proceeded to Pomeroy to inspect the bridge there. When he left Pomeroy about 1:30 a.m., February 15, the bridge at that point was all right and the water had receded about 2 feet. Returning to bridge 23.96 he found the water receding rapidly, so they continued westward about 6 miles to milepost 18; the water under the various bridges was receding more and more and no alarm was felt; they returned to bridge 23.96, and by this time the water was down considerably and the drift had settled; they remained there until 3:30 a.m. and he was satisfied that danger from water was past. They then departed for home, and arrived there about 4:10 a.m. Shortly after 6:30 a.m. he was informed of the accident; he proceeded, to that point, arriving about 7 a.m., and at that time the water had entirely receded. After the water receded during the night he thought that there would not be any danger of drift or debris coming down against bridge 13.03. He had seen the water four or five times higher in the past. A few years ago rip-rap was placed under the bridge Involved. Several years previously an ice jam broke off a pile at this bridge but no other trouble had been experienced. Since he had been on this section none of the bridges from a point 3 miles west of the bridge involved to a point 3 miles west thereof had previously been blocked with drift.

Roadmaster Pratt stated that no previous trouble had been experienced with the bridges on the Pomeroy Branch being blocked. He was not unduly alarmed about weather conditions in this instance. Apparently there was a jam somewhere along the creek that retarded the water above bridge 13.03, and when it broke loose it came down against the bridge. After the accident there was considerable debris and drift below the bridge, including poles, trees and branches. He last inspected the bridge with the division engineer and the bridge and building supervisor on January 27, 1939, and there was nothing wrong with it at that time.

Bridge and Building Supervisor Searles stated that the last annual inspection of bridge 13.03 was made in October, 1938, and the last general inspection in January, 1939. A steel bar was used to test the piles, and they were found to be in good condition, with very little sap rot. All piles had been driven to full penetration; the base was solid. After the accident he observed that bents 4 and 5 were missing from bridge 13.03 and that the stringers had broken off at the top of the cap of bent 3; bents 6 and 7 had kicked eastward under the locomotive. At that time the water was about 3 feet deep, but there was evidence on the north branch of Pataha Creek to show that at some time the water had reached a height of 9 feet. Bent 5 was washed downstream to a point 80 feet below the bridge and there was considerable debris wrapped around the lower end of the bent; where the piling had been broken off it was sound. A quantity of rip-rap, probably 30 or 40 yards, had also been displaced. Piles 1, 2, 3 and 4 in bent 5 had been broken off and the top of pile 5 had been pushed out from under the cap; piles 1 and 2 were split from the point where they broke off. Piles 1, 2 and. 3 in bent 4 were broken off. The breaking of the piles in bents 4 and 5 indicated that a heavy pressure built up until the piling snapped. In

his opinion the piling snapped off and had gone from under the bridge before the train arrived.
Bridge and Building Foreman Stone had worked on the Pomeroy Branch at different times during the past 25 years. He said that it was possible for enough drift and debris to back up and to cause the piling to break of f as occurred at bridge 13.03; he had seen bridge bents on this branch line that had broken off but never any that had been pulled out.
General Bridge Inspector Drew stated that bridge bents 1, 2 and 3 were standing; bents 6, 7 and 8, with the deck on top of them, were under the engine Piles 1, 2 and 3 of bent 4 with bracing bolted thereto were found about 3.5 miles downstream, pile 4 was lodged at a point 2.9 miles downstream and pile 5 was not found. Piles 1, 2, 3 and 4 of bent 5 were broken off just above the stream-bed line and pile 5 had been pulled out. A cloud-burst occurred in this locality during the night and he estimated that the crest of the water reached bridge 13.03 about 2:30 or 3 a.m., February 15. Apparently drift lodged against the bridge and raised the water on the up stream side 4 feet higher than on the downstream side and this was sufficient to exert a pressure strong enough to break off both bents. In his opinion it was entirely possible that the bridge could have been in the condition at 11:30 p.m., February 14, s described by the section foreman, and subsequently become completely clogged with sufficient drift to back the water on the upstream side to a depth of 9 feet, as indicated by high water marks, and to force out bents 4 and 5, leaving the deck suspended as it undoubtedly was when the train involved arrived so that the bridge appeared intact to the crew when the reflection from the headlight shone on the rails. In order to eliminate all possibility of drift it would be necessary to patrol constantly the stream above the bridge to its source and between all bridges during flood periods; this would be almost prohibitive in cost. As the most economical and practical solution to prevent the recurrence of similar accidents, consideration is being given to the construction of bridges with longer spans so that the drift will pass more freely through the openings.
Resident Engineer Murray stated that the local observer at the U. S. Weather Bureau, Pomeroy, Wash., reported 0.62 inch of rainfall between the hours of 4 p.m., February 14, and 4. p.m. February 15; however, no information could be obtained to indicate the exact hours during which this rainfall occurred. After the accident he noticed that a large amount of rip-rap of various sizes had been washed downstream; some pieces weighing as much as 2 or 3 tons had been washed down as far as 200 feet. In his opinion the great volume of water coming down against the debris that lodged against the bridge caused the piling to break off.
Division Engineer Kidder stated that during the summer time Pataha Creek is practically dry, and at the time of the year when this accident occurred the normal flow of water under bridge 13.03
is from 1 1/2 to 2 feet in depth. It was evident that a considerable amount of drift was carried down the stream and lodged against the bridge, backing the water until the pressure finally, broke the piling in bents 4 and 5. The crest of water evidently passed after the section foreman left bridge 13.03 at 11:30 p.m., February 14; and before he reached bridge 23.96. In his opinion bents 4 and 5 had been displaced before the train started across the bridge.

Observations of the Commission's Inspectors
The Commission's inspectors observed that at a point 177 feet north of the bridge the creek narrows to 37 feet with the banks about 25 feet high, and the stream makes an

abrupt bend, directing the flow almost straight at the bridge. At the narrow point marks on the bank indicated that the water had been about 9 feet high and from that point downstream to a short distance below the bridge these marks tapered downward to about 5 feet, indicating that somewhere in the vicinity of the abrupt turn a drift jam had formed.

Discussion

During the night of February 14-15, a heavy rain fell within the watershed area of Pataha Creek but some distance above bridge 13.03. The section foreman and his laborer had patrolled the track during the night and had made two inspections of bridge 13.03 and determined that every pile was in place. The last inspection of this bridge was completed by them at 11:30 p.m. and at that time there was no accumulation of debris; the water in the creek had receded about one foot and there was only about 3 to 3 1/2 feet of water flowing in the stream, which was slightly above normal. Driftwood had accumulated at a bridge about 10 miles east of the bridge involved but it had cleared by 1:30 a.m. and the water had receded; they again inspected westward to a bridge within 5 miles of the bridge involved and finding all bridges intact and the water receding they returned to their homes at 4:10 a.m. From the evidence it appeared that the crest of the water reached the bridge involved about 2:30 or 3 a.m. and that drift and debris lodged against the bridge which raised the water on the upstream side to a height of 9 feet. Apparently the crest of the flood had passed bridge 23.96 before 11:30 p.m. while the sectionmen were in the vicinity of bridge 13.03 and as they proceeded eastward they passed it at some point where the track was not close enough to the stream for them to either see or hear it; the driftwood they found at bridge 23.96 had been deposited by the crest as it passed that point, but when they reached, bridge 23.96 the water was receding and they saw no dangerous condition. That there was a great pressure exerted is evidenced by the facts that the piling of two bents were broken off at the stream-bed line, parts of which were found 3.5 miles downstream and that pieces of rip-rap weighing as much as 2 or 3 tons were washed downstream a distance of 200 feet. After bents 4 and 5 were displaced the deck of the bridge was left suspended and unsupported a distance of 45 feet.

No. 356 arrived at 6:15 a.m. proceeding cautiously, and the bridge appeared intact to the crew when the reflection from the headlight shone on the rails. It entered upon the bridge at a speed estimated at 10 to 15 miles per hour, but when reaching a point about midway thereof the bridge collapsed.

Several years ago trouble had been experienced at bridge 13.03 by an ice jam, but no previous trouble had been experienced with drift, debris or high water. During the summer time Pataha Creek is practically dry, and during February the normal flow of water under this bridge is 1 1/2 to 2 feet. On this occasion the water reached a height of 9 feet at a bend in the stream located 177 feet above the bridge. In order to prevent the recurrence of a similar accident consideration is being given to the construction of bridges with longer spans so that drift and debris can pass more freely through the openings.

Conclusions

This accident was caused by the collapse of a wooden bridge, which had been weakened by two bents being broken off and forced from under it because of pressure exerted by debris and high water.