

Sasago Tunnel Ceiling Collapse
on the Chuo Expressway
(Sequence of Events and Countermeasures)

Ministry of Land, Infrastructure, Transport and Tourism
(MLIT) of Japan

Sasago Tunnel Ceiling Collapse: MLIT's Response

MLIT's system for the incident

- Dec. 2nd 9:00 On the alert (disaster on road)
- Dec. 2nd 11:30 Chuo Expressway Sasago Tunnel Incident Task Force was formulated (chaired by Naoyoshi Sato, Vice-Minister of Land, Infrastructure, Transport and Tourism)
- Dec. 3rd 14:45 The 3rd meeting of the Task Force was held.

MLIT's action

【Sasago Tunnel】

【Tunnels Across the Country】

Dec. 2nd 15:27

Minister's instruction in response to the incident

- All efforts toward victims relief activities
- Immediate identification of the causes and preparation for urgent inspection

Dec. 3rd AM

Site investigation by Minister

14:00

Order of urgent inspection of tunnel ceiling panels

Dec. 4th

“Research & examination committee for tunnel ceiling collapse incident” was formulated and held

Dec. 6th

“Liaison committee for Chuo Expressway closure” was formulated and held

(MLIT (Kanto Regional Development Bureau and Kanto District Transport Bureau), Yamanashi Prefectural Police, Yamanashi Prefectural Development office and Central NEXCO)

Dec. 7th

Additional minister's instruction in response to the incident

- Road facilities in tunnels, in addition to ceiling panels in all similar tunnels with suspended ceilings
- Immediate examination of the safety measures, traffic solutions and prospects for reopening the outbound tunnel

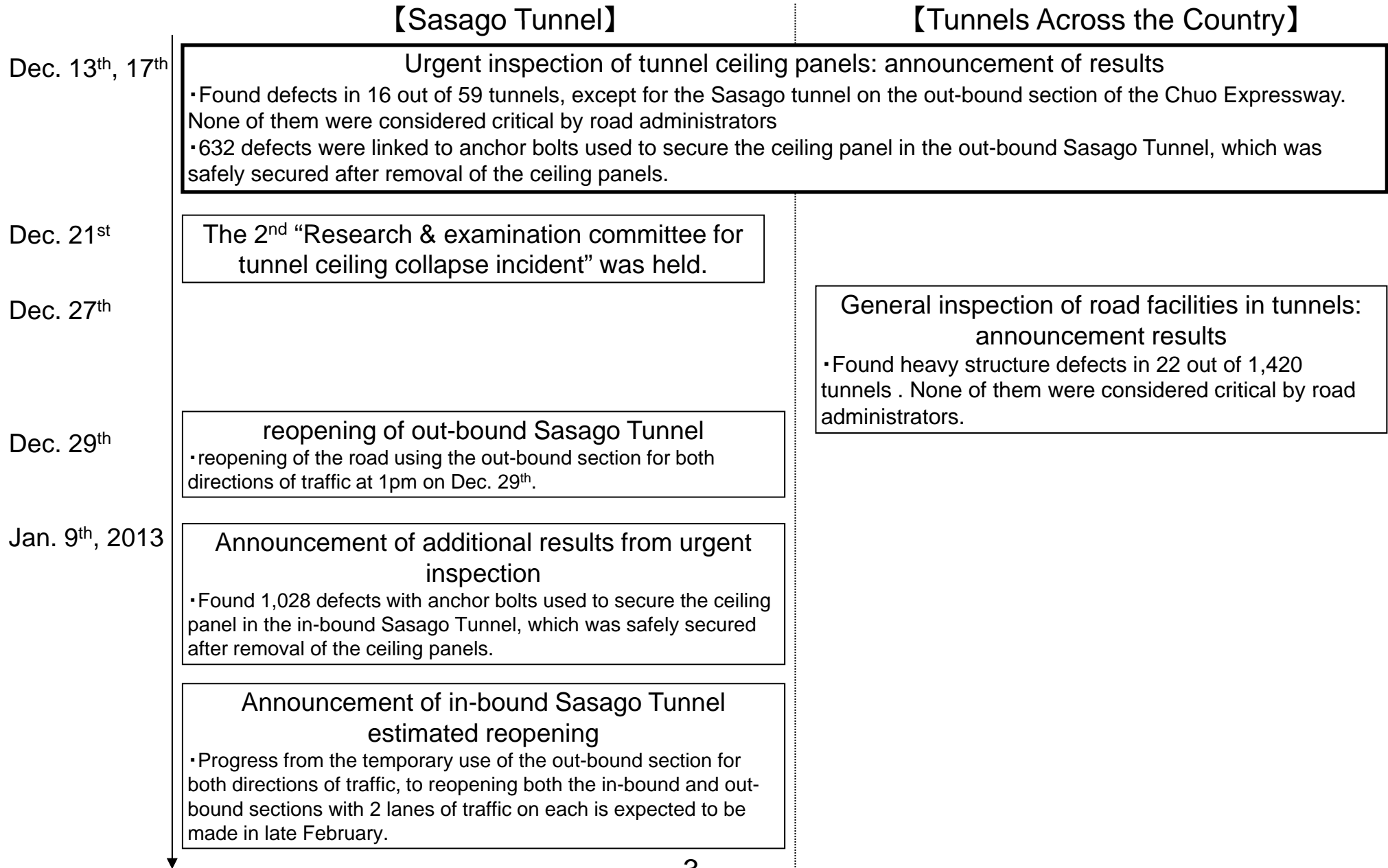
Dec. 8th

Report on the prospect for reopening the Sasago Tunnel (out-bound)

- Safety is ensured by removing out-bound tunnel ceiling panels
- To be opened to both directions of traffic using the out-bound tunnel
- To be reopened by the end of the year

Order of general inspection of road tunnel facilities

Sasago Tunnel Ceiling Collapse: MLIT's Response (cont'd)



Nationwide Urgent Inspection of Tunnel Ceiling Panels (ordered Dec. 3rd, results released Dec. 13th)

Inspection

- Target: Tunnels with ceiling panels suspended by metal fitting for hanging (segments with the ceiling)
- Items: Metal fitting for hanging & fixing bracket, soundness of concrete lining near the anchored metal fitting for hanging, deformation/damage of ceiling panels
- Method: Close visual inspection, sound check with hammers and palpation (inspection will be conducted behind the ceiling panels in the structure of upper tunnel)

Findings (Dec. 13 release, except for Jan. 9 findings for in-bound Sasago Tunnel inspection)

<59 tunnels, except both directions of Sasago Tunnel on Chuo Expressway>

Found defects in 16 tunnels, but none of them were critical. Repairs were carried out immediately (or are planned to be carried out)

<Out-bound Sasago Tunnel on Chuo Expressway>

Found 632 anchor-bolt-related defects. Tunnel's safety was secured by removing the ceiling panels

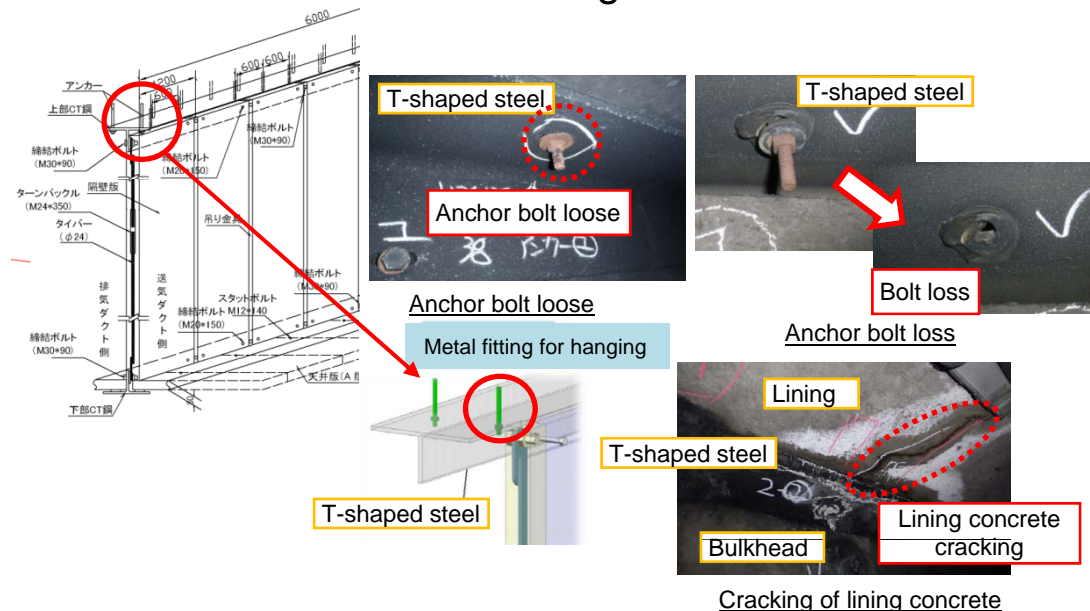
<In-bound Sasago Tunnel on Chuo Expressway>

Found 1,028 anchor-bolt-related defects. Tunnel's safety was secured by removing the ceiling panels

Number of tunnels with suspended ceiling panels

Maintained by	Number of tunnels	Number of defects
East NEXCO	14	0
Central NEXCO	3	2
West NEXCO	12	2
Metropolitan Expressway Company	6	2
Hanshin Expressway Company	3	2
National Government	9	3
Pref/Ordinance-designated cities/Road corporations	12	5
Total	59	16

Defects found in Sasago Tunnel



※Excludes the Sasago Tunnel (both bounds) on the Chuo Expressway.
 ※Independent tunnels for both directions are counted separately.
 ※Excludes tunnels with ceiling panels that are anchored at the both ends.
 ※Inspection findings of 2 tunnels managed by Yamanashi Pref were released Dec 17th.

General Inspection of Road Facilities in Tunnels (ordered Dec. 7th, results released Dec. 27th)

Inspection

- Target: Road facilities anchored with anchor bolt in the tunnel space
(lighting, signage, jet-fan, warning sign, sound insulation board, other objects)
- Items: Damage or abnormality of anchor bolts & nuts, joint and other accessories
- Method: Close visual inspection, sound check with hammers and palpation
- Deadline: Heavy facilities (jet-fan and road signage) Wednesday, December 26, 2012
Other accessories Friday, March 22, 2013

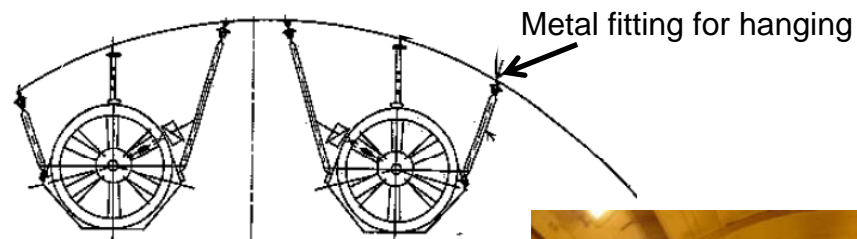
Findings (heavy structures such as jet-fans and road signs)

- <Of the 1,420 tunnels inspected, excluding 15 tunnels to be inspected in the future due to weather and traffic restrictions>
Defects found in 22 tunnels, but none of them were critical. Repairs were carried out immediately (or are planned to be carried out).

■ Inspection Findings

Maintained by	Number of tunnels with defects
Expressway Companies	9
National Government	9
Prefecture/Ordinance-designated cities	4
Total	22

■ Typical inspection of jet-fans in tunnel



Jet-fan inspection

- ※ Independent tunnels for both directions are counted separately
- ※ Excludes inspections for other facilities
- ※ Excludes in-bound Sasago Tunnel that caused the incident

Road Tunnel Inspection: additional information

- Road Tunnel Techniques Standard [Nov. 1974 (revised in 1985 and 1989) Director-generals of City Bureau and Road Bureau, Construction Ministry]

Prior to actual tunnel maintenance/repair work, inspection/maintenance manual shall be prepared. The actual work should comply with the relevant laws and regulations. Inspectors' security should be ensured during work.

- Road tunnel maintenance guide [1993 Japan Road Association]

Prepared by the Japan Road Association as a technical guide for road administrators to formulate an inspection/maintenance manual.

- Central NEXCO's inspection/maintenance manual (structure section) [Apr. 2012]

【Daily inspection】 Visual inspection from a patrol vehicle for 4 to 7 days every 2 weeks

【Basic inspection】 Remote or close visual inspection to review the condition of entire structure at least once a year (further inspection depending on the situation)

【Detailed inspection】 Close visual inspection and sound inspection with hammers to review the condition of structural soundness once every 5 to 10 years.

【Emergency inspection】 Inspection to review the structure condition in the event of an earthquake or other disaster, depending on the situation.

Note: "basic inspection" and "detailed inspection" together are called a "periodical inspection."

“Research & Examination Committee for Tunnel Ceiling Collapse Incident”

In response to the tunnel ceiling collapse incident that took place on Dec. 2nd 2012, the “Research & examination committee for tunnel ceiling collapse incident” was launched to identify the cause of the collapse and to discuss preventive measures of recurrence.

<Member>

Chair Tooru Konda	Emeritus professor at Tokyo Metropolitan University (Doctor of Engineering)
Kazuo Nishimura	Professor at Tokyo Metropolitan University (Doctor of Engineering)
Junichiro Niwa	Professor at Tokyo Institute of Technology (Doctor of Engineering)
Hideto Maki	Director of Road Technology Research Group at Public Works Research Institute
Akisato Mizuno	President of Kogakuin University (Doctor of Engineering)
Kenji Motohashi	Professor at Shibaura Institute of Technology (Doctor of Engineering)
Nozomu Mori	Director of Road Department at National Institute for Land and Infrastructure Management

<Meeting>

First meeting (Dec. 4th) “Outline of Sasago tunnel and urgent inspection of tunnel ceiling panels”

※on-site inspection took place prior to the meeting.

- Possibility of additional inspection in addition to ongoing emergency inspection was discussed
- Additional examination including, pull-out test for the anchor bolt is necessary
- Ceiling design at the construction phase needs to be reexamined

Second meeting (Dec. 21st) “Results of urgent inspection of outbound Sasago Tunnel ceiling panels and pull-out test for anchor bolt”

- Defects that were found in out-bound Sasago Tunnel were discussed
- Distribution of the defects found in out-bound Sasago Tunnel were reported
- An implementation plan of pull-out test was discussed
- Further tests, such as a compressive strength test for the core sample extracted from lining concrete, were considered

Recovery Work of In-bound Sasago Tunnel

