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RAILROAD ACCIDENT INVESTIGATION

REPORT NO. 4174

SOUTHERN RAILWAY SYSTEM

KINGS MOUNTAIN, KY..

OCTOBER 24, 1970



FEDERAL RAILROAD ADMINISTRATION

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OCTOBER 24, 1970

Synopsis

On October 24, 1970, a rear-end collision occurred between two northbound freight trains on the Southern Railway System near Kings Mountain, Kentucky, resulting in derailed equipment striking a southbound freight train moving on the adjacent main track. One train-service employee was killed, and three were injured.

Cause

The accident was caused by failure of the engineer to operate the following northbound train in accordance with restrictive signal indications.

Location and Method of Operation

The accident occurred on that part of the railroad system extending northward from Oakdale, Tennessee to Kings Mountain, Kentucky, a distance of 115.2 miles. In the accident area this is a double-track line over which trains operate in either direction on both main tracks by signal indications of a traffic control system. From the east, the main tracks are designated as No. 1 and No. 2.

The rear-end collision occurred on track No. 1, 1.3 miles south of Kings Mountain. The side collision occurred 332 feet south of the rear-end collision point.

Summary

DATE: October 24, 1970

RAILROAD: Southern Railway System

LOCATION: Kings Mountain, Ky.

ACCIDENT TYPE: Rear-end & Side Collisions

TRAINS INVOLVED: Freight Freight Freight

TRAIN NUMBERS: 150 (North) Extra 3016 229 (South)
North

LOCOMOTIVE NUMBERS: Diesel-electric units 3803, 3056, 6314 Diesel-electric units 3016, 3003, 3069 Diesel-electric units 3103, 3102, 3807

CONSISTS: 110 cars, caboose 89 cars, caboose 72 cars, caboose

SPEEDS: Standing 25-35 m p.h 35 m.p h

OPERATION: Signal indications

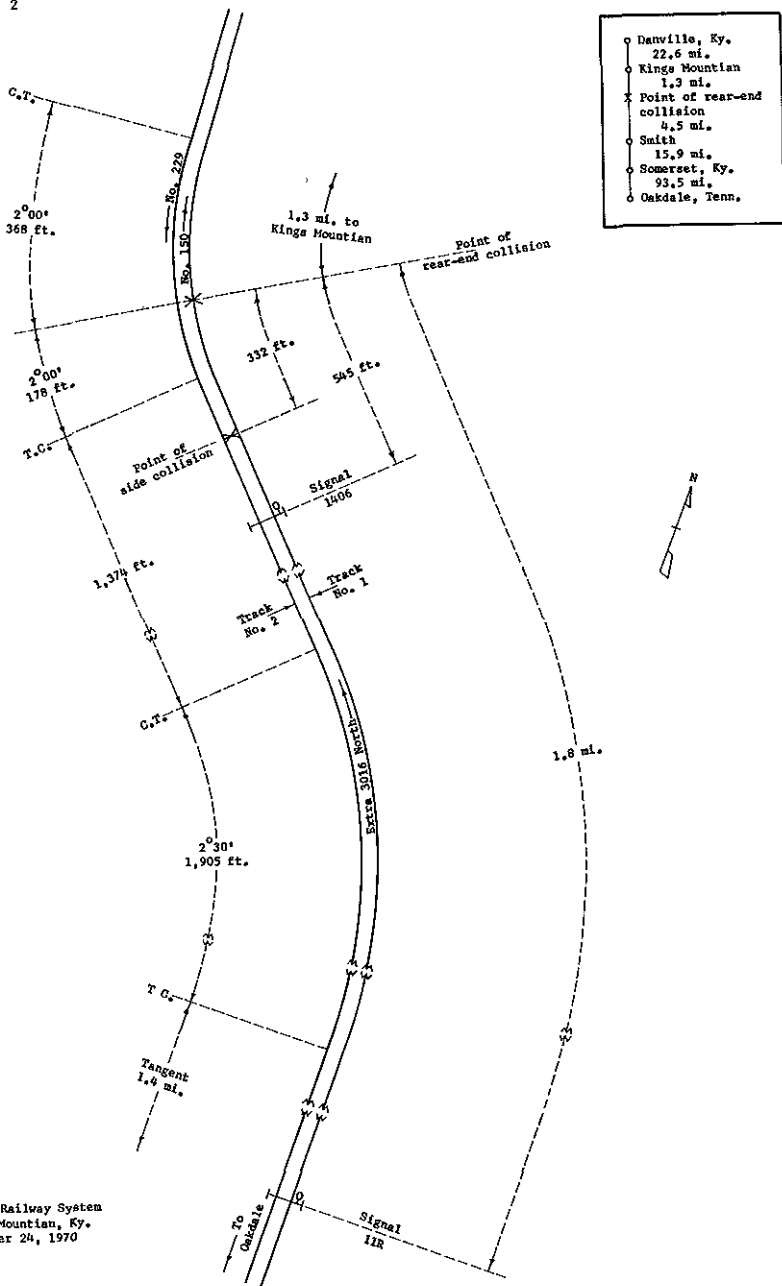
TRACKS: Double; 2°00' curve; 0 90% descending grade northward

WEATHER: Cloudy

TIME: 1:05 p m

CASUALTIES: 1 killed, 3 injured

CAUSE: Failure of engineer to operate the following northbound train in accordance with restrictive signal indications



Track

From the south on track No 1 there are, successively, a tangent 1.4 miles long; a 2°30' curve to the left 1905 feet; a tangent 1374 feet, and a 2°00' curve to the right 178 feet to the rear-end collision point and 368 feet northward

The grade for northbound trains averages 0.90% descending 1.4 miles to the rear-end collision point and about 2600 feet farther northward

Signals

Controlled signal 11R and automatic signal 1406, governing northbound movements on track No 1, are 1.8 miles and 545 feet south of the rear-end collision point, respectively. They are mounted on signal bridges and are of the continuous-lighted color-light type

The aspects applicable to this report and the corresponding indications and names are as follows:

| <u>Signal</u> | <u>Aspect</u> | <u>Indication</u> | <u>Name</u> |
|---------------|-----------------------------------|---|-------------------------|
| 1406 | Red-over No Plate | Proceed at Restrict- ed Speed | Restrict- ed Proceed |
| 11R | Green-over-Red Yellow-over-Red | Proceed Proceed, preparing to stop at next signal Train ex- ceeding Medium Speed must at once reduce to that speed | Clear Approach |

Signal 11R is controlled by the train dispatcher at Somerset, Ky. The circuits are so arranged that when the block of signal 1406 is occupied, and the block of signal 11R is unoccupied and the dispatcher has cleared signal 11R for a following movement on track No 1, signals 11R and 1406 display Approach and Restricted-Proceed aspects, respectively, for the following movement

Carrier's Operating Rules

Medium Speed - A speed not exceeding 30 miles per hour

Restricted Speed - Proceed prepared to stop short of another train, obstruction *** but at a speed not exceeding 15 miles per hour

99 ***

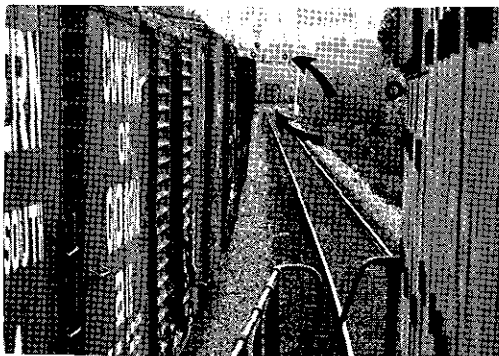
Within signaled territory, protection against following trains or engines on the same track is not required, ***

Time and Weather

The accident took place at 1:05 p m , under cloudy weather conditions

Sight Distance

Because of track curvature, signal 1406 cannot be seen from an approaching northbound locomotive on track No 1 at a distance greater than 1228 feet when a southbound train on track No 2 is passing the location of that signal (see following photograph)



Signal 1406 (top arrow) from distance of 1228 feet. Caboose shown (bottom arrow) is standing on track at rear-end collision point, 545 feet north of signal 1406.

Authorized Speed

The maximum authorized speed for all trains in the territory involved is 60 m p h It is restricted, however, to 55 m p h on curves in the accident area

Circumstances Prior to Accident

Throughout a distance of 3 6 miles north of Kings Mountain, Ky., the railroad is a single-track line controlled by a traffic control system

About 12:30 p m , the day of the accident, the train dispatcher established the route at Kings Mountain for southbound train No 229 to proceed from the single-track line to track No 2 of the double-track line As a result, the Kings Mountain controlled signal governing northbound movements from track No 1 of the double-track line to the single-track line displayed a Stop aspect

The dispatcher also established the route for northbound train No 150 to proceed northward on track No 1 to the Kings Mountain controlled signal governing northbound move-

ments to the single-track line. As that train moved northward, he established the route for Extra 3016 North to follow it on track No. 1.

No. 150

This northbound first-class freight train consisting of 3 diesel-electric units, 110 cars and a caboose, left Oakdale at 8:10 a m the day of the accident. About 12:55 p m, after passing signal 11R and 1406, it stopped on track No. 1 in the block of signal 1406 with the front end considerably short of the Kings Mountain controlled signal governing northbound movements from track No. 1 to the single-track line. When the train stopped short of this signal, which displayed a Stop aspect, its rear end stopped at a point 545 feet north of signal 1406. The engineer and front brakeman were in the control compartment of the first locomotive unit. The flagman was on the second unit, and the conductor was alone in the caboose.

Extra 3016 North

This was a northbound freight train consisting of 3 road-switcher type diesel-electric units, 89 cars and a caboose. It left Atlanta, Ga. at 10:44 p m the day before the accident, after having had an initial-terminal brake test, and proceeded to Oakdale, a crew-change point.

Extra 3016 North remained intact at Oakdale and left that point at 8:40 a m, 30 minutes after No. 150, the day of the accident. It passed Smith, 5.8 miles south of Kings Mountain, at 12:58 p m 20 minutes after No. 150. Soon afterward, while moving northward on track No. 1, it approached signal 11R, which the dispatcher had cleared after No. 150 passed signal 1406, the next signal ahead. The engineer and front brakeman were in the control compartment at the rear of the first locomotive unit. The front brakeman was seated on the right, or east, side of the compartment, and the engineer was seated at the controls on the left side. The flagman was in the control compartment of the second locomotive unit, and was sitting on the left, or west, side of that compartment. The conductor was alone in the caboose.

No. 229

No. 229, a southbound first class freight train consisting of 3 diesel-electric units, 72 cars and a caboose, left Danville, Ky., 22.6 miles north of Kings Mountain, at 12:20 p m the day of the accident. Approximately 42 minutes later, it moved from the single-track line to track No. 2 of the double-track line at Kings Mountain and began to pass No. 150, which was standing on track No. 1. Shortly thereafter, apparently at approximately 1:04 p m it began to pass the rear end of No. 150, the location of northward signal 1406, and Extra 3016 North, which was then closely approaching signal 1406 on track No. 1.

The Accident

No. 150

Approximately seven minutes after No. 150 stopped on track No 1 near the end of double track at Kings Mountain, No. 229 moved southward from the single-track line to track No 2 of the double-track line. The dispatcher then cleared the controlled signal governing northbound movements from track No 1 to the single-track line. Immediately afterward as the engineer was about to start No 150 in response to the cleared signal, that train was struck from the rear at a point 545 feet north of signal 1406.

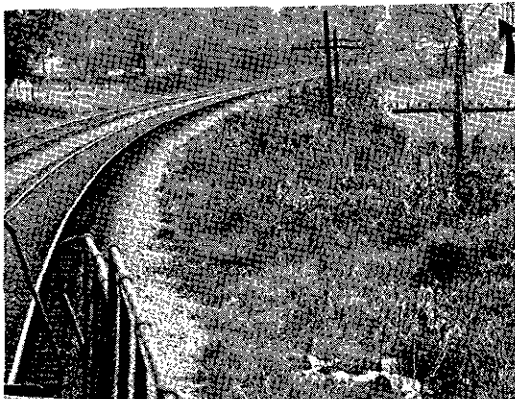
None of the crew members at the front of No 150 was aware of anything being wrong before they felt their locomotive surge forward as a result of the impact. The conductor was alone in the caboose at the time of the impact and was fatally injured. Due to a provision of the carrier's operating rule No. 99, neither he nor any other crew member had been required to provide flag protection against Extra 3016 North in the signal territory involved.

No. 229

At the time of the rear-end collision on track No 1, No 229 was passing the rear portion of No 150 while moving southward on track No 2 at an estimated speed of 35 m p h. As a result of the rear-end collision, derailed equipment struck the east side of No. 229, causing cars of that train to derail also.

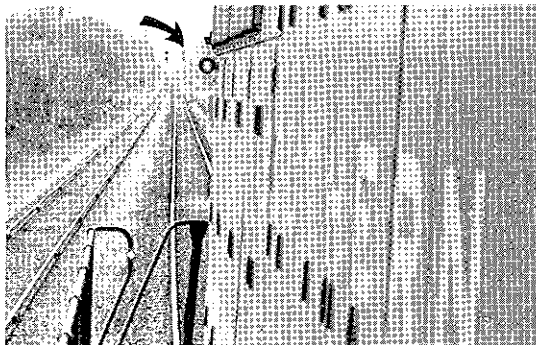
Extra 3016 North

This train was moving on a 2°00' curve to the right when signal 11R came into the front brakeman's view from the right side of the locomotive control compartment at a distance of 2243 feet (see following photograph).



Signal 11R (arrow) from distance of 2243 feet.

The front brakeman said that signal 11R was displaying a Clear aspect when he saw it come into view, and that he promptly called "Clear Block" to the engineer. The signal first became visible to the engineer at a distance of 1709 feet, when the front of the train was about to move off the north end of the 2°00' curve and enter tangent track (see following photograph)



Signal 11R (arrow) from distance of 1709 feet.

The engineer said signal 11R was displaying a Clear aspect when it came within his range of vision, and he then acknowledged the front brakeman's call by responding "Clear Block". Both the engineer and front brakeman said the signal continued to display a Clear aspect as their locomotive approached and passed it.

Soon after its locomotive passed signal 11R, Extra 3016 North entered a 1.03% ascending grade about 3000 feet in length. The engineer stated that the train was moving about 35 or 40 m p h as it moved over the summit of the ascending grade and entered the grade averaging 0.90% descending to the accident point. While moving in the vicinity of the summit, according to his statements, the engineer saw the headlight of No. 229 come into view and began to gradually move the throttle to "Idle" position, in preparation for applying the dynamic brake on the descending grade. Shortly thereafter, as Extra 3016 North moved on the descending grade in the block of signal 11R and neared a 2°30' curve to the left, the engineer applied the dynamic brake, restoring the throttle to Run 8 position. He estimated the subsequent dynamic braking action reduced the speed to 30 or 35 m p h as his train moved on the 2°30' curve and approached signal 1406.

Extra 3016 North began to pass No. 229 on the adjacent main track while moving on the 2°30' curve to the left. As a result of his view being obstructed by No. 229, the engineer was unable to see signal 1406 or No. 150 standing on track No. 1 until the front of his train reached a point

1228 feet from signal 1406 (see photograph on Page 4) He does not recall having noticed the aspect displayed by that signal. He stated, however, that he immediately applied the brakes of his train in emergency when he saw No 150 standing a short distance beyond signal 1406, and that he called a warning to the front brakeman at the same time. Due to track curvature to the left causing the long engine hood to obstruct his view from the right side of the locomotive control compartment, the front brakeman was unable to see either signal 1406 or the train stopped ahead when he heard the engineer's warning. He immediately crossed over to the engineer's side of the control compartment and simultaneously saw that signal 1406 was displaying a Restricted-Proceed aspect and that the caboose of No 150 was stopped on track No 1 a short distance beyond the signal.

Recognizing that a collision was inevitable, both the engineer and front brakeman jumped from the first locomotive unit. Before he jumped, the front brakeman radioed the flagman on the second unit and warned him of the emergency. The flagman said he had not observed signal 11R, but had observed that signal 1406 was displaying a Restricted-Proceed aspect just before the front brakeman radioed the warning. He estimated the train was moving at a speed of 30 to 40 m. p. h. at that time, and said he jumped from the second locomotive unit shortly after hearing the front brakeman's warning.

A few seconds after the engineer, front brakeman and flagman alighted from the locomotive, the front of Extra 3016 North passed signal 1406 and struck the caboose of No 150. It is estimated the speed of Extra 3016 North had been reduced to between 25 and 35 m p h. at the time of the impact.

Casualties

No. 150

The conductor of this train was found trapped inside his overturned caboose. He was fatally injured, and the medical cause of his death was attributed to a "Transverse fracture of the trachea above the thyroid."

Extra 3016 North

As a result of falling after jumping from their locomotive, the engineer, front brakeman, and flagman sustained various abrasions and lacerations, with the engineer sustaining fairly severe laceration of the face and scalp.

No. 229

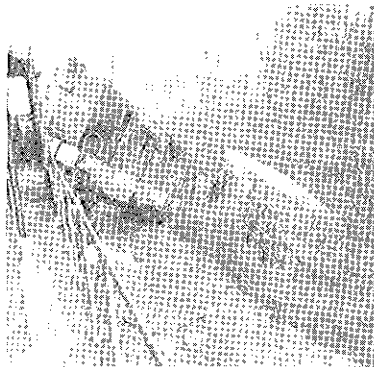
No crew member of this train was injured.

Damages

No. 150

This train was moved a short distance northward by the force of the impact. The 55th, 56th and 57th cars, and the

caboose, were derailed. The derailed cars jackknifed from the train and stopped on the east side of track No. 1. The caboose overturned on one side, and stopped on an embankment on the east side of track No. 1 (see following photograph). The caboose and two of the derailed cars were destroyed or heavily damaged.



Caboose of No. 190 at right. First and second locomotive units of Extra 3016 North also shown.

Extra 3016 North

This train stopped with the front end 106 feet north of the rear-end collision point. The first and second locomotive units, and the fourth to seventh cars, inclusive, were derailed. Both derailed locomotive units stopped upright as shown in the foregoing photograph. The fourth and seventh cars stopped upright on and in line with the structure of track No. 1. The fifth car buckled from the train, and stopped overturned on the east side of track No. 1. The sixth car buckled, struck the east side of No. 229, and stopped on track No. 1 as shown in the following photograph. It was destroyed. The other three derailed cars and the first two locomotive units were heavily damaged.



Sixth car of Extra 3016 North at center. Fourth and seventh cars of train also shown.

No. 229

Several trailers on flat cars were struck by the buckled sixth car of Extra 3016 North, and the trucks at the rear of the 42nd and 45th cars were derailed. Both of those cars stopped upright on and in line with the structure of track No. 2. They were flat cars and were destroyed, and six other trailers were slightly damaged.

Cost of Damages

According to the carrier's estimate, the total cost of damages was \$150,646.

Train Crew's Hours of ServiceNo. 150

All the crew members of this train had been on duty 14 hours 5 minutes in the aggregate at the time of the accident, after having been off duty over 22 hours.

Extra 3016 North

The crew members of this train had been continuously on duty 5 hours 15 minutes, after having been off duty more than 15 hours.

Post-Accident Examinations and TestsExtra 3016 North

Examination of the control compartment of the first locomotive unit found the independent brake valve in release position; the automatic brake valve in emergency position; the selector lever in dynamic braking position, and the throttle in Run 8 position. The safety control feature commonly known as the "deadman pedal" was found inoperative due to the pedal being blocked and held in depressed position by a journal-packing iron.

The brakes of the non-derailed cars of Extra 3016 North were tested after the accident. The test revealed that ten of these cars had excessive piston travel, and that the brakes of four other cars were inoperative because of defective conditions.

Signals

Soon after the accident, signal maintainers arrived at the scene and sealed cases containing signal apparatus involved. Before applying the seals, the signal maintainers opened the cases to check the condition of the signal apparatus. Their statements indicate that they observed no unusual condition and made no changes to the signal apparatus inside before the signal cases were sealed.

On the day following the accident, the non-derailed equipment of Extra 3016 North was pulled southward out of the blocks of signal 1406 and 11R while the block of signal 1406 remained occupied by other equipment involved in the accident. Prior to this movement, signal 11R was seen to be displaying a Stop (red-over-red) aspect, the normal aspect displayed by that signal when its block is occupied. In addition, the seals on the signal cases were broken and the cases were opened for examination in the presence of representatives of the carrier and Federal Railroad Administration.

After the non-derailed equipment of Extra 3016 North was pulled south of signal 11R, track occupancy conditions were similar to those existing prior to the accident, i. e. the block of signal 11R was unoccupied; the block of signal 1406 was occupied. The train dispatcher then initiated a control code to clear signal 11R, simulating the action he took the day before to clear this signal for Extra 3016 North after No. 150 passed signal 1406. When the control code was initiated, the aspect of signal 11R changed to Approach (yellow-over-red), indicating the portion of the signal system involved in the accident was functioning properly.

Also on the day after the accident and on subsequent days representatives of the Federal Railroad Administration and the carrier's signal department conducted extensive tests and examinations in efforts to discover any condition of the signal system that would permit or cause signal 11R to display a Clear aspect while signal 1406 displayed a Restricted-Proceed aspect. No such condition was disclosed.

Crew Members - Extra 3016 North

The engineer, age 64, entered the carrier's service as a fireman in November 1942 and was promoted to engineer in November 1950. His service record indicates he was subjected to minor disciplinary action in August 1952 for running with doors open on diesel-electric units, and was dismissed from service for approximately six weeks in 1965 because of failure to comply with instructions related to stopping a train by use of the dynamic brake only. The records indicate the engineer last underwent a physical examination on June 1, 1967, an eye examination on September 9, 1970, and last attended a rule review class on May 20, 1970.

The front brakeman, age 27, entered the carrier's service as a brakeman on October 28, 1968. His record was clear. He last underwent physical and eye examinations in September 1968, and last attended a rule review class on May 20, 1970.

Analysis

The cause of this accident hinges on whether signal 11R displayed a Clear or Approach aspect for Extra 3016 North while signal 1406 displayed a Restricted-Proceed aspect due to its block being occupied by No. 150. Since extensive tests and examinations made after the accident revealed that

the portions of the traffic control system functioned properly, it is apparent that when the train dispatcher cleared signal 11R for Extra 3016 North, the aspect of that signal changed to Approach. Under these circumstances, Extra 3016 North was authorized to proceed in the block of signal 11R at a speed not exceeding 30 m p h , prepared to stop at signal 1406. It was also authorized to pass the latter signal without stopping and to proceed in its block at a speed not exceeding 15 m p h , prepared to stop short of a train or obstruction.

Statements made by the engineer and front brakeman of Extra 3016 North as to the aspect displayed by signal 11R apparently were erroneous, as tests and examinations revealed the most favorable aspect that signal could display under the existing circumstances was Approach. As Extra 3016 North moved in the block of signal 11R, its speed was in excess of the maximum speed authorized by the Approach aspect displayed by that signal and it was not running prepared to stop short of signal 1406, as required. When the caboose of No 150 and the Restricted-Proceed aspect displayed by signal 1406 came within his range of vision, the engineer saw the caboose standing a short distance beyond the signal and applied the brakes of his train in emergency. There was insufficient braking distance at that time for the train to reduce speed as required in the block of signal 1406 or to stop short of the train ahead, resulting in the accident.

Findings

1. At the time of the accident, No. 229 was moving southward on track No. 2 and No. 150 was stopped on track No. 1 in accordance with applicable rules and regulations.

2. Extensive tests and examinations after the accident revealed the portions of the signal system involved were functioning properly. Hence, it is apparent that signals 11R and 1406 displayed Approach and Restricted-Proceed aspects, respectively, for Extra 3016 North, and that the engineer and front brakeman of this train were mistaken as to the aspect displayed by signal 11R.

3. Extra 3016 North moved in the block of signal 11R at a speed in excess of the maximum authorized speed permitted under the Approach aspect displayed by that signal and approached signal 1406 without being prepared to stop at that signal, as required.

4. When signal 1406 and No. 150 came into view, the engineer of Extra 3016 North promptly applied the brakes in emergency. However, there was insufficient braking distance for the train to reduce speed in the block of signal 1406, as required by the Restricted-Proceed aspect displayed by that signal.

5. As a result of having insufficient braking distance, Extra 3016 North passed signal 1406 at excessive speed and struck the rear end of No. 150.

6 From results of tests made after the accident, it appears Extra 3016 North left its initial terminal (Atlanta, Ga.) without defects in its air brake system having been corrected, as required by the Power Brake Law of 1958. The FRA has taken appropriate action with respect to this matter. The aforesaid defects, however, were not a significant factor in the accident due to their minimal effect on the total braking capability of the train.

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