

(10) Damages at the anchorage of prestressing tendons

(a) General description and damage characteristics

This subject is defined as the condition in which rust stain from the cracks or spalling can be found in the concrete of the anchorage area of prestressing tendon. This includes the corrosion of prestressing tendon at the anchorage area.

(b) Relation to the other damages

The other damages such as corrosion, rebar exposure, cracking besides this damage shall be also evaluated in the related subjects if exist.

(c) Inspection area


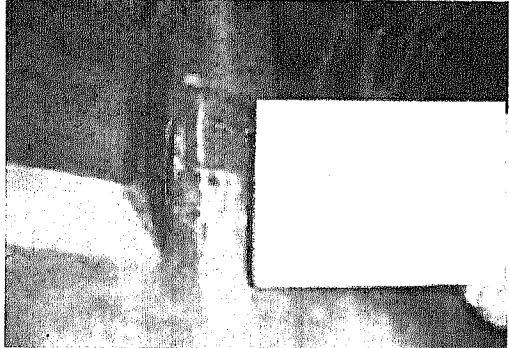
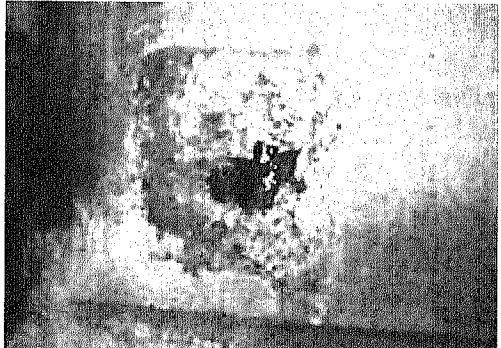
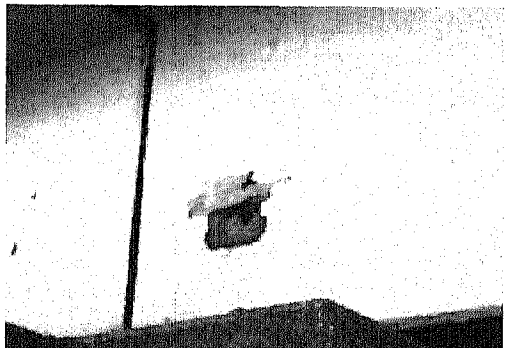
The existence of damages at all the anchorage of prestressing tendon within visually perceptible area shall be inspected.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Classification
No damage	a
Damages at the anchorages of prestressing tendons Damages in the prestressing tendons	e

(Examples)

Damage level e	Damage level e
	
Rust stain on the concrete surface at the anchorage	Rust stain on the concrete surface at the anchorage
Damage level e	Damage level e
	
Spalling of the anchorage concrete and steel corrosion	Spalling of the anchorage concrete and slip out of the PC tendon

2.2.3 Road surface

(11) Unevenness of road surface

(a) General description and damage characteristics

This subject is defined as unevenness or level difference on the road surface in the bridge longitudinal direction, which increases the shock impact caused by the traffic.

(b) Relation to the other damages

- All the unevenness and the level difference in the bridge longitudinal direction shall be evaluated in this subject regardless of cause and location.
- Corrugation, pot hole and cave-in of pavement, unevenness at the expansion joint or the parapet of abutment, etc. shall be also evaluated in this subject.

(c) Inspection area

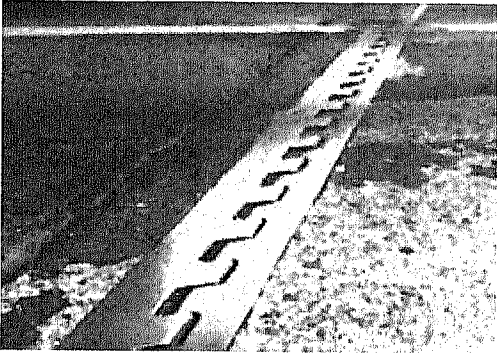

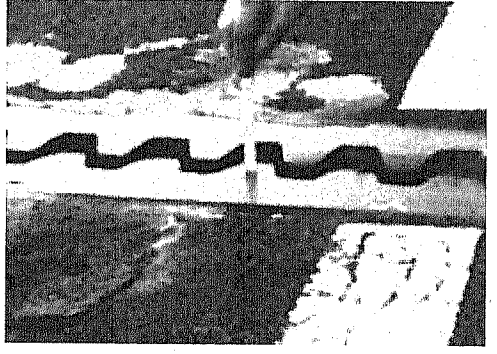
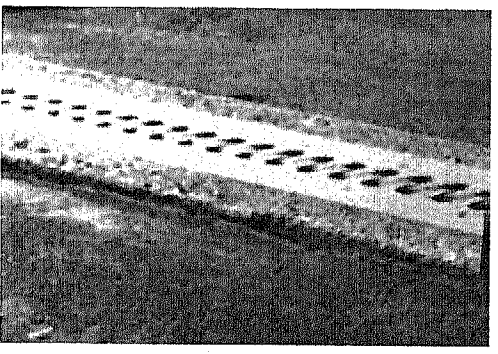
The existence of unevenness and level difference all over the road surface shall be inspected approaching closely.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Classification
No damage	a
Level difference < approx. 20mm (No difficulty in driving)	c
Level difference = approx. 20mm (Difficulty in driving)	c

(Examples)

Damage level c	Damage level c
	
Level difference < 20mm (expansion joint)	Level difference < 20mm (concrete – pavement)
Damage level e	Damage level e
	
Level difference \geq 20mm (expansion joint)	Level difference \geq 20mm (concrete – pavement)

2.2.4 Bearings

(12) Functional damages of bearings

(a) General description and damage characteristics

This subject is defined as the condition of the bearing in which the functions such as load supporting, displacement following function, etc. are damaged fully or partially. The missing of the bearing roller shall be also evaluated in this subject.

(b) Relation to the other damages

Damages of each member of bearing area, such as those of bearing anchor bolt like corrosion, fracture, etc, those of bearing seat concrete like cracking, water leakage, free lime or rebar exposure etc. shall be also evaluated in the related subjects.

(c) Inspection area

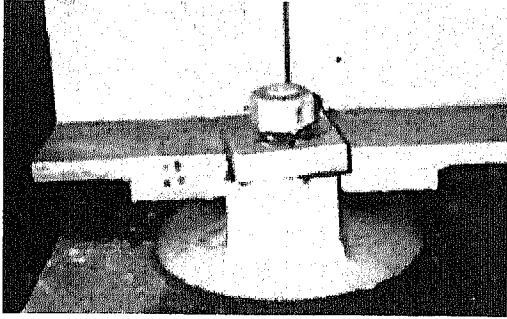

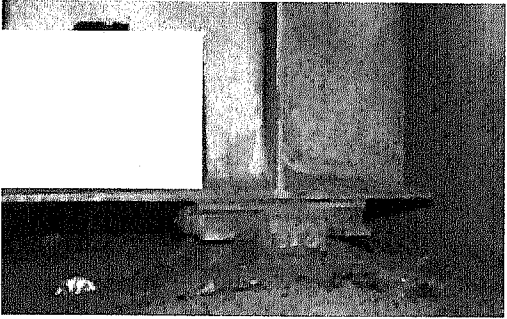
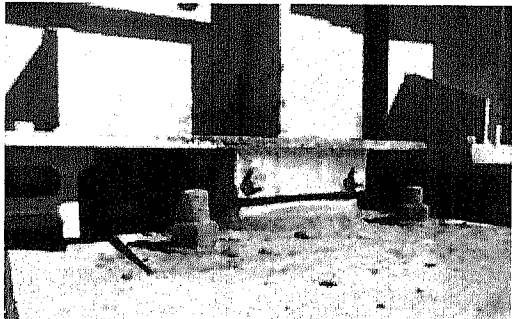

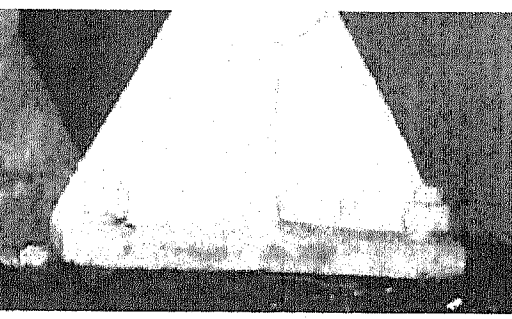
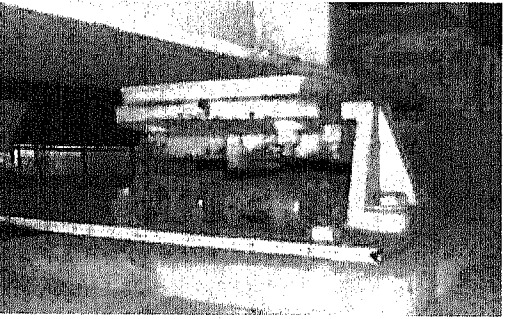
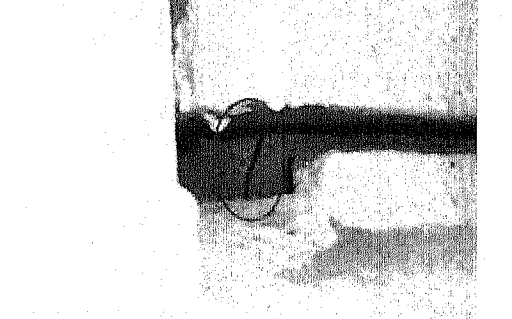
The existence of functional damages for all bearings shall be inspected approaching closely.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Classification
No damage	a
Functional damages of bearings	c
Remarkable functional damages of bearings	e

(Examples)

<p>Damage level c</p>  <p>Loosed anchor bolts of bearing</p>	<p>Damage level c</p>  <p>Limited damages in bearing seat only (evaluated in cracks, water leakage, free lime or rebar exposure)</p>
<p>Damage level c</p>  <p>Bearing corrosion without remarkable functional damage</p>	<p>Damage level c</p>  <p>Bearing corrosion without remarkable functional damage</p>
<p>Damage level e</p>  <p>Functional damage in movement due to the accumulation of soil and dirt</p>	<p>Damage level e</p>  <p>Raised bearing</p>
<p>Damage level e</p>  <p>Broken bearing</p>	<p>Damage level e</p>  <p>Broken bearing</p>

2.2.5 Substructures

(13) Damages in substructures

(a) General description and damage characteristics

This subject covers the damages such as settlement, movement, inclination, and erosion at the abutment and the piers.

(b) Relation to the other damages

Level difference, movement, etc. found at the expansion joints shall not be evaluated in this subject.

(c) Inspection area

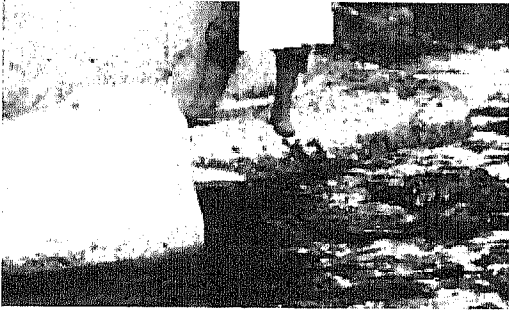
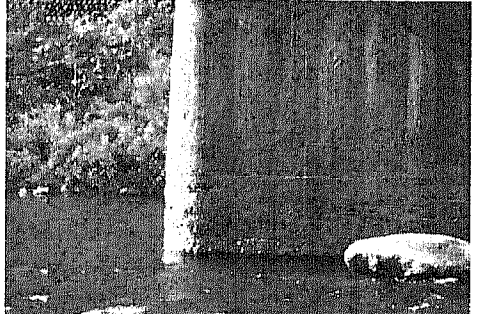
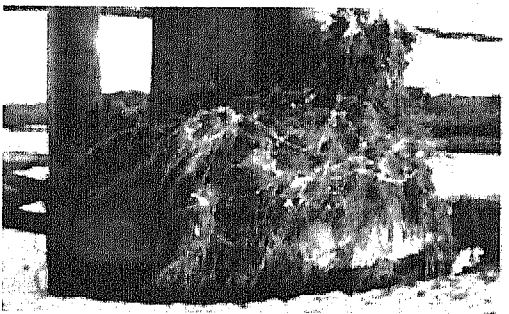


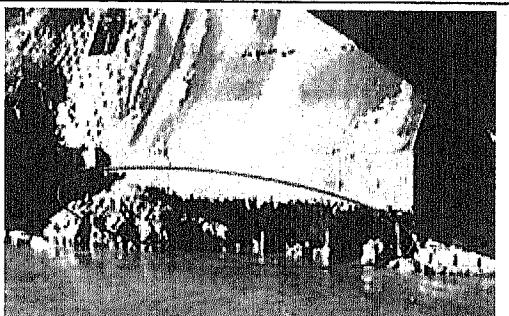
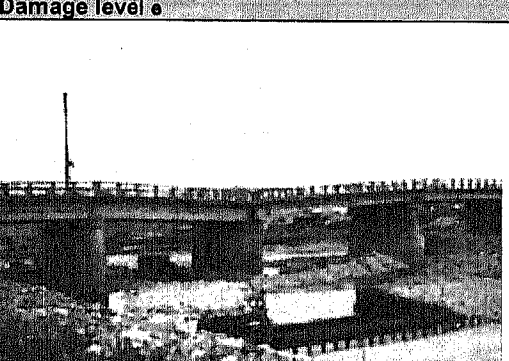
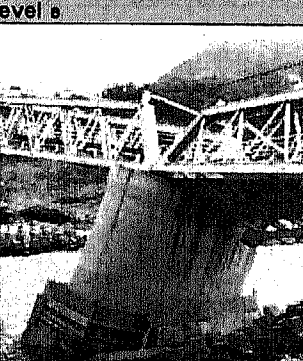
The existence of settlement, movement, inclination, scour and erosion within visually perceptible area shall be inspected for all substructures. Especially settlement, movement, inclination, scour and erosion of substructures on land can be detected easily through observing the condition change of the surrounding ground such as the ground surface, interlocking pavement, etc..

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria		Classification
Settlement, movement, inclination	Scour, erosion	
No settlement, movement and inclination	No scour, erosion	a
	Slight scour, erosion	b
	Remarkable scour, erosion	c
Settlement, movement or inclination	No scour, erosion	c
	Slight scour, erosion	d
	Remarkable scour, erosion	e

(Examples)

<p>Damage level b</p>  <p>Slight scour of substructure</p>	<p>Damage level b</p>  <p>Slight scour of substructure</p>
<p>Damage level c</p>  <p>Remarkable scour of substructure</p>	<p>Damage level c</p>  <p>Movement and inclination of substructure</p>
<p>Damage level d</p>  <p>Settlement / movement / inclination and slight scour of substructure</p>	<p>Damage level d</p>  <p>Settlement / movement / inclination and slight scour of substructure</p>
<p>Damage level e</p>  <p>Settlement / Inclination of substructure and remarkable scour of substructure</p>	<p>Damage level e</p>  <p>Settlement / Inclination of substructure and remarkable scour of substructure</p>

2.2.6 Pavements

(14) Damages in pavements

(a) General description and damage characteristics

This subject is defined as the damages on the surface of deck concrete such as concrete fragmentation, on the steel deck such as cracking on the deck plate or bolt connection, which appear as pavement separation, pot holes, etc..

(b) Relation to the other damages

- The subjects to be inspected and evaluated are cracking, separation and pot holes of pavement; and not used for judgement of the maintenance of the pavement itself, but for judgement of the deck healthiness.
- If the damages on the deck upper surface extend to the lower surface, the other damages such as deck cracking, rebar exposure, water leakage, free lime etc. shall be also evaluated in the related subjects if exist.

(c) Inspection area

The existence of cracks, layer separation, and pot holes shall be inspected for all pavements.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

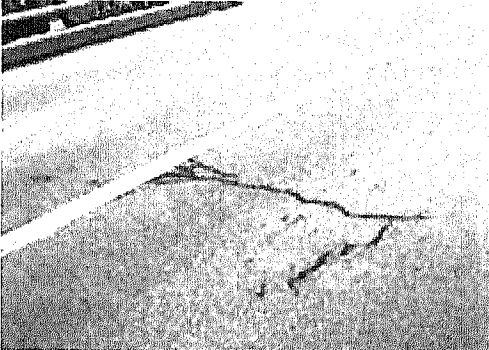
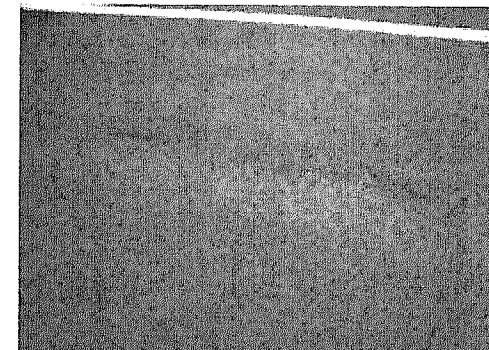

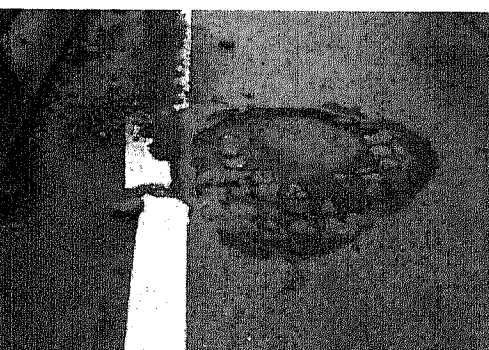
- Asphalt pavement

Evaluation criteria	Classification
No damage / - Cracks with the width $w = 5\text{mm}$ - Deck concrete not broken to small pieces nor no potentially remarkable deflection due to the fatigue cracks of a steel plate deck	a
- Cracks with the width $w = 5\text{mm}$ - Deck concrete broken to small pieces or potentially remarkable deflection due to the fatigue cracks of a steel plate deck	e

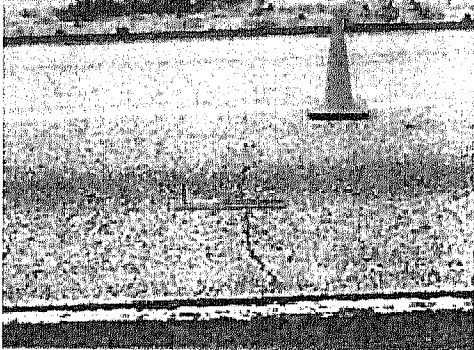
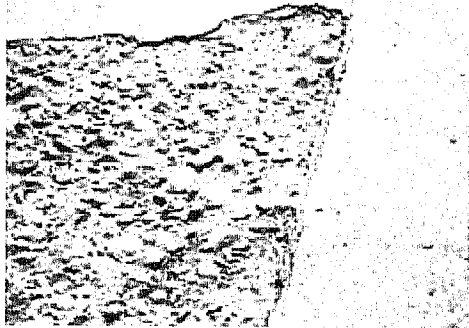
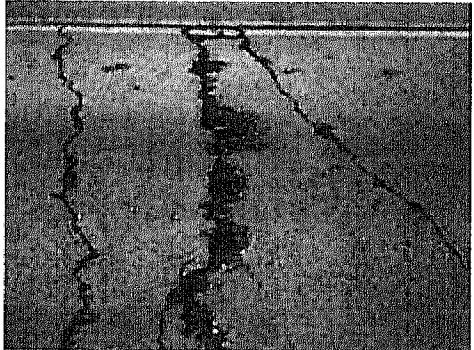
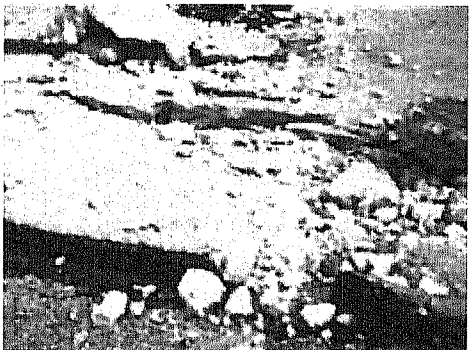
- Concrete pavement

Evaluation criteria	Classification
No damage / - Cracks with the width $w < 6\text{mm}$ - Slight spalling	a
- Cracks with the width $w = 6\text{mm}$ - Remarkable spalling	e

(Examples of asphalt pavement)

Damage level a	Damage level a
	
Crack with the width = 5mm, but not latticed	Crack with the width = 5mm, but not latticed
Damage level e	Damage level e
	
Remarkable unevenness. Bicycle or motorcycle can turn over.	Spalling or cave-in of the deck potentially. Dangerous traffic condition.

(Examples of concrete pavement)

<p>Damage level a</p>  <p>Crack with the width < 3mm</p>	<p>Damage level a</p>  <p>Slight spalling / level difference</p>
<p>Damage level e</p>  <p>Crack with the width = 3mm</p>	<p>Damage level e</p>  <p>Remarkable spalling / level difference</p>

2.2.7 Barriers

(15) Damages in barriers

(a) General description and damage characteristics

This subject is defined as local deformation and loss of the steel or concrete barrier due to vehicle collision etc..

(b) Relation to the other damages

- The damages of the anchor bolts of the steel barrier such as corrosion, fracture, missing bolts, etc. shall also be evaluated in the related subjects if exist.

(c) Inspection area

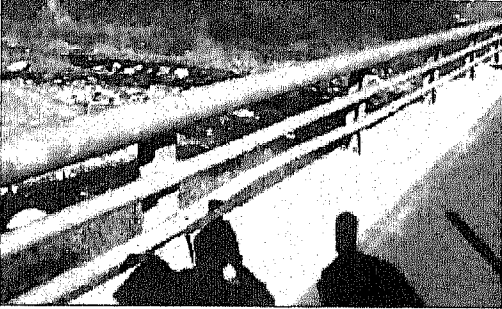


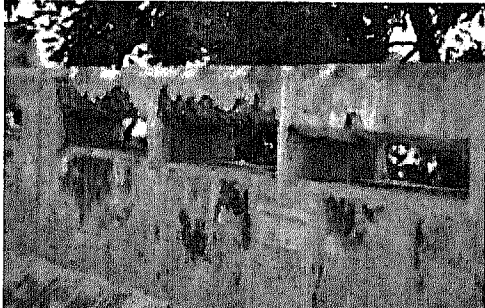
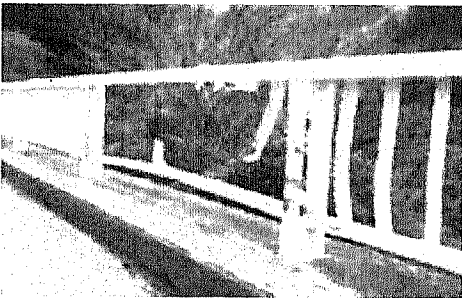
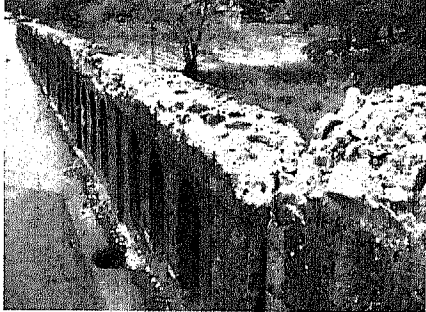
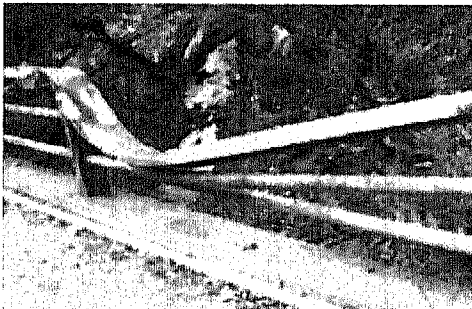
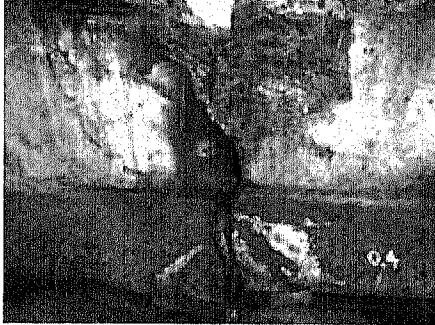
The existence of deformation and loss of materials shall be inspected for all barriers.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Classification
No damage	a
Local deformation and partial loss of steel or concrete	c
Remarkable local deformation and remarkable partial loss of steel or concrete	e

(Examples)

<p>Damage level c</p>  <p>Local deformation</p>	<p>Damage level c</p>  <p>Rebar exposure with remarkable area of damage</p>
<p>Damage level e</p>  <p>Remarkable reduction in strength by the sectional reduction due to pitting corrosion</p>	<p>Damage level e</p>  <p>Remarkable partial loss of concrete.</p>
<p>Damage level e</p>  <p>Breakage in large area. Dangerous traffic condition</p>	<p>Damage level e</p>  <p>Remarkable partial loss of concrete.</p>
<p>Damage level e</p>  <p>Large deformation. Dangerous traffic condition.</p>	<p>Damage level e</p>  <p>Remarkable partial loss of concrete.</p>

2.2.8 Expansion joints

(16) Damages in expansion joints

(a) General description and damage characteristics

This subject is defined as deformation and loss on the expansion joint due to traffic or bridge expansion.

(b) Relation to the other damages

The level difference at the expansion joint shall be evaluated as “unevenness of road surface” in the related subject.

(c) Inspection area

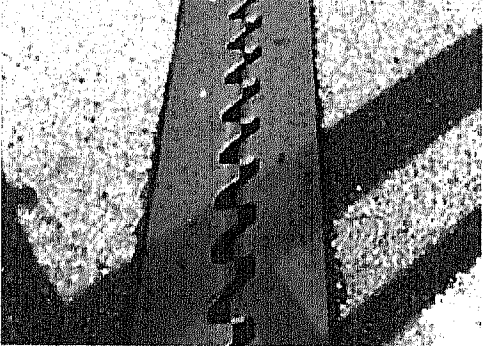
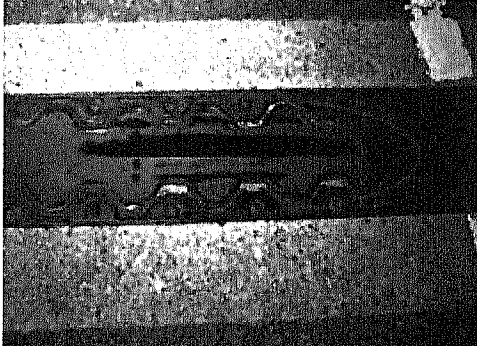

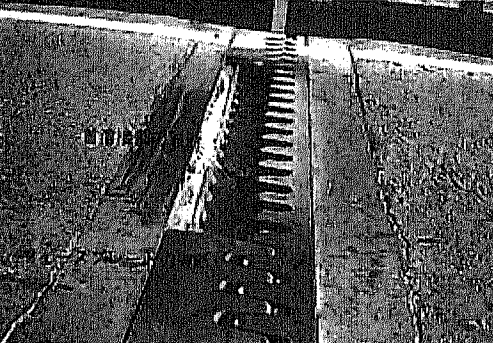
The existence of damages, unusual gap and water leakage downward shall be inspected for all expansions.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Classification
No damage	a
Local deformation or partial loss of steel or rubber etc / Excessive gap to the design value leads to the difficult traffic condition to the pedestrians and bicycles	c
Remarkable local deformation or remarkable partial loss of steel etc. / Corrosion in girders or bearings due to water leakage	e

(Examples)

Damage level c	Damage level c
	
<p>Large gap. Problem to pedestrian or vehicles</p>	<p>Local crack in the rubber Problem to pedestrian or vehicles</p>
Damage level e	Damage level e
	
<p>Water leakage. Potential corrosion in the bearings</p>	<p>Breakage of expansion joint Potential turning over of bicycles or motorcycles</p>