

Chapter 4 Railway accident and serious incident investigations

1 Railway accidents and serious incidents to be investigated

<Railway accidents to be investigated>

◎Article 2, paragraph (3), 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 2 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 Article 2, paragraph (3) of the Act for Establishment of the Japan Transport Safety Board)

- 1 The accidents specified in Article 3, paragraph (1), items (i) through (iii) 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 Article 3, paragraph (1), items (iv) through (vi) 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 Article 3, paragraph (1), items (iv) through (vii) of the Ordinance which are found to be particularly rare and exceptional;
- 4 The accidents equivalent to those specified in Article 3, paragraph (1), items (i) through (vii) 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 (i) through (iii) 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 Article 3, paragraph (1), each items of the Ordinance on Report on Railway Accidents, etc.

item (i): Train collision

item (ii): Train derailment

item (iii): Train fire

item (iv): Level crossing accident

item (v): Accident against road traffic

item (vi): Other accidents with casualties

item (vii): 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 Article 2, item (v) of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board)

1 From among the accidents specified in Article 1, paragraph (1), items (i) through (vi) 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 Article 1, paragraph (1), items (i) through (vii) 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 Article 3, paragraph (1) of the Ordinance on Tramway Operations, the accidents equivalent to those specified in Article 1, items (i) through (iii) of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

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

item (i): Vehicle collision

item (ii): Vehicle derailment

item (iii): Vehicle fire

item (iv): Level crossing accident

item (v): Accidents against road traffic

item (vi): Other accidents with casualties

item (vii): Heavy property loss without casualties

Railway accidents to be investigated

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

*1 Except for derailment accidents of working snowplows. [Ordinance 2-1] However, accidents that are particularly rare and exceptional are to be investigated. [Ordinance 2-3]

*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>

◎Article 2, paragraph (4), item (ii), 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 3 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 Article 2, paragraph (4), item (ii) of the Act for Establishment of the Japan Transport Safety Board)

【JTSB Website: <https://www.mlit.go.jp/jtsb/example.pdf> (See cases ①～⑩.) (Japanese only)】

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

[A situation where a train starts moving for the purpose of operating in the relevant block section before completion of the block procedure: Referred to as "Incorrect management of safety block." (case ①)]

2 The situation specified in Article 4, paragraph (1), item (ii) 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." (case ②)]

3 The situation specified in Article 4, paragraph (1), item (iii) 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." (case ③)]

4 The situation specified in Article 4, paragraph (1), item (vii) 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." (case ⑦)]

5 The situation specified in Article 4, paragraph (1), item (viii) 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 a vehicle: Referred to as "Dangerous trouble in vehicle." (case ⑧)]

6 The situation specified in Article 4, paragraph (1), items (i) through (x) of the Ordinance which

is found to be particularly rare and exceptional; and

[These are referred to as: item (iv) "Main track overrun" (case ④); item (v) "Violating closure section for construction" (case ⑤); item (vi) "Vehicle derailment" (case ⑥); item (ix) "Heavy leakage of dangerous object" (case ⑨); and item (x) "Others," (case ⑩) respectively.]

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

○Article 2 of the Public Notice of the Japan Transport Safety Board

(A situation prescribed by the public notice stipulated in Article 3, item (vii) 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 Article 2, item (i) 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 Article 2, item (iv) of the Ordinance, which caused malfunction, damage, destruction, etc., bearing a particularly serious risk of collision, derailment or fire in a vehicle operating on the main track;

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

3 The situation specified in Article 2, item (v) 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 Article 2, items (i) through (vii) of the Ordinance which is found to be particularly rare and exceptional; and

[These are referred to as: item (ii) "Violating red signal;" item (iii) "Main track overrun;" item (vi) "Heavy leakage of dangerous object;" and item (vii) "Others," respectively.]

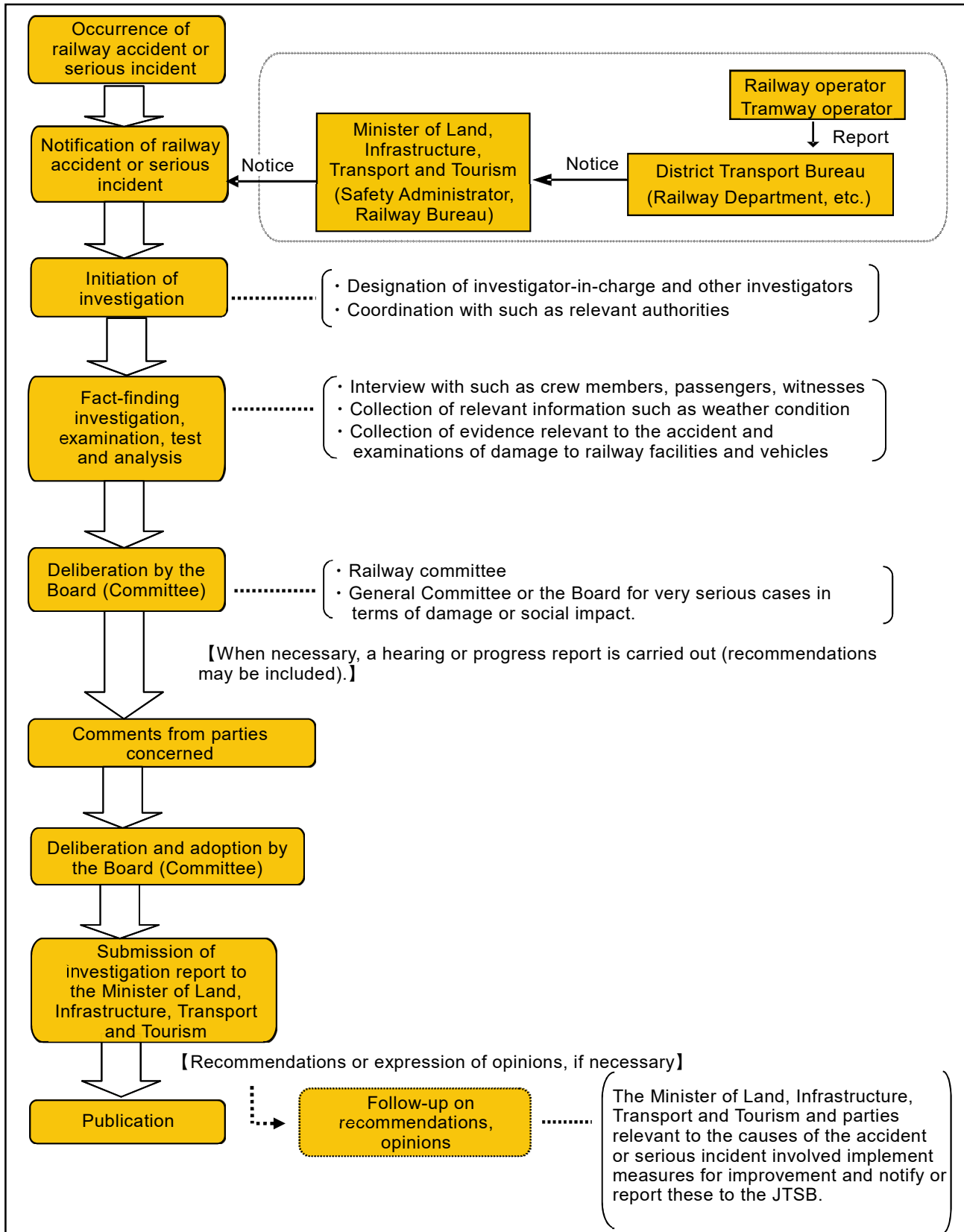
5 From among the situations occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways mutatis mutandis as specified in Article 3, paragraph (1) of the Ordinance on Tramway Operations, the situations equivalent to those specified in Article 2, items (i) through (vi) of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

Serious incidents to be investigated

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

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

2 Procedure of railway accident/serious incident investigation



* Opinions may be expressed in a flow chart (as above) or whenever and however necessary to prevent accidents or incidents or mitigate damage thereof.

3 Statistics of investigations of railway accidents and serious incidents

The JTSB carried out investigations of railway accidents and serious incidents in 2021 as follows:

14 accident investigations were carried over from 2020, and 11 accident investigations were newly launched in 2021. Among these, 12 investigation reports were published in 2021, and 13 accident investigations were carried over to 2022.

Moreover, two railway serious incident investigations were carried over from 2020, and one serious incident investigation was newly launched in 2021. Among these, two investigation reports were published in 2021, and one investigation was carried over to 2022.

Among the 14 investigation reports published, the JTSB provided one recommendation and one opinion.

Investigations of railway accidents and serious incidents in 2021

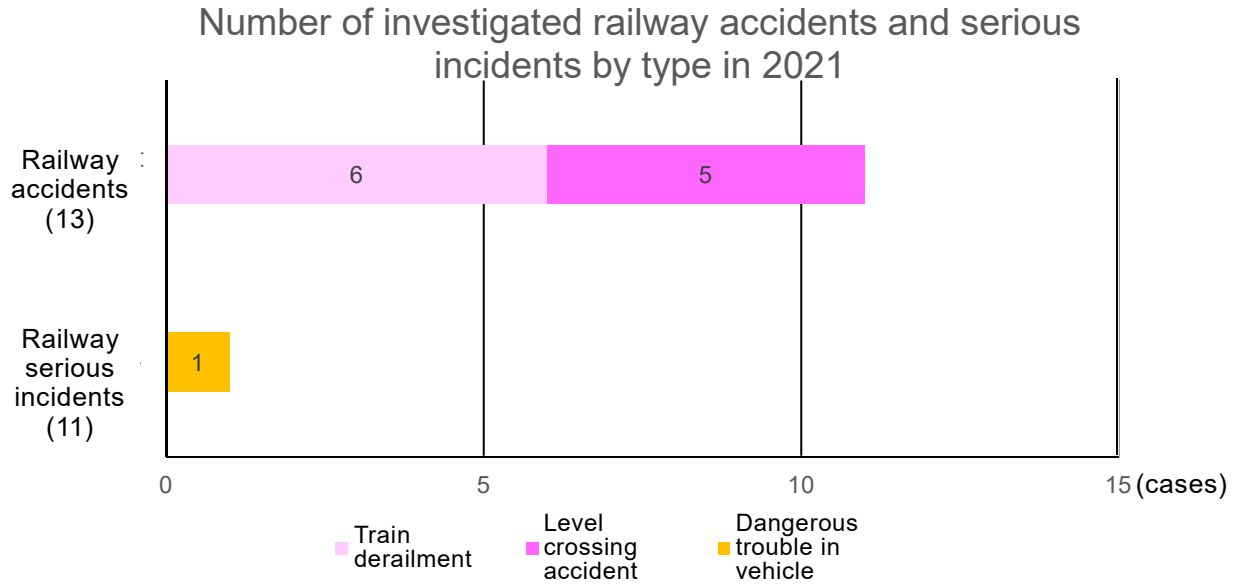
(Cases)

Category	Carried over from 2020	Launched in 2021	Total	Published investigation reports	(Recommendations)	(Opinions)	Carried over to 2022	(Interim report)
Railway accident	14	11	25	12	(1)	(1)	13	(4)
Railway serious incident	2	1	3	2	(0)	(0)	1	(0)

4 Statistics of investigated railway accidents and serious incidents in 2021

Regarding the number of railway accidents and incidents investigated in 2021, there were 11, a decrease of two from 13 in the previous year, and there was one serious railway incident, a decrease of one from two in the previous year.

The breakdown by type of accidents and serious incidents is as follows: The railway accidents consisted of six derailments and five level crossing accidents. As for railway serious incidents, there was one dangerous trouble in vehicle.



There were eight persons killed or injured in 11 accidents, five of whom were killed and three were injured.

The number of casualties (in railway accidents)

(Persons)

2021							
Category	Dead			Injured			Total
	Crew	Passenger	Others	Crew	Passenger	Others	
Casualties	0	0	5	0	3	0	8
Total	5			3			

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

5 Summaries of railway accidents and serious incidents which occurred in 2021

The railway accidents and railway serious incidents which occurred in 2021 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 26, 2021 Train derailment	East Japan Railway Company	Between Tsuchiura Station and Kandatsu Station on the Joban Line, Ibaraki Prefecture
	Summary	The driver of the train noticed an automobile stopped on the railway and carried out an emergency stop operation, but failed to avoid collision. All of the No. 1 bogie axles of the forefront vehicle derailed.	
2	Date and accident type	Railway operator	Line section (location)
	May 16, 2021 Level crossing accident	East Japan Railway Company	Between Oguni Station and Echigo-Kanamaru Station on the Yonesaka Line, Yamagata Prefecture Masuoka level crossing (class 4 level crossing without automatic barrier machine nor road warning device)
	Summary	The driver of the train noticed that an automobile entered the level crossing from the right of the train's travel direction and carried out an emergency stop operation, but failed to avoid collision. Later, the death of the driver of the automobile was confirmed.	
3	Date and accident type	Railway operator	Line section (location)
	July 5, 2021 Train derailment	East Japan Railway Company	Between Mataka Station and Rikuchu-Kanzaki Station on the Ofunato Line, Iwate Prefecture
	Summary	The driver of the train noticed a fallen tree obstructing the route of the train and carried out an emergency stop operation, but failed to avoid collision. All two axles of the first bogie derailed.	
4	Date and accident type	Railway operator	Line section (location)
	July 12, 2021 Level crossing accident	Amagi Tetsudou	Between Nishitachiarai Station and Yamaguma Station on the Amagi Line, Fukuoka Prefecture Minami-Tsuchitori level crossing (class 4 level crossing without automatic barrier machine nor road warning device)
	Summary	The driver of the train noticed that an automobile entered the level crossing from the left side of the train's travel direction and carried out an emergency stop operation, but failed to avoid collision. Later, the death of the driver of the automobile was confirmed.	
5	Date and accident type	Railway operator	Line section (location)
	July 21, 2021 Level crossing accident	Hokkaido Railway Company	Between Shikaribetsu Station and Niki Station on the Hakodate Line, Hokkaido Naito level crossing (class 4 level crossing without automatic barrier machine nor road warning device)
	Summary	The driver of the train noticed that a pedestrian entered the level crossing from the left side of the travel direction and carried out an emergency stop operation, but failed to avoid collision. Later, the death of the pedestrian was confirmed.	
6	Date and accident type	Railway operator	Line section (location)
	July 24, 2021 Train derailment	Japan Freight Railway Company	In the Sumidagawa Station yard on the Joban Line, Tokyo

	Summary	The train started running for the return line, and the locomotive was conducting propelling movement of 19 freight wagons, both axles on the front side of the travel direction of the third freight wagon from the locomotive derailed.	
7	Date and accident type	Railway operator	Line section (location)
	September 27, 2021 Level crossing accident	Echigo TOKImeki Railway Company	Between Sekiyama Station and Nihongi Station on the Myoko Haneuma Line, Niigata Prefecture Fukuzaki level crossing (class 4 level crossing without automatic barrier machine nor road warning device)
	Summary	The driver of the train noticed that a motorcycle entered the level crossing from the left side of the travel direction and carried out an emergency stop operation, but failed to avoid collision. Later, the death of the motorcyclist was confirmed	
8	Date and accident type	Railway operator	Line section (location)
	October 7, 2021 Train derailment	Tokyo Metropolitan Bureau of Transportation	In the Toneri-koen Station yard of the Nippori-Toneri Liner, Tokyo
	Summary	The commander noticed the warning sound sounded by the Urgent Earthquake Detection and Alarm System (Earthquake Early Warning), and used the button for emergency stop of all trains. The train stopped while running the junction after departing Toneri-koen Station. Later, checking the vehicle revealed that the front bogie of the forefront vehicle had deviated from the running track.	
9	Date and accident type	Railway operator	Line section (location)
	December 27, 2021 Train derailment	OHMI Railway Co., Ltd.	In the Hikoneguchi Station yard of the Main Line, Shiga Prefecture Okamichi level crossing
	Summary	When the train was running on the level crossing to remove snow at a speed of 15 km/h, the first axle of the front bogie of the forefront vehicle derailed to the left side of the travel direction.	
10	Date and accident type	Railway operator	Line section (location)
	December 28, 2021 Train derailment	Japan Freight Railway Company	Between Seno Station and Hachihommatsu Station on the Sanyo Line, Hiroshima Prefecture
	Summary	When the train was running between these stations, the train stopped by an automatic emergency brake. Checking the vehicle condition revealed that all axles (four wheels) of the front-side bogie of the 12th vehicle from the forefront had derailed.	
11	Date and accident type	Railway operator	Line section (location)
	December 30, 2021 Level crossing accident	Joshin Dentetsu Co., Ltd.	Between Higashi-Tomioka Station and Joshu-Tomioka Station on the Joshin Line, Gunma Prefecture Seiunji level crossing (class 4 level crossing without automatic barrier machine nor road warning device)
	Summary	The driver of the train noticed a person crouching in the level crossing and carried out an emergency stop operation, but failed to avoid collision. Later, the death of the person was confirmed.	

(Railway serious incidents)

1	Date and incident type	Railway operator	Line section (location)
	November 23, 2021 Dangerous trouble in vehicle	Kintetsu Railway Co., Ltd.	In the Ise-Asahi Station yard on the Nagoya Line, Mie Prefecture
	Summary	The conductor of the train noticed the open passenger door on the left side of the furthest vehicle's travel direction while passing in the vicinity of Ise-Asahi Station. No passengers fell outside the train through the open door.	

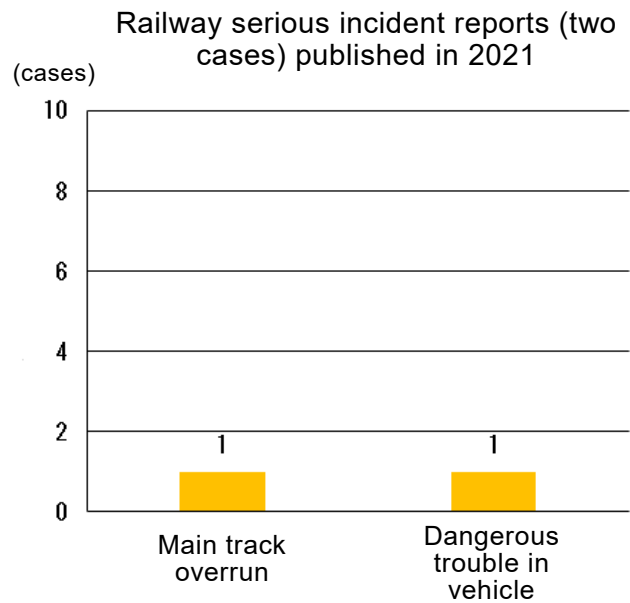
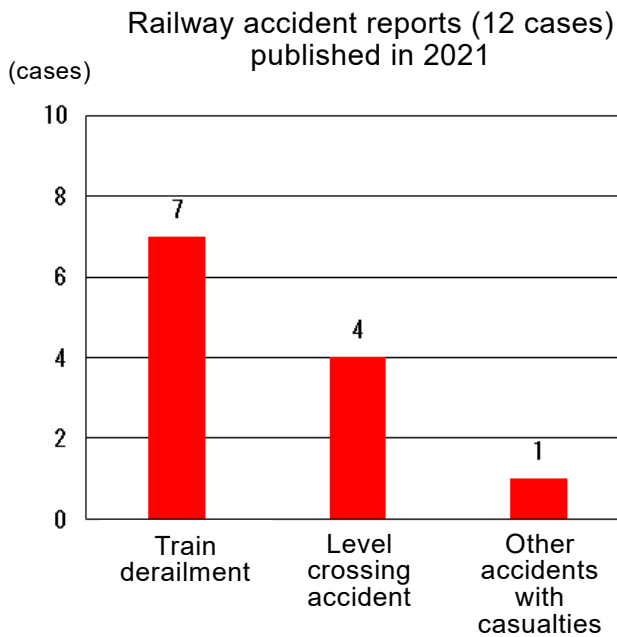
6 Publication of investigation reports

The number of investigation reports of railway accidents and serious incidents published in 2021 was 14, consisting of 12 railway accidents and two serious incidents.


Breaking them down by type, the railway accidents contained seven train derailment accidents, four level crossing accidents, and one accident resulting in casualties. The railway serious incidents contained one main track overrun, and one dangerous trouble in vehicle.

In the 12 accidents, the number of casualties was 103, consisting of seven deaths and 96 injuries.

The investigation reports on railway accidents and serious incidents published in 2021 are summarized as follows.



Railway accident investigation reports published in 2021

1	Date of publication	Date and accident type	Railway operator	Line section (location)	
	February 18, 2021	June 1, 2019 Other accidents with casualties	Yokohama Seaside Line Co., Ltd.	In the Shin-Sugita Station yard on the Kanazawa Seaside Line, Kanagawa Prefecture	
	Summary	<p>The train departed from the starting station, Shin-Sugita station, on schedule, by the unmanned automatic operation. However, the train moved to the inbound direction opposite to the direction of travel i.e., the outbound direction, and collided with the car stop at the end terminal of the track.</p> <p>There were 25 passengers boarded on the train, the 17 passengers among them were injured.</p>			
	Probable causes	<p>The JTSB concludes that the probable cause of this accident was certain that this accident occurred because the Train started to run in the inbound direction, i.e., the outbound direction opposite to the direction of travel, when turned back in Shin-Sugita station, and collided with the car stop at the end terminal of the track.</p> <p>It is highly probable that the Train started to move by the power running in the direction opposite to the designated running direction without intention, because the motor control device of the 2000 series vehicle drove the motors in the inbound direction that had been preserved in the memory function, as the F cable, which is the command cable to transmit the signal on the running direction of the train to the motor control device, became in the de-energized status due to be broken in the 1st vehicle. Furthermore, it is probable that the measures such as the emergency stop procedures could not be implemented, because the station ATO ground unit recognized that the running direction of the train had been set normally, as the station ATO onboard unit had transmitted the status of the running direction based on the energized status of the command line to select the driving desk, which is different to the input signal to the motor control device, and also there was no function to detect the backward running or the function to detect by the other methods backward moving such as in this accident.</p> <p>It is probable that the F cable had broken as that the insulator of the F cable wore gradually by the friction with the upper surface of the end panel due to the vibration while the vehicle was running, and fault grounded to the end panel, as the results of that the bundle of cables including the F cable in the device room were wired without attaching the protecting materials for the electric wires sufficiently, and had been contacted with the end panel made of the stainless steel, but the inspection had not been implemented after finished the wiring works.</p> <p>It is likely that the existence of the latent causes for such dangerous incident and the insufficient security of the safety against the abnormal status such as the backward running, etc., were not noticed, because the confirmation and the arrangement on the understandings for the designing organization, the basic concept, and the specifications, etc., among the Company, the vehicle manufacturer and the device manufacturer, and the extraction of the safety factors before designing were not implemented sufficiently, in the designing and manufacturing process of the 2000 series vehicle, the latent causes of the dangerous incident for the occurrence of the backward running was generated, in addition, also the verification of the safety was insufficient, in the back ground of this accident.</p>			
	Safety actions	<p>Measures taken by the Company</p> <p>Safety actions of the running in wrong direction implemented by the Company after this accident were as follows.</p> <p>[1] Changed the electric circuit to add the contact terminal of the relay to detect the energized status of the F cable and the R cable, in the condition of the operation of the departure condition relay in the ATO*¹ onboard unit.</p> <p>In addition, for the purpose that the ground units comprehend correctly the recognition on the running direction of the vehicle, changed the command cable, which return the information on the status of running direction to the ground units via the station ATO onboard unit, from the conventional command cables to select the</p>			

driving desk, i.e., the 194G cable and the 195G cable, to the F cable and the R cable, furthermore, set the F cable and the R cable as the loop circuit in the trainset to enable to obtain the information from the end terminal side.

- [2] Changed the software of the motor control device to implement the powering operation and the regenerative braking control only when one of the F cable and the R cable was in the energized status.
- [3] Changed the software in the ATC*² onboard unit, as to operate the emergency brake when detected vehicle running in the status that both the F cable and the R cable, which are the command cable for the running direction, are in the de-energized status due to the breakage of cables, etc.
- [4] Abolished the relay to correct the stopped position backward*³, in order to improve the reliability still more of the circuit to instruct running direction of the vehicle. Besides, the Company implemented the following measures.
- [5] The wired status in the device rooms in all trainset composed of the 2000 series vehicles were checked and attached the protecting materials to the electric wires and the vehicle materials for the electric wires, etc., close to the vehicle materials.
- [6] Implemented the hazard analysis on the automatic operation system of the 2000 series vehicles, and implemented to check the existence of the part with the safety problem. As the results, it is confirmed that there was no part with the safety problem, except for the implemented measures in the above [1] to [4].
- [7] It was difficult to investigate the personal information of the passengers and to comprehend the number of the transported injuries, etc., correctly, due to the small number of the station staffs who responded just after the accident against the number of the injured passengers in this accident. Therefore, created the "contact address card" to establish the system that enabled to be contacted from the passengers in the other day by distributing it to the injured passengers when the similar incident happened, and enabled to comprehend the number of the transferred persons, etc.

Measures Implemented by the Vehicle Manufacturer

The vehicle manufacturer implemented the following measures against the wiring works after this accident.

- [1] Revised the check sheet for the wiring works of the low voltage terminal rack, by adding the items on the wired status and the protected status of the electric wires. In addition, the vehicle manufacturer conducted the education and training on the revision to the company staffs thoroughly.
- [2] Expressed clearly the concrete examples with the explanatory diagrams on the protection for the electric wires and the body structure, in the manual for wiring processing. In addition, added the confirmation of the distance between the electric wires and the body structure and the flaws of the electric wires, etc., in the manual to draw up instructions of the works.
- [3] The procedures of the wiring and connecting works, implemented as the contract works, were made clear that as to implement the inspection of the first products is implemented by the relevant staffs, and receive after implemented the minor adjustment.
- [4] Decided to manage and share the photographs recording the wired status in the unified format as the formal record.
- [5] The actual vehicle implementing the wiring works were checked by the staffs relevant to the designing and manufacturing, and after the wired status and the protection of the wired cables are confirmed particularly in the narrow portion, they are added to the manual for designing and the instruction for manufacturing. Furthermore, strengthen the instruction by brushing up the on-site confirmation, the drawings and the manuals, considering as necessary to check the omission of the instruction and the on-site confirmation in the designing work for the new vehicles.
- [6] The vehicle manufacturer established the "working team to study on the manual for handling wiring works in the narrow space" composed of the relevant persons in the design section, manufacture section, etc., and implemented together with the "review of wiring in the narrow space" and the examination of wiring in narrow space in the actual vehicles, and decided to feedback to the design drawings and the manual for handling wiring works, etc.

In addition, the vehicle manufacturer implemented the following measures as the effort to

improve the safety of the products.

- [7] Revised the contents to be attended to the covering electric wires in the "10 admonitions", which was established in order to make lessons on the important works for the safety in the manufacturing process, and excite further attentions.
- [8] Implemented the education to the workers, and known well again by the managers on the circumstances to establish the "10 admonitions" established in 2018 and on the important parts in the working site.
- [9] On the "rules for safety products design, the 10 rules" established in 2018, decided to utilize in the "review of new standpoints", etc., that had been started before this accident to review on the risk of the safety when the design was changed, and aimed the improvement of the product safety.


Measures Taken by the MLIT after this Accident

- [1] On June 2, 2019, the MLIT instructed the Company to implement the investigation on the probable causes and the safety actions to secure the safe railway transportation.
- [2] On June 2, 2019, the MLIT issued "On the railway accident with casualties occurred in Kanazawa seaside Line of Yokohama Seaside Line Co. Ltd.", Railway Technology No.18, Railway Facility No.25, Railway Safety No.8, to the railway and tramway operators in the whole country, and issued the notification "On the railway accident with casualties occurred in Kanazawa Seaside Line, information provision" to the guide rail type railway operators, to let them well known the summary of this accident and instructed to endeavor to secure the safe and stable transportation by the railway and the tramway system consecutively.
- [3] On June 3, 2019, the MLIT issued "On the railway accident with casualties occurred in Kanazawa Seaside Line of Yokohama Seaside Line Co. Ltd.", Railway Technology No.19, Railway Facility No.30, Railway Safety No.9, to the railway and tramway operators in the whole country to let them known well on the status of investigation reported from the Company, and instructed the six railway operators who are operating the vehicles by the unmanned automatic operation, to pay sufficient attention particularly to the train operation in the turn back station, until the probable causes are made clear.
- [4] From the evening of June 3 to early morning of June 4, 2019, the staffs of the Railway Bureau and the Kanto District Transport Bureau attended the confirmation test conducted to resume the operation by the manual operation of Kanazawa Seaside Line.
- [5] On June 6, 2019, the MLIT gathered 7 operators who are operating the vehicles by the unmanned automatic operation, and shared the information on this accident and exchanged opinions on the prevention of the accidents, etc.
- [6] On June 14, 2019, the MLIT established the "Study meeting on the prevention of the accident in the railway and tramway systems operated by the unmanned automatic operation system", and held the first meeting. In the study meeting, the information was shared and the study on the measures to prevent the recurrence, etc., was implemented among the relevant persons. The meetings were held 3 times.
- [7] On July 19, 2019, in the 3rd study meeting, the MLIT instructed to share the information on the analyzing method for the occurrence and the causes of the dangerous incidents such as the FTA^{*4}, FMEA^{*5}, etc., from the professionals on the risk analysis, and to implement the verification of the safety by the FTA, etc., on the malfunction of the brake which is one of the serious risks other than the backward running, because the analysis based on the FTA, etc., is considered as effective as the method to evaluate the safety, even though it was confirmed that there was no problem in the other method on the operation of the motor control device.
- [8] On the same day, the above-mentioned study meeting published the intermediate report^{*6}.
- [9] From the night time of August 23, 2019, to early morning in the next day, and from the night time of August 30, 2019, to the early morning in the next day, the staffs of the Railway Bureau and the Kanto District Railway Bureau attended in the confirmation test conducted to resume the automatic train operation after implemented the measures to prevent the recurrence of the Route.
- [10] On February 27, 2020, the MLIT gathered 7 operators who are operating the vehicles by the unmanned automatic operation and the vehicle manufacturers, etc., and implemented to exchange opinions on the interim report issued by the JTSC, etc.



		<p>*1 The "ATO" is the abbreviation of the Automatic Train Operation that is the system to implement automatically, the starting control, the on-schedule operation control, the stopping control at the predetermined position, etc.</p> <p>*2 "ATC" is the abbreviation of the automatic train control, and the system to control the velocity of the train continuously less than the limited velocity when the velocity of the train exceeded the limited velocity, by checking the train velocity continuously based on the speed control signal instructed continuously responding to the position of the foregoing train and the conditions of the track.</p> <p>*3 "Relay to correct stopped position backward" in this context, is the relay used when corrected the stop position of the train if the train stopped after overran beyond the designated stop position in the station, in the automatic operation.</p> <p>*4 "FTA" is the abbreviation of the fault tree analysis, and the technique to analyze the process, the causes and the provability of the occurrence of the undesirable incidents.</p> <p>*5 "FMEA", is the abbreviation of the failure mode and effect analysis, and the technique to analyze the effects of the trouble mode of the components and the effects to the higher link items.</p> <p>*6 Intermediate report of the "Study meeting on the prevention of the accident in the railway and tramway systems operated by the unmanned automatic operation system", the MLIT, 2019</p>		
	Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-1-1.pdf https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-1-1-p.pdf (Explanatory material, in Japanese only)</p>		
	Reference	Major activities in the past year (page 4) and Chapter 2 (page 19 and page 24)		
2	Date of publication	Date and accident type	Railway operator	Line section (location)
	February 18, 2021	September 5, 2019 Train derailment, accompanied to the level crossing accident	Keikyu Corporation	In the Kanagawa-shimmachi Station yard on the Main Line, Kanagawa Prefecture Kanagawa-shimmachi No.1 level crossing (class 1 level crossing with automatic barrier machine and road warning device)
	Summary	<p>The train departed from Keikyu Kawasaki station on schedule. While the train was running between Koyasu station and Kanagawa-shimmachi station at the velocity of about 120 km/h, the driver of the train noticed that the obstruction warning signal of Kanagawa-shimmachi No.1 level crossing (the level crossing) was indicating the stop signal, then applied the service brake.</p> <p>After that, the driver noticed that the emergency inform device of Kanagawa-shimmachi station is also operating, then applied the emergency brake. After that, the driver of the Train noticed a standard sized truck (the truck) entering the route of the Train in the level crossing, then sounded the whistle and operated the emergency alarm of the train protection radio, but the Train collided with the truck and stopped after passed about 67 m from the level crossing.</p> <p>About 500 passengers, the driver and the conductor boarded on the Train, among them, 75 passengers, including 15 seriously injured passengers, and the driver and the conductor were injured. In addition, the driver who was in the truck alone was dead.</p> <p>Due to this collision, the 1st vehicle to the 3rd vehicle of the Train derailed and a part of the vehicle bodies and the apparatus were damaged. In addition, the truck had wrecked and caught fire.</p>		



<p>Probable causes</p>	<p>The Japan Transport Safety Board concludes that probable cause of this accident was certain that the standard sized truck entered the Kanagawa-shimmachi No.1 level crossing and hindered the route of the train, and the train could not stop before the level crossing although the obstruction warning signal of the level crossing had been indicating the stop signal, then collided with the truck.</p> <p>It is certain that the truck hindered the route of the train because the road warning device started the warning operation after the truck started to enter the level crossing, and completed the blocking operation before the truck had passed through the level crossing, then the truck stayed in the level crossing.</p> <p>It is likely that the truck stayed in the level crossing because it took long time for the truck to pass through the level crossing due to the narrow width of the road against the size of the truck, when the truck turned right in the intersection and enter the level crossing.</p> <p>As a side note, it is likely that the truck driver, selected the route to the level crossing via the Urashima route 152 to bypass the usual route, related to that the truck could not operate in the usual route. However, it could not be determined why the truck passed the unusual route because the truck driver was dead.</p> <p>The train could not stop before the level crossing, even though the obstruction warning signal of the level crossing had been indicating the stop signal. It is probable that this situation was caused because the driver of the train could not implement the braking operation to stop the train before the level crossing at the position where the indication of the obstruction warning signal of the level crossing became to be sighted from the driver of the train.</p> <p>Concerning that the driver of the train could not implement the braking operation at the place where the driver became able to sight the operation of the obstruction warning device of the level crossing, it is probable that it was difficult for the driver to respond instantaneously to the obstruction warning signal that indicate the stop signal in unanticipated timing. In addition, it is probable that the driver noticed with delay concerned with that there was the scene that the flickering status of the remote obstruction warning device was blocked intermittently by the masts, etc. in spite of the place where the obstruction warning device became to be sighted. As a side note, it is likely that the velocity when the train collided could be reduced if the Driver had operated the emergency stop procedures by the emergency brake when operated the service brake. However, the company stipulated to use the service brake to stop the train as the principle under the rule "when the stop signal was indicated in the obstruction warning device, stop immediately". And the company had entrusted the driver with the judgement to operate the service brake or the emergency brake, considering the status as the velocity, distance, etc. Therefore, it is likely that the above situation was caused as related with that the brake to be used had not been prescribed clearly in the implementing standard of handling operation and the working standard of the driver of electric railcar.</p>
<p>Safety actions</p>	<p>Measures Taken by the Railway Operators after the Accident</p> <p>On September 2019, after this accident, the Company notified the change of the Working Standards of the Driver of Electric Railcar, an internal rule, to "stop immediately" on the handling of the brake when noticed the stop signal of the OWS. After that, the rule was changed as "operate the emergency brake procedures immediately" on November 2019. Furthermore the rule was changed as "when noticed the indication of the flashing light signal, operate the emergency brake immediately and stop the train, provided that the use of the service brake is allowed only when the train can stop certainly in approach of the confirmed flashing light signal, such as the train was operating in low speed as in the slowing down operation or there is enough distance until to the noticed flashing light signal" on February 2020. At the same time, the Company implemented the education and the training for all drivers.</p> <p>On December 2019, the Company reviewed the rules to install the OWS, and decided the installing position where the OWS can be sighted from the place in the distance that the margins are added to the conventional place, i.e., "the place where the OWS can be sighted from the place beyond the distance that train can be stopped by the emergency brake", in order to add the still more margins to brake operation and to improve the visibility of the OWS.</p> <p>Additionally, the Company installed the additional OWS for the Level crossing on December 2019. In addition, the Company implemented the additional measures to install the OWS, for the other level crossings.</p> <p>Measures implemented by the trucking company after the accident</p>

		<p>Corresponding to the occurrence of this accident, the trucking company, for which the driver of the standard sized truck was working, implemented the instruction to the drivers so that they select the proper route and operate the truck studying on the selection of the operating route in advance. In addition, the trucking company instructed for the drivers to contact with the police when the passage became in the difficult status.</p> <p>Measures Taken by the Ministry of Land, Infrastructure, Transport and Tourism after the Accident</p> <p>On September 6, 2019, the Automobile Bureau of the Ministry of Land, Infrastructure, Transport and Tourism, the MLIT, responded to the occurrence of this accident, in order to prevent the recurrence of the similar accident, made commonly known the trucking operators in the whole country to enforce the followings in the roll call, the guidance, supervising for the drivers.</p> <ol style="list-style-type: none"> (1) Implement the required instruction to secure the safe operation of the automobiles for business purpose such as to select the route that can pass, to the drivers in the roll call. (2) Instruct the drivers to implement the proper measures for protection against the trains by pushing the emergency push button, etc., when the automobile became unable to operate in the level crossing. (3) Urge the drivers to select the proper operating route to avoid the route difficult to pass through, as the driver comprehended the operating route in advance, in the guidance and the supervising for the drivers. <p>In addition, the Automobile Bureau has been studying on the investigation and analysis of the factors to cause the accident related to the truck in this accident and on the measures to prevent the recurrence in the investigation committee for the accident of the automobiles for business purpose.</p> <p>The Railway Bureau of the MLIT, responding to the measures of the Company against this accident to install the additional OWS and to review the braking operation when the OWS indicated the stop signal, let the railway operators in the whole country known well on the measures implemented by the Company, in order to make absolutely sure to secure the safety of the train operation and to prevent the recurrence of the similar accident, and instructed to review on the installed status of the OWS and on the handling when the drivers noticed the indication of the stop signal of the OWS, and to implement the measures depending on the necessity.</p> <p>Measures Taken by the Road Administrator after the Accident</p> <p>The road administrator, i.e., Kanagawa Civil Engineering Office of the City of Yokohama, installed the guidance board to suppress the entrance of the large-sized automobiles and the guiding sign to indicate the bypass route, in around Nakakido station, i.e., in the direction to end of the Urashima route 152, where the Truck had passed on the way to the Level crossing, as shown in Figure 10 (see the report), in December 2019.</p>		
	Report	https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-1-2.pdf https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-1-2-p.pdf (Explanatory material, in Japanese only)		
	Reference	Major activities in the past year (page 6)		
3	<p>Date of publication</p> <p>February 18, 2021</p> <p>Summary</p>	<p>Date and accident type</p> <p>November 27, 2019 Train derailment</p>	<p>Railway operator</p> <p>Aizu Railway Co., Ltd.</p>	<p>Line section (location)</p> <p>Between Tonohetsuri station and Yunokami Onsen station on the Aizu Line, Fukushima Prefecture</p> 


	Probable causes	<p>The JTSB concludes that the probable cause of this accident was that the slope in the railway track side collapsed, and the train ran onto the earth and sand flowed into the railway track and derailed in the accident.</p> <p>It is probable that the slope collapsed and earth and sand flowed into the railway track because the strength of the waterway, which had been laid underground of the Fukushima Prefectural Road 347 located in upper part of the collapsed slope, deteriorated over the years, and broken caused the leaking water, that soaked into the collapsed slope, composed of the colluvium layer, and made unstable status due to the increased water content.</p> <p>It is likely that the waterway broke as deteriorated strength due to the deterioration over the years, related by that the management of the waterway had not been conducted properly.</p>		
	Safety actions	<p>Measures taken by the Company</p> <p>(1) Emergency measures taken</p> <ol style="list-style-type: none"> 1. Requested a traffic ban of dump trucks for construction to the Minami-Aizu Construction Office (hereinafter referred to as "the Office") of Fukushima Prefecture that is the administrator of Fukushima prefectural road No. 347 (hereinafter referred to as "the prefectural Road") after the accident occurred. 2. Allocated on-site lookout persons in the vicinity of the collapsed slope from the restarting day on November 30, 2019 (up to December 14 when a wire net was installed), and also regulated the Prefectural Road at a slow speed of 15 km/h during the period for the traffic of dump trucks for construction. 3. Installed lighting equipment in the vicinity of the collapsed slope when restarting the train operation. (Up to September 30, 2020) 4. Reinforced the surrounding area including the collapsed slope using a wire net as a temporary slope treatment. (Installation completed on December 14, 2019) 5. Confirmed with the Office as of June 10, 2020 that the traffic of dump trucks for road construction shall be restarted after the execution of slope protection work, and also confirmed the traffic restrictions (one track operation, very slow speed, and precipitation control, etc. in the area of about 300 m in the vicinity of the route with the collapsed slope). <p>(2) Permanent measures taken</p> <ol style="list-style-type: none"> 1. Executed slope protection work by slope crib (free frame method) on the slope that is likely to impede the train operation around the accident site including the collapsed slope. (See Figure Implementation status of slope protection work) 2. Installed a protection net and a collapse detection sensor, and also reinforced the lower part of the slope that is likely to impede the train operation in the vicinity of the collapsed slope. 3. Confirmed with the Office that the Office shall carry out the joint reinforcement of road gutters, the maintenance and management of road-crossing water conduit and catch basin. <div data-bbox="970 1077 1362 1366" data-label="Image"> </div> <p>Measures taken by Fukushima Prefecture</p> <p>Removed the water conduit buried under the Prefectural Road on December 5, 2019, installed a new water conduit on February 22, 2020, and decided that the Fukushima Prefecture shall manage it.</p>		
	Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-1-3.pdf (In Japanese only) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-1-3-p.pdf (Explanatory material)</p>		
4	Date of publication	Date and accident type	Railway operator	Line section (location)
	February 18, 2021	March 10, 2020 Train derailment, accompanied to the level crossing accident	Chikuho Electric Railroad Co., Ltd.	Between Kusubashi station and Chikuho-Katsuki station on the Chikuho Electric Railroad Line, Fukuoka Prefecture Chikuho-Katsuki No.7 level crossing (class 1 level crossing with automatic

			barrier machine and road warning device)	
Summary	<p>The driver of the train operated the train between Kusubashi station and Chikuhokatsuki station at the velocity of about 57 km/h, the driver of the train noticed the compact sedan entered Chikuhokatsuki No.7 level crossing, class 1 level crossing, from left, and applied the emergency brake immediately, but the train collided with the compact sedan and all 2 axles in the front bogie derailed to right.</p> <p>The driver of the compact sedan was dead on this accident.</p>			
Probable causes	<p>The JTSB concludes that the probable cause of this accident was that the approaching train collided with the compact sedan at the velocity of about 50 km/h, and right wheels of the train ran onto right rail and derailed in this accident, because the compact sedan turned right and entered the level crossing as pushing up the crossing rod in the status that the road warning device was operating and the crossing rod had been lowered, and stopped, and the compact sedan was caught between left side surface of the train and the concrete column for the overhead trolley, etc., and pushed out the vehicle body of the train to right. Besides, it could not be determined why the compact sedan entered the level crossing, because the driver of the compact sedan was dead.</p>			
Safety actions	<p>Measures taken by the Company</p> <p>(1) The Company took the following measures.</p> <p>[i] Installed the red colored revolving lights aimed to improve the sighting ability when the level crossing is operated, to the prop of the road warning device of the level crossing, on May 20, 2020.</p> <p>[ii] Let the information on this accident commonly possessing, and conducted the education on the importance of the train protection to all train crews.</p> <p>(2) The company and the road administrator, i.e., Kitakyushu City, discussed on the measures for the safety.</p> <p>Measures taken by Kitakyushu City</p> <p>(3) Responding to the discussion in the above (2), the road administrator, i.e., Kitakyushu City, painted again the blurred stop lines, and installed the light-emitting type road rivets*1 to promote the attention of car drivers, on October 2, 2020.</p> <p>*1 "Light-emitting type road rivet" emits flashing night-light to raise awareness of car drivers, and is installed by embedding them on road surfaces such as stop lines, edge markings, and cross walk.</p>			
Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-1-4.pdf (In Japanese only)</p> <p>https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-1-4-p.pdf (Explanatory material)</p>			
5	Date of publication	Date and accident type	Railway operator	Line section (location)
	March 25, 2021	March 9, 2020 Train derailment	West Japan Railway Company	Between Tojo station and Bingo-Yawata station on the Geibi Line, Hiroshima Prefecture
Summary	<p>The train departed from Tojo station on schedule.</p> <p>While the train was running between Tojo station and Bingo-Yawata station at the velocity of about 65 km/h, in the dark circumference before sunrise, the driver of the train felt a shock and operated the emergency brake but the train collided with earth and sand in the pocket type catch net for falling rocks accumulated due to the collapse of the slope. The train tilted to left side against the direction of travel and the vehicle body turned over, caused the derailment of the whole axles.</p> <p>Only the driver was onboard the train, but was not injured.</p>			
Probable causes	<p>The JTSB concludes that the probable cause of this accident was that the fallen rocks and earth and sand, etc., which were caused by the collapse of the slope and accumulated in the pocket type catch net for falling rocks and pushed out resulted to hinder the route of the train,</p>			

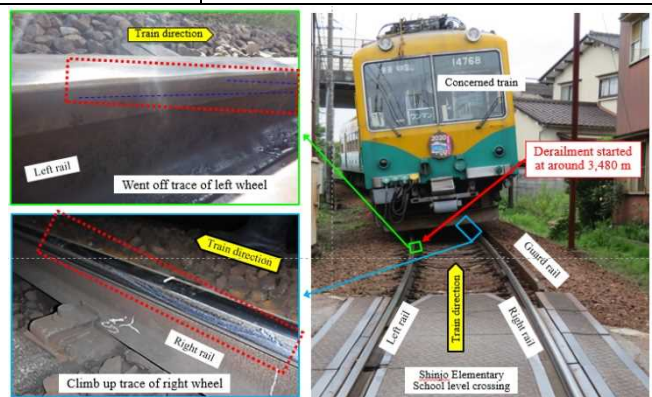
		<p>and the approaching train collided with them, turned over, and resulted the derailment of all axles, in this accident.</p> <p>It is probable that the slope had collapsed because the strength of the fragile inner bedrock in upper part of the slope deteriorated gradually by the progress of the weathering in long period.</p> <p>In addition, it is likely that the driver could not noticed that the earth and sand, etc., accumulated in the pocket type catch net for the falling rocks was hindering the route of the train, related with that the circumference was dark as it was before sunrise.</p>		
	Safety actions	<p>Reinforced the slope using the mortar spraying (lath net*¹ included) method to prevent weathering and erosion as restoration measures and installed non-pocket type catch net*² made of high-specification zinc-aluminum-plated wires, with technical instructions provided by the third party that was requested to investigate the derailed area of the train caused by the collapsed slope.</p> <p>Ensured inspectors in the track maintenance area, etc. to inspect slopes that have a pocket type catch net by adding "the accumulation status of the earth and sand on the back of the pocket type catch net and the tension status of the wire net, etc." to the viewpoints of inspections.</p> <p>*1 "Lath net" is a wire net used as a mortar underbed to prevent mortar from coming off. *2 "Non-pocket type catch net" is a measure to bind rocks that lost the bonding strength to natural ground using the friction with natural ground and the tension of the net.</p>		
	Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-2-1.pdf (In Japanese only) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-2-1-p.pdf (Explanatory material)</p>		
6	Date of publication	Date and accident type	Railway operator	Line section (location)
	March 25, 2021	March 18, 2020 Train derailment	Nagaragawa Railway Co., Ltd.	In the premises of Mino-Ota station, Etsuminan Line, Gifu Prefecture
	Summary	<p>While the train was running in around the left curved track of 300 m radius in the premises of Mino-Ota station at the velocity of about 17 km/h, the driver of the train felt the impact and applied the emergency brake to stop the train.</p> <p>After the train stopped, the driver checked the under floor of the vehicle and found that all axles in the front bogie had been derailed to right.</p> <p>There were 10 passengers and the driver were onboard the train, but no one was injured.</p>		
	Probable causes	<p>The JTSB concludes that the probable cause of this accident was that, the left wheels of all 2 axles in the front bogie went off to the inside gauge, after that the right wheels of all 2 axles in the front bogie went off to outside gauge in this accident, because the gauge was widened dynamically while the train was passing through left curved track of 300 m radius.</p> <p>It is probable that that the gauge was widened dynamically by the rail tilting and the rail movement caused by the lateral force while the train was passing, because the poor sleepers and the poor rail fastening status had been existed continuously.</p> <p>It is probable that the poor sleepers and the poor rail fastening status existed continuously because the company staff in the work-site division, who was assumed as lacked in the technical abilities, had judged that the status was enough to be observing the progress and had not been implemented the maintenance, in the management of the sleepers and the rail fastening status. In addition, it is probable that the lack of the technical activity was caused by the insufficient education and confirmation for the staffs in the work-site division by the head office.</p>		
	Safety actions	<p>Measures Taken by the Railway Operator after the Accident</p> <p>(1) Urgent measures</p> <ol style="list-style-type: none"> 1. Exchanged 292 poor sleepers located in the area from the starting point up to about 0 k 470 m, and implemented track maintenance (completed on March 28). 2. Exchanged at least one in three sleepers in the area where continuous failure of sleepers is confirmed and sleepers with ongoing failure (68 sleepers) and installed tie plates in the curve of 400 m radius or less of the whole line (completed on March 28). 3. Implemented running at 40km/h reduced speed from 55 km/h, i.e. at 15 km/h or less as 		



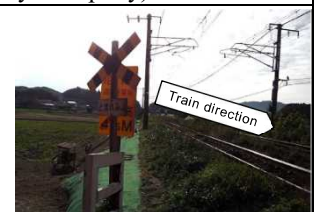
		<p>the speed limit for outbound trains, and at 30km/h reduced speed from 45 km/h, i.e. at 15 km/h or less as the speed limit for inbound trains and monitored the track status by carrying out a daily track inspection for seven days from the restarting day of the train operation (from April 1 to April 7, 2020).</p> <p>(2) Permanent measures</p> <ol style="list-style-type: none"> 1. When inspecting sleepers or conducting an on-foot track patrol, etc., the corrosion status of sleepers shall be checked, and the digging into or displacement of wooden sleepers of the rail bottom or tie plates shall be checked according to the situation especially, the fastening status of the sleepers and the rail fastening device shall be confirmed. In addition, the inspection results of sleepers shall be securely managed using a management ledger for one sleeper, and also appropriate track maintenance shall be carried out (started from March 31, 2020). 2. Inspection documents shall be confirmed by personnel up to the safety manager, and a system shall be established to enable reporting information to superiors urgently without considering costs, etc., if emergency repair, etc. is needed. In addition, it was decided to share information regularly (about once a month) by interviewing each section head (for the building work section, started from November 26, 2020). 3. Since the work did not proceed much due to the small number of workers of the building work section, two new recruits were provided to the building work section (October 1, 2020). In addition, one more recruit was provided in December of the same year. 4. Wooden sleepers in the vicinity from the starting point to 0 k 470 m were replaced with PC sleepers (October 3, 2020). 5. Reference cases with photographs were informed within the building work section for references when evaluating poor sleepers and floating spikes (implemented from October 16, 2020). 6. When inspecting sleepers, if a sleeper, for which replacement is not needed, has a floating spike, although the sleeper management ledger has not described the floating spike, the internal regulations for managing one sleeper shall be changed (to be carried out early) to add D rank to the judgment ranking (a triangle mark shall be given if spare work or hammering is needed due to the floating spike despite of good condition of the sleeper). Moreover, a triangle mark was given using a paint to sleepers with a floating spike, found during the sleeper inspection (completed on November 10, 2020). 7. It was decided to change the number of spikes to be hammered to the number stated in the "track maintenance and management manual" when maintenance is made, such as replacing sleepers in the tie plate installation section (to be implemented every time construction work occurs). 8. Inspection and maintenance of poor bridge sleepers between Mino-Ota station and Seki station (to be replaced in FY 2022). 9. Replacement with PC sleepers for at least one in three sleepers in the curve of 400 m radius or less, excluding the area with switch sleepers (to be implemented by FY 2023). 		
	Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-2-2.pdf (In Japanese only)</p> <p>https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-2-2-p.pdf (Explanatory material)</p>		
7	Date of publication	Date and accident type	Railway operator	Line section (location)
	March 25, 2021	May 8, 2020 Train derailment	East Japan Railway Company	Between Awa-Kamogawa station and Awa-Amatsu station on the Sotobo Line, Chiba Prefecture
	Summary	<p>The train departed from Awa-Kamogawa station on schedule. While the train was running at the velocity of about 94 km/h, the trainee driver of the train felt the impact as thrust up from downward when passed No.1 Shinden level crossing, then applied the emergency brake to stop the train. After the train stopped, the instructor driver, who had been coaching the trainee driver, reported the situation to the train dispatcher and checked the vehicle. As it was found that the 1st and the 2nd axles in the front bogie of the 1st vehicle had been derailed to left side of the direction of travel, the instructor driver reported it to the train dispatcher.</p> <p>There were 16 passengers and 3 train crews, i.e., the trainee driver, the instructor driver</p> <div data-bbox="1066 1709 1412 1989" style="float: right; text-align: center;"> </div>		

		<p>and the conductor, were onboard the train, among them, one passenger was injured.</p>		
	<p>Probable causes</p>	<p>The JTSB concludes that the probable cause of this accident was that, while the train was running in No.1 Shinden level crossing, the 1st and the 2nd axles in the front bogie of the 1st vehicle ran onto the plural ballasts in around the top surface of rail in the level crossing and derailed to left side of the direction of travel, in this accident.</p> <p>It could not be determined the precise reason why the plural ballasts had been existed in around the top surface of rail in the level crossing, although there was the possibility as to be placed intensively.</p>		
	<p>Safety actions</p>	<p>Measures taken by the railway operator after the accident</p> <p>(1) Installed a guard angle within the gauge parallel to the rail before and behind the level crossing and a surveillance camera to the road warning device of the level crossing. In addition, these are installed at the level crossing as tentative measures in the stage where probable causes of the derailment are unknown. (See the figure)</p> <p>(2) Issued a document requesting cooperation to local governments in Chiba Prefecture in order to raise awareness on the dangerous act of placing stones.</p> <p>(3) Taken the following awareness-raising actions to prevent unsafe actions at a level crossing.</p> <ol style="list-style-type: none"> 1. Displayed posters at stations and advertisement in trains running mainly in Chiba Prefecture 2. Implemented awareness-raising activities at multiple locations in Kamogawa City with cooperation of local governments, etc. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Installed surveillance camera</p> </div> <div style="text-align: center;">  <p>Installed guard angles</p> </div> </div> <p style="text-align: center;">Figure Installation status of guard angles and a surveillance camera</p>		
	<p>Report</p>	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-2-3.pdf (In Japanese only) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-2-3-p.pdf (Explanatory material)</p>		
<p>8</p>	<p>Date of publication</p>	<p>Date and accident type</p>	<p>Railway operator</p>	<p>Line section (location)</p>
	<p>June 24, 2021</p>	<p>May 5, 2020 Level crossing accident</p>	<p>East Japan Railway Company</p>	<p>In the premises of Higashi-Yamato station on the Senseki Line, Miyagi Prefecture No.1 Shimoura level crossing (class 3 level crossing without automatic barrier machine, with road warning device)</p>
	<p>Summary</p>	<p>While the train was running between Yamoto station and Higashi-Yamato station at the velocity of about 90 km/h, the driver of the train noticed the pedestrian entering No.1 Shimoura level crossing (class 3 level crossing; the level crossing) at about 20 m before the level crossing, and sounded the whistle and applied the emergency brake immediately, but the train collided with the pedestrian.</p> <p>The pedestrian was dead in this accident.</p> <div style="text-align: right;">  </div>		

	Probable causes	<p>The JTSB concludes that the probable cause of this accident was that the pedestrian entered No.1 Shimoura level crossing, the class 3 level crossing equipped with the road warning device but without the crossing gate, in the status that the road warning device was operating and responded to the approaching train.</p> <p>It could not be determined why the pedestrian entered the level crossing because the pedestrian was dead, although it is likely that the pedestrian did not hear the rumbling sound of the road warning device and that the pedestrian overlooked the red flashing lamps of the road warning device.</p>		
	Safety actions	<p>Proposed a discussion to Higashi-Matsushima City regarding abolition or upgrading the level crossing, given that the accident occurred. However, since the discussion with the city did not progress, the level crossing was constructed for upgrading to class 1 level crossing, considering safety as the first priority.</p> <p>(1) Measures taken by the Company</p> <ol style="list-style-type: none"> 1. Applied yellow paint to the edge end of the level crossing on May 11. 2. Taken the awareness-raising activities regarding level crossing accidents at Higashi-Yamato station and Yamoto station on May 13. (jointly with the cities and Ishinomaki Police Station). 3. Changed the red flashing lamps of the level crossing to omnidirectional red flashing lamps on May 13. 4. Applied a paint to the halt line of the level crossing on May 14. 5. Upgraded the level crossing to class 1 level crossing, and started to operate it from November 21. <p>(2) Measures taken by the City</p> <ol style="list-style-type: none"> 1. Taken public-relations activities at Higashi-Yamato station and Yamoto station on May 13 jointly with Ishimaki Police Station, Ishinomaki district safe driving manager society, the Company, and the traffic safety association, and the disaster prevention section, the general affairs department of Higashi-Matsushima City. 2. Leveled crushed stones as safety measure for pedestrians for non-statutory public properties owned and managed by Higashi-Matsushima City on July 22. 3. Confirming the on-site status such as the paint of the edge ends and halt lines of No.1 Shimoura level crossing once a month by the construction section, the construction department of Higashi-Matsushima City. 		
	Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-3-1.pdf (In Japanese only) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-3-1-p.pdf (Explanatory material)</p>		
9	Date of publication	Date and accident type	Railway operator	Line section (location)
	June 24, 2021	July 26, 2020 Train derailment	Toyama Chihou Tetsudou Inc.	In the premises of Higashi-Shinjo station on the Main Line, Toyama Prefecture
	Summary	<p>While the train was passing in the left curved track of 181 m radius at the velocity of about 34 km/h, the driver of the train felt the abnormal sound and the impact, then, applied the emergency brake to stop the train.</p> <p>After the train stopped, the driver checked the vehicle and found that the 1st axle in the front bogie of the front vehicle derailed to right, and all axles in the front bogie and the 1st axle in the rear bogie of the rear vehicle derailed to right.</p> <p>There were 31 passengers and the driver were onboard the train, but no one was injured.</p>		



	Probable causes	<p>The JTSB concludes that the probable cause of this accident was that the gauge widened significantly while the train was passing in the left curve of 181 m radius, and the left wheel of the 1st axle in the front bogie went off inside gauge.</p> <p>It is probable that the gauge widened significantly because the gauge widened dynamically due to the lateral movement and the tilting of rail caused by the lateral force accompanied by the train running, as the poor rail fastening devices existed continuously in the curved track, where the static irregularity of gauge had been exceeding the maintenance standard value.</p> <p>It is probable that the irregularity of gauge had been exceeded the maintenance standard value because the maintenance was not implemented before the occurrence of this accident as the period from when the gauge exceeded the maintenance standard value to the maintenance had not been stipulated, and there were many places where the gauge exceeded the maintenance standard value and the maintenance of the other places were considered as in higher priority.</p> <p>It is likely that the poor rail fastening devices existed continuously because the management based on the dangerousness against the wide gauge had not been conducted as there was no manual, etc., to enable the proper judgement and measures in the inspection of sleepers and the lack of technical activities for the maintenance management.</p>		
	Safety actions	<p>Measures taken by the railway operator after the accident</p> <p>(1) Replaced the sleepers and right rail (outer track) in the curve. In addition, removed the guard rail, and installed a derailment prevention rail inside the gauge of the left rail (inner track). In addition, the derailment prevention rail is to be changed to a derailment prevention guard in the future.</p> <p>(2) Applied a reduced train speed of 25 km/h in the curve.</p> <p>(3) Decided to implement an on-foot track patrol once in five days and confirm the rail fastening status by measuring the track irregularities at the same time.</p> <p>(4) Made replacement of all the poor portions and portions with white paint applied for the follow-up purpose of the rail fastening device.</p>		
	Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-3-2.pdf (In Japanese only) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-3-2-p.pdf (Explanatory material)</p>		
10	Date of publication	Date and accident type	Railway operator	Line section (location)
	August 26, 2021	October 18, 2020 Level crossing accident	Japan Freight Railway Company	Hachioji No.2 level crossing, between Hikari station and Shimata station on the San-yo Line, Yamaguchi Prefecture (class 4 level crossing without automatic barrier machine nor road warning device) (managed by West Japan Railway Company)
	Summary	<p>While the train was running between Hikari station and Shimata station at the velocity of about 70 km/h, the driver of the train noticed two pedestrians entering Hachioji No.2 level crossing (the level crossing)*1, class 4 level crossing, from right, and applied the emergency brake, but the train collided with the pedestrians.</p> <p>The two pedestrians were dead in this accident.</p> <p>*1 West Japan Railway Company (hereinafter referred to as the "JR West Japan") manages the level crossing.</p>		
Probable causes	<p>The JTSB concludes that the probable cause of this accident was certain that two pedestrians entered Hachioji No.2 level crossing, the class 4 level crossing without crossing gate nor road warning device, in the status that the train was approaching and collided with the train.</p> <p>It could not be determined the precise situation why two pedestrians entered the level crossing concerned in the status that the train was approaching, because the two pedestrians were dead.</p>			



	Safety actions	<p>Measures taken by the JP West Japan</p> <ol style="list-style-type: none"> 1. Implemented periodic weeding around the level crossing. (October 23, 2020) 2. Installed a stop sign at the level crossing. (November 30, 2020) (See the figure) 3. Explained the situation of the accident and reported the current status of class 4 level crossings in Yamaguchi Prefecture to Yamaguchi Prefectural Police Headquarters. (October 22, 2020) 4. Discussed with Hikari Police Station and Hikari City and confirmed to cooperate with them in order to discuss with local communities toward the abolition of the level crossing. (November 6 and 25, 2020) 		
	Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-4-1.pdf (In Japanese only) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-4-1-p.pdf (Explanatory material)</p>		
11	Date of publication	Date and accident type	Railway operator	Line section (location)
	November 18, 2021	November 15, 2020 Level crossing accident	Echizen Railway Company	Between Nakatsuno station and Washizuka-Haribara station on the Mikuni-Awara Line, Fukui Prefecture Nakatsuno level crossing (class 4 level crossing without crossing gate nor road warning device)
	Summary	<p>While the train was running between Nakatsuno station and Washizuka-Haribara station at the velocity of about 60 km/h, the driver of the train noticed the subcompact truck entering Nakatsuno level crossing (the level crossing), class 4 level crossing, and applied the emergency brake immediately, but the train collided with the subcompact truck.</p> <p>The driver of the subcompact truck was dead by this accident.</p>		
	Probable causes	<p>The JTSB concludes that the probable cause of this accident was certain that the train collided with the subcompact truck in Nakatsuno level crossing, the class 4 level crossing without the crossing gate nor the road warning device, because the subcompact truck entered the level crossing in the status as the train was approaching.</p> <p>It could not be determined the precise reasons why the subcompact truck entered the level crossing in the status when the train was approaching, because the driver of the subcompact truck was dead, even though it is likely that the driver did not noticed the approaching train.</p>		
Safety actions	<p>(1) Measures taken by the Company</p> <ol style="list-style-type: none"> 1. Installed the board to call attention for the level crossings, as shown in the figure, under the warning post on both left and right sides (hereinafter, the fore and aft and side to side shall be based on the train direction) of the level crossing in December 2020. 2. Reapplied yellow paint to the railroad crossing warning fences of the level crossing in February 2021. 3. Installed the weed-killer sheets on both the left and right sides of 50 m before and beyond the level crossing, and also attached yellow reflecting materials to the railroad crossing warning fences in March 2021. 4. Installed the board similar to that of 1 in March 2021. at the five level crossings (one on the Mikuni-Awara Line, and four on the Katsuyama Eiheiji Line) where many crossing 			

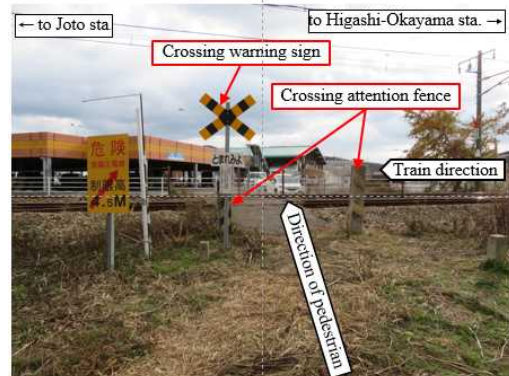


Figure Safety measures implementation status by the JR West Japan



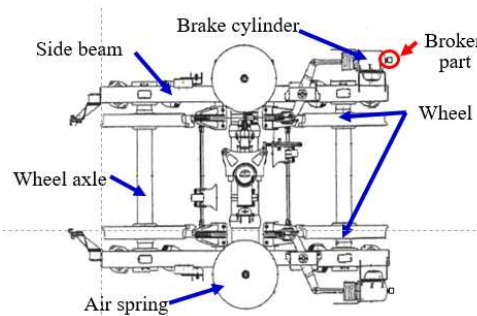

Figure Warning board planted by the company on the level crossing

		<p>automobiles, which were forbidden to pass were witnessed by the drivers of the trains after the occurrence of the accident at the level crossing where the traffic control of automobiles is established. In addition, boards similar to that of 1. are to be installed according to the frequency of witnessed cases at other level crossings.</p> <p>5. Promoted the arrangement with the relevant parties in the policy to abolish the Class 4 level crossing basically, responding to the occurrence of the accident.</p> <p>(2) Measures taken by the road administrator</p> <p>Fukui City that is the road owner informed the land improvement district*1 that is the road administrator of the safety check stated in (3) below, and the land improvement district decided to install a board to warn of the traffic control, etc. at the farm roads connecting to the level crossing by the end of 2021.</p> <p>In addition, Fukui City decided to explain traffic rules and manners, and hazards for crossing level crossings at traffic safety seminars for elderly in the area adjacent to the level crossing and regions where there are level crossings. Moreover, the city decided to call for compliance with traffic rules and manners including how to cross level crossings to citizens including elderly from time to time.</p> <p>(3) Measures taken by Fukui Police Station</p> <p>Strengthened the regulation on the traffic control at the level crossing for a certain period after the accident, given instructions to avoid passing the level crossing with automobiles subject to the traffic control, and let regional residents known well on occurrence of the accident and arising attention to that automobiles are forbidden to pass, etc through representatives of regional self-government body etc.</p> <p>Conducted the safety check including the company, Fukui City, transport safety association, relevant regional self-governing body in the vicinity of the level crossing, etc. at the level crossing in December 2020. Exchanged opinions on and discussed safety measures, etc. during the safety check. Made the summary of the accident and the traffic ban of standard-size and subcompact automobiles at the level crossing known again. Planned to consider that the road administrator, etc. improves traffic markings.</p> <p>*1 "Land improvement district" is an organization of farmers that implement land improvement business in lieu of the administration, and manages land improvement facilities including farm roads pursuant to the "Land Improvement Act" (Act No. 195 of 1949) and other law.</p>		
	Report	<p>https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-5-1.pdf (In Japanese only)</p> <p>https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-5-1-p.pdf (Explanatory material)</p>		
12	Date of publication	Date and accident type	Railway operator	Line section (location)
	December 16, 2021	December 19, 2020 Level crossing accident	Japan Freight Railway Company	Between Higashi-Okayama station and Joto station on the Sanyo Line, Okayama Prefecture (class 4 level crossing without automatic barrier machine nor road warning device) (managed by West Japan Railway Company)
	Summary	<p>While the train was running between Higashi-Okayama station and Joto station at the velocity of about 84 km/h, the driver of the train noticed a figure in Gonotsubo level crossing, class 4 level crossing, at about 100 m before the level crossing, and sounded the whistle. After that the driver recognized that the figure was the pedestrian at about 50 m before the level crossing, and sounded the whistle again and applied the emergency brake, but the train collided with the pedestrian.</p> <p>The pedestrian was dead in this accident.</p> <p>*1 West Japan Railway Company (hereinafter referred to as the "JR West Japan") manages</p>		



		the level crossing.
Probable causes		<p>The JTSB concludes that the probable cause of this accident was that the pedestrian entered Gonotsubo level crossing, the class 4 level crossing, the without crossing gate nor the road warning device, in the status that the train was approaching the level crossing, and collided with the train.</p> <p>It could not be determined the precise reason why the pedestrian entered the level crossing in the status that the train was approaching, because the pedestrian was dead.</p>
Safety actions		JR West Japan and Okayama City abolished the level crossing on September 29, 2021 after discussion.
Report		https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-6-1.pdf (In Japanese only) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2021-6-1-p.pdf (Explanatory material)

Railway serious incident investigation reports published in 2021

1	Date of publication	Date and serious incident type	Railway operator	Line section (location)
	August 26, 2021	October 4, 2021 Main track overrun	WILLER TRAINS Inc.	Between Tangoyura station and Kunda station on the Miyazu Line, Kyoto Prefecture
	Summary	<p>While the driver operated the train between Tangoyura station and Kunda station at the velocity of about 68 km/h in the coasting operation, the driver heard the dull sound as "bump", after that, he felt that the brake did not act well as usual, therefore, stopped the train using the emergency brake.</p> <p>The driver checked the instruments such as the pressure gauge, etc., and found that the pressure in the main air reservoir was 0 kPa. The driver tried to implement the measures to prevent rolling wheels, but the train started to move, therefore, he applied the security brake and the conductor's valve but the brake had not been acted. After the train passed Kunda station, stopped again temporarily and ran in the reverse direction, and stopped at the place about 206 m from Kunda station in the direction to Toyooka station.</p> <p>There were three passengers and two train crews were boarded on the train, but no one was injured.</p> <p>The Kitakinki Tango Railway Corporation, hereinafter referred to as "the Tango Railway Co.", owned and managed the railway facilities of the Miyazu Line and the Miyafuku Line as the Class 3 railway operator*1, and the Company operated the trains as the Class 2 railway operator*2.</p> <p>*1 "Class 3 railway operator" is the operator who constructed the railway track and let the Class 2 railway operator, who transported the passengers or the freights, to use them.</p> <p>*2 "Class 2 railway operator" is the operator to implement the transportation of the passengers or the freights using railway track that was constructed by the other operator.</p>		
		 		

<p>Probable causes</p>	<p>The JTSB concludes that the probable cause of this serious incident was highly probable that the train, that stopped once by the emergency brake in the down grade section, overran in this serious incident, because all brake shoes pushed to each wheel were released and both the service brake and the security brake became not to function, caused as the compressed air, stored in the main air reservoir, the supply air reservoir and the security brake air reservoir, had been lost completely due to the leakage of the compressed air between the main air reservoir and the brake cylinder completely, since the train had collided with the animal invaded to the front part of the rear axle in the front bogie from right side and the pipe connected to the brake cylinder had folded and broken.</p> <p>It is probable that the pipe connected to the brake cylinder had folded and broken as bent in around the root part in the direction opposite to the direction of travel, because the pipe had been overhung in lower side of the brake cylinder in the near place to side surface of the vehicle body and could not prevent the collision with the animal invaded to front part of the rear axle of the front bogie from right side of the track.</p>
<p>Safety actions</p>	<p>1 Measures Implemented by the Company after this Serious Incident</p> <p>(1) Urgent measures</p> <p>The Company decided to implement the following items.</p> <ol style="list-style-type: none"> 1. The Company let all train crews in the Company about this serious incident, and to pay the closest attention to the air leakage from the brake pipe of the cylinder part when implemented the under floor inspection during operation, etc., including the inspection implemented in the train depot. Finished to commonly known this item on October 11, 2020. 2. The Company implemented the measures that the pipe does not folded and broken easily when collided with animals, as fixed the pipe connected to the brake cylinder to the bogie frame in all 16 vehicles of the same kind structure, and completed on October 23, 2020. Here, the Company and the Tango Railway Co., discussed each other on the measures, and the Tango Railway Co., arranged the budget and implemented the measures. 3. The Company and the Tango Railway Co., requested the track side local government on the activities to capture animals, and the track side local government asked their jurisdictional hunting companions and started to capture animals in the places where there were many records of collision along the track side. <p>(2) Permanent measures</p> <p>The Company decided to implement the following items.</p> <ol style="list-style-type: none"> 1. Revised the "Basic procedures when faced abnormality" to make clear the handling when the brake did not work, and prescribed to use the hand brake, on November 1, 2020. 2. The Company and the Tango Railway Co., discussed each other and promote the preparation toward the implementation of changing layout of the pipe connected to the brake cylinder in the all 16 vehicles of the similar structures. <p>2 Measures Implemented by the Ministry of Land, Infrastructure, Transport and Tourism after this Serious Incident</p> <p>The Ministry of Land, Infrastructure, Transport and Tourism took the following actions based on the occurrence of this serious incident.</p> <ol style="list-style-type: none"> (1) On October 5, 2020, implemented the "information provision" to the railway and tramway operators, and instructed the "investigation of causes and implementation of the safety actions" to the Company. (2) On October 6, 2020, instructed the railway and tramway operators to report on the existence of the vehicles with the similar structure, i.e., both the brake pipe and the brake cylinder are laid in the most outside of the bogie frame in the vehicle operated alone. (3) On May 6, 2021, let the railway and tramway operators known well on the contents of the measures described in 1 (1) (ii) and (2) (ii), and instructed the railway and tramway operators who owned the vehicles with the similar structure, to study on the similar measures.
<p>Report</p>	<p>https://www.mlit.go.jp/jtsb/railway/rep-inc/RI2021-1-1.pdf https://www.mlit.go.jp/jtsb/railway/p-pdf/RI2021-1-1-p.pdf (Explanatory material, in Japanese only)</p>

2	Date of publication	Date and serious incident type	Railway operator	Line section (location)
	December 16, 2021	December 30, 2020 Dangerous trouble in vehicle	West Japan Railway Company	In the premises of Hommataga station on the Yamaguchi Line, Shimane Prefecture
	Summary	<p>The driver of the train noticed the door-pilot lamp, etc., has been turned off while operating the braking operation when arriving at the platform of Hommataga station. After the train stopped at the station, the driver implemented the inspection of the cabin, and found that the rear door in right side (hereinafter, the fore and aft and side to side shall be based on the train direction), opposite to the platform, had been opened by about 70%. Therefore, the driver locked the door, and after reported it to the train dispatcher, continued the train operation.</p> <p>There were seven passengers and a train crew, i.e., the driver, onboard the train, but no one was injured by being fallen to the track.</p>		
	Probable causes	<p>The JTSC concludes that the probable cause of this serious incident was highly probable that the force pushing the slide door had decreased and became smaller than the inertial force caused by the braking operation, because as the valve base frame which was press fitted to the counterbore had come off, in the D valve in the valve cabinet of the door operating equipment, which opened while the train was running, and consequently the compressed air in the closing cylinder of the door operating equipment flew out to the air.</p> <p>It is probable that the valve base frame, which had been press fitted to the counterbore, came off from the counterbore related with the following situations.</p> <ol style="list-style-type: none"> 1. There was the possibility that the upward force by the restoring force of the spring had acted to the switching valve A, and the upward force had also acted to the valve base frame indirectly, when there is no compressed air in the closing cylinder of the door operating equipment. The friction force of the side surface of the counterbore of the D valve and the side surface of the valve base frame was small compared in the status when press fitted as usual, and the valve base frame had been in the status to be risen easily. 2. The valve base frame had been in the status that the unexpected force acted to rise the valve base frame in the undersurface of the valve base frame, while the vehicle was operating and the doors were closed (there was the compressed air in the closing cylinder of the door operating equipment) because there was the space between the undersurface of the valve base frame and bottom surface of the counterbore. 3. There was the possibility that the switching valve A and the valve base frame were strongly pressed and adhered, because the unexpected force had been acted for a long period to the contacted part between the switching valve A and the valve base frame. 4. As the results of the above situations 1 to 3, there was the space that the valve base frame could pass through inside of the spring when the valve base frame was rising in the counterbore, and, at the same time, the valve base frame could rise to the upper edge of the counterbore between the undersurface of the screw cock and the upper edge of the switching valve B. <p>It is likely that the valve base frame settled in the inside of the counterbore in the status as the side surface was in the upside, because the situations of the above 1 to 3 had been repeated for a long period, the undersurface of the valve base frame, which rose gradually inside the counterbore, got over the upper edge of the counterbore when the serious incident occurred, that caused the leakage of the compressed air in the closing cylinder of the door operating equipment, and resulted that the valve base frame fell when from the pressed and adhered valve base frame and the switching valve A were released by the wind pressure of the air stream.</p> <p>Furthermore, it is probable that the chance to prevent the concerned serious incident could not be used in the most, because, although the driver of the train had been noticed that there was the leakage of air from the door before departed from the starting station, and it took a long time to turn on the door pilot lamp compared to as usual, the driver departed the train</p>		

Camera



Side surface of valve base frame, that came off from the base hole, facing upward



		<p>unless to not reporting it to the related sections such as the train dispatcher or the station master, etc., because the doors had closed.</p>
	<p>Safety actions</p>	<p>1 Measures taken by the Company</p> <p>The Company implemented emergency checks and an instructions as shown below after the occurrence of the serious incident.</p> <p>(1) Vehicle depot</p> <p>Checked the existence of the leaked air from the door operating equipment in the door "closed" status by the operation start on January 1, and made the summarized events of the incident and the following details known to relevant sections and persons concerned.</p> <p>Inspection and repair employees</p> <ul style="list-style-type: none"> · Pay particular attention to the status of the door operating equipment and check carefully the existence of the leaked air from the door operating equipment. · If noticing leaked air, promptly report it to relevant employees and deal with the leakage before resuming the operation. <p>Drivers in the premises:</p> <ul style="list-style-type: none"> · Pay attention to check the existence of the leaked air from the door operating equipment when carrying out the inspection before departure from depot or when going through the vehicles to carry out switching work, etc. · If noticing air leak noise, arrange an inspection and repair as currently specified. <p>(2) Crew depot</p> <p>Made the summarized incident and the details stated below known to the crew. Made written notification on January 3, 2021 after raising awareness and giving instructions as a flash report on December 31, 2020.</p> <p>Drivers:</p> <ul style="list-style-type: none"> · Pay attention to check for air leak noise from the vicinity of the doors when checking each door status of vehicles in the inspection before departure from depot. · If noticing the leaked air, communicate to the train dispatcher, the station master, or the shift workers of inspection and repair. If noticing it before driving the train, communicate to the dispatcher or the station master. · If noticing the leaked air or receiving the report of the leaked air, in the middle of driving the train, immediately carry out a stop operation. · If noticing that a lamp to notify the driver (or the door pilot lamp) is turned off, immediately apply the emergency brake, and if there is an adjacent line, trigger the train protection radio. <p>Conductors:</p> <ul style="list-style-type: none"> · If noticing the leaked air from the vicinity of the door, carry out a stop operation of the train. · If noticing that the "fully-closed-door lamp" is turned off during driving a passenger train, carry out an emergency stop operation. <p>2 Measures taken by the Door Operating Equipment Manufacturer</p> <p>The door operating equipment Manufacturer considers that there is no particular need to take urgent measures for the valve cabinet because there had been no air leak after the valve cabinet was modified to be numerically controlled. However, the manufacturer created and established the "TK105 valve cabinet assembly work standard" document as a recurrence prevention measures on May 11 2021.</p> <p>The standard document describes integrated precautions for work on valves D and E that have the same press-fitting process.</p>
	<p>Report</p>	<p>https://www.mlit.go.jp/jtsb/railway/rep-inci/RI2021-2-1.pdf (In Japanese only) https://www.mlit.go.jp/jtsb/railway/p-pdf/RI2021-2-1-p.pdf (Explanatory material)</p>

7 Actions taken in response to recommendations in 2021 (railway accidents and serious incidents)

No actions were taken in response to recommendations, etc. notified in 2021.

8 Provision of factual information in 2021 (railway accidents and serious incidents)

The JTSC provided no factual information in 2021.

Column

Establishment of a website summarizing information on the prevention of level crossing accidents

Accident Prevention Analyst and Railway Accident Investigator

In February 2021, the Japan Transport Safety Board established the page, entitled "To prevent level crossing accidents from occurring," summarizing information on the prevention of level crossing accidents, on our website. This is our first initiative for raising awareness on safety.

Of the whole railway operation accidents, level crossing accidents account for a large percentage, i.e., 34.2% (FY 2020). In particular, level crossings (classes 3 and 4) where automatic barrier machines are not installed have higher accident risk, comparing to level crossings (class 1) where level crossing safety equipment (automatic barrier machine, road warning device) is installed, therefore it is important to comply with rules when crossing level crossings, and also take measures, such as abolishing level crossings without such safety equipment or installing such safety equipment (i.e., upgrading to class 1 level crossings).

The promotion of such measures needs many people's understanding, including users'. For that purpose, the JTSB created the webpage by avoiding the use of technical terms as much as possible and making the design of the webpage creative, and also added the banner with a train logo for quick access to the webpage on the top page of the website.

Moreover, for users, the webpage provides rules for crossing level crossings with slogans, e.g., "Stop, look, and listen" to call for complying with the rules. For railway operators, road administrators, and other relevant parties, the webpage provides examples of initiatives, e.g., abolishing level crossings, as references for proceeding with discussions and taking measures in order to prevent accidents.

The JTSB would be very happy if you use the content introduced in the webpage as references in order to reduce level crossing accidents.

The screenshot shows the JTSB website interface. At the top, there are logos for JTSB (運輸安全委員会) and MLIT (国土交通省). Navigation icons for Aviation (航空), Railway (鉄道), and Maritime (船舶) are present. A search bar and a link for '踏切事故を起こさないために' (To prevent level crossing accidents) are highlighted with a red dashed circle. Below the navigation, the page content includes a section titled '1. 踏切事故の現状' (Current status of level crossing accidents) with a sub-section '(1) 踏切事故の発生状況' (Occurrence status of level crossing accidents). A table provides details on accident statistics, and a QR code is visible at the bottom left.

事故調査報告書の参照先		
第3種踏切及び、第4種踏切における死亡事故全ての事故調査報告書	死亡者の年代別の報告書	種別別の報告書
- 20歳未満	- 人	
- 20～64歳	- 自動車	
- 65歳以上	- 二輪車	
	- 自動車	

(参考) 踏切の種類について
(一般社団法人日本鉄道連合会「大学京鉄の素顔」(2018年10月)の資料を加工して作成)

<第1種踏切>

踏切警報機 踏切遮断機

URL: <https://www.mlit.go.jp/jtsb/guide/fumikiri.html> (In Japanese only)