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

<table>
<tr><th>Category</th><th>Train collision*2)</th><th>Train derailment*2)</th><th>Train fire*2)</th><th>Level crossing accident</th><th>Accident against road traffic</th><th>Other accidents with casualties</th><th>Heavy property loss without casualties</th></tr>
<tr><td rowspan="2">Railway (including tramway operated as equivalent to railway)
[Notice 1-3]</td><td colspan="3" rowspan="2">All accidents*1)
(These refer to train accidents and do not include vehicle accidents on railways.
[Ordinance 1-1]</td><td colspan="3">・ 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]</td><td></td></tr>
<tr><td colspan="4">Accidents that are particularly rare and exceptional
[Ordinance 1-3]</td></tr>
<tr><td>Dedicated railway</td><td colspan="7">Accidents that are particularly rare and exceptional [Ordinance 1-4]</td></tr>
<tr><td rowspan="2">Tramway [Ordinance 1-5]</td><td colspan="6">Accidents involving the death of a passenger, crewmember, etc., accidents involving five or more casualties with at least one of the casualties dead, and fatal accidents that occur at level crossings with no automatic barrier machines.
[Notice 1-1]</td><td></td></tr>
<tr><td colspan="7">Accidents that are particularly rare and exceptional [Notice 1-2]</td></tr>
</table>

*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 Tramway 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 in preceding items.

〇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 of 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.]

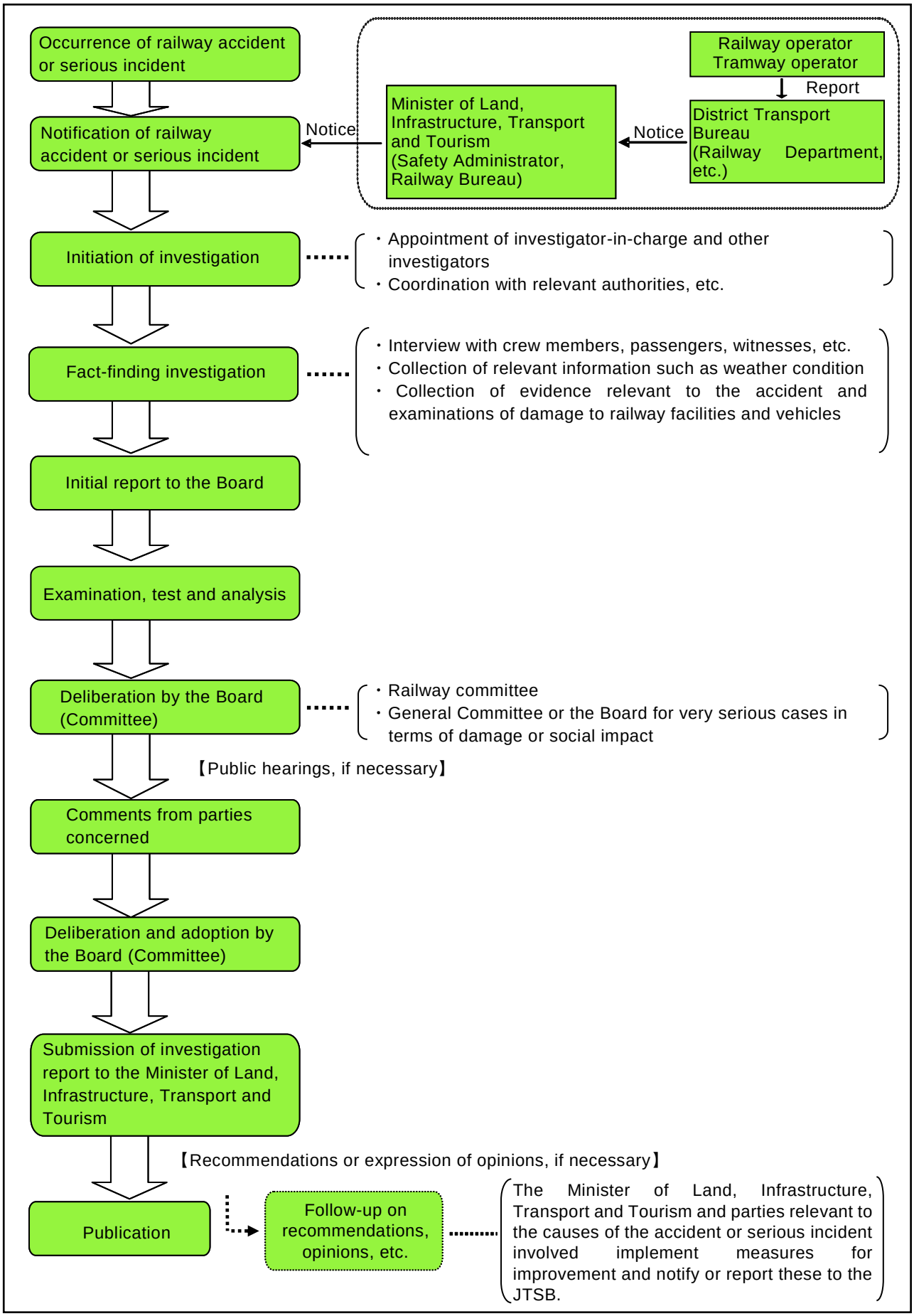
5 From among the situations occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways mutatis mutandis as specified in paragraph 1 of Article 3 of the Ordinance on Tramway Operations, the situations equivalent to those specified 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

<table>
<tr><td>Category</td><td>・Incorrect management of safety block (Railway)
・Incorrect management of safety block (Tramway)</td><td>・Incorrect indication of signal (Railway)
・Violating red signal</td><td>Dangerous damage in facilities</td><td>Dangerous trouble in vehicle</td><td>・Main track overrun
・Violating closure section for construction (Railway)
・Vehicle derailment (Railway)
・Heavy leakage of dangerous object
・Others</td></tr>
<tr><td rowspan="2">Railway (including tramway operated as equivalent to railway) [Notice 2-5]</td><td colspan="2">Certain conditions such as the presence of another train [Ordinances 2-1, 2-2, and 2-3]</td><td colspan="2">Risk of collision, derailment or fire [Ordinances 2-4 and 2-5]</td><td></td></tr>
<tr><td colspan="5">Incidents that are particularly rare and exceptional [Ordinance 2-6]</td></tr>
<tr><td rowspan="2">Tramway [Ordinance 2-7]</td><td>Certain conditions such as the presence of a vehicle [Notice 2-1]</td><td></td><td colspan="2">Risk of collision, derailment or fire [Notices 2-2 and 2-3]</td><td></td></tr>
<tr><td colspan="5">Incidents that are particularly rare and exceptional [Notice 2-4]</td></tr>
</table>

(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/incident investigation



3 Statistics for the investigations of railway accidents and serious incidents

The JTSB carried out investigations of railway accidents and serious incidents in 2016 as follows:

13 accident investigations had been carried over from 2015, and 23 accident investigations were newly launched in 2016. 17 investigation reports were published in 2016, and thereby 19 accident investigations were carried over to 2017.

Two serious incident investigations had been carried over from 2015, and two serious incident investigations were newly launched in 2016. Two investigation reports were published in 2016, and thereby two serious incident investigations were carried over to 2017.

Investigations of railway accidents and serious incidents in 2016

(Cases)

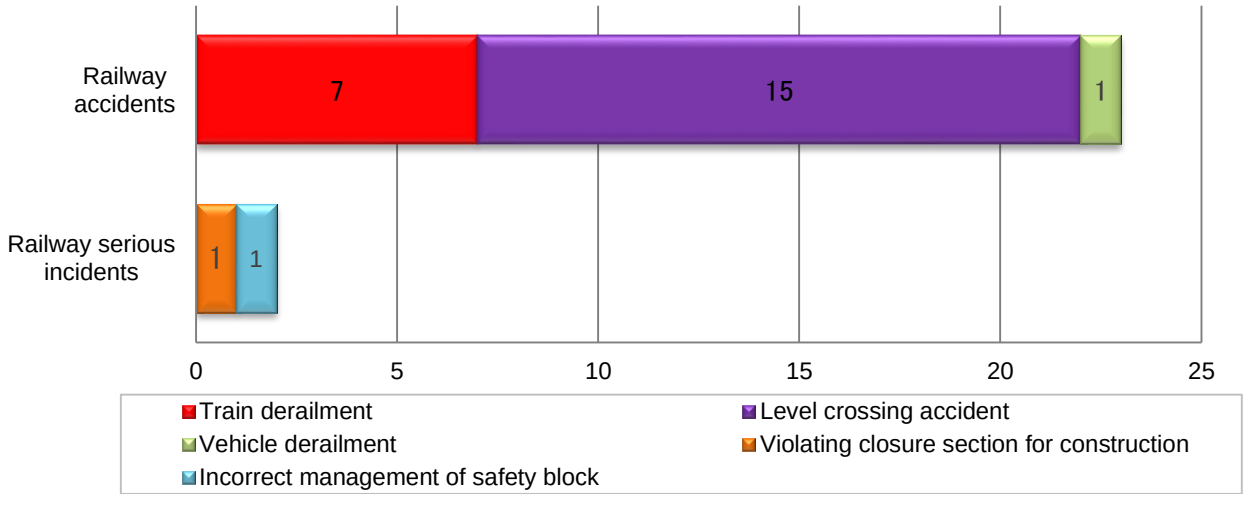
Category	Carried over from 2015	Launched in 2016	Total	Published investigation reports	(Recommendations)	(Opinions)	Carried over to 2017	(Interim report)
Railway accident	13	23	36	17	(0)	(0)	19	(0)
Railway serious incident	2	2	4	2	(0)	(0)	2	(0)

4 Statistics of investigations launched in 2016

The railway accidents and serious incidents that were newly investigated in 2016 consisted of 23 railway accidents, up by 10 from 13 for the previous year, and two railway serious incidents, down by one from three for the previous year.

The breakdown by type of accidents and serious incidents is as follows: The railway accidents included seven train derailments, 15 level crossing accidents, and one vehicle derailment. The railway serious incidents included one violating closure section for construction, and one incorrect management of safety block.

Number of investigated railway accidents and serious incidents by type in 2016



In the 23 railway accidents, the number of casualties was 16, consisting of 15 death and one injured person.

The number of casualties (in railway accidents)

(Persons)

2016							
Category	Dead			Injured			Total
	Crew	Passenger	Others	Crew	Passenger	Others	
Casualties	0	0	15	1	0	0	16
Total	15			1			

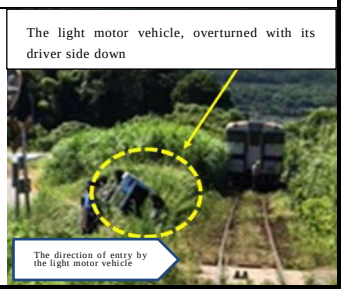
5 Summaries of railway accidents and serious incidents that occurred in 2016

The railway accidents and railway serious incidents that occurred in 2016 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)
	March 3, 2016 Level crossing accident	Nagano Electric Railway Company	Gosyokubo Crossing (class four level crossing without automatic barrier machine nor road warning device) Between Zenkojishita Station and Hongo Station, Nagano Line (Nagano Prefecture)
	Summary	While the train was running between Zenkojishita Station and Hongo Station, the train driver noticed a pedestrian entering the Gosyokubo Crossing, class four level crossing, and applied the emergency brake immediately, but the train collided with the pedestrian. The pedestrian died as a result of the accident.	
2	Date and accident type	Railway operator	Line section (location)
	March 20, 2016 Level crossing accident	Ryutetsu Co., Ltd.	No.10 Crossing (class four level crossing without automatic barrier machine nor road warning device) between Koya Station and Koganejoshi Station, Nagareyama Line (Chiba Prefecture)
	Summary	While travelling in the above section, the driver noticed the pedestrian in the No.10 Crossing, class four level crossing, and applied an emergency brake, but the train collided with the pedestrian. The pedestrian died as a result of the accident.	
3	Date and accident type	Railway operator	Line section (location)
	April 14, 2006 Train derailment accident	Kyushu Railway Company	Between Kumamoto Station and Kumamoto Railway Depot, Kyushu Shinkansen (Kumamoto Prefecture)
	Summary	The train driver felt a violent jolt while the train was running, applied the emergency break and brought the train to a halt. On subsequently checking, cars 1-6 had become derailed.	
4	Date and accident type	Railway operator	Line section (location)
	April 15, 2016 Train derailment accident	Nagaragawa Railway	Between Hanno Station and Suhara Station, Etsumi-Nan Line (Gifu Prefecture)
	Summary	The train driver felt an abnormal sound accompanied by a violent jolt while running in the Suhara Tunnel with coasting, and therefore immediately applied the emergency brake to bring the train to a halt. When the driver alighted and checked, both axles of the rear bogie had become derailed to the left. The driver was injured as a result of this accident.	

5	Date and accident type	Railway operator	Line section (location)
	April 16, 2016 Train derailment accident	Kyushu Railway Company	In the premises of Akamizu Station, Hohi Line (Kumamoto Prefecture)
	Summary	The train departed Akamizu Station at 1:24. Just after the train passed through the turnout for Oita Station in Akamizu Station, the train driver felt violent tremor as if the train were having upward. At the same time, he noticed the sound of the earthquake early warning information from the cellular phone, and applied an emergency brake to stop the train. It was found that the all axles in the front bogie of the first vehicle derailed to the right, and the all axles in the front bogie of the second vehicle derailed to the left and the all axles in the rear bogie of the second vehicle derailed to the right. There was the driver onboard the train, but he was not injured. As the train was not in service operation, there was no passenger onboard. Here, at about 1:25, of the same day, the earthquake, of which magnitude was 7.3 and epicenter was Kumamoto district in Kumamoto Prefecture, in the series of earthquake, named "Heisei 28th year, 2016, Kumamoto Earthquake", had occurred, and the maximum seismic intensity of 7 was observed in Mashiki town, Kumamoto Prefecture.	
6	Date and accident type	Railway operator	Line section (location)
	May 18, 2016 Train derailment accident	Tobu Railway Co., Ltd.	Between Naka-Itabashi Station and Oyama Station, Tobu Tojo Main Line (Tokyo)
	Summary	The train driver felt that the train was slowly accelerating after leaving Naka-Itabashi Station, and at the same time the emergency alarm button inside the train was operated, and so the driver immediately stopped the train. On subsequently alighting and checking, both axles of the 2nd bogie of the 5th car from the front had become derailed.	
7	Date and accident type	Railway operator	Line section (location)
	June 2, 2016 Vehicle derailment accident	Nagasaki Electric Tramway Co., Ltd.	Between Suwa Jinja-Mae Tram Stop and Kokaido-Mae Tram Stop, Sakuramachi Branch Line (Nagasaki Prefecture)
	Summary	The tram driver stopped temporarily just before the Kokaido-mae Intersection, then set off again after checking the indication of the departure signal on the track signals and the points opening direction. Near the middle of the intersection, when the tram accelerated to about 6km/h, the driver noticed an abnormal sound accompanied by irregularity in the direction of travel, and so applied the emergency break to stop the tram. On alighting and checking, both axles of the rear bogie had become derailed to the left in the direction of travel. 	
8	Date and accident type	Railway operator	Line section (location)
	June 10, 2016 Level crossing accident	Tarumi Railway Company	Motosu-Minami Crossing (class three level crossing without automatic barrier machine, with road warning device) between Itonuki Station and Motosu Station, Tarumi Line (Gifu Prefecture)
	Summary	While travelling in the above section, the train driver noticed the light motor vehicle entering the Motosu-Minami Crossing, class three level crossing. He applied the emergency brake immediately, but the train collided with the light motor vehicle. The driver of the light motor vehicle died as a result of the accident.	
9	Date and accident type	Railway operator	Line section (location)
	June 17, 2016 Level crossing accident	Chichibu Railway Co., Ltd.	Ishihara No.12 Crossing (class four level crossing without automatic barrier machine nor road warning device) inside the premises of Hirosegawara Station, Chichibu Main Line (Saitama Prefecture)
	Summary	While the train was passing through Hirosegawara Station, the train driver noticed a pedestrian on the Ishihara No.12 Crossing (class four level crossing) and sounded the emergency whistle and applied the emergency brake, but the train collided with the pedestrian. The pedestrian died as a result of this accident.	

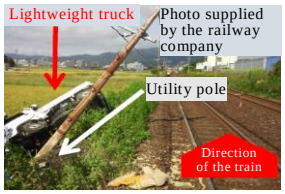
10	Date and accident type	Railway operator	Line section (location)
	June 23, 2016 Train derailment accident	West Japan Railway Company	Between Seno Station and Hachihommatsu Station, Sanyo Line (Hiroshima Prefecture)
	Summary	Noticing that earth sediments had spilled onto the tracks, the train driver applied the emergency brake but could not stop the train in time before entering the area of the sediments. On alighting and checking, the driver confirmed that the train had ridden over the sediments, and that both axles of the front bogie on the front car had become derailed.	
11	Date and accident type	Railway operator	Line section (location)
	July 7, 2016 Level crossing accident	Shikoku Railway Company	Miyaji Crossing (class four level crossing without automatic barrier machine nor road warning device) between Iyo-Yokota Station and Torinoki Station, Yosan Line (Aichi Prefecture)
	Summary	While traveling in the above section, the train driver noticed a pedestrian on the Miyaji Crossing (class four level crossing) and applied the emergency brake, but the train collided with the pedestrian. The pedestrian died as a result of the accident.	
12	Date and accident type	Railway operator	Line section (location)
	July 14, 2016 Train derailment accident	West Japan Railway Company	Between Nishi Miyoshi Station and Shiwachi Station, Geibi Line (Hiroshima Prefecture)
	Summary	While traveling at a speed of about 70km/h, the train driver noticed that earth sediments had spilled onto the track. He applied the emergency brake but could not stop the train in time before entering the area of the sediments. On alighting and checking, the driver confirmed that the train had ridden over the sediments, and that multiple axles of the front and rear bogies on the front car had become derailed.	
13	Date and accident type	Railway operator	Line section (location)
	July 29, 2016 Level crossing accident	East Japan Railway Company	Ainoya-Momogashira Crossing (class four level crossing without automatic barrier machine nor road warning device) between Kunisada Station and Iwajuku Station, Ryomo Line (Gunma Prefecture)
	Summary	While travelling in the above section, the train driver noticed a person riding a bicycle entering into the Ainoya-Momogashira Crossing, class four level crossing. He applied an emergency brake immediately, but the train collided with the bicycle. The cyclist died as a result of the accident.	
14	Date and accident type	Railway operator	Line section (location)
	August 22, 2016 Level crossing accident	Kyushu Railway Company	Dai-ni Motoyashiki Crossing (class four level crossing without automatic barrier machine nor road warning device) between Ei Station and Irino Station, Ibusuki Makurazaki Line (Kagoshima Prefecture)
	Summary	While traveling in the above section at a speed of about 44km/h, the train driver noticed a light motor vehicle entering the Dai-ni Motoyashiki Crossing (class four level crossing). He therefore applied the emergency brake, but the train collided with the light motor vehicle. The driver of the light motor vehicle died and a passenger in the vehicle was injured as a result of this accident.	
15	Date and accident type	Railway operator	Line section (location)
	September 6, 2016 Level crossing accident	Tsugaru Railway Company	Level crossing located 6.1km from the origin at Goshogawara (class four level crossing without automatic barrier machine nor road warning device) between Tsugaru-Iizume Station and Bishamon Station, Tsugaru Railway Line (Aomori Prefecture)

	Summary	While traveling in the above section, the train driver noticed that a light motor vehicle had entered the level crossing located 6.1km from the origin at Goshogawara (class four level crossing). He immediately applied the emergency brake, but the train collided with the light motor vehicle. The driver of the light motor vehicle died as a result of this accident.  The level crossing (class four)

16	Date and accident type	Railway operator	Line section (location)
	September 12, 2016 Level crossing accident	Kanto Railway Co., Ltd.	Inoue 1st Crossing (class four level crossing without automatic barrier machine nor road warning device) between Kurogo Station and Otago Station, Joso Line (Ibaraki Prefecture)
	Summary	While traveling in the above section, the train driver noticed that a person riding a bicycle had entered the Inoue 1st Crossing (class four level crossing), immediately sounded the whistle and applied the emergency brake, but the train collided with the cyclist. The cyclist died as a result of this accident.	

17	Date and accident type	Railway operator	Line section (location)
	September 27, 2016 Level crossing accident	East Japan Railway Company	Nakahara Crossing (class four level crossing without automatic barrier machine nor road warning device) between Minamihara Station and Chitose Station, Uchibo Line (Chiba Prefecture)
	Summary	While traveling in the above section, the train driver noticed that a motorcycle had entered the Nakahara Crossing (class four level crossing), immediately sounded the whistle and applied the emergency brake, but the train collided with the motorcycle. The rider of the motorcycle died as a result of this accident.	

18	Date and accident type	Railway operator	Line section (location)
	October 6, 2016 Train derailment accident	Seino Railway Co, Ltd.	Inside the premises of Mino-Akasaka Station, Ichihashi Line (Gifu Prefecture)
	Summary	While operating the brakes on entering Mino-Akasaka Station, the train driver felt that the brakes were not having the same effect as usual, and immediately stopped the train. On checking, all axles in the 11th and 12th cars from the locomotive had become derailed.	

19	Date and accident type	Railway operator	Line section (location)
	October 8, 2016 Level crossing accident	West Japan Railway Company	Nakata No.1 Crossing (class four level crossing without automatic barrier machine nor road warning device) between Yotsutsuji Station and Shin-Yamaguchi Station, Sanyo Line (Yamaguchi Prefecture)
	Summary	While traveling in the above section, the train driver noticed that a lightweight truck had entered the Nakata No.1 Crossing (class four level crossing) and immediately applied the emergency brake, but the train collided with the lightweight truck. The driver of the lightweight truck died as a result of this accident. 	

20	Date and accident type	Railway operator	Line section (location)
	October 16, 2016 Level crossing accident	Kumamoto Electric Railway Co., Ltd.	No.8 Crossing between Hakenomiya and Horikawa (class four level crossing without automatic barrier machine nor road warning device) between Horikawa Station and Hakenomiya Station, Kikuchi Line (Kumamoto Prefecture)
	Summary	When approximately 8 meters ahead of the No.8 Crossing between Hakenomiya and Horikawa, the train driver noticed a motor vehicle entering the level crossing and immediately applied the emergency brake, but the train collided with the vehicle. The driver of the motor vehicle died as a result of this accident.	

21	Date and accident type	Railway operator	Line section (location)
	November 2, 2016 Level crossing accident	East Japan Railway Company	Takami-Kita Crossing (class four level crossing without automatic barrier machine nor road warning device) between Hakuba Station and Shinano-Moriue Station, Oito Line (Nagano Prefecture)
	Summary	The train driver noticed a motorcycle entering the Takami-Kita Crossing from the right side in the direction of travel just before the train was about to pass over the level crossing. He simultaneously sounded the whistle and applied the emergency brake, but the train collided with the motorcycle before stopping. The rider of the motorcycle died as a result of this accident.	

22	Date and accident type	Railway operator	Line section (location)
	November 6, 2016 Level crossing accident	East Japan Railway Company	Hatchonome Crossing (class four level crossing without automatic barrier machine nor road warning device) between Kogota Station and Kitaura Station, Rikuu East Line (Miyagi Prefecture)
	Summary	The train driver noticed a light motor vehicle entering the Hatchonome Crossing from the left side in the direction of travel about 30m before reaching the level crossing. He simultaneously sounded the whistle and applied the emergency brake, but the train collided with the light motor vehicle before stopping. The driver of the light motor vehicle died as a result of this accident.	

23	Date and accident type	Railway operator	Line section (location)
	November 10, 2016 Level crossing accident	East Japan Railway Company	No.2 Shinmachi Crossing (class three level crossing without automatic barrier machine, with road warning device) between Nakagomi Station and Otabe Station, Koumi Line (Nagano Prefecture)
	Summary	The train driver noticed a pedestrian entering the No.2 Shinmachi Crossing from the right side in the direction of travel just before passing over the level crossing. He simultaneously sounded the whistle and applied the emergency brake, but the train collided with the pedestrian before stopping. The pedestrian died as a result of this accident.	

(Railway serious incidents)

1	Date and incident type	Railway operator	Line section (location)
	July 27, 2016 Violating closure section for construction	Keisei Electric Railway	Between Keisei Usui Station and Keisei Sakura Station, Keisei Main Line (Chiba Prefecture)
	Summary	While traveling at approximately 70km/h between Keisei Usui Station and Keisei Sakura Station, the train driver noticed a workman approximately 50m ahead and applied the emergency stop operation, but could only stop approximately 140m beyond the works site. When the driver alighted and checked, the worker had evacuated to a safe place and was unharmed, but the train had collided with a plastic work basket that had been near the tracks. After reporting this incident to Transport Command and stopping at the site for nine minutes, the driver set off again. The works site in question was included in the railway track section closed after a permission for work was obtained.	

2	Date and incident type	Railway operator	Line section (location)
	November 17, 2016 Incorrect management of safety block	Tosaden Traffic Co., Ltd.	Between Asakura Tram Stop and Asakura Ekimae Tram Stop, Ino Line (Kochi Prefecture)
	Summary	The driver of an outbound tram forgot to collect the token that is supposed to be collected when an inbound tram has arrived at Asakura tram stop (a tram passing point), as part of the procedure for entering a single track section. The driver then set off from the tram stop even though the inbound tram had not yet arrived. While traveling, the driver realized that there was no token and reduced speed, then noticed an inbound tram ahead and immediately stopped the tram.	

6 Publication of investigation reports

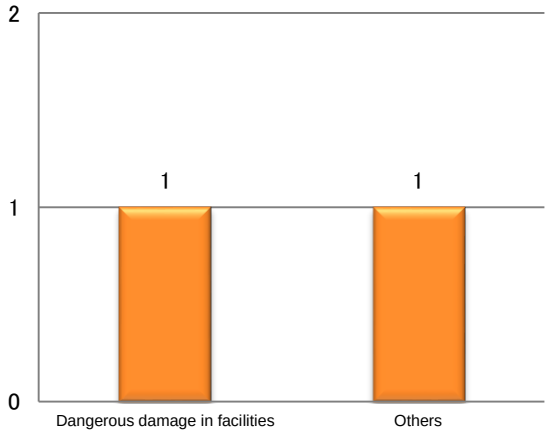
The number of investigation reports of railway accidents and serious incidents published in 2016 was 19, consisting of 17 railway accidents and two serious incidents.

Breaking them down by type, the railway accidents contained one train collision accident, five train derailment accidents, one train fire, eight level crossing accidents, one other accidents with casualties and one vehicle derailment. The railway serious incidents contained one dangerous damage in facilities and one others.

In the 17 accidents, the number of casualties was 86, consisting of 10 death and 76 injured persons.

Railway accident reports (17 cases) published in 2016

Railway serious incident reports (two cases) published in 2016



Summaries of the investigation reports for railway accidents and serious incidents published in 2016 can be found on JTSB website at:

http://www.mlit.go.jp/jtsb/railrep.html

7 Actions taken in response to recommendations in 2016

Actions taken in response to recommendations were reported with regard to one serious railway incident in 2016. Summaries of these reports are as follows.

① Hokkaido Railway Company: Train derailment in the premises of Seifuzan signal station, Sekisho Line

(Recommendations on May 31, 2013)

Following its investigation of a train derailment in the premises of Seifuzan signal station on the Sekisho Line of the Hokkaido Railway Company on May 27, 2011, the Japan Transport Safety Board published an investigation report and issued recommendations to the Hokkaido Railway Company as a party relevant to the cause of the serious incident on May 31, 2013. The Board received the following report concerning actions taken based on the recommendations (completion report).

○ Summary

The six-car of the inbound train limited express "Ki-4014D train" (Super Ozora 14), of Hokkaido Railway Company, starting from Kushiro station bound for Sapporo Station, departed Tomamu Station about 2 minutes behind schedule, on May 27, 2011.

The conductor, in the conductor's compartment of the fourth vehicle of the train, running toward Seifuzan signal station, have heard an abnormal sound and have felt irregular vibration, so he notified those events to the train driver. The train driver applied braking operation immediately after notified from the conductor. The train stopped in Niniu No.1 tunnel in the premises of Seifuzan signal station.

After that, the smoke of the fire which broke out from the train flowed into the train. The train driver tried to move the train halting in the tunnel to outside of the tunnel, but the train could not be moved.

Status of the burnt cars

There were 248 passengers, the train driver, the train conductor, and 2 cabin attendants on board the train. All members had evacuated outside the tunnel on foot, but 78 passengers and the conductor were injured.

It was found that the first axle of the rear bogie of the fifth vehicle of the train had derailed to the left. There were many parts of the dropped power transmission device, etc. scattered along the track for about 2 km length away from the halted point of the train. Moreover, all the 6 vehicles of the train were burnt by the fire.

○ Probable Causes

It is probable that all 2 axles of the rear bogie of the forth vehicle and the first axle of the rear bogie of the fifth vehicle of the train were derailed as a results of the following steps, originated from the pin dropping out the reduction gear device on the rear part of the fourth vehicle fell down.

(1) When the reduction gear device was hung down forward as rotate around the axle, the propeller shaft was also hung down. As a result, the universal joint was broken and finally the reduction gear and the propeller shaft were separated.

(2) As the separated reduction gear device further rotated, the suspender of the reduction gear device hit the lead rail of the turnout No.12-Ro in the premises of Seifuzan signal station. At this moment, the rear bogie of the fourth vehicle was pushed to the left along the lead rail and the first axle derailed, the second axle of the rear bogie derailed following the first axle. The derailed 2 axles were restored at the turnout No.11-I.

(3) As the rear bogie of the fifth vehicle hit the bevel gear on the track fallen off from the hanged reduction gear device, the rear bogie was pushed up and the first axle was derailed.

It is probable that the pin suspending the reduction gear device fell down following the process described below. It is also probable that these process were related with huge vibration acting on the rear bogie of the fourth vehicle, due to the circular irregularity of the tread profile of the left wheel in the first axle of the rear bogie of the forth vehicle.

(1) There were local wear caused by contacts with other components in the split pin which fixed the grooved hexagonal nut for the suspension pin supporting the reduction gear device, and in the stopper split pin which was inserted at the head of the suspension pin to prevent fallen out.

(2) As the grooved hexagonal nut was loosened, the split pin inserted in the groove was exposed to the iterative tangential load and finally fell out of the groove of the hexagonal nut.

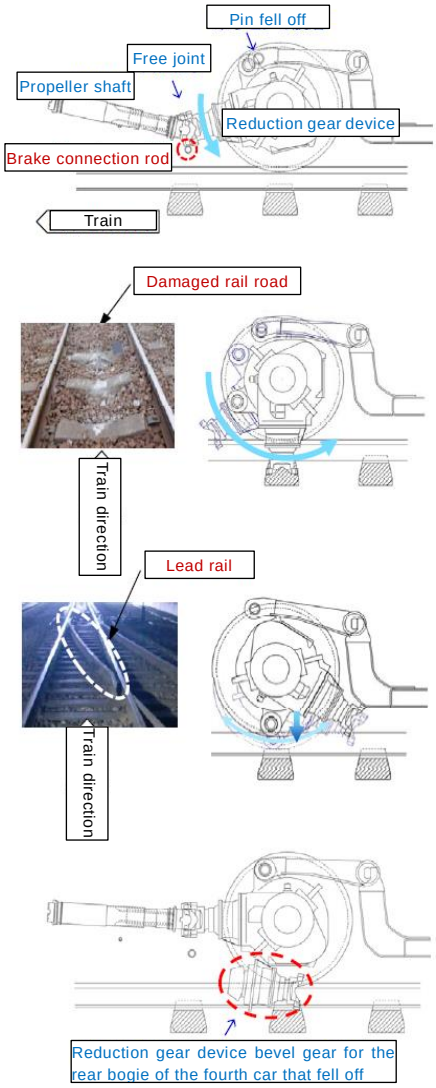
(3) The grooved hexagon nut loosened by missing the split pin and rotated still more until fell out.

(4) The stopper split pin which was inserted at the head of the suspension pin fell out by the iterative tangential load from the suspension pin.

(5) After the grooved hexagonal nut and the stopper split pin fell out, the suspension pin dropping out the reduction gear device fell out of the guide.

About the damage of the train by fire after the train derailment accident, it is probable that the fallen bevel gear of the reduction gear device hit and broke the fuel tank in the front part of the sixth vehicle, the light oil scattered on the track around the wooden sleeper had caught a fire ignited at around the generator or rear upper part of the engine and spread to the whole train.

According to the results of the overhaul inspection about the under floor equipments that were badly burnt and the equipments to get high temperature during operation, it is probable that all equipments caught fire by the external heat sources, then, the precise point where a fire was outbreak and the cause of outbreak fire were not identified.



The process of derailment (presumption)

○ Recomendations

Hokkaido Railway Co. should establish the proper inspection system, i.e., inspection period and methods for monitoring the condition of the wheel tread, and should manage the condition of the wheel tread throughout, and never use the wheel which should be treated as the wheel whose size of the tread defects or exfoliation are exceeded the limit to be used.

○ Actions based on the recommendations (completion report)

1. Actions taken in connection with the plan to “investigate the causative relationship with vibration while wheels are in motion, the progression of peeling, and other matters over several winter seasons, because ‘peeling caused by thermal cracking’ occurs gradually across the whole circumference of the wheel tread.”

(1) Since December 2013, the vehicle related planning division has been handling cases of consecutive occurrences of wheel abrasion, peeling and others as a single issue, in addition to the standard values during normal wheel inspections (including operational and alternating inspection). As a result, wheel turning is carried out before “peeling caused by thermal cracking” extends to the whole circumference of the wheel tread.

(2) At the same time as 1.(1), we set targets for wheel turning frequency based on each type of car for electric trains and limited express cars that cover particularly large distances per day, and changed to systematic wheel turning.

(3) On July 24, 2015, the vehicle-related planning division installed a “wheel flat detection device” in Naebo Station, through which all electric trains in the Sapporo region and all limited express gas-electric trains pass. With this device, situations where thermal cracking and abrasion (including peeling) are suspected can be detected continuously and quantitatively (i.e. the state and size of the damage) while trains are in motion. This has facilitated continuous investigation of the state of wheel tread in all trains and limited express cars that cover particularly large distances per day.

(4) Using the “wheel flat detection device”, vibration (vertical acceleration) due to wheel tread peeling, abrasion and other factors during vehicle motion can be measured. Since the device was installed, we have continuously cross-checked the data obtained from the device with actual wheel tread (in trial operation until June 2016).

(5) In conjunction with the initiatives in 1. (1)-(4), we are continuously investigating abrasion, peeling and other problems on actual wheels, based on wheel inspection results from pre-departure inspection and regular inspection, etc., data from the "wheel flat detection device", and confirmation of actual wheel tread. So far, no progression of "peeling caused by thermal cracking" that could cause obstruction to vehicle motion has been recognized.

Wheel tread exfoliation condition

(6) In vehicles that do not pass through the installation location mentioned in 1.(3) above, thermal cracking occurs extremely rarely as the top speeds are low and the distances run within pre-departure inspections are short. For these vehicles, we periodically maintain and manage the state of wheel tread through pre-departure inspections.

(7) In future, we will continue to manage the state of wheel tread for different vehicles using the "wheel flat detection device", which is due to come into full operation in July 2016, in conjunction with the traces in 1.(1) and (2).

2. Actions taken in connection with the plan to "optimize wheel turning frequency for different types of vehicle by applying the initiatives in 1."

(1) On the frequency of wheel turning, as stated in 1.(2) above, since December 2013, for electric trains and limited express cars that cover particularly large distances per day and whose wheels are thus thought likely to be strongly impacted, the vehicle-related planning division, consulted with site managers engaged in wheel repair in December 2013, based on the wheel management situation of each site, decided targets for wheel turning frequency for each type of vehicle, and is currently engaged in wheel turning.

(2) Judging from the state of wheel tread during wheel inspections to date, as well as data from the "wheel flat detection device", no "peeling caused by thermal cracking" had occurred in wheel tread to the extent that would obstruct vehicle motion, in any vehicle type, during the above period targeted for wheel turning frequency.

(3) At present, we feel the wheel turning frequency decided for each vehicle type to cause no problem in terms of safety. We will continue to undertake the efforts in 1. above, while also confirming the wheel turning frequency each time a new vehicle type is introduced or there is a significant change in the vehicle operation status.

Also, whenever we detect problems such as abrasion in excess of standard values for wheel tread, arising from emergency stop operations, etc., we perform wheel turning regardless of the target for wheel turning frequency.

3. Actions taken in connection with the plan to "Check whether standard values need to be revised for high-speed vehicles and vehicles that use small-diameter wheels, which have been managed under conventional standards for tread abrasion and peeling length."

(1) In collaboration with third-party bodies, we conducted experiments on three types of wheel to ascertain the relationship between vehicle speed and axle box vibration (vertical acceleration) under the standard limit for length of tread abrasion and peeling (75mm). Specifically, the experiment tested wheels with a diameter of 860mm (basic wheel diameter), 810mm (basic diameter for small-diameter wheels) and 730mm (usable limit diameter for small-diameter wheels).

(2) As a result, it was found that axle box vibration (vertical acceleration) increases with the rise in vehicle speed after starting the engine, but that vertical acceleration reaches a peak at vehicle

speeds of around 30km/h, then falls as the vehicle speed increases. This tendency was the same for all three wheel types.

The maximum value for vertical acceleration was also more or less the same for all three types, proving that the impact on the vehicle diminishes as the speed increases.

(3) In this experiment, we investigated the bending stress of axles under some of the most severe conditions of intensity unsprung units. As a result, we proved that axle bending stress was sufficiently within the tolerable stress for axles even in the case of small-diameter wheels (810mm and 730mm).

(4) In view of 3.(1)-(3) above, we judge there to be no problem if we apply the conventionally used standard values for high-speed vehicles and vehicles with small-diameter wheels, and so will not revise those standard values.

○ Actions based on the recommendations (completion report (supplement))

(1) On July 24, 2015, the vehicle-related planning division installed, on a trial basis, a "wheel flat detection device" in Naebo Station, through which all electric trains in the Sapporo region and all limited express gas-electric trains pass. With this device, situations where thermal cracking and abrasion (including peeling) are suspected can be detected continuously and quantitatively (i.e. the state and size of the damage) while trains are in motion. This has facilitated continuous investigation of the state of wheel tread in all trains and limited express cars that cover particularly large distances per day.

(2) Using the "wheel flat detection device", vibration (vertical acceleration) due to wheel tread peeling, abrasion and other factors during vehicle motion can be measured. Since the device was installed, we have continuously cross-checked the data obtained from the device with actual wheel tread. As a result, we drew up standards for extra wheel inspection needed in addition to the conventional wheel inspection, and started full operation on July 1, 2016.

(3) In future, we will continuously make efforts in connection with our revision of the wheel inspection standards in December 2013, our setting of targets for wheel turning frequency in electric trains and limited express vehicles at that time, and other matters, while at the same time continuously managing the state of wheel tread for each vehicle using the "wheel flat detection device" that we have now brought into full operation.

* The completion report can be found on the JTSB website.
http://www.mlit.go.jp/jtsb/railkankoku/railway-kankoku3re-4_20160823.pdf

② Sangi Railway Co., Ltd.: Serious railway incident on the premises of Higashi -Fujiwara Station on the Sangi Line

(Recommendation issued on October 25, 2013)

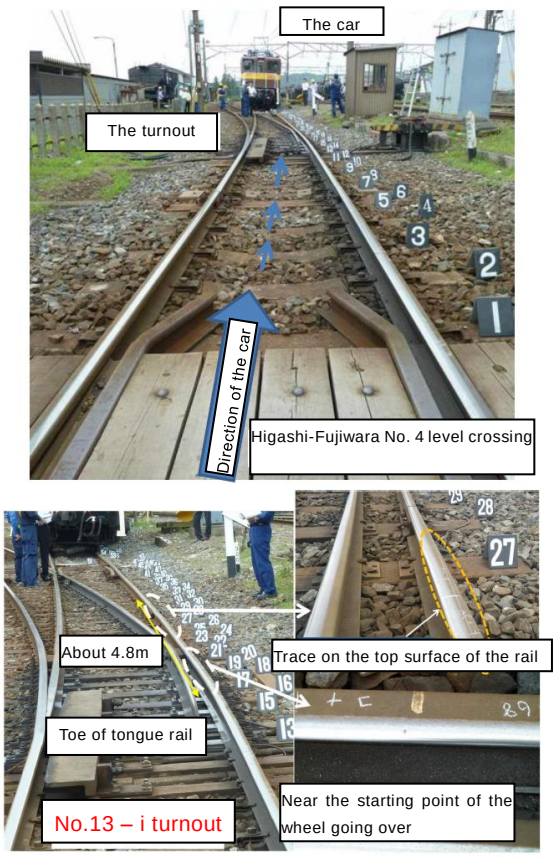
On October 25, 2013, the Japan Transport Safety Board (JTSB) published an investigation report and issued a recommendation to Sangi Railway Co., Ltd. as one of the parties relevant to the cause of the serious incident, regarding the serious railway incident that occurred on the premises of Higashi-Fujiwara Station on the Sangi Line on June 27, 2012. The Board received the following report concerning actions based on the recommendations (completion report).

○ Summary of the serious incident

At about 3:00 P.M. on June 27 2012, one of Sangi Railway Co., Ltd.'s 18-car shunting train (two electric locomotives and 16 freight cars) sets started from the private siding of a cement factory for the downbound main line in Higashi-Fujiwara Station.

The driver of the train set, noticing an abnormal condition when it was passing the Higashi-Fujiwara No. 13-I turnout, immediately applied the emergency brake to stop the train. The first axle in the front bogie of the second locomotive was derailed to the right.

A driver was working in the second locomotive, and two guides were in the first one, as well as a switchman in the third one. None of them were injured.



Derailment site

○ Probable causes

This serious incident occurred when the set of 18-car shunting train (two electric locomotives and 16 freight cars) was running along the section of the base line side of a turnout that goes in the same direction as the curve. The turnout was in a section that contained four consecutive curves. The situation was attributable to an increase in the derailment coefficient, which occurred at the same time as a decrease in the threshold derailment coefficient. As a result, the right wheel in the first axle of the second locomotive's front bogie subsequently ran up the outside rail and derailed to the right.

It is probable that the increase in the derailment coefficient is a result of the increase in lateral force, as well as a decrease in the wheel weight. This situation can be deduced from the following factors: the track was deformed in a direction that results in the reduction of the radius; the twist of the track increased so that the train leaned to the front right, and; it is probable that that the train was running with excess of cant, which was due to its low-speed. It is somewhat likely that the shift of the axle load due to the power running at an ascent was also a contributing factor.

It is probable that the decrease in the threshold derailment coefficient results from a shifting of track, which is associated with an excessive reduction of the radius, resulting in an increase in the angle of attack for the first axle of the front bogie.

It is probable that the rapid shifting of track and the increase in twists resulted from their poor management of the shapes and shifts of the tracks. They did not understand the specification of plain curves, or did not inspect the shifts of the tracks in the turnouts. As a result, they were not able to recognize that the state of the tracks exceeded the allowances of its maintenance criteria.

○ Description of the recommendation to Sangi Railway Co., Ltd.

Sangi Railway Co., Ltd. should make sure that their tracks are well maintained. They should do so by grasping the design values for maintenance and management and by inspecting shifts properly in accordance with the "Practice Criteria for construction works" in sections involving curves and/or turnouts.

○ Actions based on the recommendations (completion report)

Since specifications of curves have been clarified for curves of our Sangi main line between each station, we have utilized them for track maintenance. However, some specifications of curves were not clarified in the main line, side lines, and curves with turnouts on the premises of each station.

We had depended on the "long experience" and "review" of field workers.

As a result of investigations, we have clarified that stations, in which the specifications of curves were unclear, are 10 stations, including Tomida Station, Oyachi Station, Heizu Station, Hobo Station, Umedoi Station, Misato Station, Nyugawa Station, Ise-Hatta Station, Higashi-Fujiwara Station, and Nishi-Fujiwara Station. We took measurements in order to clarify the specifications in these stations, and performed work to define the specifications of curves one by one by reading the current curves from the survey maps. Of these, we have reported on the completion of work in Higashi-Fujiwara and Umedoi Stations in Sangi Tetsu No. 64 dated May 28, 2014, and in Tomida, Oyachi, Heizu, Hobo, Misato, Nyugawa, Ise-Hatta and Nishi-Fujiwara Stations in Sangi Tetsu No. 69 dated August 25, 2015.

With regard to turnouts in three locations inside station premises (Tomida Station *Sa* Nos. 60 and 91 and Higashi-Fujiwara Station No. 60), which were adjusted on site due to a lack of specifications (hereinafter referred to as "similar turnouts"), we took steps to remove and replace branches. We have reported on the completion of work on Higashi-Fujiwara Station No. 60 turnout in Sangi Tetsu No. 69 dated August 25, 2015. This time, we report on the completion of measures for Tomida Station *Sa* No. 60 and No. 91 turnouts.

1. Actions taken for "similar curve locations"

・Tomida Station

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014.

Based on these measurement results, we have prepared line survey maps for 11 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Oyachi Station

We started taking measurements on January 10, 2014, and the field measurements were completed on January 18.

Based on these measurement results, we have prepared line survey maps for 3 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Heizu Station

We started taking measurements on December 4, 2013, and the field measurements were completed on June 25, 2014.

Based on these measurement results, we have prepared line survey maps for 2 curves,

including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Hobo Station

We started taking measurements on March 4, 2014, and the field measurements were completed on April 4.

Based on these measurement results, we have prepared line survey maps for 8 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Misato Station

We started taking measurements on April 5, 2014, and the field measurements were completed on April 15.

Based on these measurement results, we have prepared line survey maps for 4 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Nyugawa Station

We started taking measurements on January 20, 2014, and the field measurements were completed on February 10.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No.90, dated November 7, 2014) regarding the new track shapes and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No.159, dated November 26, 2014). In response to this, we have implemented the construction to exchange to heavy turnouts with heavy tracks within the station in accordance with the defined track shape (37 kg → 50 kgN) (a total of 4 turnouts, including No. 11-I turnout, No. 11-Ro turnout, No. 12-I turnout, and No. 12-Ro turnout) as well as the curve improvement construction along with it by March 16, 2015. Due to these constructions, all 2 curves have been improved to the new track shapes.

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Ise-Hatta Station

We started taking measurements on February 25, 2014, and the field measurements were completed on March 3.

Based on these measurement results, we have prepared line survey maps for 5 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Nishi-Fujiwara Station

We started taking measurements on December 4, 2013, and the field measurements were completed on June 25, 2015.

Based on these measurement results, we have prepared line survey maps for 2 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new track shapes and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

2. Actions taken for “similar turnouts”

・Tomida Station *Sa* No. 60 turnout

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of modification of railway facilities when replacing turnouts (Sangi tetsu No. 39 dated April 14, 2016) and have received the approval of the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No.19 dated April 26, 2016). In response to this, the turnouts were replaced and curve improvements were completed by August 10, 2016.

・Tomida Station No. 91 turnout

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of modification of railway facilities when removing turnouts (Sangi tetsu No. 39 dated April 14, 2016) and have received the approval of the Director-General of the Chubu District Transport

Bureau (Chu-untetsugi No.19 dated April 26, 2016). In response to this, the turnouts were removed and the change to straight tracks was completed by July 20, 2016.

・Higashi-Fujiwara Station No. 60 turnout

We started taking measurements on May 22, 2012, and the field measurements were completed on August 7, 2012.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of modification of railway facilities when removing turnouts (Sangi tetsu No. 76, dated July 3, 2014) and have received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 84, dated July 14, 2014). In response to this, the turnouts were removed and the change to straight tracks was completed by January 27, 2015.

* The completion report can be found on the JTSB website.
http://www.mlit.go.jp/jtsb/railkankoku/railway-kankoku5re-6_20160826.pdf

8 Provision of factual information in 2016

There were no cases of provision of factual information in 2016.

Column

Outreach Lecture

- Workshop with Senior High School Pupils -

Railway Accident Investigator

As the autumn took hold, we received a request from a school in the Kansai region for a workshop on the theme of “Railway Accident Investigation”. The workshop was attended by 20 pupils in grade 1 of senior high school, and as if by coincidence, was overseen by two railway accident investigators who have children of the same age.

In the workshop, we attempted to explain the work of investigating railway accidents in a way that the pupils could envisage and readily understand. We encouraged them to express themselves as far as possible, and tried to give them a feeling for the subject.

The central focus of the workshop was the mission of the Japan Transport Safety Board, situations in which investigations are made, and the methods we use to conduct those investigations. On this basis, we asked questions like “How many railway accident investigators do you think there are?” or “What do you think we do when we don’t go to investigate in the actual site?”, and explained aspects that we thought would interest senior high school pupils.

The pupils themselves asked questions like “How can I become an accident investigator?”, “At least how many years does it take to become an investigator?”, and “What was the hardest thing you have ever done?” We were a little nervous to face pupils who were the same age as our own children, but we were once again reminded of the weight of responsibility we bear as accident investigators, and it was an invigorating experience.

Through this workshop, we would be happy if the pupils could intensify their understanding of accident investigation by the Japan Transport Safety Board and take an interest in the work of railway accident investigators.

The workshop in progress

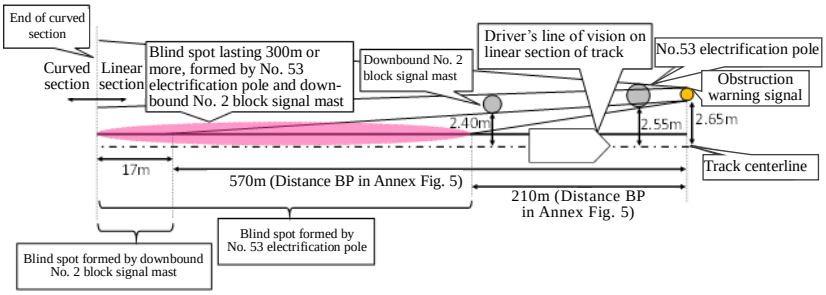
9 Summaries of major railway accident and serious incident investigation reports (case studies)

Collision with a truck on a level crossing when it was not possible to confirm the indication on the stop signal of an obstruction warning indicator West Japan Railway Company: Level crossing accident between Nishi-Achi Station and Shin-Kurashiki Station on the Sanyo Line

Summary: On February 13, 2015, the train, composed of 6 vehicles, started departed from Nishiach station on schedule. The driver of the train cruising with the speed of about 95 km/h, noticed the stop signal of the obstruction warning signal at Hachinin-yama level crossing and, at the same time, noticed the truck stopped in the level crossing, so that he immediately applied an emergency brake and blew the whistle, but it was too late, the train collided with the truck and stopped at about 210 m passed the level crossing. There were about 300 passengers, the train driver and the conductor onboard the train, among them, 44 passengers and the train driver were injured, including one seriously injured passenger. The driver of the truck was not injured because he evacuated out of the level crossing when the collision occurred. The train was not derailed but damaged in the parts of the vehicles. The truck was seriously damaged but fire was not ignited.

Findings

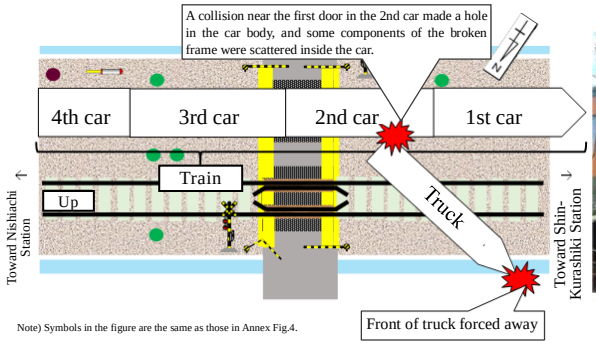
The obstruction warning signal to outbound trains on the level crossing was in a blind spot formed by electrification poles along the track, and there was a section extending to at least 300m in which the outbound train driver could not confirm the indication of the stop signal on the obstruction warning signal.



Note: Distances are not to scale.

It is probable that the occurrence of serious injury was caused by the impact of the 2nd or later collision between the truck and the train, and by a collision with objects that appear to have been parts of the frame that broke due to the collision and parts of the train that became scattered inside the vehicle. It is probable that the occurrence of numerous injuries was caused by a strong impact when the train collided with the truck.

* Obstruction warning signal: A signal that is linked to the emergency stop button, level crossing obstruction detector, etc., and presents a stop signal when these are activated.



Note) Symbols in the figure are the same as those in Annex Fig.4.

It is somewhat likely that the truck stopped on the level crossing because its engine power could not be transferred owing to an abnormality in the transmission when shifting gears just before this accident occurred. However, it could not be determined why this kind of situation occurred, because the records in the truck's control unit did not include time records, and because the state of the truck's transmission just before this accident occurred is unknown.

Probable causes (Excerpt): It is certain that the accident had occurred because the truck had stopped in Hachinin-yama level crossing road, the approaching train collided with the truck. It is highly probable that the train could not stop before the level crossing because the train driver could not notice the obstacle in the level crossing promptly. It is somewhat likely that the reason why the train driver could not notice the obstacle promptly, was related with that there were over 300 m long section where the driver of the outbound train could not confirm stop signal indication of the obstruction warning signal, as the obstruction warning signal against the outbound trains in the level crossing was in the blind angle by the track side electrification poles.

For details, please refer to the accident investigation report. (Published on March 31, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2016-3-1.pdf

A fire caused when a passenger sprinkled gasoline inside the train and ignited it
Central Japan Railway Company: Train fire accident between Shin-Yokohama Station and Odawara Station on the Tokaido Shinkansen

Summary: On June 30, 2015, the train departed from Shin-Yokohama station on schedule. At about 11:30, the driver of the train, while the train was in powering operation at about 250 km/h, confirmed indication showing that the communication buzzer installed in the cabin of the second vehicle was operated, he applied an emergency brake. and asked the conductor to check the first vehicle using the public address system. On the other hand, the conductor of the train, engaged in examination of tickets in the 4th vehicle, informed from the passenger that a passenger sprinkled oil in the first vehicle, and find the fire outbreak in the first vehicle on his way to the first vehicle. After the train had stopped, the driver and the conductor checked the cabin of the first vehicle, as they found the fallen passenger in the rear deck, they took relief activities. Furthermore, as they found another passenger fallen in the aisle of the front cabin in smoked surroundings, they carried out firefighting with the fire extinguisher.

There were about 900 passengers, the train driver, 3 train conductors and 5 pursers onboard the train, among them, two passengers fallen in the first vehicle were dead. Furthermore, 25 passengers, 2 of them were seriously injured, and the train driver and 2 train conductors were injured.

The seats, floor, side wall, sealing, etc., from the front to the mid part of the first vehicle were burnt by the fire.

Findings

It is probable that the operation by the driver after the fire broke out was appropriate, because the driver momentarily applied the emergency brake in accordance with the proper handling whenever the emergency buzzer has been sounded, since there was an intermittent series of tunnels and bridges near the accident site, he subsequently judged it possible that a fire had broken out on the train, and thus avoided tunnels or bridges when stopping the train, in accordance with the company's internal rules.

Many passengers started to evacuate independently after becoming aware of an abnormality inside the cabin of the 1st car, but some passengers subsequently did not evacuate to the rear cars but stopped and lingered on the deck, then evacuated to the rear cars when smoke started to spread inside the deck.

It is probable that initial fire extinguishing activities could not be performed, because the smoke was so thick that they could not check inside the 1st and 2nd cars immediately after the fire broke out.

It is probable that the measures are worked to prevent the spread of fire by using materials compliant with the technical standards on fire resistance, because the main damage for the cars was limited between around the middle of the cabin and the front deck of the 1st car, near the location where the fire broke out.

Since it is probable that it was difficult to confirm whether any passengers were left in the car in which the fire broke out, it is desirable that smoke masks, fireproof gloves, etc. should be equipped in the crew cabins and other locations, based on the situation of the train route and other factors, so that the crew members can assist the passengers to evacuate and support for necessary measures to be taken, as far as they can when a fire breaks out.

It is probable that, to reduce further casualties in the similar accidents, efforts will be needed to encourage passengers to evacuate independently and as quickly as possible toward other cars from those in which fire or signs of fire have been seen, until the crew can start guiding the evacuation.

① Inside the cabin, from the front

Probable causes: It is highly probable that the accident occurred because the passenger onboard the train sprinkled gasoline and ignited fire by himself in the cabin of the first vehicle.

It could not be determined precise reason why the passenger ignited the fire by himself, because the passenger was dead by the accident.

For details, please refer to the accident investigation report. (Published on June 30, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2016-5-2.pdf

Third derailment at the same intersection since 2007
Nagasaki Electric Tramway Co., Ltd.: Vehicle derailment between Suwa-Jinja-Mae tram stop and Kokaido-Mae tram stop on the Sakuramachi Branch Line

Summary: On October 11, the tram departed from Suwajinja-Mae tram stop on schedule. While the vehicle was passing through the right curved branch line to Nagasaki Eki-Mae tram stop, of the turnout in the Kokaido-Mae intersection, the tram driver noticed the tram turned to the different direction from the scheduled route and applied brake to stop the vehicle. The driver got off the tram and checked and found that the all two axles in the rear bogie derailed to left of the rail.

There were 4 passengers and the driver onboard the tram, but there was no casualty. Here, the accident site was in the intersection of roads with tramway, but the derailed tram did not contact nor collide with automobiles etc., before and after the derailment.

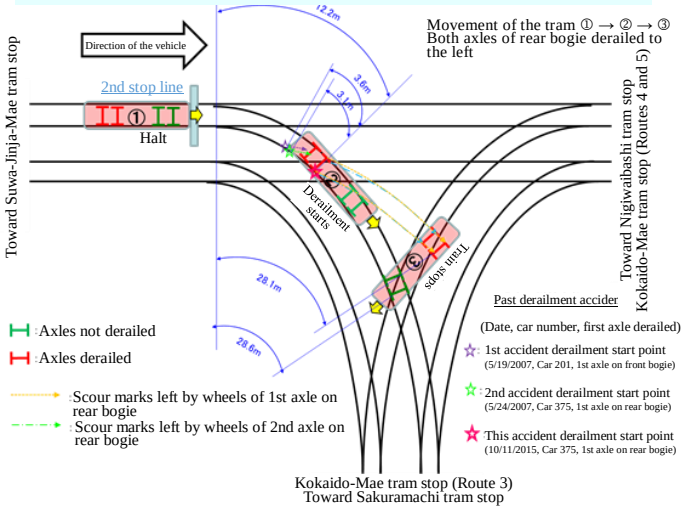
Findings

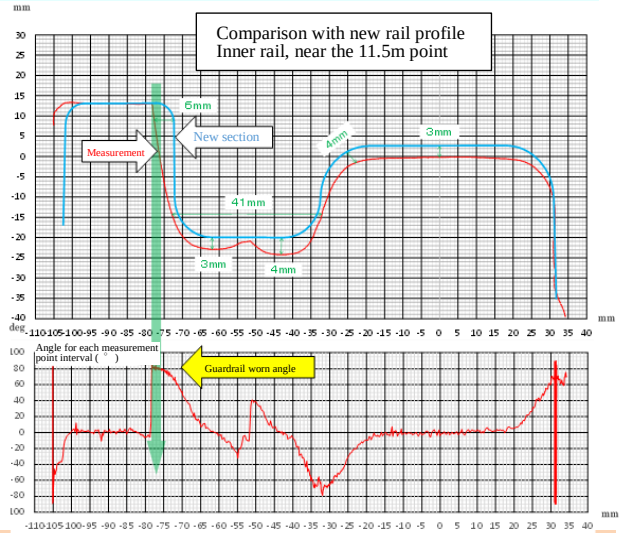
It is somewhat likely that the occurrence of the derailment was influenced by a critical variation in lateral force acting on the inner wheel back surface and increased derailment coefficient of the inner wheel back surface due to the sudden change of the back gauge and flangeway width just before the derailment start point.

When this accident occurred, the worn angle of the guardrail near the derailment start point was about 80°, smaller than the 90° at new. It is somewhat likely that the occurrence of the derailment was influenced by the resultant decrease in the critical derailment coefficient for the inner wheel back surface derailment.

It is somewhat likely that the friction coefficient was high at the point of contact between the wheel back surface and the guardrail near the derailment start point when this accident occurred, in comparison to those under the wet rail condition or sufficiently lubricated condition. It is somewhat likely that the derailment was influenced by the resultant decrease in the critical derailment coefficient for inner wheel back surface derailment.

It is probable that the main cause of both the 1st and 2nd accidents was that the finished state was inappropriate after the tracks were repaired. By contrast, it is somewhat likely that this accident was caused by a combination of factors, such as the train speed, the friction coefficient at points of contact between the wheel back face and the guardrail, the worn angle of the guardrail, and the irregularity of the back gauge, etc.





Probable causes (Excerpt): It is probable that the accident occurred as follows, while the tram was running in the right curved branch line in the turnout, as the back side of the right wheel of the first axle in the rear bogie was contacting with side surface of the rail, having the role of guard rail, in the diamond crossing, the back side of the right wheel climbed up the guard rail and derailed to left, and after that, the left wheel of the first axle climbed up the left rail and derailed to left, furthermore, the second axle on the rear bogie also derailed to left.

It is probable that the right wheel of the first axle in the rear bogie derailed due to the increased derailment coefficient against the derailment from the back surface of the inner wheel, as the wheel load decreased and the lateral force on the back surface in the right wheel increased in the diamond crossing existed in the very small radius curve, also, due to the derailment coefficient exceeded the critical derailment coefficient as the critical derailment coefficient against derailment was decreased.

For details, please refer to the accident investigation report. (Published on November 24, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2016-8-1.pdf

A vehicle derailment also occurred at the same intersection on the Sakuramachi Branch Line on June 2, 2016. The Japan Transport Safety Board published its investigation report on that accident on March 30, 2017. For a summary of the accident, see “5. Summaries of railway accidents and serious incidents that occurred in 2016” No. 7 (p.54).

Driver missed to check starting signal, causing train to run into piled gravel buffer stop and become derailed

Shikoku Railway Company: Train derailment in the premises of Orange Town Station on the Kotoku Line

Summary: On December 31, 2015, the inbound train driver opened the passenger doors after the train arrived at Orange-Town station, while he was waiting passengers got on and off, he noticed that it was the time of scheduled departure, and started the train. While the train was running in powering operation at about 33 km/h in the premises of Orange-town station, the train driver noticed the sound of the ATS alarm of the train and operation of an emergency brake, as he reminded that he had started the rain without confirming the signal indication, then he immediately set the brake handle to the emergency brake position. The train decelerated by the emergency brake, but entered into the safety siding from the main line in Orange-town station, and ran into the piled gravel as the buffer stop, and the first axle in the front bogie derailed from the end of rails in the piled gravel.

The opposite outbound train stopped urgently at around the entry signal as the signal turned red due to operation of the urgent protection device for safety siding according to the entrance of the car stop by the inbound train.

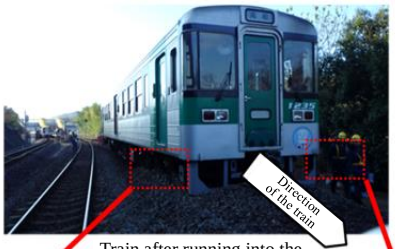
There were 45 passengers and the driver onboard the train, one of the passenger was injured.

Findings

It is highly probable that the starting signal was indicating the stop signal from the time when the train arrived at Platform 1 of Orange Town Station until it departed.

Regarding to the actions and behavior of the driver while the train was waiting at Orange Town Station, it is somewhat likely that the driver was performing driving operations unconsciously, with looking out toward the car park overpass and thinking about something else.

After an incident in which a starting signal was disregarded at Tosakure Station, the company had alerted drivers, as a measure to prevent recurrence since fiscal year 1992, with a "Confirm starting" warning under the door closed indicator lamp, reminding drivers to confirm the departure signal. However, it is somewhat likely that this reminder had merely become a formality as the company had not given guidance on its significance, and as the result, these measures taken in the past were not functioning effectively.



Train after running into the piled gravel buffer stop and stopping

Front bogie buried in piled gravel buffer stop (right side)

1st axle buried in piled gravel buffer stop (left side)

In anticipation of situations such as this accident, it is desirable that the positions of ATS ground coils and on-board coils as well as train stopping positions for dealing with passengers getting on and off, should be comprehensively reviewed and systematically developed through collaboration among staffs involved in the design, so that trains can stop safely.

This accident could have been avoided if an ATS on-board coil had been installed in a position close to the front of the car. In future, it is desirable that the position shall fully considered when designing railway cars.

Probable causes: It is highly probable that the accident occurred as the train derailed from the end of rails under the piled gravel after entered into the safety siding, in spite of the operation of an emergency brake by the automatic train stop, ATS, because the driver started the train although the stop signal was indicated in the starting signal of Orange-town station.

It is probable that the driver started the train irrespective of the stop signal indication of the starting signal because the driver forgot confirming the starting signal after the powering operation because the driver missed to check the starting signal before the powering operation due to the lack of sense to obey the operation procedure, as the driver implemented the other action when he should check the starting signal, furthermore, the driver unconsciously implemented the operation procedures to start train, thinking about something else.

For details, please refer to the accident investigation report. (Published on December 15, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2016-9-1.pdf

Route of other trains obstructed due to conflicting awareness of train position between the parties concerned when issuing instructions

Kyushu Railway Company: Serious incident (other) in the premises of Hizen-Ryuo station on the Nagasaki Line

Summary: On May 22, 2015, the outbound limited express train departed from Hakata station on schedule. While, the train was cruising at about 100 km/h between Hizen-Shiroishi station and Hizen-Ryuo station, the driver felt an abnormal sound after the finger-pointing and call about the proceed signal indication of the down line entry signal of Hizen-Ryuo station, and applied an emergency brake immediately to stop the train. After that, the driver reported to the train dispatcher about the situation to stop the train.

The train dispatcher, after received the report from the driver of the train, changed the interchange point of the outbound limited express train and the inbound limited express train, from Hizen-Kashima station to Hizen-Ryuo station.

The driver of the outbound limited express train, after checked the spot where the abnormal sound was noticed and inspected the train, restart train operation obeying the instruction of the train dispatcher. Then the driver noticed that the train entered into the No.1 line of Hizen-Ryuo station that was different from the scheduled route, and applied an emergency brake immediately to stop the train.

On the other hand, the driver of the inbound limited express train, started the train from Hizen-Kashima station as he received the notice about modification of the interchange point from the train dispatcher. When the train stopped at the designated point in No.1 line of Hizen-Ryuo station, the driver found that the outbound limited express 2019M train was stopped in front of the same No.1 line.

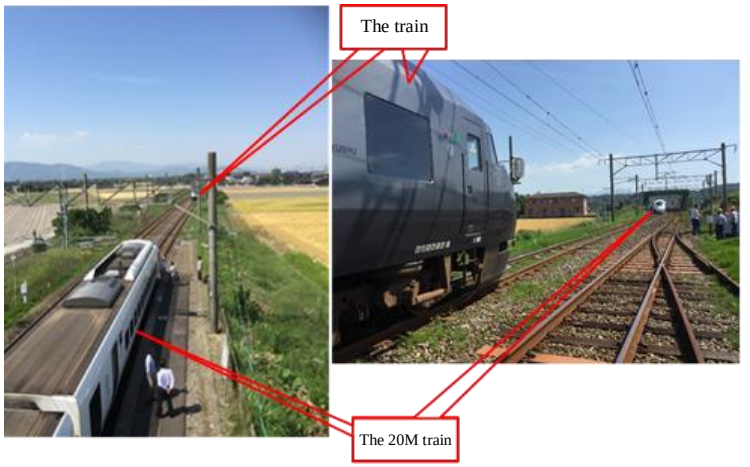
Findings

It is probable that the position where the outbound limited express stopped after feeling an abnormal sound was where the front axle of the front car was positioned between the position of the entry signal 2R and the track circuit demarcation point.

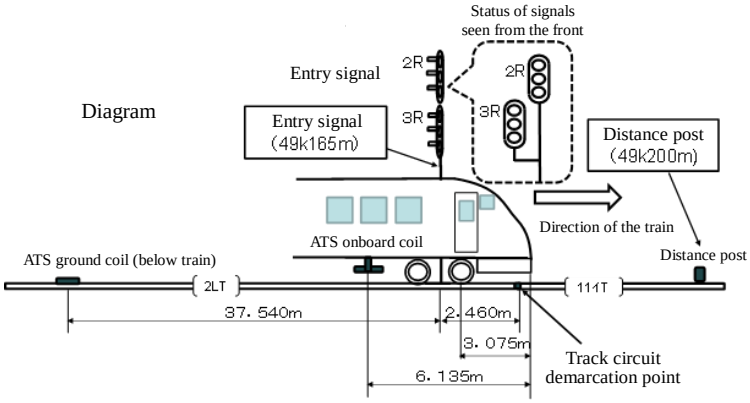
The driver of the outbound limited express only reported the mileage based on the driver console monitor, while the train dispatcher only received a distance report and judged whether the train was inside the station premises or between stations based on the track circuit short-circuit display on the control console screen.

It is probable that, after starting again, the train involved in this incident by entering to the section in which a stop signal was shown. However, because the train had already passed over the ATS ground coil (below the train), the ATS brake was not activated.

It is probable that both the train driver and train dispatcher, did not report or confirm the stopped position determined in past instruction documents and work standards regarding reports on stopped positions. It is also probable that this was because the company had not grasped the working realities of reports and confirmations.



Diagram



Probable causes (Excerpt): It is probable that the railway serious incident occurred as the outbound limited express train, stopped beyond the down line entry signal of Hizen-Ryuo station indicating proceed signal, restarted operation obeying the instruction by the train dispatcher after the entry signal indicated stop signal, resulted in the state of red signal violation against the entry signal, and entered into the safety margin for overrunning section for the inbound limited express train scheduled to stop in the No.1 line of the station, induced the possibility that the two trains were operating at the same time in the section of the safety margin for overrunning, when the inbound limited express train, operated obeying the instruction of the train dispatcher and signal indication, passed through the entry signal for the up line.

For details, please refer to the serious incident investigation report. (Published on June 30, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-inci/RI2016-1-1.pdf

Pole provided for the train operations tilted and fell, obstructing the structure gauge
East Japan Railway Company: Serious incident between Kanda Station and Akihabara Station on the Tohoku Line (Yamanote Line) (Dangerous damage in facilities)

Summary: On April 12, 2015, at about 6:10, while the train was operating between Kanda station and Akihabara station, the train driver noticed that the pole, installed between the neighboring Tohoku Lines, i.e., between Yamanote inner circle line and Yamanote outer circle line, was falling down to the direction of Kanda station, and applied an emergency brake to stop the train and operated the train protection radio.

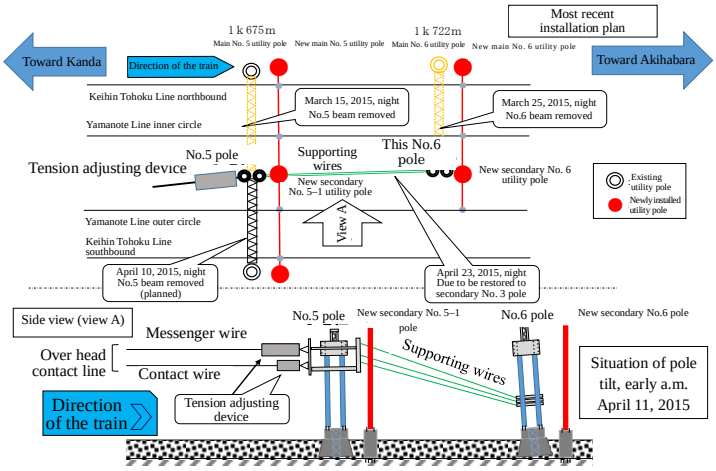
There was no injured person by the incident.

Findings

The structure of the gravity type block foundation for the pole was such that the allowable tilting moment of the foundation varied according to vertical forces produced by the mass of poles, beams, overhead contact lines, etc. It is therefore probable that the pole tilted and eventually fell during overhead line equipment renewal work, because the safety factor against tilting of the foundation had decreased, due to an increased tilting moment caused by the effect of horizontal tension, because supporting wires that were attached to the pole was at a higher position than normal (1.9m) in July 2011.

It is probable that the safety factor against tilting decreased to 1 or less, because the beam, overhead contact lines and others attached on the top of the pole were removed in March 2015, and these decrease the vertical force acting on the structure of foundation, although the tilting moment due to the force acting on the supporting wires did not change.

The company staffs, who did not understand the structure of the pole foundations, had mistakenly judged the safety factor to be adequate, based on the assumption that the foundations had a more robust structure such as the anchor bolt foundations used in more than half of the cases between Kanda and Akihabara Stations, and it is probable that this played a part in this incident.



Probable causes (Excerpt): It is probable that the serious incident had occurred as that the pole used for train operation tilted, in the process of the dismantling works of poles accompanied with the integrated overhead contact line construction of the electric circuit facility, and the pole was tilting seriously because the required measures did not implemented, though the information that the pole was tilted was announced to the plural staffs concerned, and fell down on the railway track in the service hours of train operation, and obstructed the structure gauge significantly.

It is probable that the reason why the required measures were not implemented when the information about tilting of the pole, was related with the followings.

(1) The prompt temporary measures were not implemented when the tilting of the pole was noticed, because the related staffs could not judge the situation as dangerous due to lack of the similar experiences as tilting of poles previously in the integrated overhead contact line construction work.

Furthermore, although the communication system for an emergency was prepared, the communication to the related section, such as the electric power dispatcher, etc., did not implemented promptly.

(2) No one in the Tokyo general dispatcher room did not understand that the situation was abnormal stage that should be dealt with urgently, because the report from the onsite transport section was "there was no obstruction in train operation".

Furthermore, the conventional procedures implemented in the dispatcher room, that the report to the facility maintenance commander should be done after the precise information of the dispatchers were collected, was related with the delay in communication to the related sections required.

For details, please refer to the serious incident investigation report. (Published on July 28, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-inci/RI2016-2-1.pdf