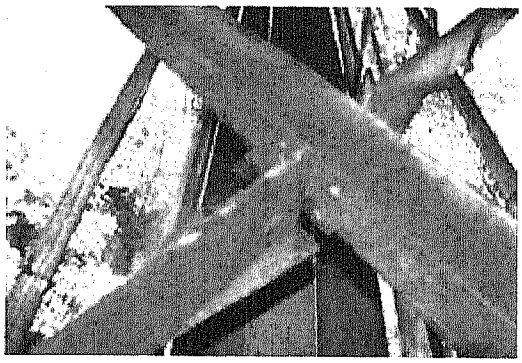
(Examples)

Damage level e	Damage level e
	
Fracture in the gusset plate of the diaphragm	Fracture in the gusset plate of the lateral bracing

(5) Deformation & loss

(a) General description and damage characteristics

This subject corresponds to the local deformation or loss of members due to the vehicle collision or the scratch during construction.

(b) Relation to the other damages

Besides these damages cracking or fracture shall be also evaluated in the related subjects if exist.

(c) Inspection area

The existence of deformation and loss for all the members shall be inspected.

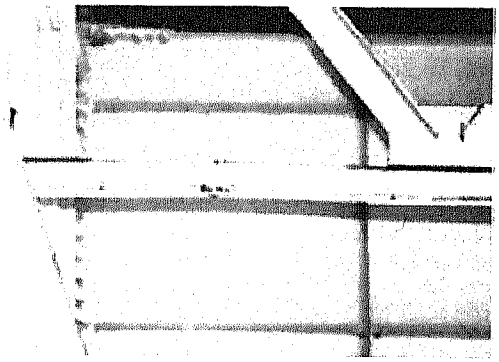
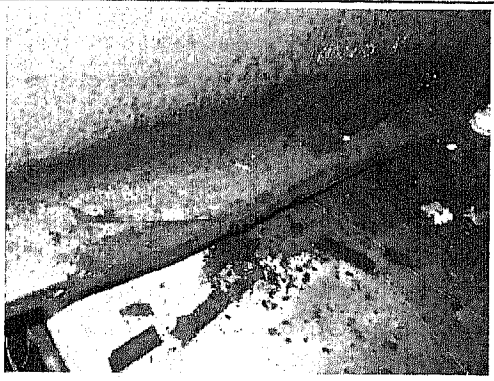
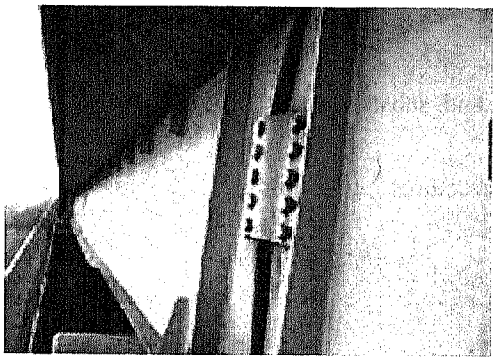
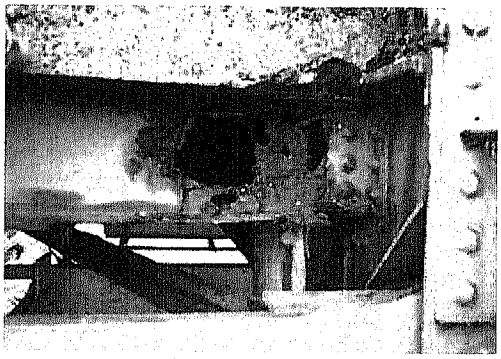
The main members shall be inspected with attention in such a situation as the bridge is considered to be dangerous due to the deformation.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Classification
No damage	a
Local deformation of the members / Loss of a small portion of the members	c
Remarkable local deformation of the members / Remarkable loss of a portion of the members	e

(Examples)

Damage level c	Damage level c
	
Local deformation in the diaphgram	Loss of a portion of the members
Damage level e	**Damage level e**
	
Remarkable local deformation of the members	Remarkable loss of a portion of the members

2.2.2 Concrete structures

(6) Cracking, water leakage and free lime

(a) General description and damage characteristics

This subject corresponds to the condition of concrete member in which cracking or water leakage exists on the surface.

(b) Relation to the other damages

- The other damages such as pop-outs, rebar exposure etc. shall be also evaluated in the related subjects if exist.
- Cracking occurring in bridge deck shall not be evaluated in this subject but evaluated as "Deck cracking".

(c) Inspection area

The conditions of the main members of girder and substructure shall be inspected visually approaching as close as possible.

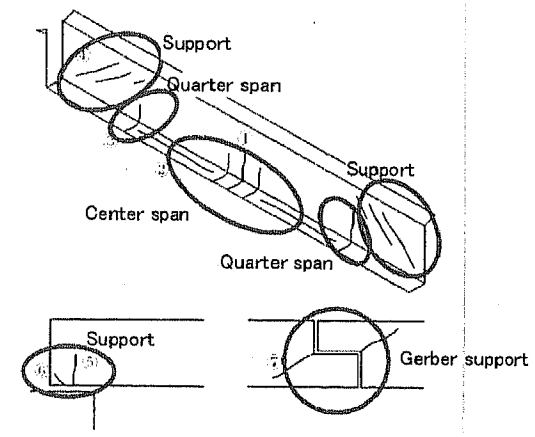
"Cracks remarkably influential cracks upon the structures", given in the following tables shall be evaluated separately from the other cracks.

Remarkably influential cracks (Girder)

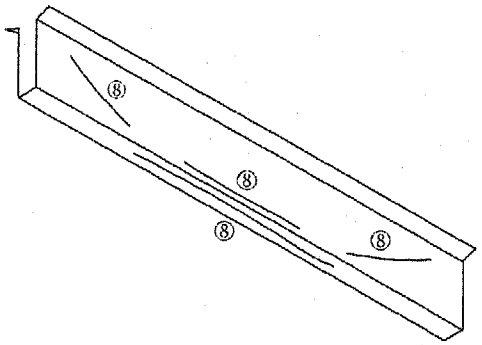
No.	Location	Crack pattern
1	Center span	Cracks in the transverse direction on the bottom surface and vertical cracks on the side surface of the girder at the center span
2		Cracks in the longitudinal direction on the bottom surface of the girder
3	Quarter span	Cracks in the transverse direction on the bottom surface and vertical cracks on the side surface of the girder at the center span
4	Support	Diagonal cracks on the side surface in the vicinity of the support
5		Cracks on the bottom surface and vertical cracks on the side surface of the girder directly above bearings
6		Diagonal cracks on the side surface of the girder directly above bearings
7	Gerber support	Cracks at Gerber supports
8	Whole PC girder	Cracks along PC sheath and PC tendon

[common to PC/RC]

PC: Prestressed concrete
RC: Reinforced concrete



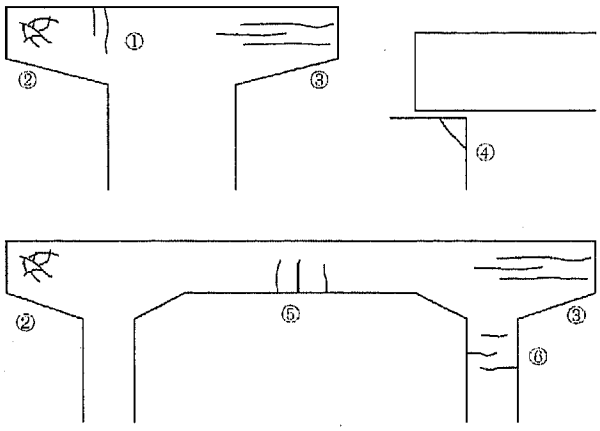
[PC girder]



Remarkably influential cracks (Pier)

No.	Location	Crack pattern
1	T-shaped pier	Cracks at the top of the cantilever
2	Common	A number of cracks in the wide range
3		Several large cracks in the longitudinal direction
4	Beneath bearings	Cracks beneath the bearing area
5	Framed pier	Cracks on the lower chord at the beam center
6		Cracks all around the pier

[Pier]



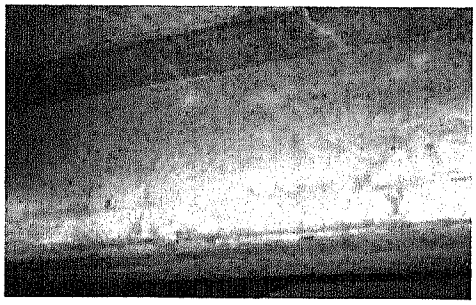
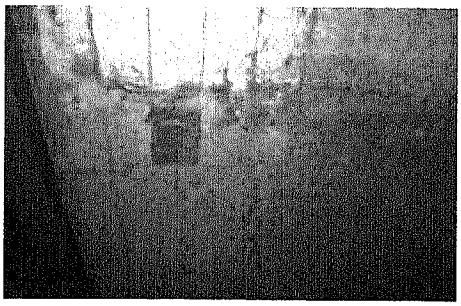
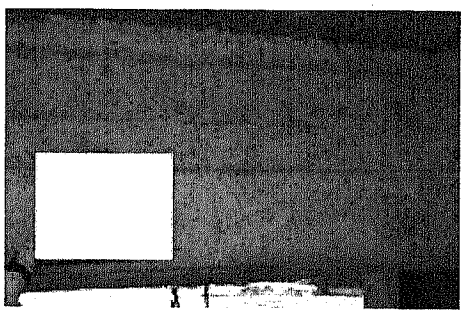
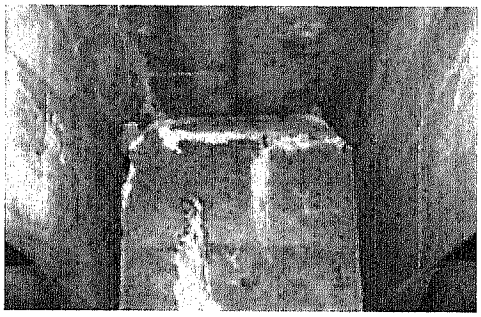
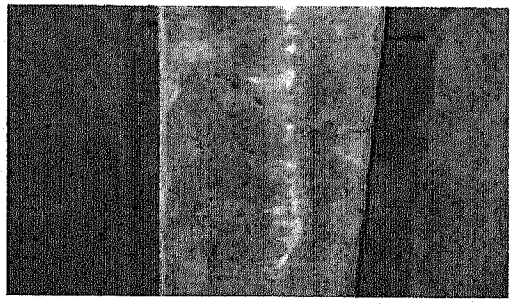
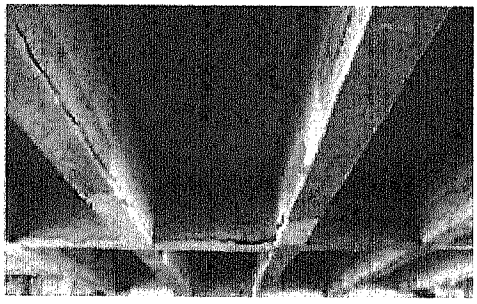
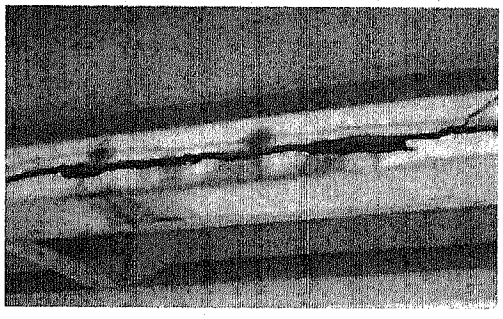
(d) Classification of damages

The inspected results shall be evaluated with the following classification:

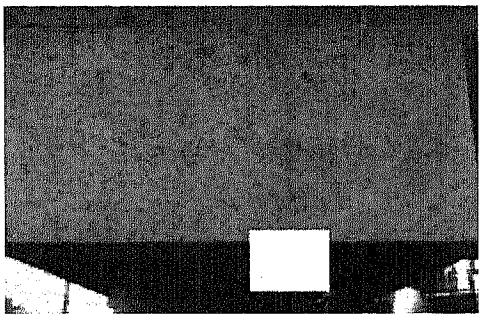
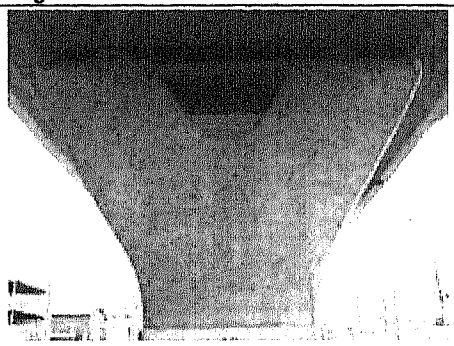
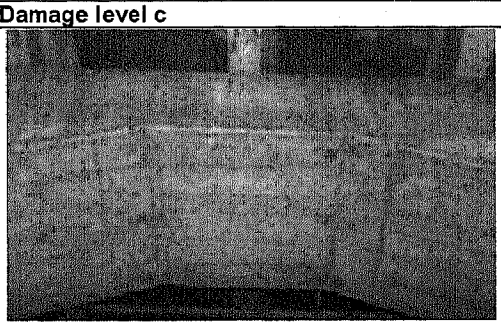
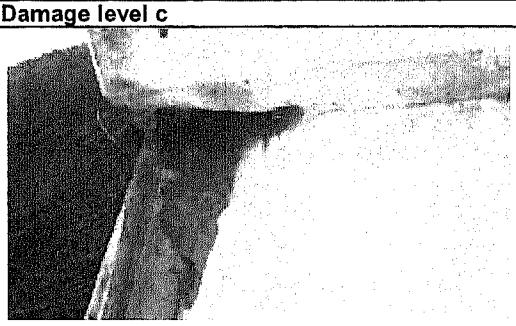
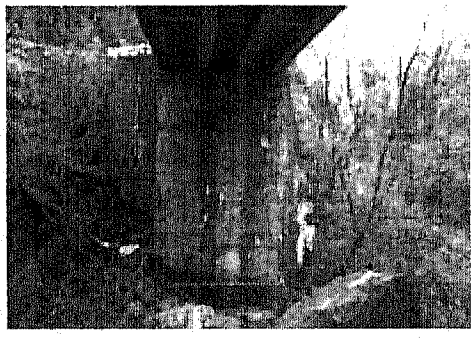
Evaluation criteria				Classification
Existence of crack	Location of crack	Crack width*	Water leakage, free lime	
N	-	-	-	a
Y	Cracks shown in (a) "Remarkably influential cracks"	< 0.2mm (small)	Independent of existence	c
		≥ 0.2mm (large)	Crack only	c
			Water leakage only	d
			Slight free lime	d
			Remarkable free lime, rust stain	e
	Cracks other than above (Small influence)	< 0.2mm (small)	Independent of existence	b
		≥ 0.2mm (large)	Crack only	b
			Water leakage only	c
			Slight free lime	c
			Remarkable free lime, rust stain	d

* In case crack width can not be measured due to inaccessibility etc. the easily perceptible cracks from a distant view shall be considered as "large crack width" in the evaluation.

(Examples Superstructure)

Damage level b	**Damage level b**
	
Cracks of small influence (marked with chalk)	Cracks of small influence (marked with chalk)
Damage level c	**Damage level c**
	
Cracks of large influence (marked with chalk) **Crack pattern No.1**	Cracks of small influence with water leakage
Damage level d	**Damage level d**
	
Cracks of small influence with water leak age and free lime	Cracks of large influence with slight water leakage and free lime **Crack pattern No.2**
Damage level e	**Damage level e**
	
Cracks of large influence with rust stain **Crack pattern No.8**	Cracks of large influence with rust stain **Crack pattern No.8**

(Examples substructure)

Damage level b	Damage level b
	
Cracks of small influence (marked with chalk)	Cracks of small influence (marked with chalk)
Damage level c	**Damage level c**
	
Cracks of large influence (marked with chalk) **Crack pattern No.5**	Cracks of small influence with water leakage
Damage level d	**Damage level d**
	
Cracks of large influence with water leakage and free lime **Crack pattern No.3**	Cracks of small influence with rust strain
Damage level e	**Damage level e**
	
Cracks of large influence with remarkable free lime **Crack pattern No.6**	Cracks of large influence with remarkable free lime **Crack pattern No.6**

(7) Rebar exposure

(a) General description and damage characteristics

Rebar exposure is defined as the condition in which the surface of concrete member is scaled and the rebars are exposed.

(b) Relation to the other damages

This subject includes corrosion of the exposed rebar, cracking, etc. and shall not be evaluated as corrosion, nor fracture, etc..

(c) Inspection area

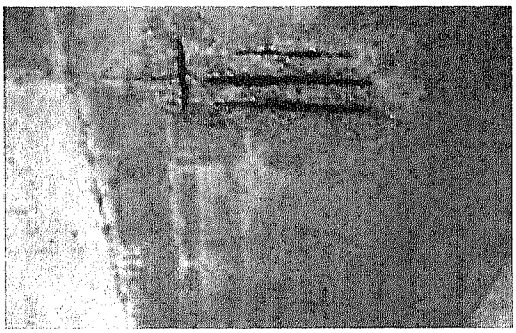
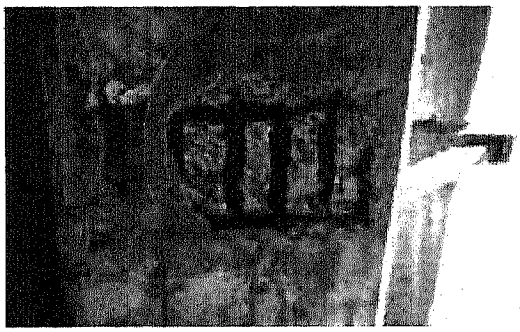
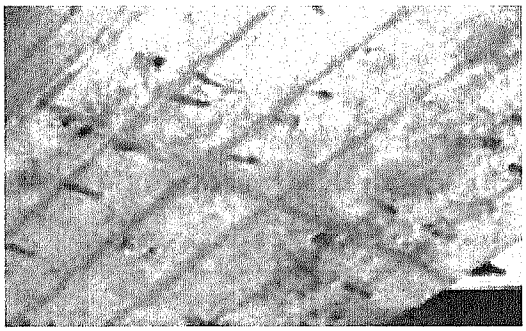
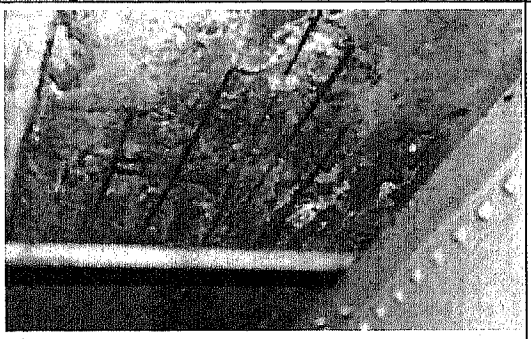
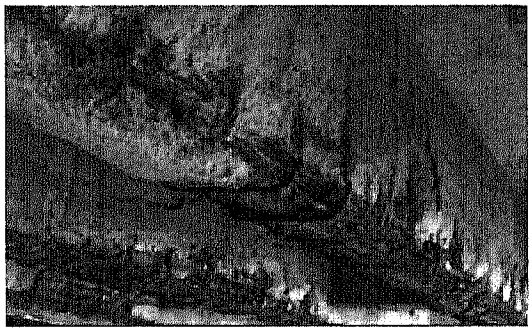
The existence of rebar exposure for all the members within visually perceptible area shall be inspected.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria			Classification
Existence of rebar exposure	Extent of corrosion	Condition of corrosion	
N	–	–	a
Y	Partial	Surface only	b
		Reduction of rebar section, remarkable expansion of rebar	c
	Global	Surface only	c
		Reduction of rebar section, remarkable expansion of rebar	e

(Examples)

Damage level b	**Damage level b**
	
Partial rebar exposure	Partial rebar exposure
Damage level c	**Damage level c**
	
Partial rebar corrosion	Superficial rebar exposure in the wide range
Damage level e	**Damage level e**
	
Rebar corrosion in the wide range	Rebar corrosion in the wide range

(8) Pop-outs

(a) General description and damage characteristics

Pop-outs are conical fragments that break out of the surface of the concrete, leaving small holes in the concrete deck including cast-in-place (C.I.P) portion. In case of pop-outs lattice cracks often occur in the deck.

(b) Relation to the other damages

- Although remarkable cracks occur in the deck concrete, these shall be evaluated as "Deck cracking" as long as the concrete fragment does not break out from the deck.
- In case spalling is developed remarkably and reaches through the deck, it shall be also evaluated as "Pop-outs".

(c) Inspection area

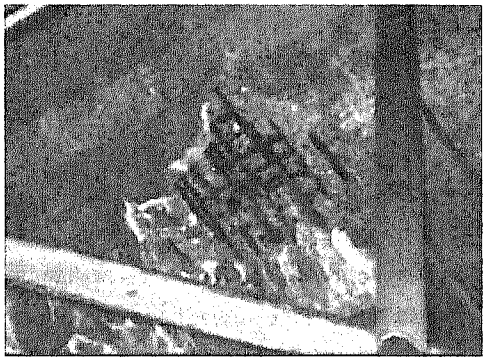
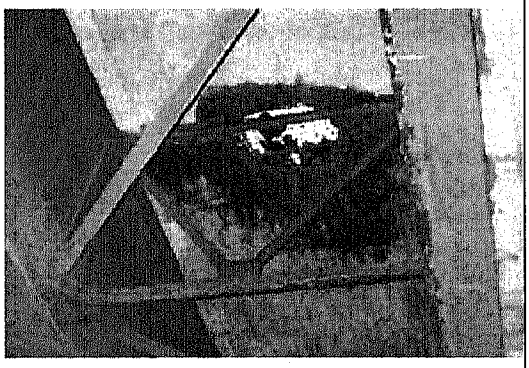
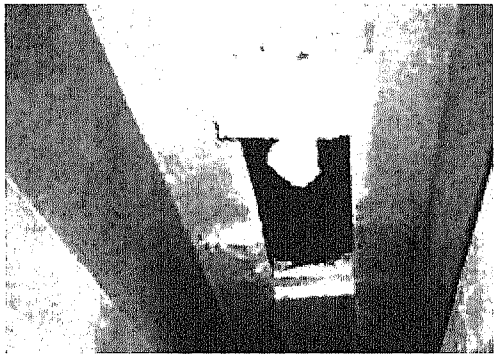
The existence of pop-outs for all the decks within visually perceptible area shall be inspected.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Classification
No damage	a
Pop-outs of concrete fragment	e

(Examples)

Damage level a	**Damage level a**
	
Evaluated by "Deck cracking" due to remarkable crack	Evaluated by "Rebar exposure" due to remarkable rebar exposure
Damage level e	**Damage level e**
	
Example of pop-outs	Example of pop-outs

(9) Deck cracking

(a) General description and damage characteristics

Deck cracking is defined as cracks in one or two directions on the lower side of the concrete deck.

(b) Relation to the other damages

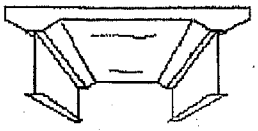
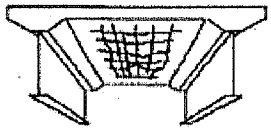
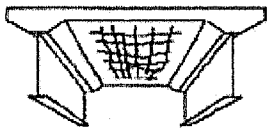
- The other damages such as rebar exposure besides deck cracking shall be also evaluated in the related subject if exists.
- The condition of water leakage, free lime and rust stain from the deck shall be evaluated in this subject.
- In case deck cracking is developed remarkably and reaches through the deck, it shall be also evaluated as "Pop-outs".

(c) Inspection area

The crack condition in the deck within visually perceptible area shall be inspected approaching close to the girder end area. It is preferable to inspect approximately 2 panels from the girder end. In case there is no partitioning member in the deck such as diaphragms, the inspection area may be considered as the area of 10m from the support.

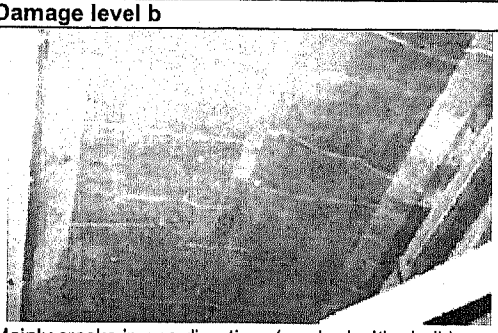
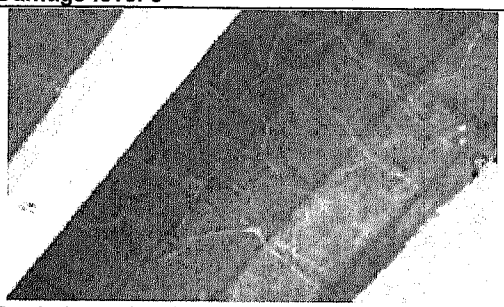
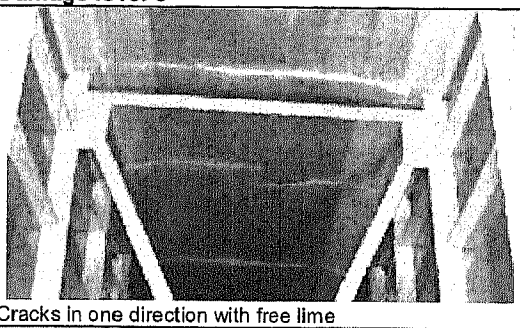
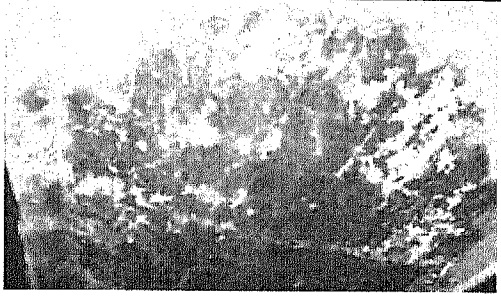
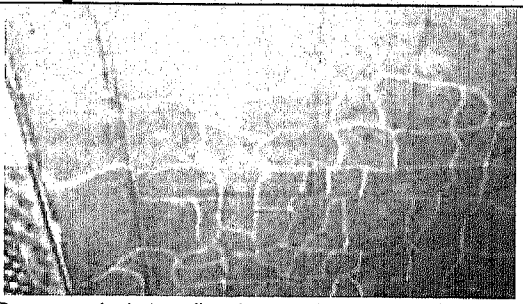
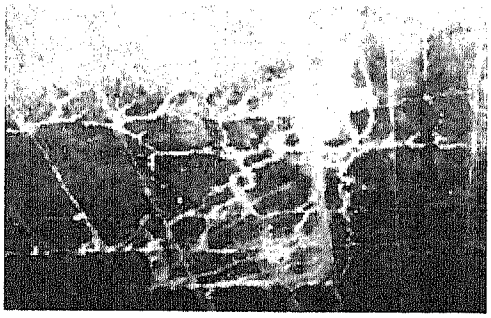
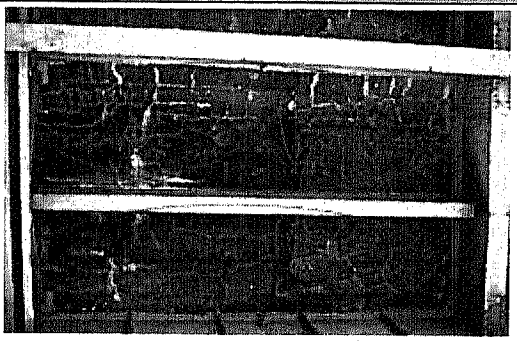
(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Conceptual figure	Classification
- No crack or fine cracks with the width w < 0.2mm and an interval of approx. 1.0m (considerably apart) - No stain of water leakage and free lime		a
- Fine cracks mainly in one direction with the width w < 0.2mm and an interval of approx. 0.5m (relative apart) - No stain of water leakage and free lime		b
- Lattice cracks with the width of approx. 0.2mm - No stain of water leakage and free lime or - Cracks in one direction with the width of approx. 0.2mm - Stain of water leakage and free lime		c
- Lattice cracks with the width of approx. 0.2mm - Stain of water leakage and free lime or - Remarkable cracks with the width ≥ 0.2mm and partially chipped - No stain of water leakage and free lime		d
- Continuously chipped - Stain of water leakage and free lime		e

* Crack width or interval does not necessarily require measurement. The easily perceptible cracks from a distant view shall be considered as "crack width ≥ 0.2mm".

(Examples)

Damage level b	**Damage level b**
	
Mainly cracks in one direction (marked with chalk)	Mainly cracks in one direction (marked with chalk)
Damage level c	**Damage level c**
	
Cracks in two directions (marked with chalk)	Cracks in one direction with free lime
Damage level d	**Damage level d**
	
Cracks in two directions with free lime	Dense cracks in two directions partially chipped (marked with chalk)
Damage level e	**Damage level e**
	
Continuously chipped with free lime	Continuously chipped with free lime