

Chapter 4 Railway accident and serious incident investigations

1 Railway accidents and serious incidents to be investigated

< Railway accidents to be investigated >

◎Paragraph 3, Article 2 of the Act for Establishment of the Japan Transport Safety

Board (Definition of railway accident)

The term "Railway Accident" as used in this Act shall mean a serious accident prescribed by the Ordinance of Ministry of Land, Infrastructure, Transport and Tourism among those of the following kinds of accidents; an accident that occurs during the operation of trains or vehicles as provided in Article 19 of the Railway Business Act, collision or fire involving trains or any other accidents that occur during the operation of trains or vehicles on a dedicated railway, collision or fire involving vehicles or any other accidents that occur during the operation of vehicles on a tramway.

◎Article 1 of Ordinance for Enforcement of the Act for Establishment of the Japan

Transport Safety Board (Serious accidents prescribed by the Ordinance of Ministry of Land, Infrastructure, Transport and Tourism, stipulated in paragraph 3, Article 2 of the Act for Establishment of the Japan Transport Safety Board)

- 1 The accidents specified in items 1 to 3 inclusive of paragraph 1 of Article 3 of the Ordinance on Report on Railway Accidents, etc. (the Ordinance) (except for accidents that involve working snowplows that specified in item 2 of the above paragraph);
- 2 From among the accidents specified in items 4 to 6 inclusive of paragraph 1 of Article 3 of the Ordinance, that which falls under any of the following sub-items:
 - (a) an accident involving any passenger, crew, etc. killed;
 - (b) an accident involving five or more persons killed or injured;
 - (c) a fatal accident that occurred at a level crossing with no automatic barrier machine;
 - (d) an accident found to be likely to have been caused owing to a railway officer's error in handling or owing to malfunction, damage, destruction, etc. of the vehicles or railway facilities, which resulted in the death of any person;
- 3 The accidents specified in items 4 to 7 inclusive of paragraph 1, Article 3 of the Ordinance which are found to be particularly rare and exceptional;
- 4 The accidents equivalent to those specified in items 1 to 7 inclusive of paragraph 1, Article 3 of the Ordinance which have occurred relevant to dedicated railways and which are found to be particularly rare and exceptional; and
- 5 The accidents equivalent to those specified in items 1 to 3 inclusive which have occurred relevant to a tramway, as specified by a public notice issued by the Japan Transport Safety Board.

[Reference] The accidents listed in each of the items of paragraph 1, Article 3 of the Ordinance on Reporting on Railway Accidents, etc.

Item 1: Train collision

Item 2: Train derailment

Item 3: Train fire

Item 4: Level crossing accident

Item 5: Accident against road traffic

Item 6: Other accidents with casualties

Item 7: Heavy property loss without casualties

◎Article 1 of the Public Notice of the Japan Transport Safety Board (Accidents specified by the public notice stipulated in item 5, Article 1 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board)

1 From among the accidents specified in items 1 to 6 inclusive of paragraph 1 of Article 1 of the Ordinance on Reporting on Tramway Accidents, etc. (the Ordinance), that which falls under any of the following sub-items:

(a) an accident that causes the death of a passenger, crewmember, etc.;

(b) an accident involving five or more casualties (with at least one of the casualties dead);

(c) a fatal accident that occurs at a level crossing with no automatic barrier machine;

2 The accidents specified in items 1 to 7 inclusive of paragraph 1 Article 1 of the Ordinance which are found to be particularly rare and exceptional; and

3 From among the accidents occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways *mutatis mutandis* as specified in paragraph 1 of Article 3 of the Ordinance on Tramway Operations, the accidents equivalent to those specified in items 1 to 3 of Article 1 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

[Reference] The accidents specified in the items of paragraph 1, Article 1 of the Ordinance on Reporting on Tramway Accidents, etc.

Item 1: Vehicle collision

Item 2: Vehicle derailment

Item 3: Vehicle fire

Item 4: Level crossing accident

Item 5: Accidents against road traffic

Item 6: Other accidents with casualties

Item 7: Heavy property loss without casualties

Railway accidents to be investigated

Category	Train collision ^{*2)}	Train derailment ^{*2)}	Train fire ^{*2)}	Level crossing accident	Accident against road traffic	Other accidents with casualties	Heavy property loss without casualties
Railway (including tramway operated as equivalent to railway) [Notice 1-3]	All accidents ^{*1)} [Ordinance 1-1]			<ul style="list-style-type: none"> ▪ Accidents involving the death of a passenger, crew member, etc. ▪ Accidents involving five or more casualties with at least one of the casualties dead ▪ Fatal accidents that occur at level crossings with no automatic barrier machines ▪ Accidents found to have likely been caused by a railway worker's error in procedure or due to the malfunction, damage, destruction, etc., of vehicles or railway facilities, which resulted in the death of a person [Ordinance 1-2] 			/
				Accidents that are particularly rare and exceptional [Ordinance 1-3]			
Dedicated railway	Accidents that are particularly rare and exceptional [Ordinance 1-4]						
Tramway [Ordinance 1-5]				<ul style="list-style-type: none"> ▪ Accidents involving the death of a passenger, crewmember, etc. ▪ Accidents involving five or more casualties with at least one of the casualties dead ▪ Fatal accidents that occur at level crossings with no automatic barrier machines. 			/

*1 Except for derailment accidents of working snowplows. [Ordinance 1-1]

However, accidents that are particularly rare and exceptional are to be investigated. [Ordinance 1-3]

*2 If these categories occur on a tramway, the accident types shall each be renamed to “vehicle collision”, “vehicle derailment”, or “vehicle fire”.

(Note) “Ordinance” refers to the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board; “Notice” refers to the Public Notice by the Japan Transport Safety Board; and the numbers refer to the Article and paragraph numbers.

< Railway serious incidents to be investigated >**◎Item 2, paragraph 4, Article 2 of the Act for Establishment of the Japan Transport Safety Board** (Definition of railway serious incident)

A situation, prescribed by the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism (Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board), deemed to bear a risk of accident occurrence.

◎Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan

Transport Safety Board (A situation prescribed by the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism, stipulated in item 2, paragraph 4, Article 2 of the Act for Establishment of the Japan Transport Safety Board)

1 The situation specified in item 1 of paragraph 1 of Article 4 of the Ordinance on Reporting on Railway Accidents, etc. (the Ordinance), wherein another train or vehicle had existed in the zone specified in said item;

[A situation where a train starts moving for the purpose of operating in the relevant block section before completion of the block procedure: Referred to as “Incorrect management of safety block.”]

2 The situation specified in item 2 of paragraph 1 of Article 4 of the Ordinance, wherein a train had entered into the route as specified in said item;

[A situation where a signal indicates that a train should proceed even though there is an obstacle in the route of the train, or the route of the train is obstructed while the signal indicates that the train should proceed: Referred to as “Incorrect indication of signal.”]

3 The situation specified in item 3 of paragraph 1 of Article 4 of the Ordinance, wherein another train or vehicle had entered into the protected area of the signal which protects the zone of the route as specified in said item;

[A situation where a train proceeds regardless of a stop signal, thereby obstructing the route of another train or vehicle: Referred to as “Violating red signal.”]

4 The situation specified in item 7 of paragraph 1 of Article 4 of the Ordinance, which caused malfunction, damage, destruction, etc. bearing particularly serious risk of collision or derailment of or fire in a train;

[A situation that causes a malfunction, etc., of facilities: Referred to as “Dangerous damage in facilities.”]

5 The situation specified in item 8 of paragraph 1 of Article 4 the Ordinance, which caused malfunction, damage, destruction, etc. bearing particularly serious risk of collision or derailment of or fire in a train;

[A situation that causes a malfunction, etc., of a vehicle: Referred to as “Dangerous trouble in vehicle.”]

6 The situation specified in items 1 to 10 inclusive of paragraph 1 of Article 4 of the Ordinance which is found to be particularly rare and exceptional; and

[These are referred to as: item 4 “Main track overrun”; item 5 “Violating closure section for construction”; item 6 “vehicle derailment”; item 9 “Heavy leakage of dangerous object”; and item 10 “others,” respectively.]

7 The situations occurred relevant to the tramway as specified by a public notice of the Japan Transport Safety Board as being equivalent to the situations specified in the preceding items.

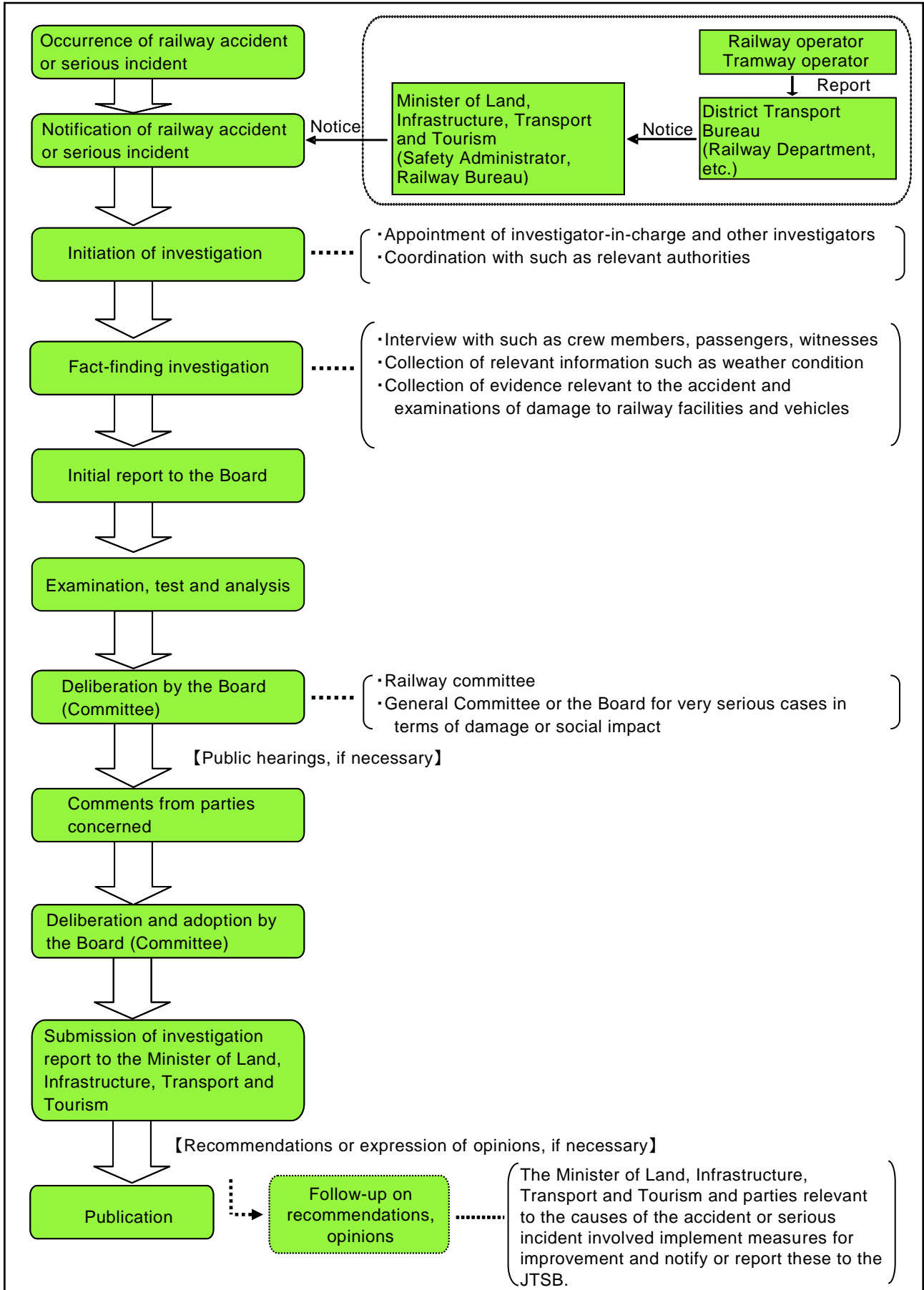
- Article 2 of the Public Notice of the Japan Transport Safety Board** (A situation prescribed by the public notice stipulated in item 7, Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board (Serious incident on a tramway))
- 1 The situation specified in item 1 of Article 2 of the Ordinance on Reporting on Tramway Accidents, etc. (the Ordinance), wherein another vehicle operating on the main track had existed in the zone specified in said item;
[A situation where a vehicle is operating on the main track for the purpose of operating in the relevant safety zone before the completion of safety system procedures: Referred to as “Incorrect management of safety block.”]
 - 2 The situation specified in item 4 of Article 2 of the Ordinance, which caused malfunction, damage, destruction, etc., bearing a particularly serious risk of collision, derailment or fire in a vehicle operating on the main track;
[A situation that causes a malfunction, etc., of facilities: Referred to as “Dangerous damage in facilities.”]
 - 3 The situation specified in item 5 of Article 2 of the Ordinance, which caused malfunction, damage, destruction, etc., bearing a particularly serious risk of collision, derailment or fire in a vehicle operating on the main track;
[A situation that causes a malfunction, etc., of a vehicle: Referred to as “Dangerous trouble in vehicle.”]
 - 4 The situation specified in items 1 to 7 inclusive of Article 2 of the Ordinance which is found to be particularly rare and exceptional; and
[These are referred to as: item 2 “Violating red signal;” item 3 “Main track overrun;” item 6 “Heavy leakage of dangerous object;” and item 7 “others,” respectively.]
 - 5 From among the situations occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways *mutatis mutandis* as specified in paragraph 1 of Article 3 of the Ordinance on Tramway Operations, the situations equivalent to those specified in items 1 to 6 of Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

Serious incidents to be investigated

Category	<ul style="list-style-type: none"> ▪ Incorrect management of safety block 	<ul style="list-style-type: none"> ▪ Incorrect indication of signal ▪ Violating red signal 	<ul style="list-style-type: none"> ▪ Dangerous damage in facilities 	<ul style="list-style-type: none"> ▪ Dangerous trouble in vehicle 	<ul style="list-style-type: none"> ▪ Main track overrun ▪ Violating closure section for construction ▪ Vehicle derailment ▪ Heavy leakage of dangerous object ▪ Others
Railway (including tramway operated as equivalent to railway) [Notice 2-5]	Certain conditions such as the presence of another train [Ordinances 2-1, 2-2, and 2-3]		Risk of collision, derailment or fire [Ordinances 2-4 and 2-5]		/
	Incidents that are particularly rare and exceptional [Ordinance 2-6]				
	<ul style="list-style-type: none"> ▪ Incorrect management of safety block 	<ul style="list-style-type: none"> ▪ Violating red signal 	<ul style="list-style-type: none"> ▪ Dangerous damage in facilities 	<ul style="list-style-type: none"> ▪ Dangerous trouble in vehicle 	<ul style="list-style-type: none"> ▪ Main track overrun ▪ Heavy leakage of dangerous object ▪ Others
Tramway [Ordinance 2-7]	Certain conditions such as the presence of a vehicle [Notice 2-1]	/	Risk of collision, derailment or fire [Notices 2-2 and 2-3]		/
	Incidents that are particularly rare and exceptional [Notice 2-4]				

(Note) “Ordinance” refers to the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board; “Notice” refers to the Public Notice by the Japan Transport Safety Board; and the numbers refer to the Article and paragraph numbers.

2 Procedure of railway accident/serious incident investigation



3 Statistics of investigations of railway accidents and serious incidents

The JTSB carried out investigations of railway accidents and serious incidents in 2019 as follows:

In 2019 11 accident investigations had been carried over from 2018, and 17 accident investigations were newly launched. Besides, 13 investigation reports were published in 2019, and thereby 15 accident investigations were carried over to 2020.

Moreover, three serious incident investigations had been carried over from 2018, and two serious incident investigations were newly launched in 2019. Furthermore, three investigation reports were published in 2019, and thereby two serious incident investigations were carried over to 2020.

Among the 16 investigation reports published, the JTSB provided no recommendation and one opinion.

Investigations of railway accidents and serious incidents in 2019

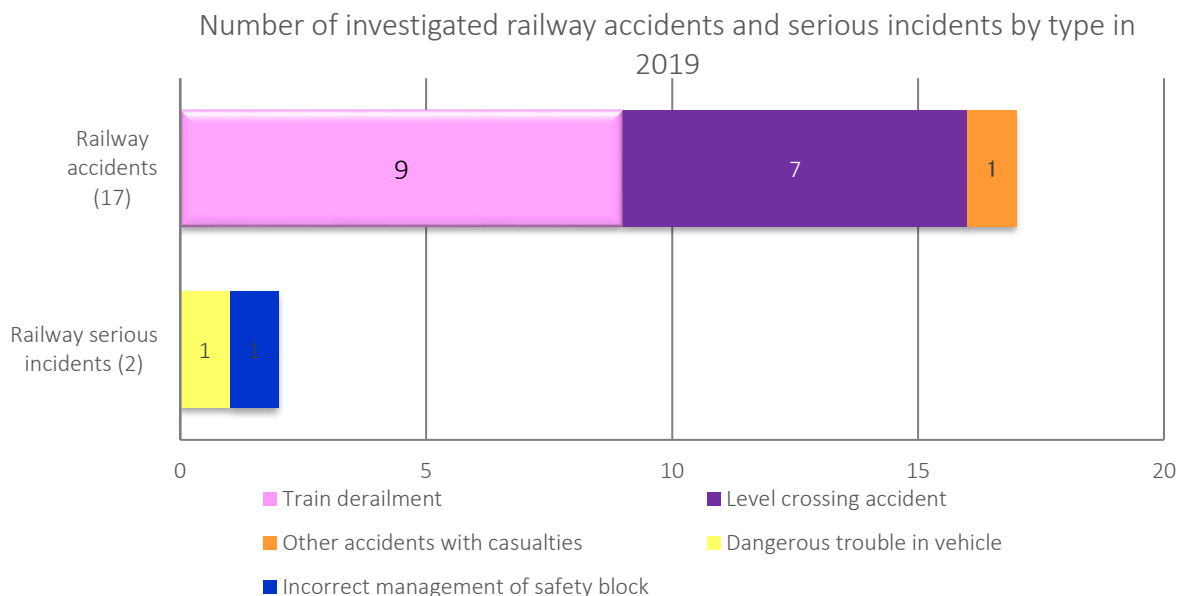
(Cases)

Category	Carried over from 2018	Launched in 2019	Total	Published investigation reports	(Recommendations)	(Opinions)	Carried over to 2020	(Interim report)
Railway accident	11	17	28	13	(0)	(1)	15	(0)
Railway serious incident	3	2	5	3	(0)	(0)	2	(0)

4 Statistics of investigations launched in 2019

The railway accidents and serious incidents that were newly investigated in 2019 consisted of 17 railway accidents, increased six from 11 for the previous year, and two railway serious incidents, same number as the previous year.

The breakdown by type of accidents and serious incidents is as follows: The railway accidents included nine train derailment accidents, seven level crossing accidents, and one case of railway injury. The railway serious incidents included one dangerous trouble in vehicles and one dangerous damage in facilities.



There were 28 persons killed or injured in 17 accidents, eight of whom were killed and 20 were injured.

The number of casualties (in railway accidents)

(Persons)

2019							
Category	Dead			Injured			Total
	Crew	Passenger	Others	Crew	Passenger	Others	
Casualties	0	0	8	1	18	1	28
Total	8			20			

*The above statistics include incidents under investigation so may change depending on the status of the investigation and deliberation.

5 Summaries of railway accidents and serious incidents which occurred in 2019

The railway accidents and railway serious incidents which occurred in 2019 are summarized as follows. The summaries are based on information available at the start of the investigations and therefore are subject to change depending on the course of investigations and deliberations.

(Railway accidents)

1	Date and accident type	Railway operator	Line section (location)
	January 9, 2019 Train	Kumamoto Electric Railway Co.,Ltd	Between Kurokami-machi station and Fujisakigumae station,, Fujisaki Line, Kumamoto Prefecture
	Summary	See “6 Publication of investigation reports” (Page 90, No.12)	
2	Date and accident type	Railway operator	Line section (location)
	January 16, 2019 Train derailment	Saitama New Urban Transit Co., Ltd.	Between Kamonomiya Station and Tetsudo-Hakubutsukan Station, Ina Line, Saitama

			Prefecture
	Summary	The driver of the train noticed a loud noise from the rear of the train, then applied the emergency brake. When the driver checked the car after stopping, he found that the tire of the left running wheel of the front axle among the two axles of the sixth car in the direction of travel was broken and the car was off the track.	
3	Date and accident type	Railway operator	Line section (location)
	March 21, 2019 Level crossing accident	East Japan Railway Company	Yamanonelevel crossing, class 4 level crossing without automatic barrier machine nor road warning device, on the premises of Zushi Station, Yokosuka Line, Kanagawa Prefecture
	Summary	The driver of the train heard an abnormal sound, so he resorted to emergency braking action and confirmed that the train collided with a pedestrian. After that, the pedestrian was rescued but was confirmed to be dead.	
4	Date and accident type	Railway operator	Line section (location)
	April 13, 2019 Level crossing accident	Fukui Railway Co., Ltd.	Yabugaichi level crossing, class 3 level crossing without automatic barrier machine but equipped with road warning device, between Iehisa station and Sundome-Nishi station, Fukubu Line, Fukui Prefecture
	Summary	See “6 Publication of investigation reports” (Page 91, No.13)	
5	Date and accident type	Railway operator	Line section (location)
	April, 14, 2019 Train derailment	Konan Railway Co., Ltd.	Between Chuo-Hirosaki Station and Hirokoshita Station, Owani Line, Aomori Prefecture
	Summary	When the driver of the train noticed an impact while running between Chuo-Hirosaki Station and Hiroko-shita Station, he stopped the train, checked and found that the first axle of the first bogie of the first train was derailed.	
6	Date and accident type	Railway operator	Line section (location)
	May 4, 2019 Level crossing accident	Hitachinaka Seaside Railway Co., Ltd.	Mitanda Daiichi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Kaneage Station and Nakane Station, Minato Line, Ibaraki Prefecture
	Summary	The driver of the train recognized a car entering the level crossing from the left side in the traveling direction, sounded a whistle, and resorted to emergency braking action, but the train hit the car. Subsequently, the car driver was confirmed to be dead and the car passenger was confirmed to be injured.	
7	Date and accident type	Railway operator	Line section (location)
	May 22, 2019 Level crossing accident	East Japan Railway Company	Sasaki level crossing, class 3 level crossing equipped with road warning device but without automatic barrier machine, between Yomogita Station and Gosawa Station, Tsugaru Line, Aomori Prefecture
	Summary	When the train was passing the level crossing, the driver of the train noticed an abnormal noise, so he resorted to emergency braking action, then the train passed the level crossing and stopped. After stopping the train, the train driver contacted the transport order and confirmed that the pedestrian had lain. After that, the pedestrian being hit by the train was confirmed to be dead.	
8	Date and accident type	Railway operator	Line section (location)
	June 1, 2019 Other accident with casualties	Yokohama Seaside Line Co., Ltd.	In the premises of Shin-Sugita Station, Kanazawa Seaside Line, Kanagawa Prefecture
	Summary	After the train departed from Shin-Sugita Station, the starting station, it proceeded in the opposite direction to the original direction of travel, collided with the car stop at the end of the line, and stopped. 17 injured persons * Information as of February 27, 2020, Interim Report	

9	Date and accident type	Railway operator	Line section (location)
	June 1, 2019 Level crossing accident	Akita Nairiku Jukan Railway Co., Ltd.	Kamatari level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Ugo-Nagatoro Station and Yatsu Station, Akita Nairiku Line, Akita Prefecture
	Summary	The driver of the train sounded a whistle and resorted to emergency braking action on discovering an agricultural machine (rice planting machine) entering the level crossing from the left side of the traveling direction and stalled at the level crossing but the train hit the machine. The driver of the agricultural machine was confirmed to be dead.	
10	Date and accident type	Railway operator	Line section (location)
	June 6, 2019 Train derailment	Transportation Bureau City of Yokohama	Between Shimoiiida Station and Tateba Station, Line 1 (Blue Line), Kanagawa Prefecture
	Summary	After leaving Shimoiiida Station, the driver of the train noticed the impact and stopped the train. As a result, 14 axles of seven cars of the first to fourth cars were found to have derailed.	
11	Date and accident type	Railway operator	Line section (location)
	June 7, 2019 Level crossing accident	West Japan Railway Company	Tomimasu No.5 level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Yumigahama Station and Wadahama Station, Sakai Line, Tottori Prefecture
	Summary	The driver of the train recognized a car entering the level crossing and resorted to emergency braking action, but the train hit the car. The car driver was later confirmed to be dead.	
12	Date and accident type	Railway operator	Line section (location)
	June 19, 2019 Train derailment	Odakyu Electric Railway Co., Ltd.	Hon-Atsugi No. 13 level crossing, class 1 level crossing with automatic barrier machine and road warning device, between Hon-Atsugi Station and Aiko-Ishida Station, Odawara Line, Kanagawa Prefecture
	Summary	While the train was running, the driver of the train noticed that a car was staying in the level crossing, so he resorted to emergency braking action, but the train hit the car. As a result, all two axles of the rear bogie of the leading car were derailed.	
13	Date and accident type	Railway operator	Line section (location)
	June 28, 2019 Train derailment	East Japan Railway Company	Between Shibukawa Station and Shikishima Station, Joetsu Line, Gunma Prefecture
	Summary	While the train was running, it collided with a fallen tree, and the first axle of the front bogie of the first train derailed.	
14	Date and accident type	Railway operator	Line section (location)
	September 5, 2019 Train derailment	Keikyu Corporation	Kanagawa-shimmachi Daiichi level crossing, class 1 level crossing with automatic barrier machine and road warning device, between Kanagawa-shimmachi Station and Nakakido Station, Main Line, Kanagawa Prefecture
	Summary	The train collided with a truck on the level crossing, and the first to third cars were derailed.	
15	Date and accident type	Railway operator	Line section (location)
	November 27, 2019 Train derailment	Aizu Railway Co., Ltd.	Between Yunokami-onsen Station and To-no-hetsuri Station, Aizu Line, Fukushima Prefecture
	Summary	While the train was running between Yunokami-onsen Station and To-no-hetsuri Station, the driver of the train found earth and sand flowing into the track. He resorted to emergency braking action, but the train ran on the earth and sand, and all the axles of the first train derailed.	

16	Date and accident type	Railway operator	Line section (location)
	December 2, 2019 Level crossing accident	Tenryu Hamanako Railroad Co., Ltd.	Tonokisaka level crossing, class 3 level crossing equipped with road warning device but without automatic barrier machine, on the premises of Nishikajima Station, Tenryu Hamanako Line, Shizuoka Prefecture
	Summary	The driver of the train recognized a pedestrian entering the railroad crossing and made an emergency stop arrangement, but he was shocked. After that, the death of the pedestrian was confirmed.	
17	Date and accident type	Railway operator	Line section (location)
	December 24, 2019 Train derailment	Aizu Railway Co., Ltd.	Between To-no-hetsuri Station and Yagoshima Station, Aizu Line, Fukushima Prefecture
	Summary	While the train was running between To-no-hetsuri Station and Yagoshima Station, all two axles of the front bogie were derailed to the left in the traveling direction.	

(Railway serious incidents)

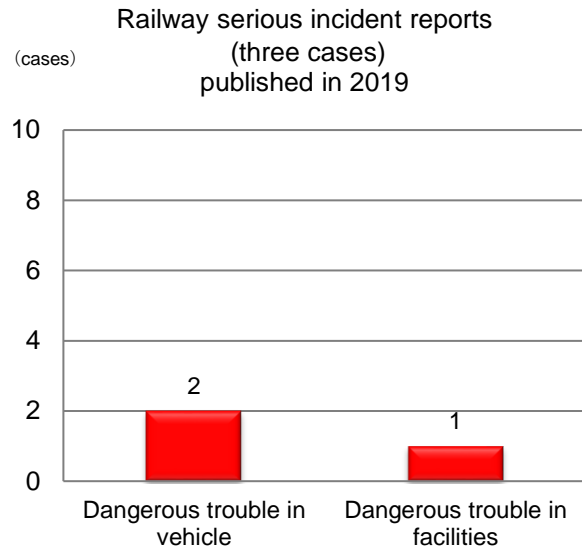
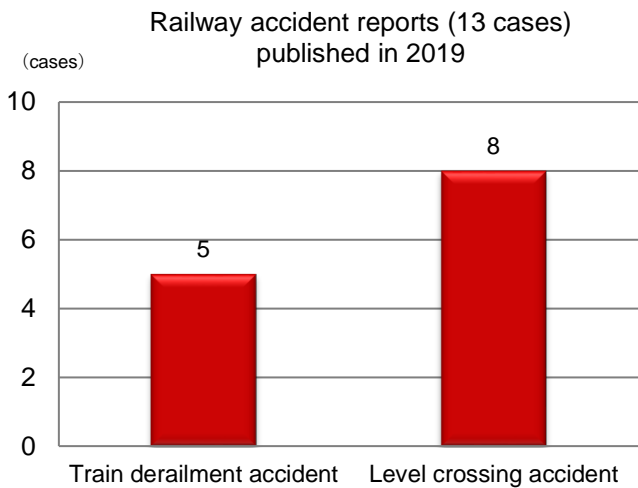
1	Date and incident type	Railway operator	Line section (location)
	March 25, 2019 Incorrect management of safety block	Tosaden Traffic Co., Ltd.	Between Asakura stop and Yashiro stop, Ino Line, Kochi Prefecture
	Summary	At the Asakura stop where is a pass-by track, the driver of the outbound train forgot to receive the Tablet (procedures for entering a single track section) that should be received when the oncoming train arrived, and started the train even though the oncoming train had not arrived. After that, the driver immediately stopped the outbound train because he had visually confirmed that the inbound train No. 332 was stopping at the Asakura intersection ahead of him.	
2	Date and incident type	Railway operator	Line section (location)
	August 24, 2019 Dangerous trouble in vehicle	Nankai Electric Railway Co., Ltd.	In the premise of Suminoe train inspection depot, Osaka Prefecture
	Summary	The inspector in charge of this inspection in the Suminoe Train Inspection Depot, who received a report from the train conductor that there was a sound of metal rubbing from the connecting part (crossing plate part), checked the connecting part, but there was no abnormality. When the inspection of the whole vehicles was carried out, a crack of approximately 140 mm was found in the main motor seat of the bogie, which was a place different from the connecting part.	

6 Publication of investigation reports

The number of investigation reports of railway accidents and serious incidents published in 2019 was 16, consisting of 13 railway accidents and three serious incidents.

Breaking them down by type, the railway accidents contained five train derailment accidents, eight level crossing accidents. The railway serious incidents contained two dangerous trouble in vehicle, and one dangerous trouble in facilities.

In the 13 accidents, the number of casualties was 13, consisting of eight death and five injured persons.




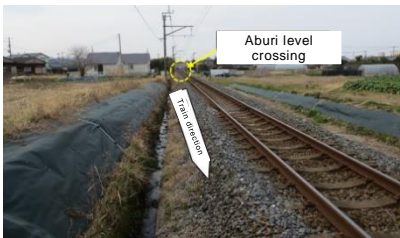
The investigation reports of railway accidents and serious incidents published in 2019 are summarized as follows.


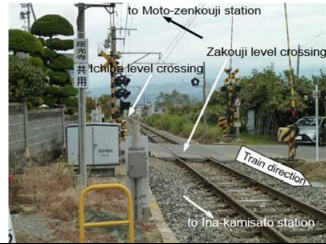
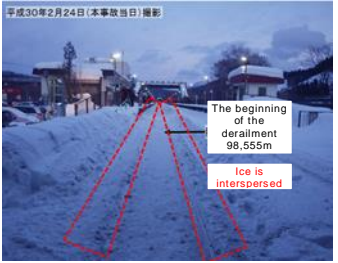
Railway accident investigation reports published in 2019

1	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	January 31, 2019	October 22, 2018 Train derailment	Nankai Electric Railway Co., Ltd	Between Tarui station and Ozaki station, Nankai Line, Osaka Prefecture
	Summary	<p>October 22, 2017, the outbound Local 6867 train, composed of 4 vehicles started from Namba station bound for Wakayamashi station, Nankai Line of Nankai Electric Railway Co.Ltd., departed from Tarui station on schedule at 16:38. While the train was operated in coasting at about 70 km/h on Onosatogawa bridge, the driver of the train noticed that the track about 50 m ahead had sagged, and applied the brake immediately but the train passed the sagged track and stopped after running for about 250 m.</p> <p>It was found in the investigation implemented after the occurrence of the accident, that the 2nd axle in the rear bogie of the 3rd vehicle of the train derailed to right on Onosatogawa bridge, and had restored after that. Hereinafter, the words "front", "rear", "left" and "right" are used based on the running direction of the train.</p> <p>In addition, the pier No.5 of the down track of Onosatogawa bridge had been subsided and tilted, and the track had been sagged and wound.</p> <p>There were about 250 passengers and 2 train crews, i.e., the driver and the conductor, onboard the train, among them 5 passengers were injured.</p> <p>Here, it had been raining in wide area in the southern area of Osaka Prefecture including the accident site, as the front crossed the southern coast of the main island of Japan was activated by the Heisei 29th year Typhoon No.21 which was moving northward in south of Japan, on the day of the occurrence of the accident.</p>		



	Probable Causes	<p>It is highly probable that the accident occurred as the 2nd axle in the rear bogie of the 3rd vehicle had derailed to right because the train was running on the track on the bridge significantly deformed by the subsided and tilted pier, after that, the derailed axle restored in the level crossing while passed as being derailed.</p> <p>It is probable that the pier had subsided and tilted because the ground in around the pier was scoured in wide area by the swollen river water at the time of the occurrence of the accident, while the function to protect the piers from scouring had already been deteriorated before the occurrence of the accident, such as the subsided riverbed in around the pier caused by the concentration of the river water due to the change of the water route, damages of the foot protection as the scour protection work, etc.</p> <p>It is probable that the deterioration of the function to protect scouring was related with that the measures such as the repair, reinforcement, etc., of the foot protection were not implemented, because the evaluation for the unusual status were not implemented sufficiently, even though the unusual status of the foot protection of the pier was recognized in the inspection of the piers.</p>		
	Report	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-2e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-1-2-p.pdf (Explanatory materials)</p>		
	Referece	<p>Feature 1 (5) (page 9), Chapter 1 (page 25), Case Studies (page 100)</p>		
2	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	January 31, 2019	December 6, 2017, Train derailment	Hokkaido Railway Company	In the premises of Zenibako station, Hakodate Line, Hokkaido
	Summary	<p>The driver of the train noticed an abnormal sound and recognized the indication showing an abnormal situation in the monitor display in the driving desk while the train was coasting in the No.2 track, the refuge track for inbound and outbound trains, in Zenibako station, at a velocity of about 34 km/h, then the driver applied an emergency brake and stopped the train.</p> <p>After checked the vehicles, train operation was resumed, but the indication of the abnormal situation had been displayed repeatedly. Therefore, the train operation was cancelled, and the train was deadheaded to Sapporo Operation Depot. As the traces showing that wheel derailed and continued running, was found in the wheel of the 1st axle in the front bogie of the 1st vehicle of the train, in the results of the vehicle inspection implemented in Sapporo Operation Depot, the investigation of the track in the premises of the station was implemented. As the results of the investigation, the trace of the derailment of train was found in Zenibako West level crossing and the trace of restoring was found in the No.11 turnout which was located in about 83 m apart from the level crossing in the direction of Otaru station.</p> <p>As the concerned train had been operated in the deadhead operation, only the driver was boarded, but he was not injured.</p>		

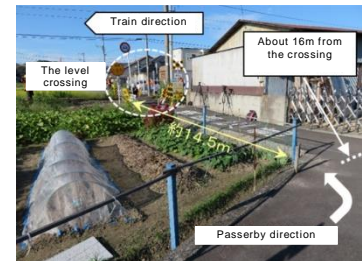
	Probable Causes	<p>It is probable that the accident occurred as the left wheel of the 1st axle in the front bogie of the 1st vehicle climbed up the left rail, i.e., the outer rail, and derailed to left, while the train Japan Transport Safety Board was passing the level crossing in the premises of the station, located in the right curved track in the refuge track for inbound and outbound trains where the frequency of train operation was low.</p> <p>It is somewhat likely that the derailment was caused as the wheel flange climbed up the compacted snow which had existed on the rail and the flangeway in the level crossing.</p> <p>It is somewhat likely that the compacted snow had been formed as it snowed hard in the previous day of the accident in the situation that the temperature around 0 °C had been continued, and the snow had been trodden hard by the automobiles passing the level crossing road in the long interval between the concerned train and the train operated just before the concerned train. In addition, it is somewhat likely that the compacted snow formed on the rail and the flangeway had been remaining without removed, because the snow removal works had not been implemented before the concerned train passed.</p> <p>It is somewhat likely that the snow removal works had not been implemented related with that the accident occurred before the period to prepare the snow removal formation in winter, that the status check of the level crossing had been implemented by the simple inspection such as the visual inspection, etc., and that the interval of the train operation was not considered well in the onsite confirmation and in the judgement to implement the snow removal work.</p>			
	Report	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-1-1-p.pdf (Explanatory material)</p>			
3	Date of Publication	Date & Accident type	Railway operator	Line section (location)	
	January 31, 2019	February 27, 2018, Level crossing accident	East Japan Railway Company	Renkoji level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Tateyama station and Kokonoe station, Uchibo Line, Chiba Prefecture	
	Summary	<p>The driver of the train noticed a passerby entering Renkoji level crossing while the train was running between Tateyama station and Kokonoe station at a velocity of about 77 km/h, then the driver applied an emergency brake, but the train hit the passerby.</p> <p>The passerby was dead in the accident.</p>			
	Probable Causes	<p>It is highly probable that the accident occurred as the train hit the passerby who entered Renkoji level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching.</p> <p>It could not be determined why the passerby entered the level crossing in the situation that the train was approaching the level crossing, because the passerby was dead in the accident.</p>			
Report	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-3e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-1-3-p.pdf (Explanatory material)</p>				
4	Date of Publication	Date & Accident type	Railway operator	Line section (location)	
	January 1, 2019	July 30, 2018 Level crossing accident	East Japan Railway Company	Between Ashikaga station and Yamamae station, Ryomo Line, Tochigi Prefecture	
	Summary	<p>The driver of the train noticed a passerby pushing a bicycle was entering Ota No.3 level crossing while the train was running between Ashikaga station and Yamamae station at a velocity of about 83 km/h, then the driver sounded a whistle and applied an emergency brake immediately, but the train hit the passerby. The passerby was dead in the accident.</p>			

	<p>Probable Causes</p>	<p>It is highly probable that the accident occurred as the train hit the passerby pushing a bicycle who entered Ota No.3 level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching.</p> <p>It could not be determined why the passerby entered the level crossing in the situation that the train was approaching the level crossing, because the passerby was dead in the accident, although it is somewhat likely that the passerby entered the level crossing without recognizing the approaching train.</p>		
	<p>Report</p>	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-4e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-1-4-p.pdf (Explanatory material)</p>		
<p>5</p>	<p>Date of Publication</p>	<p>Date & Accident type</p>	<p>Railway operator</p>	<p>Line section (location)</p>
<p>March 28, 2019</p>	<p>October 3, 2018 Level crossing accident</p>	<p>Central Japan Railway Company</p>	<p>Miyamae level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Moto-Zenkoji station and Ina-Kamisato station, Iida Line, Nagano Prefecture</p>	
<p>Summary</p>	<p>The driver of the train noticed a pedestrian entering Miyamae level crossing while the train was running between Moto-Zenkoji station and Ina-Kamisato station at a velocity of about 53km/h, then the driver applied an emergency brake and had been sounding a whistle, but the train hit the pedestrian. The pedestrian was dead in the accident.</p>			
<p>Probable Causes</p>	<p>It is certain that the accident occurred as the train hit the pedestrian because the pedestrian entered Miyamae level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching.</p> <p>It could not be determined why the pedestrian entered the level crossing in the situation that the train was approaching, because the pedestrian was dead in the accident.</p>			
	<p>Report</p> <p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-2-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-2-1-p.pdf (Explanatory material)</p>			
<p>6</p>	<p>Date of Publication</p>	<p>Date & Accident type</p>	<p>Railway operator</p>	<p>Line section (location)</p>
<p>April 25, 2019</p>	<p>February 24, 2018, Train derailment</p>	<p>Japan Freight Railway Company</p>	<p>In the premises of Tomamu station, Sekisho Line, Hokkaido</p>	
<p>Summary</p>	<p>The staff for track maintenance boarded on the snowplow motor car received the communication that the turnout in the station could not be switched from the train dispatcher. Therefore, the staff for track maintenance checked the turnout and found the traces that the train had derailed and had been running.</p> <p>In order to identify the derailed train, the wheels in the trains passed the concerned place were inspected, and the trace as derailed and continued running, was found in the wheel of the 1st axle in the front bogie of the 3rd vehicle of the High Speed Freight 2077 train, started from Sapporo Freight Terminal station bound for Obihiro Freight station of Japan Freight Railway Company, operated before the previous train of the snowplow motor car. The train had passed the station at a velocity of about 49 km/h. In the investigation implemented after that, the restored trace of the train was found in around the turnout in the station.</p> <p>The driver was boarded on the train, but he was not injured.</p>			

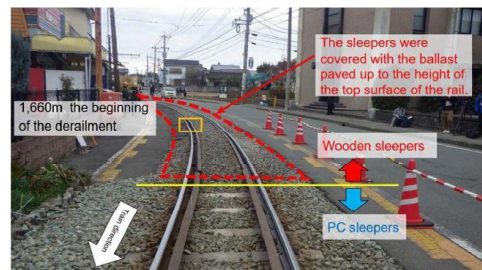
	Probable Causes	<p>It is probable that the accident occurred as the flange of the right wheel of the 1st axle in the front bogie of the 3rd vehicle climbed over the right rail and derailed at the place where large amount of ice and snow were stacked on the track, while the train was passing the straight track section in the premises of the station, and after that the train restored in the turnout while passing in the status as derailed.</p> <p>It is somewhat likely that the 1st axle in the front bogie of the 3rd vehicle of the train derailed because the side beam of the front bogie of the 3rd vehicle was pushed up over the ice and snow stacked on the railway track, at the same time, the wheel flange was raised up by the hard ice and snow which had existed in around the flangeway.</p> <p>It is somewhat likely that large amount of ice and snow had been stacked on the railway track in around the place where the derailment accident occurred, related with a large amount of snow fall and stacked snow in the previous day of the concerned accident, and that the snow removal works had not been implemented for 6 days before the occurrence of the accident.</p>		
	Report	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-3-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-3-1-p.pdf (Explanatory material)</p>		
	Reference	Case Studies (page 101)		
7	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	April 25, 2019	June 16, 2018, Level crossing accident	Kyushu Railway Company	Oho level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Nabeshima station and Kubota station, Nagasaki Line, Saga Prefecture
	Summary	<p>The driver of the train noticed an automobile entering Oho level crossing while the train was running between Nabeshima station and Kubota station at a velocity of about 84 km/h, then the driver of the train applied an emergency brake and sounded a whistle, but the train collided with the automobile.</p> <p>The driver of the automobile was dead in the accident.</p>		
	Probable Causes	<p>It is highly probable that the accident occurred as the train collided with the automobile because the automobile entered Oho level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching.</p> <p>It could not be determined why the automobile entered the level crossing in the situation that the train was approaching, because the driver of the automobile was dead in the accident.</p>		
Report	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-3-2e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-3-2-p.pdf (Explanatory material)</p>			
8	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	June 27, 2019	June 16, 2018 Train derailment	Keiyorinkai Co., Ltd.	In the premises of Soga station, Rinkai Main Line, Chiba, Prefecture
	Summary	<p>After departed from Soga station, the driver of the train felt as the train was dragged from backward. Therefore, the driver checked the backward and found that the wagon, the 4th vehicle from the front including the locomotive, had been tilted to left, then the driver operated an emergency brake and stopped the train.</p> <p>After the train stopped, the driver checked the concerned wagon, the 4th vehicle, and found that all four axles of the concerned wagon had derailed to left. There was the driver onboard the train, but he was not injured.</p>		
	Probable Causes	<p>It is probable that the accident occurred as all four axles of the wagon, the 4th vehicle from the front, derailed because the gauge widened while the freight train composed of 19 vehicles</p>		



		<p>was running in around the 106-B turnout in the premises of Soga station.</p> <p>It is probable that the gauge in around the 106-B turnout widened due to the decreased rail fastening force caused as the Japan Freight Railway Company, who was in charge of the management of track maintenance, had not implemented the measures such as the replacement of sleepers or the repairing work, etc., although the sleepers, which had been judged as inferior in the periodic inspection, existed continuously.</p> <p>It is somewhat likely that Japan Freight Railway Company had not implement the measures such as the replacement of the sleepers or the repairing work, etc., because it had not recognized the dangerous situation against the gauge widening well, as the irregularity of gauge measured under unloaded condition in the periodic inspection was within the maintenance standard value.</p>		
	Report	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-4-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-4-1-p.pdf (Explanatory materials)</p>		
9	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	July 25, 2019	September 27, 2018, Level crossing accident	West Japan Railway Company	Iwasakinoichi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Michinoue station and Managura station, Fukuen Line, Hiroshima Prefecture
	Summary	<p>The driver of the train noticed a bicycle entering Iwasakinoichi level crossing while the train was running between Michinoue station and Managura station at a velocity of about 72 km/h, class 4 level crossing, then applied an emergency brake immediately, but the train collided with the bicycle.</p> <p>The passerby riding the bicycle was dead in the accident.</p>		
	Probable Causes	<p>It is certain that the accident occurred as the train collided with a bicycle because the passerby riding bicycle entered Iwasakinoichi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching.</p> <p>It could not be determined why the passerby riding bicycle entered the level crossing in the situation that the train was approaching, because the passerby was dead in the accident, although it is somewhat likely that the passerby did not recognize the approaching train.</p>		
	Report	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-5-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-5-1-p.pdf (Explanatory materials)</p>		
	Reference	Case studies (page 103)		
10	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	July 25, 2019	December 12, 2018 Level crossing accident	Shikoku Railway Company	Nakatsuchi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Iyo-Tomita station and IyoSakurai station, Yosano Line, Ehime Prefecture
	Summary	<p>The driver of the train noticed a motorized bicycle entering Nakatsuchi level crossing, class 4 level crossing, while the train was running between Iyo-Tomita station and Iyo-Sakurai station at a velocity of about 120 km/h, then applied an emergency brake and sounded a whistle, but the train collided with the motorized bicycle.</p> <p>The driver of the motorized bicycle was dead in the accident.</p>		
	Probable Causes	<p>It is highly probable that the accident occurred as the train collided with the motorized bicycle because the motorized bicycle entered the Nakatsuchi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching.</p> <p>It could not be determined why the motorized bicycle entered the level crossing in the situation that the train was approaching, because the driver of the motorized bicycle was dead in the accident.</p>		



	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-5-2e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-5-2-p.pdf (Explanatory material)		
11	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	August 29, 2019	December 19, 2018, Level crossing accident	Chichibu Railway Co., Ltd.	Hanyu No.22 level crossing, class 4 level crossing without automatic barrier machine nor road warning machine, in the premises of Shingo station of Chichibu Main Line, Saitama Prefecture
	Summary	<p>The driver of the train noticed a pedestrian entering Hanyu No.22 level crossing while the train was running in the premises of Shingo station at a velocity of about 43 km/h, then sounded a whistle and applied an emergency brake immediately, but the train hit the pedestrian.</p> <p>The pedestrian was dead in the accident.</p>		
	Probable Causes	<p>- It is highly probable that the accident occurred as the train hit the pedestrian because the pedestrian entered Hanyu No.22 level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching.</p> <p>- It could not be determined why the pedestrian entered the level crossing in the situation that the train was approaching, because the pedestrian was dead in the accident.</p>		
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-6-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-6-1-p.pdf (Explanatory materials)		
12	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	October 31, 2019	January 9, 2019 Train derailment	Kumamoto Electric Railway Co., Ltd.	Between Kurokami-machi station and Fujisakigumae station, Fujisaki Line, Kumamoto Prefecture
	Summary	<p>The velocity of the train suddenly decreased while the train was passing the right curved track of 100 m radius between Kurokami-Machi station and Fujisakigumae station and the train stopped.</p> <p>After the train stopped, the driver checked the situation and found that all two axles in the rear bogie of the rear vehicle had derailed to left.</p> <p>There were about 25 passengers and the driver onboard the train, but no one was injured.</p>		
	Probable Causes	<p>It is probable that the concerned accident occurred as the right wheel of the 1st axle in the rear bogie of the rear vehicle fell to inside gauge because the gauge was widened significantly while the train was passing the right curved track of 100 m radius, and after running as being widening the gauge, the left wheel flange of the same axle climbed up left rail and went off to left, and the 2nd axle of the same bogie followed to went off to left.</p> <p>It is probable that the gauge had widened significantly as the gauge was dynamically widened due to the rail tilting etc., caused by the lateral force by the running train, because the inferior rail fastening devices existed continuously in the concerned curved track.</p> <p>It is probable that the inferior rail fastening devices existed continuously because the inspection of the sleepers and the rail fastening devices was not implemented well as the sleepers were covered by the ballast spread in the height of upper surface of the rail, and the measures preventing the recurrence of the same kind accident occurred in 2017, such as the replacement to the prestressed concrete sleepers or the additional driving spikes, had not been implemented.</p> <p>In addition, it is somewhat likely that the occurrence of the concerned accident was related with that the function of the guardrail to prevent the derailment could not work well, because of the decreased margin against derailment to inside gauge due to the relatively large slack in the curved track, and the dynamically enlarged width of the flange way by the tilting, etc., of the guardrail due to the lateral force acting on backside of wheel, etc., from right wheel caused by</p>		





		the insufficient fastening of the guardrail to the sleepers.		
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-7-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-7-1-p.pdf (Explanatory materials)		
13	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	December 19, 2019	April 13, 2019, Level crossing accident	Fukui Railway Co., Ltd.	Yabugaichi level crossing, class 3 level crossing without automatic barrier machine but equipped with road warning device, between Iehisa station and Sundome-Nishi station, Fukubu Line, Fukui Prefecture
	Summary	<p>The driver of the train noticed a light motor truck entering Yabugaichi level crossing while the train was running between Iehisa station and Sundome-Nishi station at a velocity of about 45 km/h, then applied an emergency brake immediately and sounded a whistle, but the train collided with the light motor truck.</p> <p>The driver of the light motor truck was dead in the accident.</p>		
	Probable Causes	<p>It is certain that the accident occurred as the train collided with the light motor truck because the light motor truck entered Yabugaichi level crossing, the class 3 level crossing equipped with the road warning device, in the situation that the road warning device was operating as the train was approaching.</p> <p>It could not be determined why the light motor truck entered the level crossing while the road warning device was operating because the driver of the light motor truck was dead in the accident, although it is somewhat likely that the driver of the light motor truck did not recognize the approaching train.</p>		
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-8-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-8-1-p.pdf (Explanatory materials)		



Railway serious incident investigation reports published in 2019

1	Date of Publication	Date and serious incident type	Railway operator	Line section (location)
	March 28, 2019	December 11, 2017 Dangerous trouble in vehicle	West Japan Railway Company	In the premises of Nagoya station, Tokaido Shinkansen, Aichi Prefecture
	Summary	<p>The inbound 34A train, "Nozomi 34", of West Japan Railway Company, composed of 16 vehicles started from Hakata station bound for Tokyo station, departed from Hakata station of Sanyo Shinkansen on schedule. The train crews, etc., had been noticed unusual smell in the cabin and unusual noise from underfloor of the vehicle, from just after departed from Hakata station, but the train was operated until to Shin-Osaka station, and the subsequent train operation was handed over to Central Japan Railway Company. When the 34A train arrived at Nagoya station of Tokaido Shinkansen, the vehicle maintenance staffs, dispatched to Nagoya station obeying the instruction of the operation dispatcher of Central Japan Railway Company, noticed unusual sound from the 4th vehicle, and implemented the underfloor inspection in Nagoya station. As the results of the inspection, the leaked oil was found in around the gear box in the front bogie of the 4th vehicle, then the further operation of the 34A train was cancelled. After that, when the works to move the concerned vehicle to the train depot, i.e., Nagoya Rolling Stock Depot, was implemented, the crack was found in the side beam in left side of the bogie frame of the front bogie in the 4th vehicle. There were about 1,000 passengers, 4 train crews, i.e., the driver and 3 conductors, and 3 pursers engaging in the cabin sales, etc., boarded on the train when the train had arrived at Nagoya station, but there was no injured person. Here, the vehicles operated as the 34A train were owned by West Japan Railway Company.</p>		

	<p>Probable Causes</p>	<p>It is highly probable that the concerned serious incident occurred because the gear type flexible shaft coupling displaced exceeding the allowable range and damaged due to deformation of the bogie frame caused by the crack which had generated in the side beam of the bogie frame of the vehicle and had expanded by fatigue. The crack had generated in the side beam of the bogie frame of the vehicle because it is somewhat likely that the split had generated in around the back boundary of the slot welded part where the crack had originated when the welding work had implemented. In addition, it is highly probable that the crack had generated related with the followings.</p> <p>(1) The residual stress was generated in around the slot welded part due to the implementation of the overlay welding on the bottom surface of the axle spring seat after annealed.</p> <p>(2) The thickness of the bottom plate of the side beam had become thinner than the designed standard value, because the bottom surface of the side beam had been grinded excessively when attached the axle spring seat to the bottom plate of the side beam.</p> <p>In addition, it is highly probable that the crack had expanded in the period shorter than the vehicle life, i.e., the usable period of the bogie, because the expanding speed of the crack became faster as the thickness of the bottom plate of the side beam became thinner due to the excessive grinding works implemented in the bottom plate of the side beam.</p> <p>Here, it is highly probable that the bottom plate of the side beam was grinded excessively related with that the problem, that the machining work was required to attach the axle spring seat due to the swell in the bottom surface of the side beam generated in the manufacturing process of the bogie frame, was dealt without studying the essential causes and counter measures, and the manufacturing works had implemented without well understandings on the instructions for the work related to the strength of the bogie frame.</p>		
	<p>Report</p>	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2019-1-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RI2019-1-1-p.pdf (Explanatory materials)</p>		
	<p>Reference</p>	<p>Case Studies (page 104)</p>		
<p>2</p>	<p>Date of Publication</p>	<p>Date and accident type</p>	<p>Railway operator</p>	<p>Line section (location)</p>
				<p>Summary</p> <p>The passenger standing on the platform talked to the conductor of the train about the door, something unclear, when the train was departing the station.</p> <p>After the conductor finished watching the platform while departing, he went to check the doors of each vehicle, and found that the rear door of the double doors in left side of the rear most of the 3rd vehicle had been opening by about 40 cm. Therefore, he locked the concerned door when the train stopped at the next station, i.e., Zasshonokuma station. The train was operated to the next station, i.e., Ijiri station, and the train operation was cancelled.</p> <p>There were about 250 passengers and 3 train crews, i.e., the driver, the conductor and the assistant station master for handling operation, but no one was injured.</p> 

	<p>Probable Causes</p>	<p>It is probable that the concerned serious incident was caused as the door did not closed certainly when the closing door operation was implemented, because the hanging device of the door and the piston rod transferring the force to open and close operation of the doors were disconnected and became not to work as linking each other as the buffer rubber of the hanging part for a door in the double door of the vehicle had fallen away, in addition, the train operation was continued in the status that the opening door could not be detected.</p> <p>It is probable that the buffer rubber in the hanging part of the door had fallen away in the following process, i.e., the nut of the piston rod and the buffer rubber had been in the status as contacted directly with each other due to mistaking the attached position of the plain washer in the fastening works of the hanging parts in the important parts inspection of the vehicle, the doors had been operated to open and close actions repeatedly in this status, then, the nut continued to cut into the hole part of the buffer rubber to cause the removal of the buffer rubber.</p> <p>It is probable that the situation of the opening door could not be detected because the opened door could not be detected by the door control switch, as the door was in the opening status even though the piston rod was in the close position, because the piston rod and the door had become not to work as linking with each other due to the fallen away buffer rubber.</p>		
	<p>Report</p>	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2019-2-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RI2019-2-1-p.pdf (Explanatory materials)</p>		
<p>3</p>	<p>Date of Publication</p>	<p>Date and accident type</p>	<p>Railway operator</p>	<p>Line section (location)</p>
	<p>December 19, 2019</p>	<p>November 9, 2018, Dangerous damage in facilities</p>	<p>Hokkaido Railway Company</p>	<p>In the premises of Shin-Sapporo station, Chitose Line, Hokkaido</p>
<p>Summary</p>	<p>The driver of the train checked the indication of the caution signal in the No.2 home signal of Shin-Sapporo station in order to stop at the station while the train was running between Heiwa station and Shin-Sapporo station at a velocity of about 50 km/h , after that, he found that the column of the No.1 starting signal, planted in the opposite track side, had collapsed and hindered the up and down tracks, from about 200 m before the No.1 starting signal.</p> <p>Therefore, the driver applied the normal brake and stopped the concerned train, then, he issued the train protection radio and reported to the train dispatcher.</p> <p>No one was injured in the incident.</p> 			
<p>Probable Causes</p>	<p>It is probable that the concerned serious incident had occurred because there was the inferior construction work as the insufficient cleaning in the hole after drilled into concrete body in the construction work of the metal extension anchor based on the "after constructing anchor method", in the planting work of the down line No.1 starting signal column.</p> <p>It is probable that the metal extension anchor was in the status as insufficient tolerance against tensile force because the cone of the metal extension anchor had not expanded the swelling part of the anchor due to the inferior construction work when the signal column had been planted.</p> <p>Therefore, it is somewhat likely that the signal column had collapsed because the external force exceeded the tolerance of the metal extension anchor fixing the signal column of the home signal, as the anchor of the metal extension anchor was loosening gradually, caused by vibration due to running trains on the viaduct in addition to the effects of the external force such as windstorm, earthquake, etc., in the period of about 38 years from planting, in the status that the metal extension anchor supporting the signal column had been insufficient endurance against tensile force, in cooperation with the wind pressure of about 20 m/s instantaneous wind speed on the collapsed day.</p>			
<p>Report</p>	<p>http://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2019-3-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RI2019-3-1-p.pdf (Explanatory materials)</p>			
<p>Reference</p>	<p>Case Studies (page 102)</p>			

7 Actions taken in response to opinions in 2019 (railway accidents and serious incident)

A summary of the actions taken in response to opinions in 2019 is as follows.

(1) Opinions on the derailment accident at Nankai Electric Railway Co., Ltd Nankai Main Line

(Opinions on January 31, 2019)

See “Chapter 1: Summary of recommendations and opinions issued in 2019 – Opinions 1” (Page 25)

8 Provision of factual information in 2019 (railway accidents and serious incidents)

The JTSB provided factual information for one case in 2019. The content is as follows.

(1) Provision of information relating to the railway accident with casualties on the Yokohama Seaside Line Co., Ltd, Kanazawa Seaside Line

(Information provided on June 14, 2019)

* The progress report published on February 27, 2020 is posted on the Committee's website.

<https://www.mlit.go.jp/jtsb/railway/rep-acci/keika20200227.pdf>

(Summary of Railway Accidents with Casualties)

At around 20:15 on June 1 (Sat), 2019, when the train No. 2009B (5 car train set) from Shin-Sugita Station to Namikichuo Station departed from Shin-Sugita Station, it proceeded in the opposite direction to the original direction, and it collided with the car stop at the end of the line and stopped.

14 passengers were injured in this accident.

(Provision of Information)

The content of the information provided is as shown in the attachment.

The cause of the accident will be investigated in detail in the future.

Attachment

Provision of Information relating to the railway accidents with casualties on the Yokohama Seaside Line Co., Ltd, Shin-Sugita Station

The factual informations that the JTSB has ever investigated are described on pages 2 to 5. The summary is as follows. Note that [] indicates the description part corresponding to the content of the fact information.

Summary of factual information

1. Disconnection of the line transmitting the direction of travel command

- Disconnection of the F line near the rear end of the first car on the Kanazawa-hakkei Station side [1. (1)]
- Of the F line (forward direction command) and the R line (reverse direction command), the F line is disconnected.
- One of the broken portions of the F line is welded to a member on the vehicle body side [1. (2)].
- The broken F line was detached from the bundle of cables [1. (3)]

2. Operation record of the equipment

- Confirmed that the F line was not pressurized when the accident occurred in the operation record of the equipment [2. (2)].
- When the F line was changed to non-pressurized, it was confirmed that one outbound trains before the one where the accident occurred were running according to the operation records of the equipment. [2. (3)]

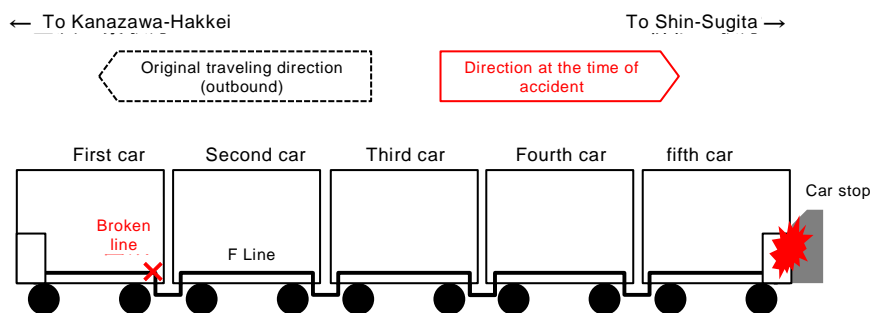
3. Motor control specifications

- The motor control device is designed to maintain the direction of travel immediately before the F line and R line when they are not pressurized. [3.]

* In the case of the vehicles where the accident occurred, the signal device switches the traveling direction to the "down direction" when turning back at Shin-Sugita Station, but the motor control device maintains the previous "up direction" due to the disconnection of the F line.

4. Operation Records of Station ATO On-board Equipment and Ground Equipment

- In the records of the operation of the station ATO on-board equipment and the station ATO ground equipment, there is no record showing any abnormality of the equipment related to the occurrence of this accident. [4.]



Contents of the factual information

1. Results of Train Wiring Investigation

In the investigation of the wiring of the train, the following conditions were found.

- (1) When the train (No. 2009B) collided with the train stop on the Kanazawa-hakkei Station side (hereinafter, the train is counted from the Kanazawa-hakkei Station side), Of the F line

and the R line for transmitting the traveling direction to the VVVF control device (motor control device installed in the first, third, and fifth car) from the station ATO on-board equipment, the F line was found to be disconnected. The relation between the conditions of the F line and the R line and the traveling direction will be described later in 3.

(2) Lines F and R were routed through the entire 5 - car train, and the disconnection of Line F was found near the rear end of the first car (on the connecting side with the second car), and one of the disconnection parts was welded to the member on the car body side.

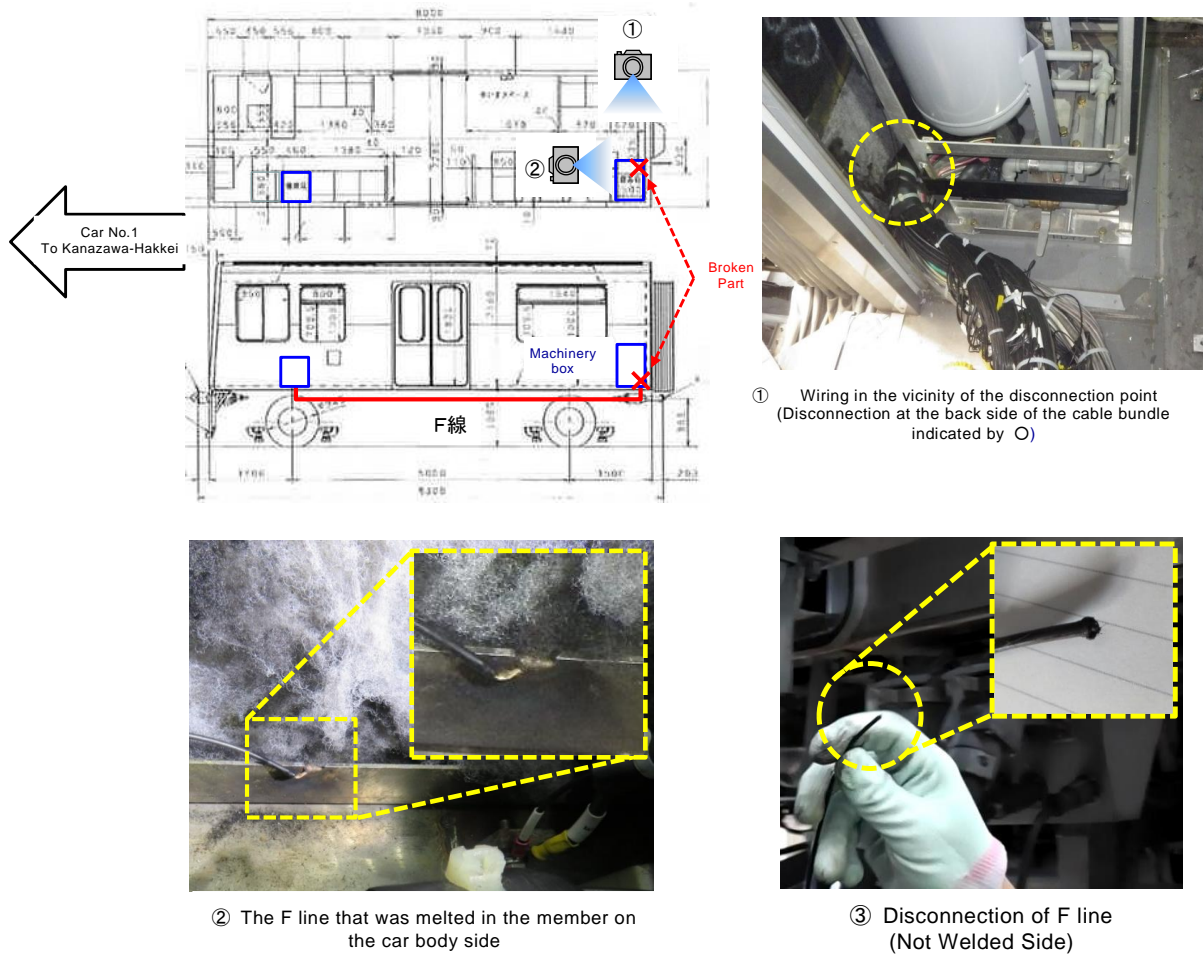


Figure 1 Disconnection of F line

(3) Only one of the F-lines were separated from the bundle of bundled cables.



Figure 2 F line out of bundle

(4) The traveling direction is set by the on-board equipment of the station ATO, and a voltage (100 V) is applied to the F line or R line through a relay to transmit the traveling direction to the VVVF controller. However, the condition of the F line was not transmitted to all the VVVF controllers due to the disconnection of the F line.

2. Operation record of the equipment

The following records were found in the operation records of the equipment at the time of the accident.

- (1) There was a record that Line 194 was pressurized in Shin-Sugita Station before this accident occurred, and the station ATO on - board equipment set the train's traveling direction to the outbound direction (from Shin-Sugita Station to Kanazawa-hakkei Station). This is the predetermined operation.
- (2) A voltage should have been applied to the F - line by the setting of the traveling direction in (1), but there was no voltage on the F - line even after the setting of the traveling direction, and neither the F - line nor the R - line was pressurized.

Table 1 Status of Operation Records of Equipment

Traveling Direction	Train Status	Station ATO On-board Device Output		F Line	R Line
		194 line	195 line		

Inbound	Arrival at Shin-Sugita	Without pressure	With pressure	Without Pressure	With Pressure
Outbound	Departure from Shin-Sugita	With Pressure	Without pressure	Without Pressure	Without Pressure

* With regard to Content 1 (3) of the Factual Information, in the subsequent investigation, the F line one of the 4 cable bundles. It was confirmed that the cable was in the cable bundle at the bottom. (February 27, 2020 interim report)

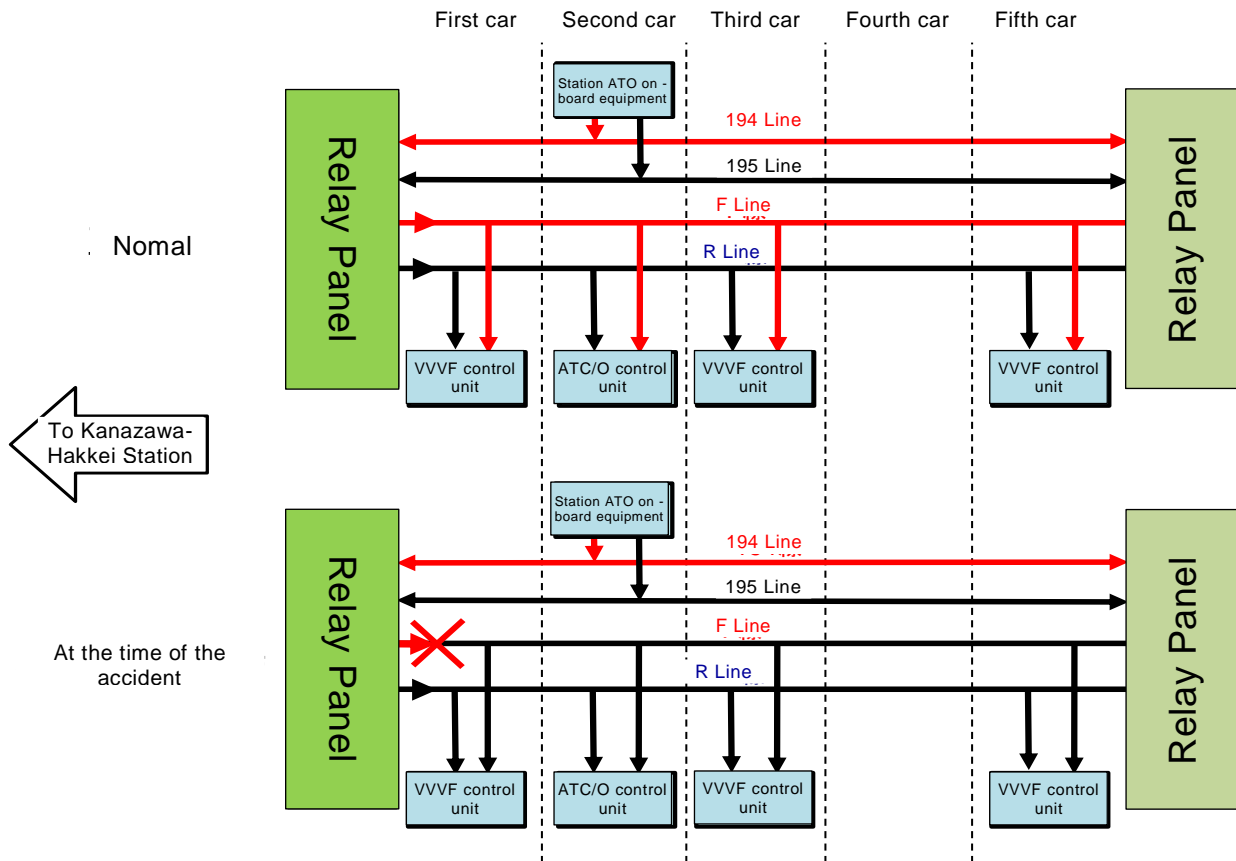


Figure 3 : Schematic diagram of vehicle related wiring (red line indicates pressurization when traveling direction is down)

- (3) While the outbound train (No. 1905) was running (between Sachiura Station and Sangyoshinko Center Station), the voltage on Line F changed from pressurized to non - pressurized. The next inbound train (No. 1910 (the inbound train just before the accident occurred)) was running in the correct direction because voltage was applied to the open R - line.

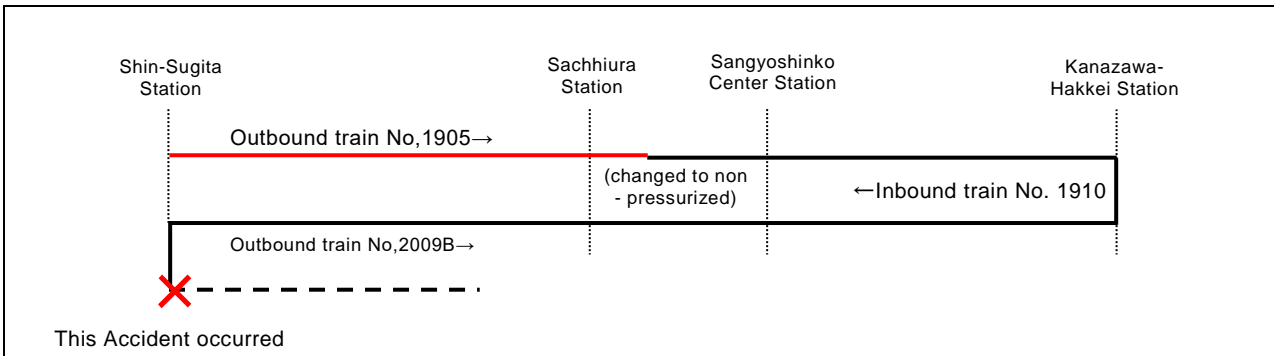


Figure 4 Pressing Condition of F Line (Red Line Indicates Pressing of F Line)

3. VVVF Control unit Specifications

According to the specifications of the VVVF control unit, the relationship between the conditions of the F and R lines and the direction of travel is shown in the table below. The VVVF control unit is designed to maintain the previous direction of travel when both F and R lines are not pressurized.

Table 2. Relationship between F - and R-line Conditions and Traveling Direction Based on VVVF Control unit Specifications

F line	R line	Direction of travel, etc.
Without pressure	With pressure	Maintain the previous condition
With pressure	Without pressure	Shin-Sugita Station → Kanazawa-hakkei Station (outbound direction)
Without pressure	With pressure	Kanazawa-hakkei Station → Shin-Sugita Station (inbound direction)
With pressure	With pressure	protection operation

4. Operation Records of Station ATO On-board Equipment and Ground Equipment

In the investigation so far, the records of the operation of the station ATO on-board equipment and the station ATO ground equipment have not been found to show any abnormality of the equipment related to the occurrence of this accident.

* This information is published on the JTSB website.

<http://www.mlit.go.jp/jtsb/iken-teikyo/seasideline20190614.pdf>

9 Summaries of major railway accident and serious incident investigation reports (case studies)

A train ran on a track where a bridge pier sank and tilted, causing a large deformation, and derailed

Nankai Electric Railway Company, Nankai line, between Tarui station and Ozaki station, Train derailment

Summary: On October 22, 2017, While the train was operated in coasting at about 70 km/h on Onosatogawa bridge, the driver of the train noticed that the track about 50 m ahead had sagged, and applied the brake immediately but the train passed the sagged track and stopped after running for about 250 m. It was found in the investigation implemented after the occurrence of the accident, that the 2nd axle in the rear bogie of the 3rd vehicle of the train derailed to right on Onosatogawa bridge, and restored after that. In addition, the pier No.5 of the down track of Onosatogawa bridge had been subsided and tilted, and the track had been sagged and wound. There were about 250 passengers and 2 train crews, i.e., the driver and the conductor, onboard the train, among them 5 passengers were injured.

Findings

The damages had started from the part of the soldier beams and lagging structure using the log piles and the wooden plates, where it was fragile compared to the steel sheet piles, as the riverbed had been subsided and the foot protection had been exposed due to the erosion by the flowing water after 2008.

The side surface of the footing had been exposed by the deterioration of the washed away cobble stones, etc., between 2012 and 2014.

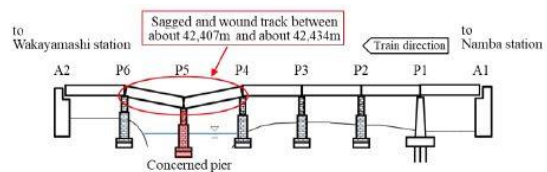


Insufficient evaluation of the deformation of the foot protection and necessary measures were not taken

It is somewhat likely that the water flow in backward of the steel sheet piles became to complex and generated exfoliation flow and eddy current, and the ground in around the pier had been suffered the actions mainly composed of the drawing out effects.



It is required to judge the healthiness by comprehending the unusual status of the scour protection works such as the status of the riverbed and the foot protection, etc., from the viewpoints to maintain the function of the scour protection works against the swollen water, for the piers which the significant reduction of the natural frequency was not found at that time.



Probable causes : It is highly probable that the accident occurred as the 2nd axle in the rear bogie of the 3rd vehicle had derailed to right because the train was running on the track on the bridge significantly deformed by the subsided and tilted pier, after that, the derailed axle restored in the level crossing while passed as being derailed.

It is probable that the pier had subsided and tilted because the ground in around the pier was scoured in wide area by the swollen river water at the time of the occurrence of the accident, while the function to protect the piers from scouring had already been deteriorated before the occurrence of the accident, such as the subsided riverbed in around the pier caused by the concentration of the river water due to the change of the water route, damages of the foot protection as the scour protection work, etc.

It is probable that the deterioration of the function to protect scouring was related with that the measures such as the repair, reinforcement, etc., of the foot protection were not implemented, because the evaluation for the unusual status were not implemented sufficiently, even though the unusual status of the foot protection of the pier was recognized in the inspection of the piers.

Please refer to the accident investigation report for the detailed investigation results. (Published on January 31, 2019)

http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-2e.pdf

Based on the results of this accident investigation, JTSB has stated our opinions to the Minister of Land, Infrastructure, Transport and Tourism in order to contribute to the prevention of recurrence of similar accidents.

For details, please refer to “Chapter 1: Summary of recommendations and opinions issued in 2019 (page 25)”.

Train derailed due to the lifting of the bogie side beam of the freight car by the ice and snow on the track

Japan Freight Railway Company, In the premises of Tomamu station, Sekisho Line, Train derailment

Summary: At about 03:55, February 24, 2018, while the snowplow motor car of Hokkaido Railway Company, dispatched for the snow removal works, arrived at the down line main track in Tomamu station of Sekisho Line, the staff for track maintenance boarded on the snowplow motor car received the communication that the turnout in the station could not be switched from the train dispatcher. Therefore, the staff for track maintenance checked the turnout and found the traces that the train had derailed and had been running. The train had passed Tomamu station at a velocity of about 49 km/h, at about 02:09, February 24, 2018. In the investigation implemented after that, the restored trace of the train was found in around the turnout in the station. The driver was boarded on the train, but he was not injured.

Findings

It is highly probable that there was a large amount of snow and snow on the day before the accident at the accident site. In addition, it is considered somewhat likely that the snow on the track melted due to the sunshine was frozen because the temperature remained below freezing.



The area concerned had not been cleared of snow 6 days before the accident occurred.

It is considered somewhat likely that the accumulated snow and ice pushed the bogie upward, and the wheel flange was lifted by the hard snow and ice, causing the derailment.

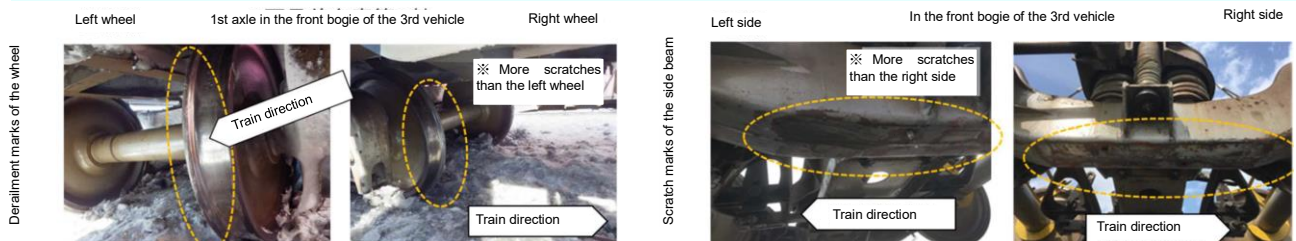


It is considered necessary to remove snow from railway tracks at a higher frequency in consideration of the conditions of snowfall, snow accumulation, and accumulated snow on the site, and to judge the appropriate timing, scope and method.

When removing snow, it is especially necessary to pay attention to the ice and snow formed higher than the rail surface on the outside of the track gauge in the railroad section where freight trains run, considering the side beam position of freight cars.



Since it is necessary for the driver to take corrective action immediately after detecting a derailment, it is desirable to develop and popularize a device that can notify the driver of the occurrence of a train derailment.



Probable cause: It is probable that the accident occurred as the flange of the right wheel of the 1st axle in the front bogie of the 3rd vehicle climbed over the right rail and derailed at the place where large amount of ice and snow were stacked on the track, while the train was passing the straight track section in the premises of the station, and after that the train restored in the turnout while passing in the status as derailed. It is somewhat likely that the 1st axle in the front bogie of the 3rd vehicle of the train derailed because the side beam of the front bogie of the 3rd vehicle was pushed up over the ice and snow stacked on the railway track, at the same time, the wheel flange was raised up by the hard ice and snow which had existed in around the flangeway. It is somewhat likely that large amount of ice and snow had been stacked on the railway track in around the place where the derailment accident occurred, related with a large amount of snow fall and stacked snow in the previous day of the concerned accident, and that the snow removal works had not been implemented for 6 days before the occurrence of the accident.

Please refer to the accident investigation report for the detailed investigation results. (Published on April 25, 2019)
<http://www.mlit.go.jp/jtsb/eng-rail-report/English/RA2019-3-1e.pdf>

The traffic light collapsed, obstructing the tracks and affecting the safety of train operation.
Hokkaido Railway Company, Chitose Line, in the premises of Shin-Sapporo station,
Serious Incident (Facilities damage)

Summary: On November 9, 2018, the driver of the train composed of 3 vehicles checked the indication of the caution signal in the No.2 home signal of Shin-Sapporo station in order to stop at the station, after that, he found that the column of the No.1 starting signal, planted in the opposite track side, had collapsed and hindered the up and down tracks, from about 200 m before the No.1 starting signal. Therefore, the driver applied the normal brake and stopped the concerned train, then, he issued the train protection radio and reported to the train dispatcher. No one was injured in the incident.

Findings

The traffic signal pole of this traffic signal is fixed to the existing concrete body using the metal expansion anchor, and this method is called "post construction anchor" construction.

As all eight of the metal expansion anchors to which the traffic signal pole was fixed were removed from the concrete body, and the cone remained in the perforation of the concrete body, it is probable that all eight anchors had the same construction conditions.

Judging from the condition of the cone inside the perforation of the concrete body, it is highly probable that the worker cast the anchor of the metal expansion anchor in the condition that chips, etc. remained at the bottom because the cleaning inside the perforation was insufficient.

It is presumed that the cone sank inside the chip without receiving the reaction force at the time of anchor injection, and as a result, the anchor expansion part was not expanded.

It is somewhat likely that the reason why the cleaning of the inside of the perforation was insufficient was that the knowledge and experience of the worker at the time of the construction was insufficient.

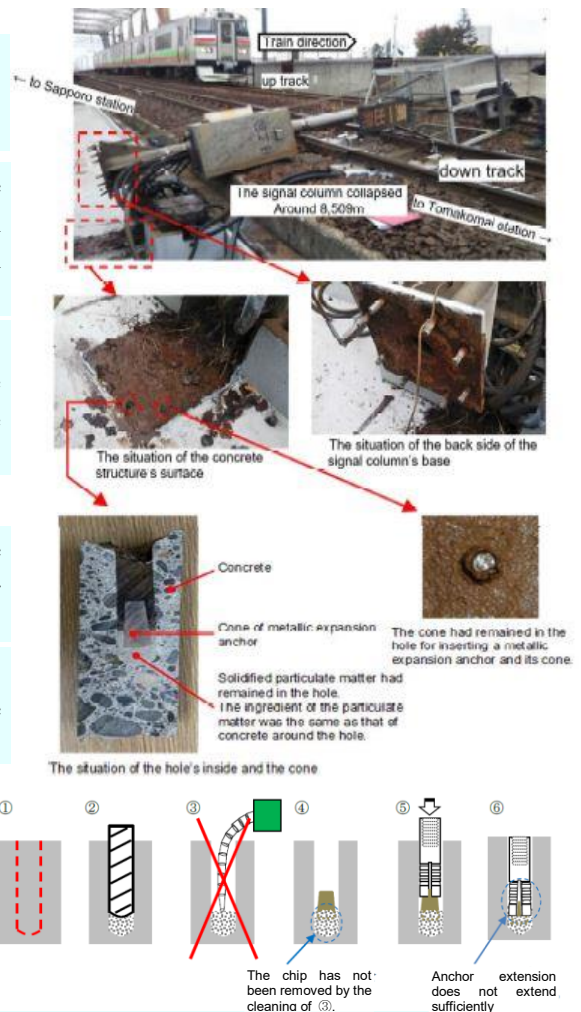
Since it is difficult to find out any problems after construction, it is desirable to carry out the construction surely after satisfying the conditions described in the guide, etc., and it is desirable that the construction is carried out by the worker with the work qualification, and that the record of the construction content, etc. is left.

It is desirable to add reinforcement to areas where there is no record to confirm the contents of construction work, etc., and where there is a high risk of contact with a train in case of collapse.

Probable Causes: It is probable that the concerned serious incident had occurred because there was the inferior construction work as the insufficient cleaning in the hole after drilled into concrete body in the construction work of the metal extension anchor based on the "after constructing anchor method", in the planting work of the down line No.1 starting signal column.

It is probable that the metal extension anchor was in the status as insufficient tolerance against tensile force because the cone of the metal extension anchor had not expanded the swelling part of the anchor due to the inferior construction work when the signal column had been planted.

Therefore, it is somewhat likely that the signal column had collapsed because the external force exceeded the tolerance of the metal extension anchor fixing the signal column of the home signal, as the anchor of the metal extension anchor was loosening gradually, caused by vibration due to running trains on the viaduct in addition to the effects of the external force such as windstorm, earthquake, etc., in the period of about 38 years from planting, in the status that the metal extension anchor supporting the signal column had been insufficient endurance against tensile force, in cooperation with the wind pressure of about 20 m/s instantaneous wind speed on the collapsed day.



Please refer to the serious incident investigation report for the detailed investigation results. (Published on December 19, 2019)
<http://www.mlit.go.jp/jtsb/eng-rail-report/English/RI2019-3-1e.pdf>

A bicycle with a child entered a class 4 level crossing and collided with a train.

West Japan Railway Company, between Michinoe station and Managura station, Fukuen Line,
Level crossing accident

Summary: On September 27, 2018, train was running between Michinoe station and Managura station at a velocity of about 72 km/h, the driver of the train noticed a bicycle entering Iwasakinoichi level crossing, class 4 level crossing, then applied an emergency brake immediately, but the train collided with the bicycle.

The passerby, an elementary schoolchild, riding the bicycle was dead in the accident.

Findings

About one year before the accident, a level crossing accident occurred at the same level crossing, in which the driver of a motorized bicycle died.



After the previous accident, the level crossing warning signs were replaced, color plates were attached to the level crossing warning fence, and road markings were carried out. Therefore, it is probable that the level crossing had been maintained so that passers by could easily notice the existence of the level crossing.

It is considered probable that through the execution of the weed - proof soil, it was possible to see 240m or more ahead from the dot - line display on the side of the passers by approach, and the distance of the down train was secured.

In the traffic safety education at the elementary school where the passers - by went, it is somewhat likely that there were some children who did not know the existence of the level crossing, there was no instruction that there was a class 4 level crossing in the school district and it was necessary to cross carefully.

It is somewhat likely that, from the child's point of view, it was not possible to easily recognize that "the warning sound did not sound and the crossing gate did not descend, but the train might be dangerous if it approaches and crosses over." Therefore, it is considered probable that sufficient measures were not taken in terms of facilities in consideration of the child's point of view and in terms of education concerning the existence of the class 4 level crossing.



Expected Measures to Prevent the Recurrence:

- Necessity of the traffic safety education on the class 4 level crossing based on the viewpoint of the children.
- Necessity of the measures in the region where the population is increasing.

Probable Causes: It is certain that the accident occurred as the train collided with a bicycle because the passerby riding bicycle entered Iwasakinoichi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching. It could not be determined why the passerby riding bicycle entered the level crossing in the situation that the train was approaching, because the passerby was dead in the accident, although it is somewhat likely that the passerby did not recognize the approaching train.

Please refer to the accident investigation report for the detailed investigation results. (Published on July 25, 2019)
<http://www.mlit.go.jp/jtsb/eng-rail-report/English/RA2019-5-1e.pdf>

Cracks in the bogie frame expanded, continued operation despite abnormal noise and odor.
West Japan Railway Company, In the premises of Nagoya station,
Tokaido Shinkansen, Serious Incident (Vehicle damage)

Summary: On December 11, 2017, the train crews composed of 16 vehicles had been noticed unusual smell in the cabin and unusual noise from underfloor of the vehicle, from just after departed from Hakata station, but the train was operated until to Shin-Osaka station, and the subsequent train operation was handed over to Central Japan Railway Company.

When the train arrived at Nagoya station, the vehicle maintenance staffs, dispatched to Nagoya station obeying the instruction of the operation dispatcher of Central Japan Railway Company, noticed unusual sound from the 4th vehicle, and implemented the underfloor inspection in Nagoya station. As the results of the inspection, the leaked oil was found in around the gear box in the front bogie of the 4th vehicle, then the further operation of the train was cancelled. After that, when the works to move the concerned vehicle to the train depot, i.e., Nagoya Rolling Stock Depot, was implemented, the crack was found in the side beam in left side of the bogie frame of the front bogie in the 4th vehicle.

There were about 1,000 passengers, 4 train crews, i.e., the driver and 3 conductors, and 3 pursers engaging in the cabin sales, etc., boarded on the train when the train had arrived at Nagoya station, but there was no injured person.

Findings

It is highly probable that the crack, the broken surface in around the slot, was not expanded in a short period.

As the bottom surface of the side beam swelled during the manufacturing process, the assembly worker did the mating in order to remove the shake, but the worker did not know that "the grinder finishing of the bottom surface of the side beam should not be done" as described in the work order.

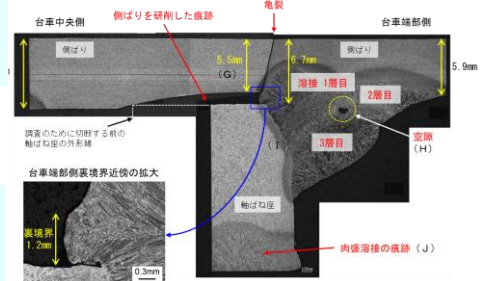


It is considered somewhat likely that the crack was not detected because the crack was not opened because the inspection was carried out in a non-loaded condition with the bogie frame as a single unit during the general inspection and no abnormality was found in the dimensional inspection.



No measures were taken

It is probable that on the previous day, the crack had developed to the extent that it affected the rigidity of the side beam, and that the crack had further expanded to the extent that the side beam was deformed during the operation on the day and affected the bogie components.



Probable Causes: It is highly probable that the concerned serious incident occurred because the gear type flexible shaft coupling displaced exceeding the allowable range and damaged due to deformation of the bogie frame caused by the crack which had generated in the side beam of the bogie frame of the vehicle and had expanded by fatigue.

The crack had generated in the side beam of the bogie frame of the vehicle because it is somewhat likely that the split had generated in around the back boundary of the slot welded part where the crack had originated when the welding work had implemented. In addition, it is highly probable that the crack had generated related with the followings.

- (1) The residual stress was generated in around the slot welded part due to the implementation of the overlay welding on the bottom surface of the axle spring seat after annealed.
- (2) The thickness of the bottom plate of the side beam had become thinner than the designed standard value, because the bottom surface of the side beam had been grinded excessively when attached the axle spring seat to the bottom plate of the side beam.

In addition, it is highly probable that the crack had expanded in the period shorter than the vehicle life, i.e., the usable period of the bogie, because the expanding speed of the crack became faster as the thickness of the bottom plate of the side beam became thinner due to the excessive grinding works implemented in the bottom plate of the side beam.

Here, it is highly probable that the bottom plate of the side beam was grinded excessively related with that the problem, that the machining work was required to attach the axle spring seat due to the swell in the bottom surface of the side beam generated in the manufacturing process of the bogie frame, was dealt without studying the essential causes and counter measures, and the manufacturing works had implemented without well understandings on the instructions for the work related to the strength of the bogie frame.

Factors to Continue Train Operation as Being Noticed Abnormal Sound and Nasty Smell, etc.:

It is probable that the staffs concerned in the JR West could not concluded to judge that there was the hindrance in the train operation although they had noticed the abnormal sound, the nasty smell, etc., related with the followings.

- (1) The dispatcher was in the situation that the definite information to understand the seriousness of the abnormal situation were not obtained, as the generation of the abnormal sound, the nasty smell, etc., were discontinuously, and when the dispatcher asked "Is there any hindrance in the train operation?", the vehicle maintenance staff had replied as "I think it was not in such situation".
- (2) The vehicle maintenance staff understood that the dispatcher had been arranging the implementation of the underfloor inspection of the vehicle, but the dispatcher received some reports from the vehicle maintenance staff and thought that the vehicle maintenance staff would implement the measure to open motor circuit instead of the underfloor inspection against the abnormal situation in the vehicles. Thus, the difference in the recognition on the necessity of the underfloor inspection of the vehicle between the dispatcher and the vehicle maintenance staff was brought out, and the differences did not clear and continued after that.
- (3) The dispatcher considered that the vehicle maintenance staff would report that there was the hindrance in the train operation if it was dangerous actually, because the vehicle maintenance staff was the professional engineer on the vehicles. On the contrary, the vehicle maintenance staff understood that the decision to implement underfloor inspection had been entrusted to the dispatcher. Therefore, there was a side of the characters to depend on each other between the dispatcher and the vehicle maintenance staff, to judge the continuation of the train operation.

Please refer to the serious incident investigation report for the detailed investigation results. (Published on March 28, 2019)

<http://www.mlit.go.jp/jtsb/eng-rail-report/English/RI2019-1-1e.pdf>

On June 28, 2018, based on the results of the fact - finding investigation and analysis of the bogie cracks, the JTSB submitted a interim report to the Minister of Land, Infrastructure, Transport and Tourism and stated its opinions.

Columns

Analysis of Causes of Train Derailment Accident Due to Gauge Widening

Railway accident investigator

The causes of train derailment accidents are diverse. One of them is the "derailment on the track due to an increase in the gauge widening." This is a phenomenon in which the gauge widening, which is the distance between the left and right rails, has abnormally increased from the basic dimension (for example, 1067 mm for narrow rails, which are often used on domestic conventional lines), causing the wheels to fall and derail within the gauge widening.

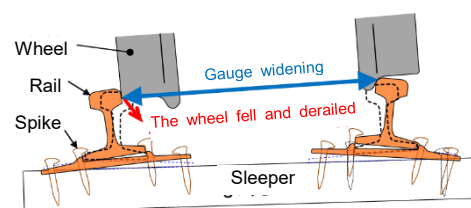


Image of a derailment caused by gauge widening

The Japan Transport Safety Board investigates the damage and traces of tracks and vehicles at the accident site in order to identify the cause of a train derailment accident. The main train derailment on a track are as follows :

- In many cases, it occurs on a curve rather than a straight line. This is because a lateral pressure (a force that a wheel pushes a rail sideways) is generated when a vehicle travels on a curve, and a slack (a width of a rail is made larger than a predetermined size in order to smoothly travel on a curve) is set.
- In many cases, the wheels fall within the inner rail (rail inside the curve) because the wheels on the front axle of the bogie travel along the outer rail (rail outside the curve) within the curve.
- It occurs even when the rail is wet due to rain, etc. flange climb derailment in which a wheel rides on a rail while rotating does not occur almost when the friction coefficient between the wheel and the rail is low due to rain, etc.

- The track gauge is enlarged for some reason. In the vicinity where the wheel fell into the track and became the starting point of the derailment, there are damage and traces related to the track gauge enlargement, such as a large track gauge displacement (difference between the dimension of the track gauge and the design value) and a floating dog spike.

There are various reasons for the expansion of the gauge widening. However, the gauge widening, which was originally wide, has expanded further due to the lateral pressure caused by the running of vehicles, resulting in a large expansion of the gauge widening. The main reasons are as follows :

- Because of corrosion of wooden sleepers and loosening of rail fastening devices such as dog nails, the ability to fasten the rail and hold the track gauge has become weak. These are not a major problem on their own, but are more significant as they continue.
- A large gauge displacement exceeding the standard value was found in the periodic inspection, but the track maintenance was not carried out.
- The standard value of track gage displacement is not appropriate, and necessary track maintenance is not carried out.
- Slack is larger than the required amount, and there is less room for derailment on the track.

In order to show preventive measures for each accident, it is important to analyze and identify the cause of the increase in the gauge widening at the time of accident investigation.

Train derailment accidents due to an increase in the gauge widening are common among local railways. In many cases, local railways are difficult to secure sufficient profits with a small number of employees. On the other hand, in order to operate railways safely, it is essential to secure facilities in various fields such as civil engineering, rolling stock, and electricity, as well as the level of technology to maintain and manage them. As these are almost the same as those of major railway companies, economic and technical support is required.

In June 2018, the Japan Transport Safety Board stated its opinion to the Minister of Land, Infrastructure, Transport and Tourism about the derailment accident caused by the gauge widening.

For example, it is difficult to manage wooden sleepers because they often rely on visual inspection. Replacing wooden sleepers with concrete sleepers with excellent durability and maintainability requires a large amount of money. Therefore, it takes time to take measures to prevent track gauge expansion. However, it is important to advance as much as possible what can be done using public assistance systems and technical support systems to prevent similar accidents.