CHAPTER 6 MAINTAINANCE MANAGEMENT PLAN

6.1 Current Status of Maintenance System

6.1.1 Outline of Management Office

The management office of the Suez Canal Bridge is located at the crossing point of Ismailia-Port Said Road and the Suez Canal Bridge (Figure 2.7.1). Basic information regarding this office is as follows.

Office: Main office, West gate, East Gate (with control room for the monitoring camera).

Working staff: 30 persons, total of residents and temporary workers (23 people stay on the west side, 7 are on the east side).

Working time: AM 8:30－PM 3:00 (no lunch break), Fridays & Saturdays are holidays. Working time for the tollgates, monitoring cameras and security is 24 hours (2 shifts)

Figure 6.1.1 Location of Management Office

Photo 6.1.1 GARBLT Management Office

6.1.2 Current Inspection Status

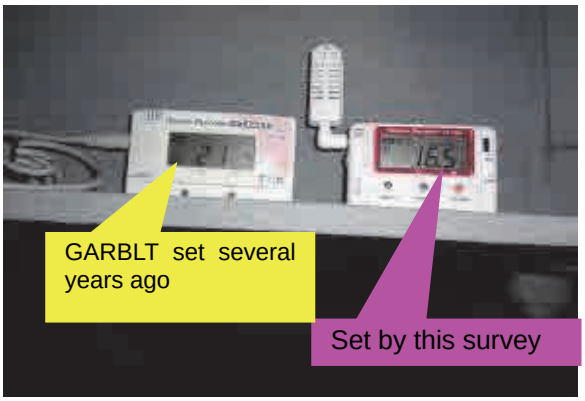
Maintenance of the Suez Canal Bridge has been carried out based on the "Operation and Maintenance Manual" prepared by Kajima - NKK Nippon Steel Consortium of July 2001. Existing inspection items for the Main Bridge (steel) are shown in Table 2.7.1.

Table 6.1.1 Inspection Items for Main Bridge (Steel)

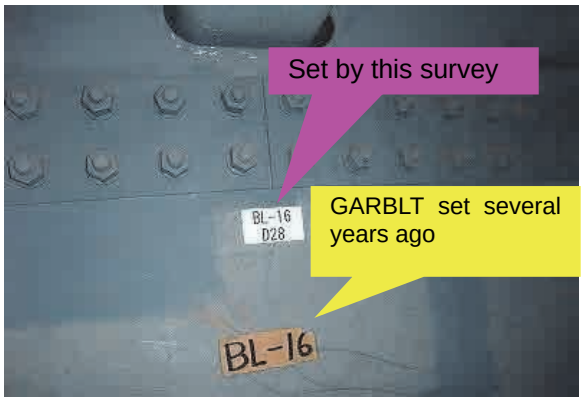
Object	To be Inspected	Method of Inspection	Maintenance Period
Steel box girder	Abnormal deformation Deterioration of painting	Side walk from the ground Inspection walkway	Routine (daily) General (Every year)
	Cracks in weld joints Abnormal sound Looseness of bolts	Inspection walkway Inspection vehicle Maintenance platform	General (Every year)
Survey of girder profile	Girder elevation Temperature of girder Inclination of pylon	Road surface Inspection walkway from ground	Principal (Every five years)
Bearing	Looseness of setting bolts/nuts Surface cracks of rubber/grouting Damage to bearing plate Deterioration of painting Cracks on welding joints Abnormal sound of bearing plate	Through manhole of pylon Side walk Lower cross beam Through inspection walkway Manhole of girder Platform on pier	General (Every year)
Cable	Abnormal sag Damage to sheathing	Side walk	Routine (daily)
	Measured by vibration method Abnormal slip of zinc-copper alloy	Side walk Inspection vehicle Gondola lifted by crane	Principal (When cable has abnormal sag)
Cable damper	Looseness of setting bolts Abnormal cracks in rubber material Backing out of anchor bolts	Inspection vehicle Gondola lifted by crane	Principal (When cable has abnormal vibration)
Pavement	Deterioration	By car	Routine (daily)
Drainage system	Abnormal drainage	Side walk	Routine (daily)
	Leakage of water at joints Looseness of setting bolt/nut Corrosion of the pipes	Through inspection walkway Manhole of girder	General (Every year)

Object	To be Inspected	Method of Inspection	Maintenance Period
Guard fence/ Net fence	Deformation	Side walk	Routine (daily)
	Looseness of setting bolt/nut	Side walk	General (Every year)
Expansion joint	Abnormal sound Excess gap of finger joint	Side walk	Routine (daily)
	Looseness of setting bolts/nuts Corrosion of finger/basement	Through manhole of end diaphragm	General (Every year)
	Gaps in expansion joint between fixed finger and moved finger Temperature of girder	Manhole of end diaphragm	Principal (Every five years)
Inspection vehicle	Looseness of setting bolts/nuts Breaking system Moving system	On the inspection vehicle	General (Every year)
Anemometer	Irregularity	Side walk	Routine (daily)
	Looseness of setting bolts/nuts	Side walk	General (Every year)
Navigation light	Irregularity Burn-out	Side walk	Routine (daily)
	Looseness of setting bolts/nuts	Side walk	General (Every year)

The JICA Survey Team was able to confirm some points as the result of maintenance in the time of the site survey; for example, the lighting system worked well, temperature and humidity were maintained at constant levels conforming to the steel deck because the air ventilation system worked well. Interviews and guided inspections went smoothly with GARBLT staff. They understand the situation of the site because they keep ledgers and pictures of the maintenance works. The next pictures were taken by the Study Team in this survey term and show some confirmations of the status of various items.



Temperature and Humidity Sensors



Numbering of Diaphragm

Photo6.1.2 Items of Maintenance Work in Steel Deck by GARBLT

GARBLT installed five sensors to monitor temperature and humidity in the steel deck. They monitor these throughout the year.

The JICA Survey Team numbered all diaphragms in this survey because the Survey Team had to match the same points that were chosen for the cut and excavation tests of the pavement and detailed inspection of the steel deck. But, GARBLT had already designated numbers for their own maintenance work several years ago and they were exact.

GARBLT staff were accustomed to guiding viewers into the steel deck and moving in the narrow space smoothly. The thing that impressed us most is that they worked diligently at the maintenance. According to the interviews, they implement detailed visual inspections in the steel deck once every 3 months at least.

Photo 6.1.3 Entrance Manhole of Steel Deck Girder

6.1.3 Toll Gate Work

The management office also operates the tollgate as its main duty. 10 to 12 staff are working in this capacity. This work has two items: one is inspection of axle weight (refer to Chapter 2.4), the other is fare collection at the tollgate.

1) Fare collection

Toll fares for the Suez Canal Bridge are shown in Table 8.1.2.

Table 6.1.2 Toll Fares on the Suez Canal Bridge

Type of Vehicle	Toll Fare（EGP）
Private small car	2.0
Micro bus, Pickup truck(including minivan)	3.0
Large-sized bus, Small truck	5.0
Large-sized truck	10.0

Vehicles belonging to the military, police, ambulance service or GARBLT are free.

Photo6.1.4 Sign Board Showing Toll Fares

Photo6.1.5 Booth and Fare Collection

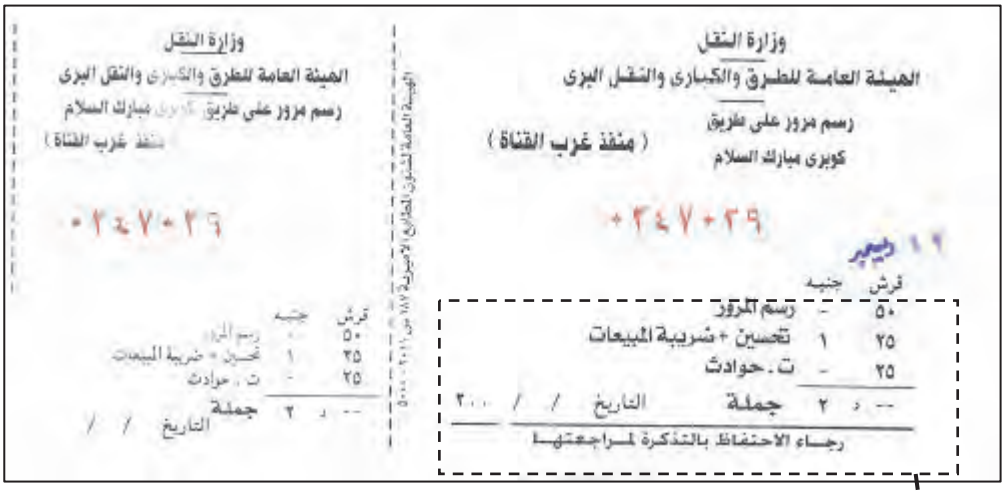


Figure 6.1.2 Ticket to Cross the Bridge (for Private Small Car)

Tickets (Figure 2.7.2) are classified in 4 colors, one for each toll fare (Table 2.7.2): white (2.0 EGP), yellow (3.0 EGP), green (5.0 EGP), and pink (10.0 EGP).

In addition, the ticket shows a breakdown of the toll fare as below.

Toll fare : 0.50EGP
For maintenance : 1.25EGP
For insurance : 0.25EGP
Total : 2.0EGP

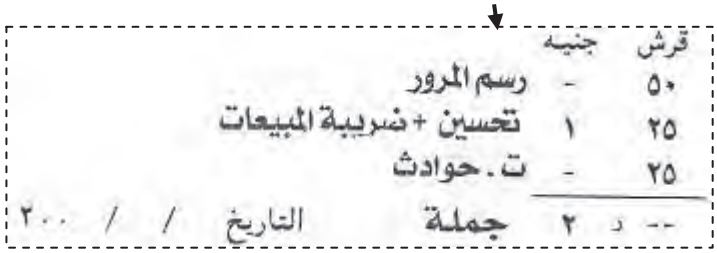


Figure 6.1.3 Ticket（Part of Toll Fare）

"Insurance" means insurance against an accident on the bridge; the driver can show this ticket as evidence of insurance, if an accident happens.

These tickets are carried from the Headquarters of GARBLT every day. They bring the toll fare at the same time.

2) Road closure

GARBLT has to close the Suez Canal Bridge if the army uses the Suez Canal to move. At this time, traffic congestion occurs (Photo 2.7.6). The JICA Survey Team faced this “road closed” condition three times in the site survey period in November and December 2011.

Photo6.1.6 Traffic Jam due to Road Closure

6.2 Operation and Maintenance Costs

Annual budget 2011F.Y of the Suez Canal Bridge site office of GARBLT is approximately 600,000 LE in according to the hearing. And fiscal year’s budget of each years for recent has been fluctuating annually, based on the result of negotiation between the site office and thee Head Quarter of GARBLT

At present, the GARBLT site office has technical and skilled laborers totaling 30 persons working on operation and maintenance for the Bridge and approach sections, and is in possession of only a few some vehicles to be used to daily inspection. It can not be said have sufficient capacity to conduction for maintenance work. If annual budget to site office is similar to previous annual ones, additional budget for implementing proper maintenance work targeting whole of the Suez Canal Bridge is estimated as follows;

To estimate categorized objects that require maintenance are as follows.

- Removal and renewal of the surface layer. / (implemented by GARBLT H.Q. budged)
- Regular maintenance of s pavement on bridge/(Implemented by site office budget)
- The body of the steel girder of main bridge / (ditto)
- Approach bridge section (pre-stress concrete box girders) / (ditto)
- Skill up training to site office staffs. / (ditto)

The maintenance costs for each object are estimated as below, and the sum of these is considered to be necessary additional budget.

(1) Renewal of the surface layer

As Deterioration and abrasion might advance **even** without passage of overloaded vehicles, generally the work of renewal of the asphalt surface layer is required at a frequency of once a decade to prevent from influence to the body of the bridge. After the pavement repair project is implemented, renewal of the asphalt surface layer is indispensable in this frequency.

The summary cost which has been estimated in the study for renewal of asphalt surface layer including removal of existing one is estimated about 2,040,0000L.E. (Yen 26,300,000). In considering

the cost and procedure of the construction, GARBLT Headquarter shall make the decision of the renewal timing and ensure the budged of the construction.

In the other hand, ② to ⑤ mentioned below shall be dealt as allocated budget to the site office managing the maintenance work of the bridge.

(2) Required additional budget for maintenance of pavement

In addition to daily inspections, repair materials and equipment are needed for emergency operation and maintenance of the pavement. Proper and adequate maintenance will reduce further deterioration, stop damage deeper than the wearing course, and lengthen the time until the next periodic maintenance period (usually 10 years for the surface course) resulting in maintaining a good surface for a long time.

Additional Operation and Maintenance Costs per Year of Pavement

Even after the repair works, additional maintenance costs for emergency repairing are needed such as:

Major equipment

- Hot-mix sealing materials
- Hot-mix tank (approx. Yen 500,000)
- Compressor (approx. Yen 1,500,000)
- Truck with a crane (second hand, approx. Yen 1,500,000)

Miscellaneous tools (consumables)

- Hot-mix sealing materials for emergency cases
- Hand dippers for sealing materials
- Trowels

Considering the above equipment and tools, additional yearly maintenance costs will be needed totaling LE 80,000 as shown below:

- Initial purchase: Yen 6,000,000=LE 470,000 (for 10 years of use),
  LE 47,000/year

(Hot-mix tank, compressor, 2-ton truck, truck with a crane, gas burner, etc. for 10 years of use)

- Sealing material (CMB, CETOKOL 200, for example, 300 kg/year)x LE 20/kg=
  LE 6,000/year
- Consumables
  LE 2,000/year

Total (1)

LE 55,000/year・・・(2)

(3) Required budget for maintenance of the body of the steel girder of main bridge

As to for the body of the steel girder, detail investigation to judge the degree of soundless shall be carried out in a time per decade, in using the special measurement equipment similar to that have been carried out in the Study.

As the survey firms that can conduct the detail investigation is not yet grown in Egypt, for example, it is supposed that Japanese survey firm which possesses special measurement equipment and skilled engineers will be dispatched to Egypt. The cost is estimated with reference to an embodiment carried out in the site investigation of the Study.

・ Detail survey and evaluation to the degree of soundness about steel deck plate : approx. Yen 8,000,000 / sum = LE 620,000 /10 years ―＞LE 62,000/year・・・(3)

(4) Required budget for maintenance of approach bridge section (pre-stress concrete box girders)

The approach bridge section is composed of the continuous viaduct of pre-stress concrete box girder. Essential item in regular inspection for pre-stress concrete bridges is visual inspection of deterioration on structure members and supporting systems. Particularly, deterioration occurred on the surface from the foundation of parapet to below portion, which is directly exposed to wind and rain, is often found. These deterioration portions are difficult to be found from surface of the bridge. In addition, as the approach section is placed at some tens height from the ground, the inspection is hard to be carried out. For the solution to the matter, employment and operation of the special Bridge Inspection Car, which can implement the inspection in being set on the bridge, is effective.

Major equipment: Special Bridge Inspection Car (second hand, approx. Yen 5,000,000) = LE 390,000 (for 10 years of use), => LE 39,000/year・・・ (4)

(5) Required budget of capacity building of maintenance for the site office staffs

To obtaining maintenance work skill, capacity building for Egyptian staff is indispensable. Regular training for maintenance work shall take place in Cairo. For budgeting purposes, every year, 2 technical staff and 4 skilled laborers are assumed to attend the training in Cairo.

LE 1,200 (=US$ 200)/person/day x 6 persons x 3 days = LE 21,600 ・・・(5)

(2) + (3) + (4) + (5)＝55,000+62,000+39,000+21,600 ＝LE 177,600、approx. LE 180,000LE (=Yen 2,300,000)

In conclusion, in addition to the ordinary budget, the site office shall be ensured LE 180,000/year for regular inspection of the pavement and maintenance of the Suez Canal Bridge.

Based on the above, the additional yearly budget allocated to the site office up to 10 years is assumed as follows;

Sample of Required Annual Additional Budget for Maintainance the Bridge							
FY2012	The Sutdy (including detail investigation of pavement and steel deck plate)						
FY2013	Repair PavementC onstruction of The Bridge（if ncessary, deteriorated steel deck plate will be reinforced)						
	① Renewal of the surface layer	②Maintenance of pavement		③ Maintenance of the body of the steel girder of main bridge（once in about 10years）	④Maintenance of approach bridge section	⑤ Capacity building of maintenance for the site office staffs	Sub-total (from② to ⑤)
		Purchase for Major Maintenance Equipment（Updated in 10	Miscellaneous tools (consumables) and ? Sealing material		Purchase for Major Maintenance Equipment（Updated in 10		
	Budget prepared by GARBLT Headquarters	Additional Budget allocated to the Suez Canal Bridge site office					
FY2014		470,000	8,000			180,000	658,000
FY2015			8,000		390,000	180,000	578,000
Fy2016			8,000			180,000	188,000
Fy2017			8,000			180,000	188,000
FY2018			8,000			180,000	188,000
FY2019			8,000			180,000	188,000
FY2020			8,000			180,000	188,000
FY2021			8,000			180,000	188,000
FY2022			8,000	620,000		180,000	808,000
FY2023	20,400,000		8,000			180,000	188,000
FY2024		470,000	8,000			180,000	658,000
FY2025			8,000		390,000	180,000	578,000

6.3 Proposal Plan of Future Maintenance Management System

It is important to plan well-structured maintenance management to keep the bridge safe and comfortable. The maintenance management plan includes providing a maintenance management system and building an information database to implement a systematized and effective maintenance management processes.

(1) Maintenance Management System

The maintenance management system includes the process of performing the Plan-Do-Check-Act cycle shown in Figure 8.2.1.

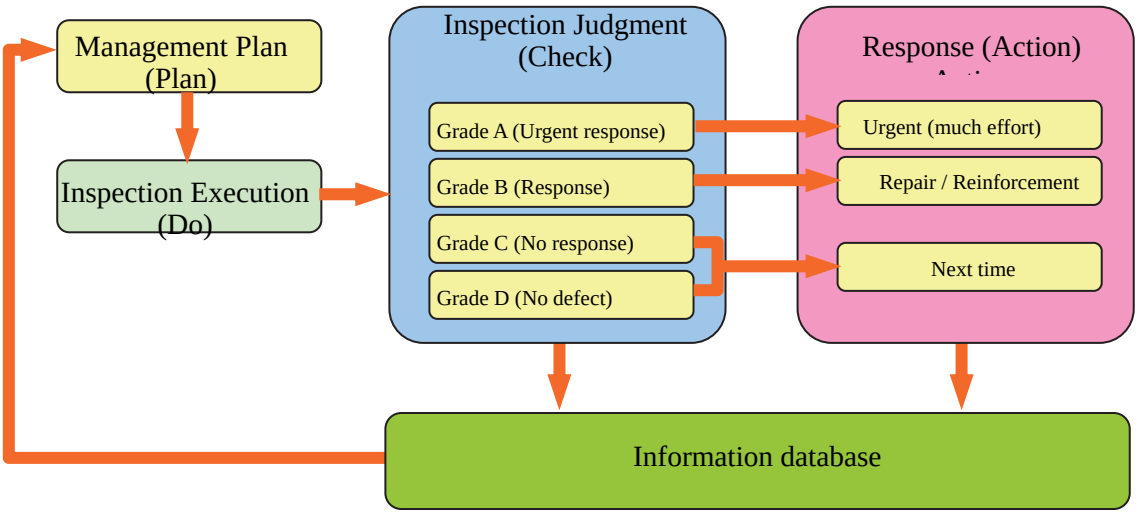


Figure 6.3.1 Schematic Setup of Maintenance Management System

(2) Build Information Database

Building an information database is essential for consolidating a number of types of data associated with inspection, structure properties, accessories, and historic logs into a single management system. This would help determine the priority order of damage that needs quick repair and enable planning to undertake proper measures and perform follow-up reviews after repair is complete. The schematic setup is plotted in Figure 8.2.2.

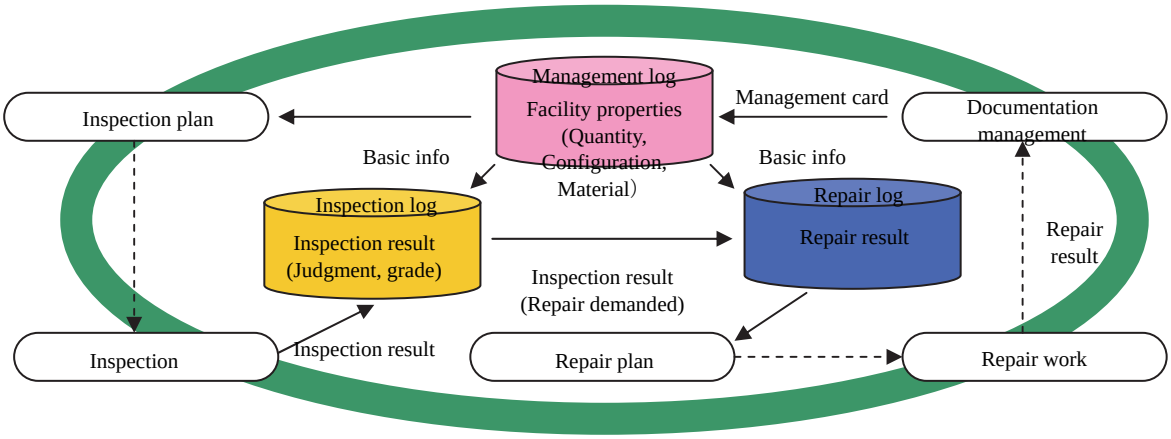


Figure 6.3.2 Schematic Setup of Information Database

(3) Inspection Activities

Comprehensive inspection includes activities involved in daily inspection, routine inspection, and special (or ad-hoc) inspection that are required when a disaster occurs, as listed in Table 8.2.1.

Table 6.3.1 Inspection Types and Cycle

Inspection type		Inspection title	Inspection description	Inspection cycle
Daily inspection	Patrol	Bridge deck	Visual inspection by a patrol car	2-3 times per week
		Substructure		Once every month
		Rainfall	Sewage system inspection by a patrol car	When rain falls
		Traffic	Monitoring by traffic control staff	Once per am and pm
	Walk	Bridge deck	Visual inspection	Every 5 yrs
		Inside box girder	Visual inspection	Once or twice every 2 yrs
Routine inspection	Macro	Main structure and accessories	Use a vehicle for work at height	Every 5 yrs
			Use a temporary scaffold	At the re-paving time
		Other	Other facilities – architecture, machinery, power supply, etc.	As may be necessary
	Tools		Measure cracks and flatness	Every year
	Damaged spot added		Track inspection for aging	Every year
Special (or ad-hoc) inspection	Emergency		Earthquake and typhoon	When emergency occurs
	Accident		Accident or similar events	When accident occurs
	Ad-hoc basis		As may be necessary	Before special event starts

Effective maintenance management and a well-organized repair process would extend the bridge service life and minimize the occurrence of unknown risk. A conceptual diagram of assuring a long service life is plotted in Figure 8.2.3.

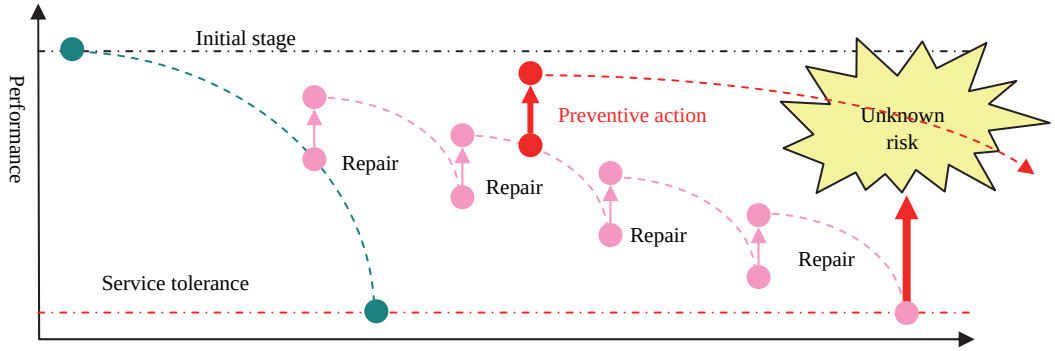


Figure 6.3.3 Conceptual Diagram for a Long Service Life

CHAPTER 7 COCCLUSION AND RECOMMENDATION

7.1 The Damaged Condition of Pavement and Soundness of Steel Deck Plate

As a result of the 1st site investigation (from November to December 2011), it was found that cracks occurred in 95% of the pavement area, and that approximately 70% of the area had some cracks with a width of more than 10 mm. The cracks greater than 10 mm in width had a troughed binder layer and the bonding layer, which is required to connect the binder layer firmly to the steel deck plate, had almost lost its bonding performance.

As a result of the excavation test that examined serious damaged pavement portions, rust was found on the surface of the steel deck plate. It caused a thickness reduction about 0.5 mm of the steel deck plate. On the other hand, the inspection conducted inside the steel box girder proved that no fatigue cracks were present. Although the steel deck plate girder is currently structurally stable, progression of corrosive conditions would lead to the Bridge having a dangerous structural condition.

It has been determined that cracks were caused by passage of overloaded vehicles soon after bridge inauguration, and these cracks have been developing. Resultantly, rainwater penetrated into those cracks and damaged the bonding layer. Eventually water reached the surface of steel deck plate, which seems to be cause of rust occurrence.

From the above considerations,

Conclusion-1: For existing pavement and rust on surface of steel deck plate, pavement repair work shall be conducted an early stage by an appropriate method

7.2 Selection of guss asphalt method

Regarding the selection of pavement repair method, the study has been progressing considering the viewpoint of procurement and natural conditions in Egypt.

Judgment about the repair method adjusting to steel deck plate (structural features of the bridge)

In 1st stage of comparison, some methods that can be used for steel deck plates were suggested. Subjects that were compared are: SMA method, normal asphalt method, guss asphalt method, and new technology method (epoxy resin, steel fiber reinforced concrete, rubber latex mortar).

Comparing the technical features, cost of construction, procurement for main equipment conditions and workability of each extracted method, the guss asphalt method is recommended for the following main reasons:

- In Japan or Germany, the guss asphalt pavement method is common with proven track records for most of the steel deck plate bridges.
- It has superior flexibility regarding deflection issues in steel deck plates
- Due to the requirements for construction in hot temperatures with special materials and machines, construction is relatively easy and is less likely to fail as long as the established mix design is used.

For the guss method the Study Team recommended, although GARBLT understood its good features, they would not use it because it would be hard to procure uncommon equipment necessary for this method in Egypt. GARBLT also believed that they could produce SFRC and easily procure equipment. Then, GARBLT requested JICA to study the cement-based pavement method for re-comparison with the guss method. Upon this request, the Study Team extracted 4 types of SFRC method, which have been used in Japan, and studied them. Then, the SFRC-stud type, which is the most reliable among them, was selected and compared with the guss method.

Finally, a conclusion was reached stating that the SFRC method would not be suitable for the repair method for the Bridge for the following reasons:

- Supervision of painting work when using the high-durability epoxy resin bond is difficult under the climate conditions of Egypt. If this work is not done properly, attaching the guss layer to the steel deck plate cannot be done. Thus, very strict quality controls are required.
- As it is necessary to suppress the vibration until the concrete becomes hard, the bridge must be fully closed to traffic. This will largely affect the economic and social situation.

From the above considerations,

Conclusion-2: The pavement repair method to be adopted is a guss asphalt binder layer with a dense-graded modified asphalt surface layer

7.3 Notice of technical concerning about implementation of pavement repair ptroject

The draft tender documents have been submitted to GARBLT. In the technical specifications (T.S), material requirements and criteria of quality requirements have been noted. Furthermore, in order to help the understanding of the Egyptian Contractor, construction procedures, indepensable machines and material, and points of concern regarding construction have been mentioned.

Also, methods to confirm the soundness of the steel deck have been added to the T.S.

- After completing shot-blasting, an inspection on the existance cracks ocurring inside the steel deck must be done by magnetic particle test. If fatigue cracks are found, the steel plate reinforcing method shall be adapted.

- To ensure that the thickness of the steel deck plate, especially along the portion of U-shaped ribs and longtuidinal ribs in severely damaged south lanes, has not been significantly reduced compared to the time of the study by ultrasonic test.

7.4 Recommendations for the Implementation of the Repair Project

Due to the wishes of the Egyptian government, the pavement repair project for the damage of pavement of the Bridge has been concluded to be ordered through local tender that targets Egyptian constrution companies.

At the meetings held during early site investigation, the Survey Team illustrated the points regarding technical concerns of the guss asphalt method to key officers of the relevant departments in GARBLT and executives of Egyptian construction companies. However, it can't be said that the degree of understanding of officers and executives on the guss method is sufficient due to their lack of experience. If fatigue cracks or thickness reduction of the steel deck plate is found by detailed inspection during the pavement repair project, reinforcing the steel deck plate by additional methods will be required. This raises similar concerns regarding experience.

Although the Bridge was constructed through Japanese Grant Aid funds, it is clear that the responsibility for operation and maintenance of the completed road infrastructure is borne by the recipient country Egypt. However, as a result of the Study, inadequacies cannot be denied from the viewpoint of the technical situation and facility conditions. Therefore, it is considered to be essential that technical support from Japan will be conducted regarding guss asphalt pavement construction and additional reinforcing plate method for success of the project.
In addition, the contribution to the concerned institutions in Egypt shall be considered, which will help to improve awareness and technical capabilities of maintenance of the steel deck plate girders.

More specifically, it is considered necessary to carry out technical support services conducted by a Japanese engineer, to adjust to the schedule of the ppavement repair project GARBLT has ordered.

Recommendation -1: For the repair pavement construction that will be conducted by Egyptian contactor, the support system shall be established in assist by engineers having high technical skill and many experience about guss asphalt.

7.5 Recomandation to establish the maintenance system

GARBLT in charge of the planning and development of the main highway is an important organization to support the economic and social activities efficient in the responsiblity for the stable maintenance of the road infrastructure.

However some sections of viaducts in the capital city Cairo is assumed be re quired a relatively large repair work. In addition, based on the study, although few years and a decade have passed after construction for the Suez Canal Bridge, some reason inclusing unaduquate repair work have caused requirement of whole pavement renewal. It presumed that budget allocation in focusing building new

bridges have been conducted continuously but awareness to maintenance work after completion of them is lack.

Also in Japan, enormous volume of road infrastructure facilities have been accumulated in the rapid economic develoing duration. However currently, the usage period of them have reached the time to update, the road facilities management authorities in Japan is in the process of being serious about their repair, maintenance and prolong life exactly. As well, it is necessary to move to well-balanced distribution of funds and human source to both of the new construction and the maintainance in early future in Egypt.

Bridge maintenance technology is not in the technical field that is established singly. Maintenance technology is made up on the basis of the design and construction technology of the new bridge. In other words, wide range knowledge and accumulated experience including improvement actual failure on the construction project are essential.

Based on the situation recognized through the survey, current capability of each domestic organizations and necessary measure for them in near future will be mentioned as below;

1) Consultants, who is in charge of design and construction supervision

It is infered that thay have possessed each design capability and be able to conduct the stractual analysis in their own. However, they have not reached to the dgree which is able to make comprehensive technical decision on the entire bridge. Therefore, the cooperation with international consultant firm having high-technology range is necessary. And in other hand, it is essential to encourage to train up young employees who will develop to chief enginner or siner manager in the firms.

2) Contractors, who are in charge of construction:

It is infered that they have certain level of technical skill and experience to conduct construction, especially to build the body of concrete bridges or ordinary pavement. And common materials are producted in country or obtained through domestic commercial firms. When it becomes necessary to repair sligt damage on concrete bridges, they are available to deal with it in their own. But knowleage and record of steel bridges is inadequate. They have record of large scale bridge project, but it is limited as sub-contractor or secondary member of Joint Venture. Therefore their capability have not reach to range to accomplish repair work in own.

3) GARBLT, who manage the order of new bridge project and manage the maintenance work to exsisting ones.

The allocation of construction budged has been much emphasis to build new bridges so far in Egypt. Nowaday the importance of maintenance to exsisting bridges is being recognized little by little. The situation for purchase of essencial material and equipment is lagging behind. And it is indipensable to enhence to lead young staffs obtain the necessary performance to conduct accurately maintainance work. It is expected that the range of maintainance performance will advance in accumulation of management to order and conduct maintainance worka or renewal projects.

First of all, to carry out fisible and practicable maintenance work is important. Actions that should be addressed as entire GARBLT and others that should be addressed as the Suez Canal Bridge site office are mentioned as below;

7.5.1 The Actiivity that shall be addressed as entire GARBLT To enhence maintainance management,

a) Daily inspection and reguler repair work, which are applied with general knowleage, shall be sure to perform in each site office.the targets are small damaged portion which could be found by simple instruments and visual. And the detection, repair, and monitoring to damaged portion shall be recorded, and these data shall be reported to relative section in GARBLT headquortor.

b) Small damaged portion is, for example, the surface of concrete girder where rust water is leaking out, or where small cracks along structual element connection become including and others. These damages are easy to identified and measured by svisual, simple scale or hummer. However, remaining small damaged portion make it develop serious one. In the other word, doing repairing immediately small damage can prevent from serious damage occurring. To repair damage portion immediately, it is essential to purchse specisl equipment and to stock repair material always. For the maintainance to the Bridge, Equipment and materials necessary minimum is special equipment to repairing pavement and special bridge car, which have been noted on section 6.2.

c) carriy out inspection for these objections continuously in regular basis, and to entrench these are important.

d) On the other hand, the Department in charge of headquarters shall prepare the bridge list. The bridge list shall consist not only documents of ordering and completion of the project , but also the record of quality controal activity, the detail of countermeasure to the unexpected failure in the site and record of usage l of materials differ to technical standard.

e) The bridge, regarding to asphalt surface pavement and attachments around bridge bearing and expansion joint and concrete guard rails and painting of bridge body surface, the update-timing and repair cycle time for these are able to be expected. Thus GARBLT headquorter is able to project summary costs and timing for individual exsisting bridge in advance. Utilizing the expected maintainance cost with bridge list is much effective to plan of budged allocation and to minimize the risk of deterioration.

f) Although series of operations of the above seem tedious and innocuous-looking, accumulating these works will ensure to make staffs be capable to specific the cause of deterioration, to predict progress of damage, and to take correct determination, and also will genarate a good result maintenance capacity of the entire organization can be improved.

g) As mentioned in section 6.2, for upgrading skill for junior generation, oppotunitiese of

paticipation in study session and technical seminnars on regular basis shall be given to junior officers belonging to the main position of GALBRL.

7.5.2 The Activitis that should be addressed as the Suez Canal Bridge site office to ensure maintainance management,

h) To carry out below daily investigation for the body of steel box girder

- ✓ Peeling of painting film on the exterior surface ofgirders
- ✓ Looseness of bolts installed inside of the girders (is possible to be detected at Peeling of painting film)
- ✓ Abnormality at the cable sockets fixed to girder (trace of rusty water, injury of soket)
- ✓ Damage of injury of pavement around drain pipe or drain basin (It will cauce water leakage into insaide of girders. Also in Approach section)

i) Prestressed concrete box girder on approach section

- ✓ Injury of surface of concrete
- ✓ Appearance of inside reinforcing steel bar
- ✓ Abnormality at the expansion joint (step on surface, injury of members composing extension equipment.)
- ✓ Visual inspection of changing-colored surface of girder profile, which is identified from far (in utilizing bridge inspection car)

j) Substructure

- ✓ Detection of abnormality Concrete towers of main bridge will be carried out by high precision Telescope
- ✓ For the substructures which have been completed repair work (in the relative project to the study,"the supervision of substructutr of repair project in the Suez Canal Bridge construction projectfollow up study"), inspect whether re-deterioration or similar degradation identified in the study apper or not.

Recomedation-2: Implementation of reliable regular inspection and the retention of maintainance record by GARBLT headquarters and the Site Office

As mentioned in section 6.2, regarding to the maintainance cost for the bridge,in addition to daily appropriate inspection, special equipments and materials is require to be prepared in regular. And in order to conduct independent-minded maintainance work, upgrading skill of the office staffs is indispensable. Furthermore, to achieve these goals, additional budged about 180,000LE except current annial budged is reqired.

Althrough sueface asphalt layer is planed to be repaired in FY 2013, it is reqired to be renewaled

once every decade to maitain soundness of the bridge.

Recomedation-3: Planning and implementation of budget allocation in the future for the bridge by GARBLT headquarters

APPENDIX

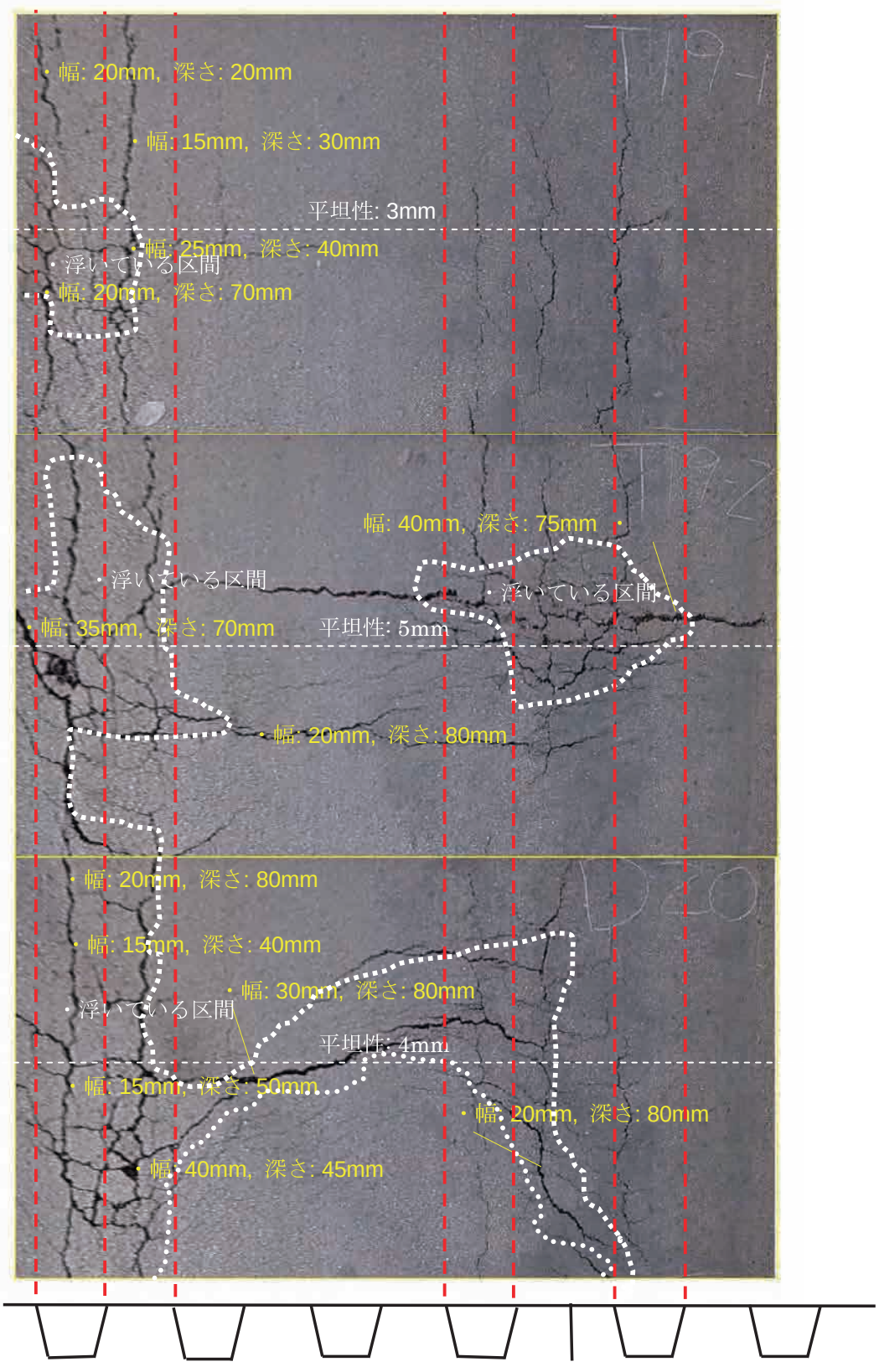
Appendix Contents

Page

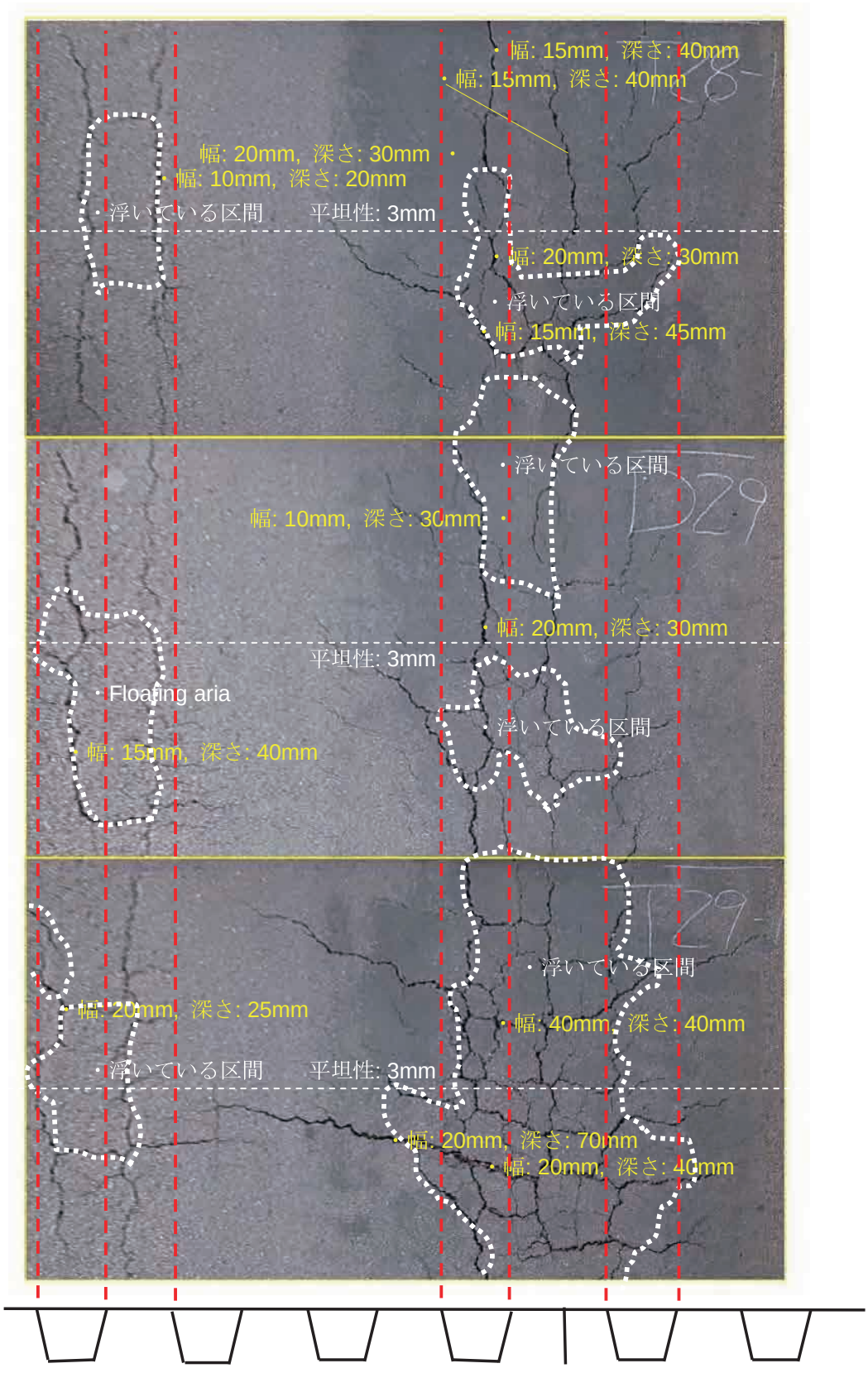
Appendix 1 Detailed Inspection Data of Pavement

APPENDIX 1 Detailed Inspection Data of Pavement

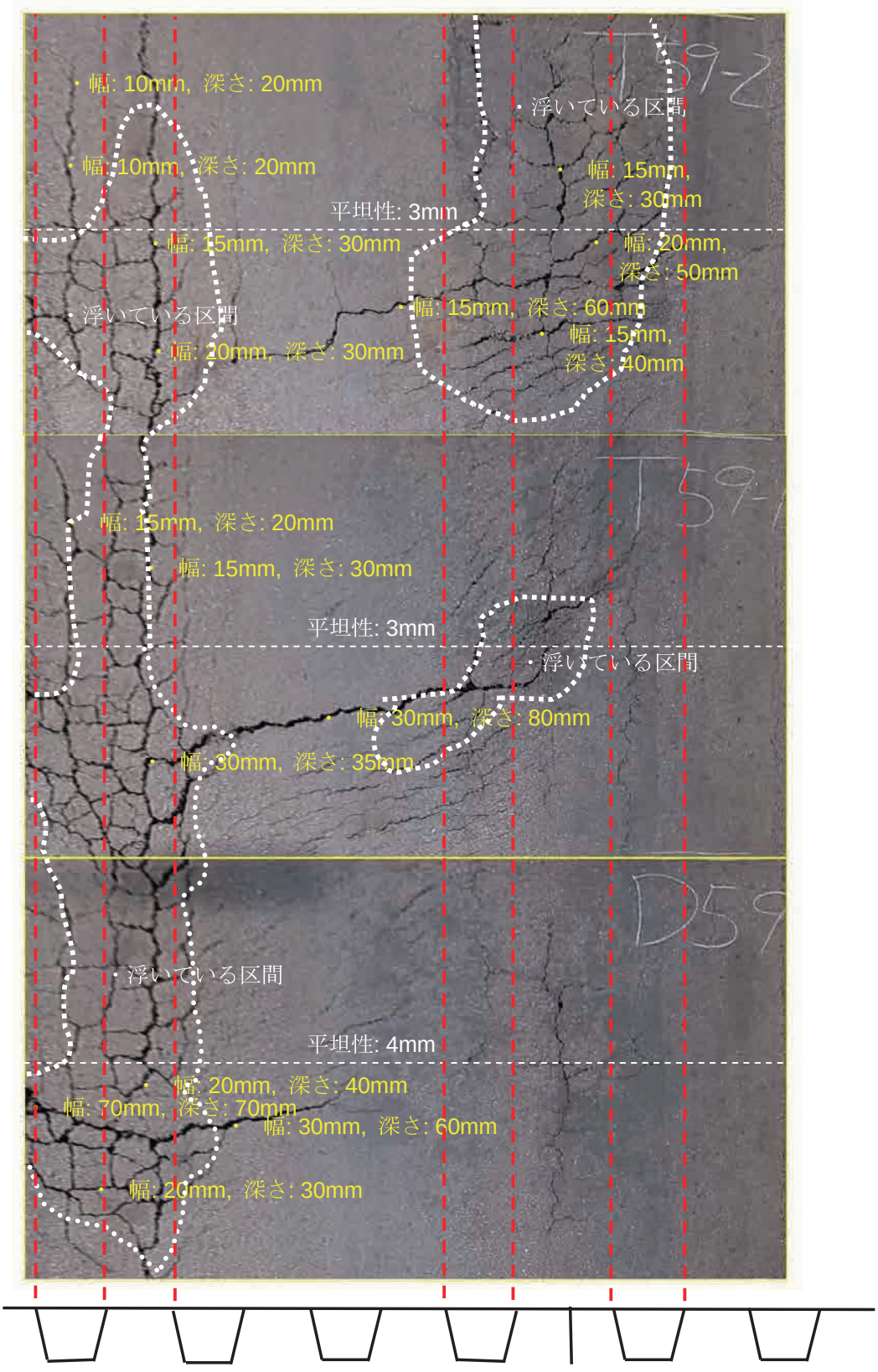
1) N-1 (Tr19-1/Tr19-2/D20)



2) N-2 (Tr28-1/D29/Tr29-1)

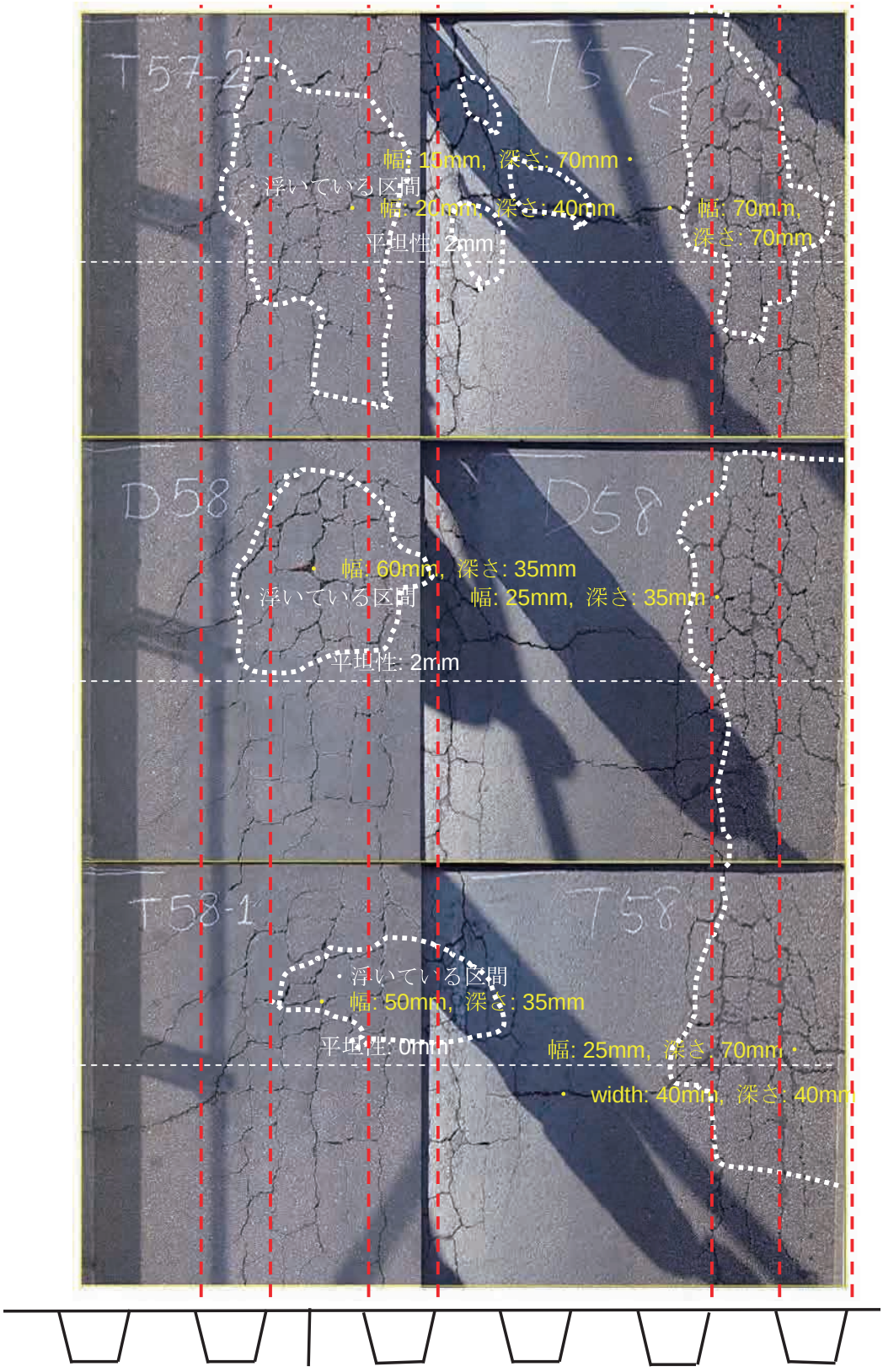


3) N-3 (Tr59-2/Tr59-1/D59)

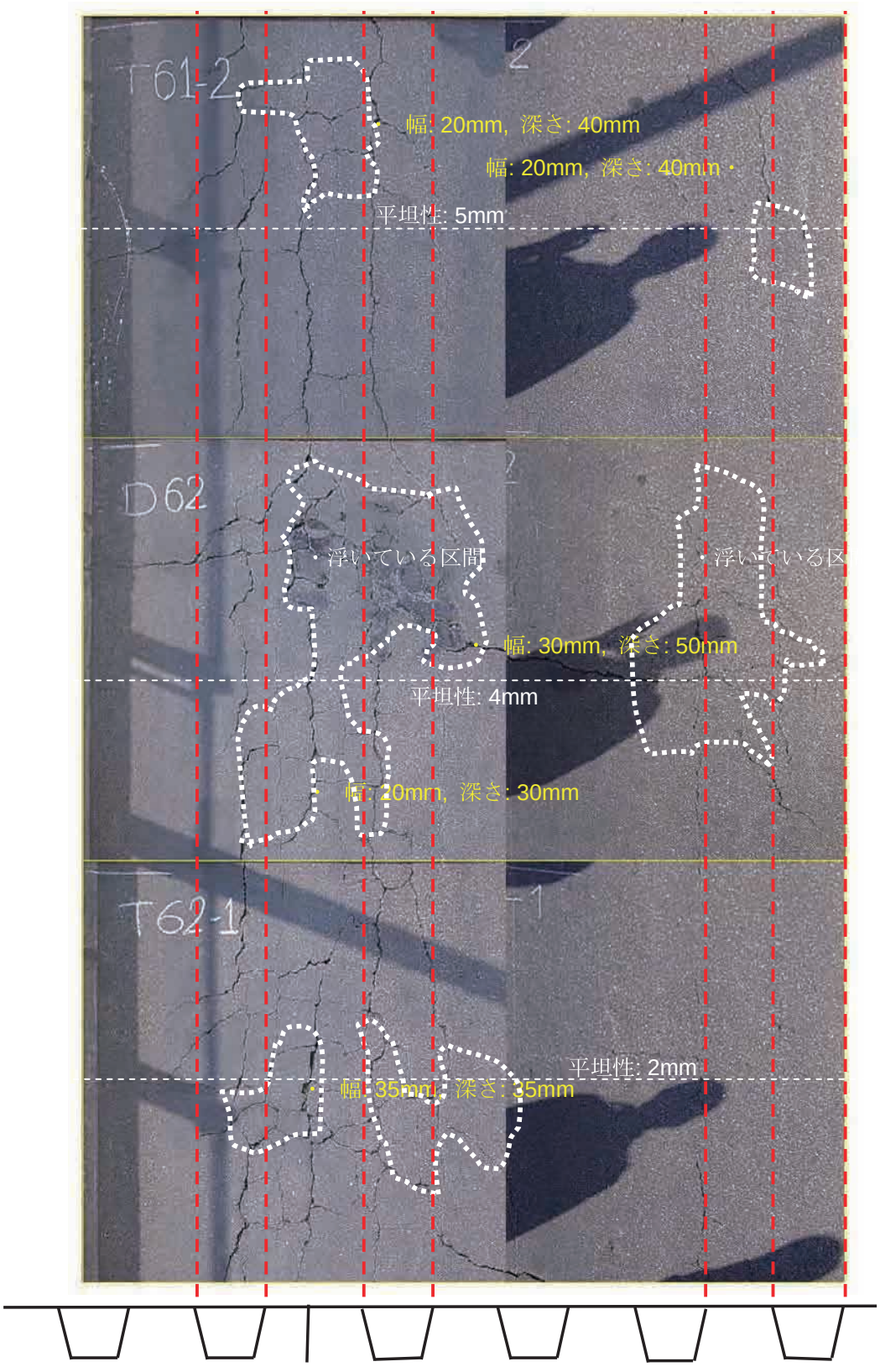


Inspection date of South: 30th November 2011

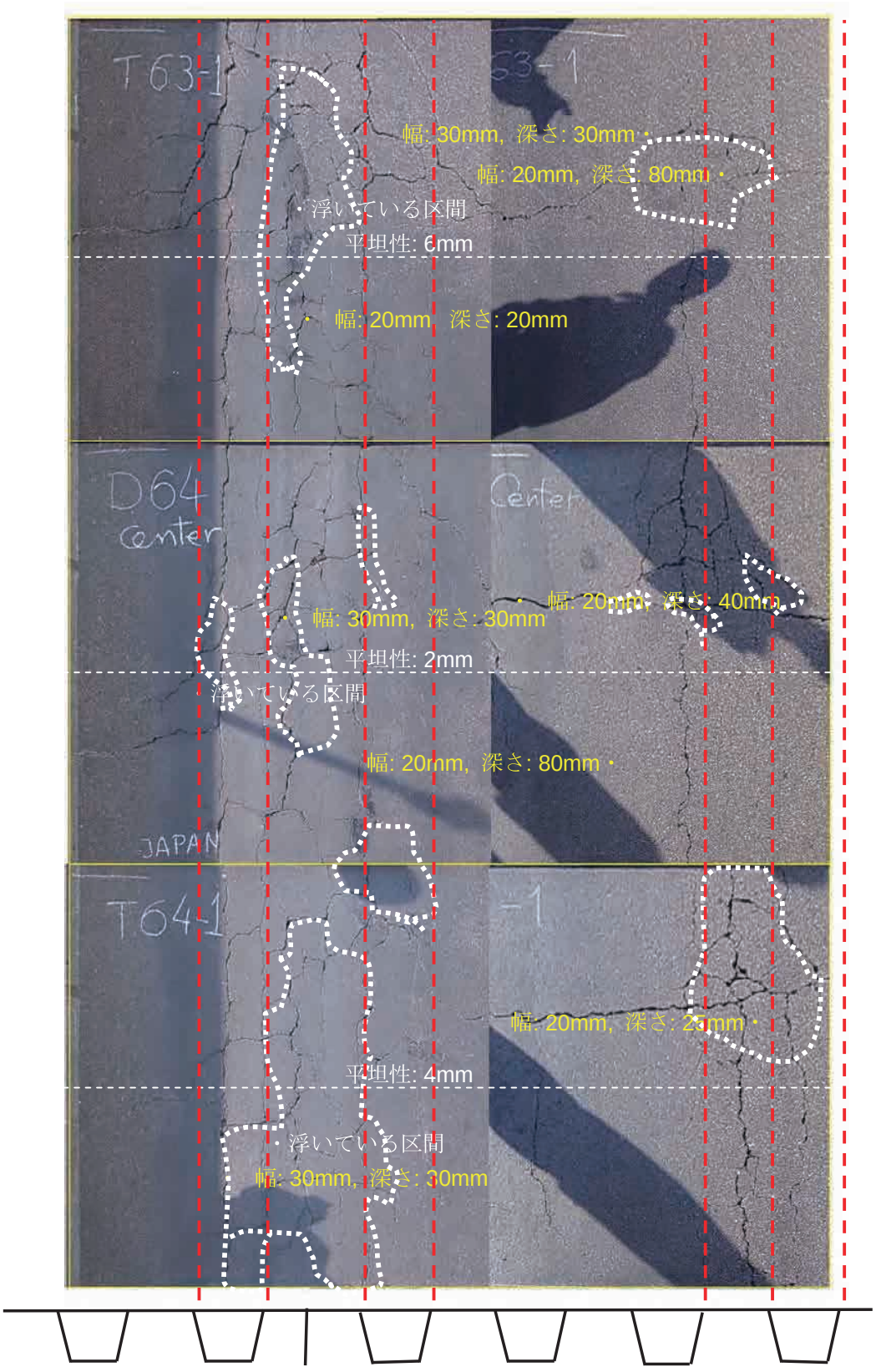
1) S-1 (Tr57-2/D58/Tr58-1)



2) S-2 (Tr61-2/D62/Tr62-1)

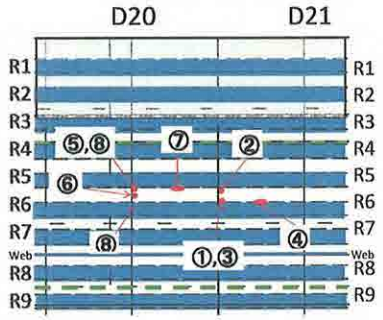
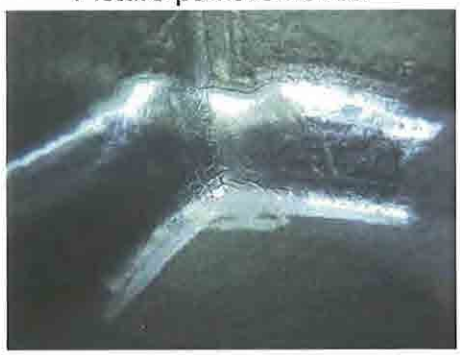
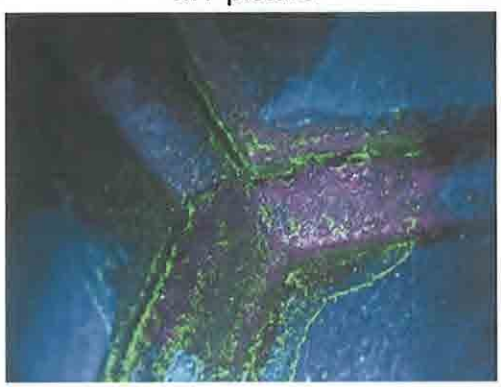
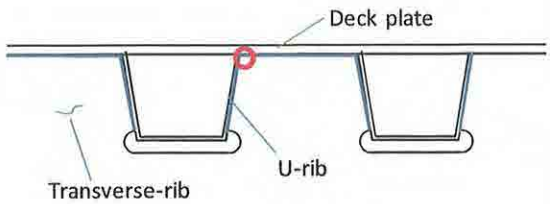


3) S-3 (Tr63-1/D64/Tr64-1)

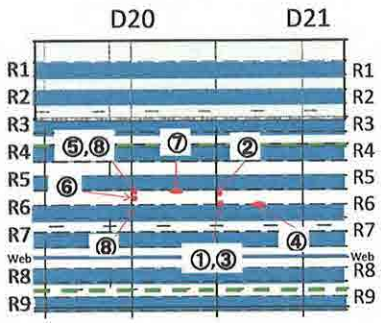
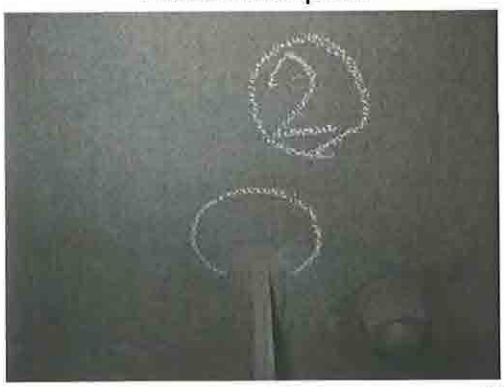
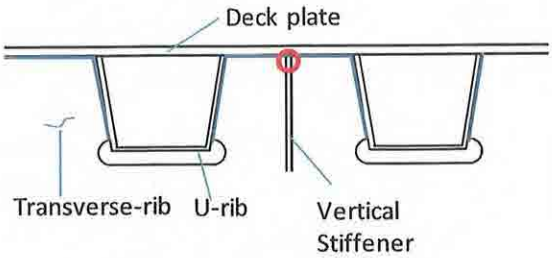


Appendix 2 Magnetic Particle Inspection Data

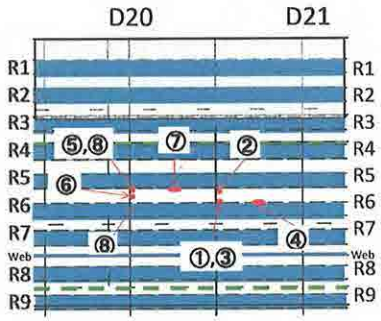
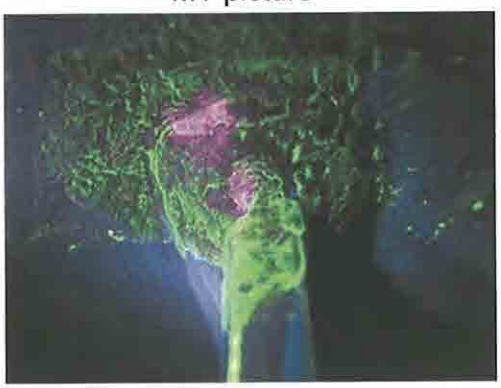
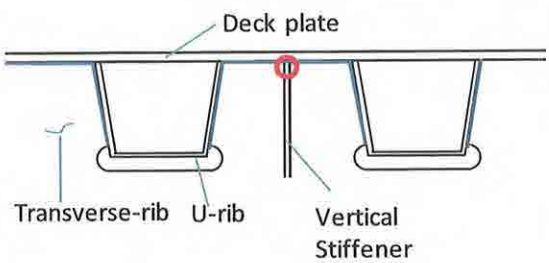
Inspection Photo D/B in the Suezu Cannal Bridge

No 1	Date 2011/12/06
connection name junction of 3-weld line U-rib and T. rib	MT result
paint crack	Risk of fatigue crack
Location L1(1):WT20-1W,R6S(5)	Comment welding crack
Location map  	Picture paint removed  741
Picture with paint  739	MT picture  743
Sketch  	

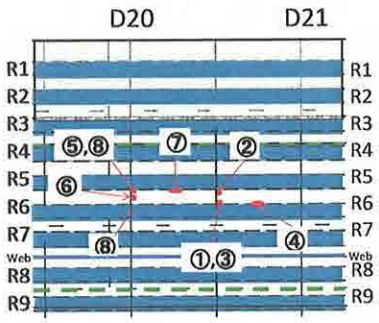
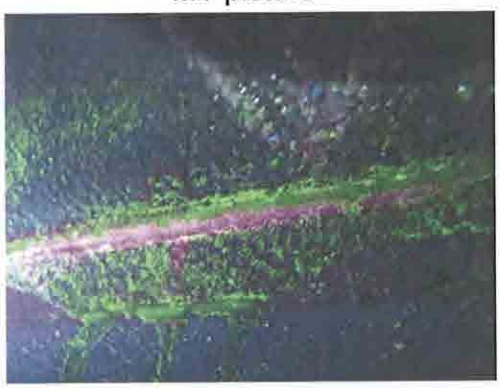
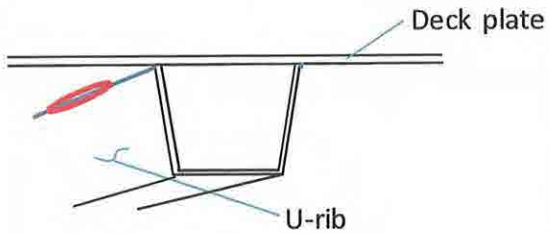
Inspection Photo D/B in the Suezu Cannal Bridge

No 2	Date 2011/12/06
connection name junction of 3-weld line U-rib and T. rib	**MT result**
paint crack mud cracking, very shallow, surface cracking	**Risk of fatigue crack** small
Location L1 (2) :	**Comment** Weld crack, no clear reason
Location map  817	**Picture paint removed** 
Picture with paint  815	**MT picture** 
Sketch  	

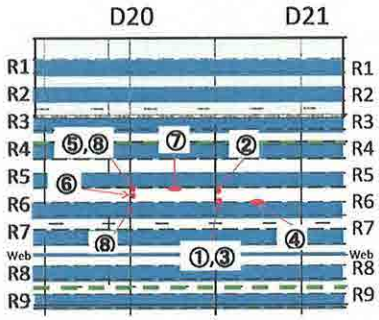
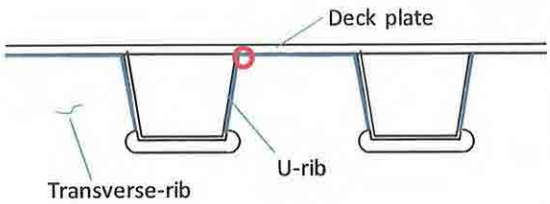
Inspection Photo D/B in the Suezu Cannal Bridge

No 3	Date 2011/12/06
connection name	MT result
paint crack	Risk of fatigue crack
Location L1(3):	Comment
Location map  	Picture paint removed 
Picture with paint 	MT picture 
Sketch  	

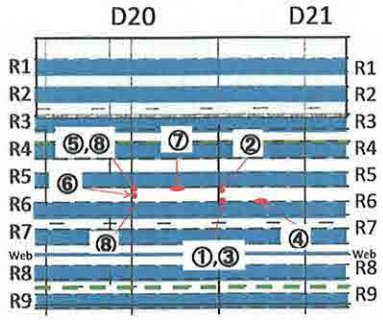
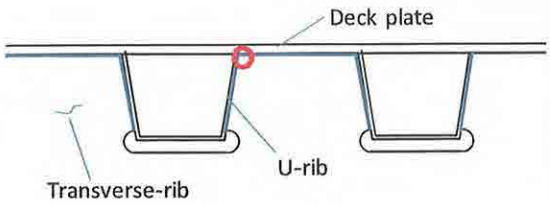
Inspection Photo D/B in the Suezu Cannal Bridge

No 4	Date 2011/12/06
connection name Weld between U-rib and Deck plate	MT result
paint crack	Risk of fatigue crack few
Location L1 (4) : D20(2) R6(5)	Comment weld crack
Location map  1074	Picture paint removed  804
Picture with paint 	MT picture  806
Sketch  	

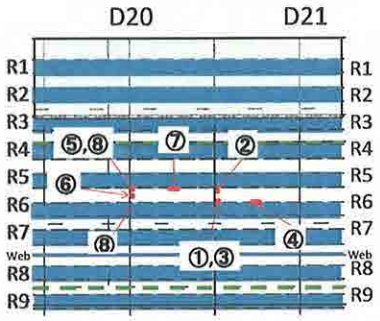
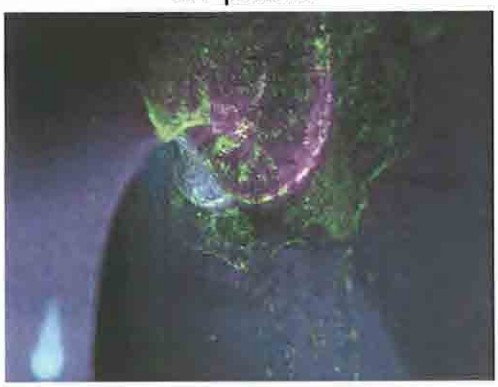
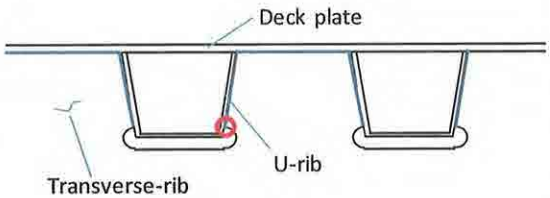
Inspection Photo D/B in the Suezu Cannal Bridge

No 5	Date 2011/12/06
connection name junction of 3-weld line U-rib and T. rib	**MT result** No crack
paint crack mud cracking, very shallow, surface cracking	**Risk of fatigue crack** small
Location L1 (5) : D20E R5(6)	**Comment** Weld crack, no clear reason
Location map  783	**Picture paint removed**  790
Picture with paint  784	**MT picture**  794
Sketch  	

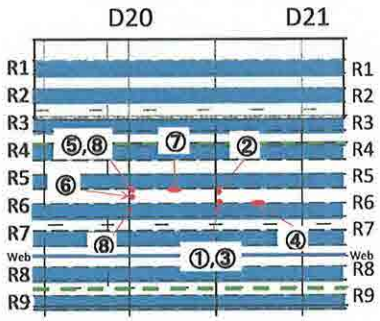
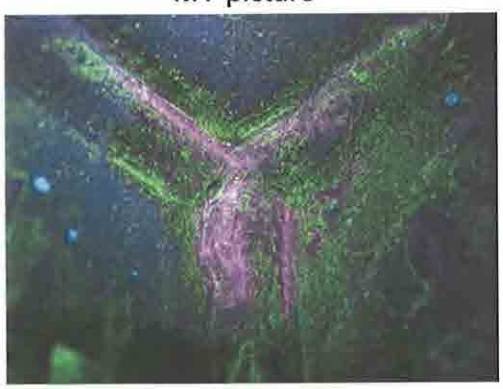
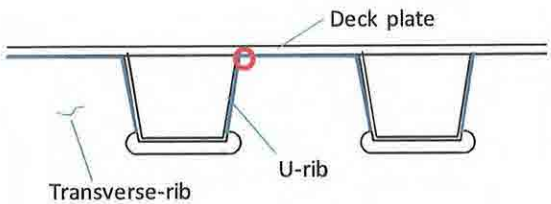
Inspection Photo D/B in the Suezu Cannal Bridge

No 6	Date 2011/12/06
connection name junction of 3-weld line	MT result No crack
paint crack	Risk of fatigue crack small
Location L1 (6) : D20E VS	Comment
Location map  783	Picture paint removed  790
Picture with paint  785	MT picture  794
Sketch  	

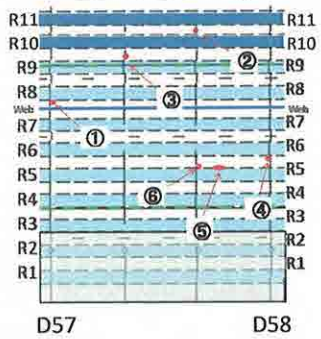
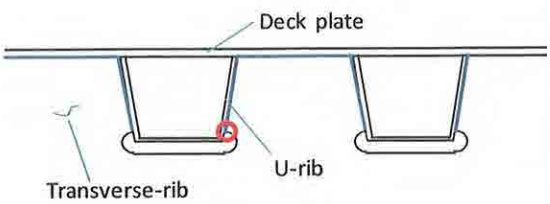
Inspection Photo D/B in the Suezu Cannal Bridge

No 7	Date 2011/12/06
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L1(7):	Comment
Location map  	Picture paint removed 
Picture with paint 	MT picture 
Sketch  	

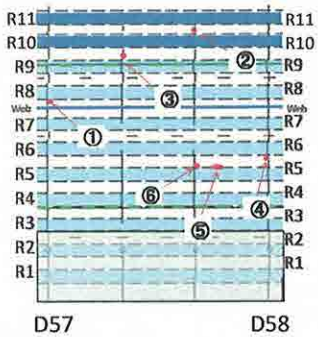
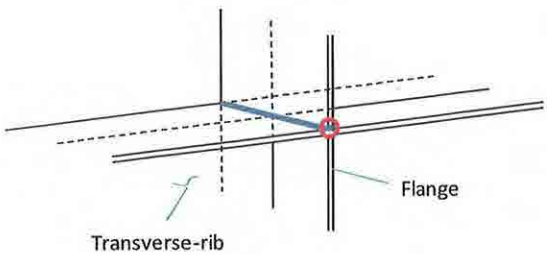
Inspection Photo D/B in the Suezu Cannal Bridge

No 8	Date 2011/12/06
connection name junction of 3-weld line U-rib and T. rib	**MT result** No crack
paint crack mud cracking, very shallow, surface cracking	**Risk of fatigue crack** small
Location L1 (8) : D20E R6(5)	**Comment** Weld crack, no clear reason
Location map  783	**Picture paint removed**  798
Picture with paint  788	**MT picture**  800
Sketch  	

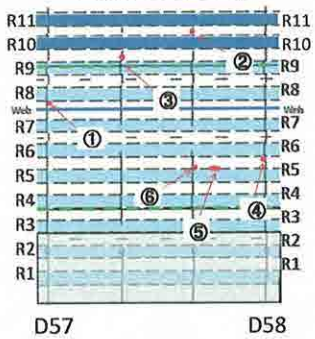
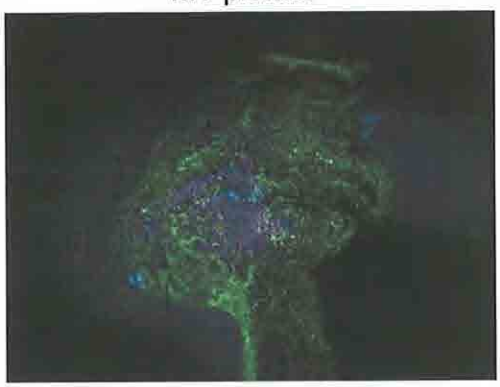
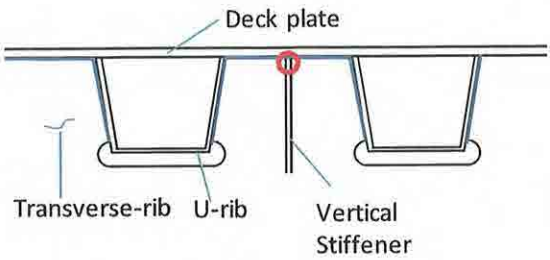
Inspection Photo D/B in the Suezu Cannal Bridge

No 9	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L2,S2(1):W D57E R8S_w	Comment
Location map 	Picture paint removed 
Picture with paint 	MT picture 
Sketch 	

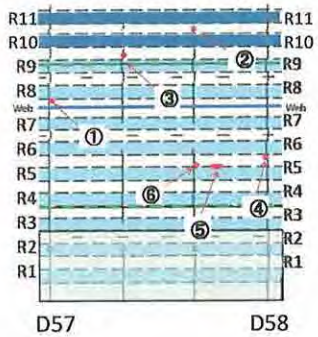
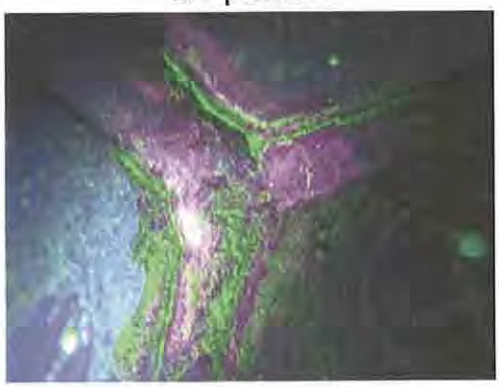
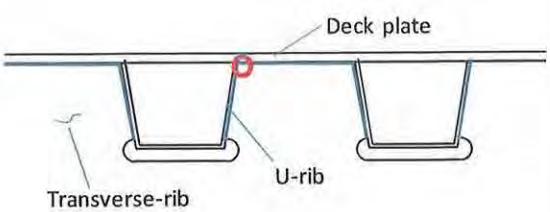
Inspection Photo D/B in the Suezu Cannal Bridge

No 10	Date 2011/12/07
connection name	MT result
paint crack	Risk of fatigue crack
Location L2,S2(2):W T57-2	Comment
Location map  	Picture paint removed 
Picture with paint 	MT picture 
Sketch  	

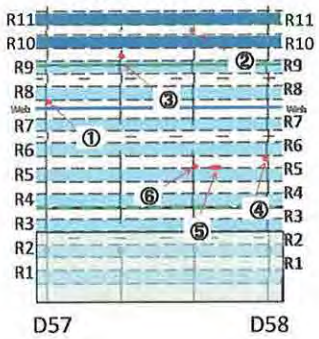
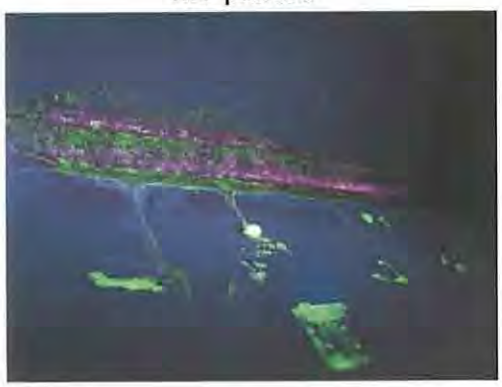
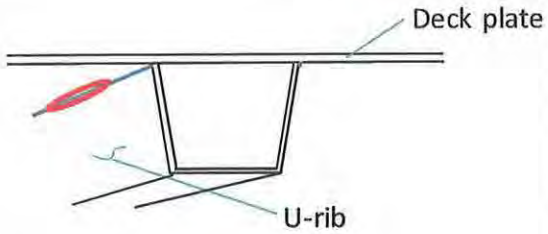
Inspection Photo D/B in the Suezu Cannal Bridge

No 11	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L2,S2(3):W 57E R8S-Web	Comment
Location map  	Picture paint removed 
Picture with paint 	MT picture 
Sketch  	

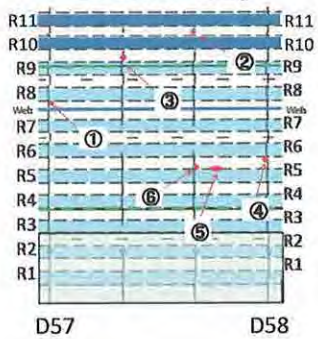
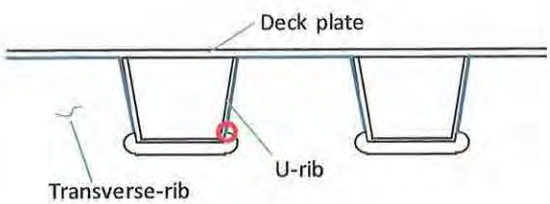
Inspection Photo D/B in the Suezu Cannal Bridge

No 12	Date 2011/12/07
connection name junction of 3-weld line U-rib and T. rib	MT result No crack
paint crack	Risk of fatigue crack
Location L2,S2(4):W 58W R6S_5	Comment
Location map  	Picture paint removed
Picture with paint	MT picture 
Sketch  	

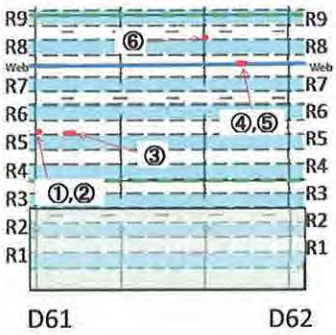
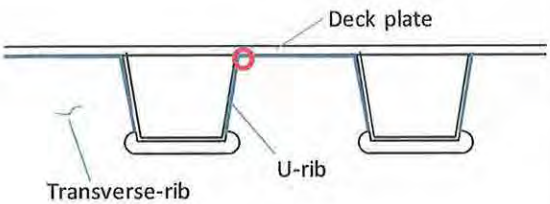
Inspection Photo D/B in the Suezu Cannal Bridge

No 13	Date 2011/12/07
connection name Weld between U-rib and Deck plate	MT result No crack
paint crack	Risk of fatigue crack
Location L2,S2(5):W57(3) R5S_4	Comment
Location map  	Picture paint removed
Picture with paint	MT picture 
Sketch  	

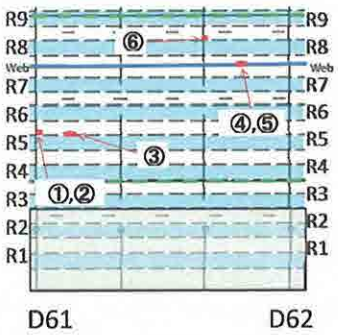
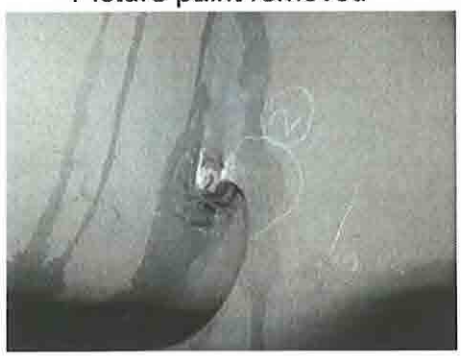
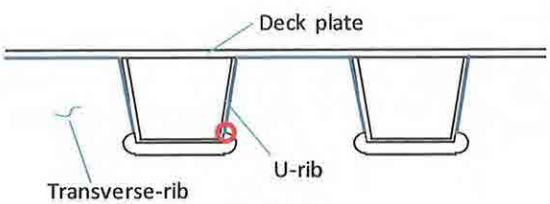
Inspection Photo D/B in the Suezu Cannal Bridge

No 14	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L2,S2(6):W T57-2E R5S_6	Comment
Location map  	Picture paint removed
Picture with paint	MT picture 
Sketch  	

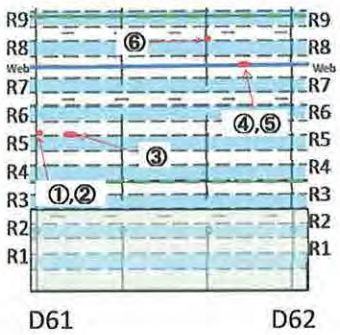
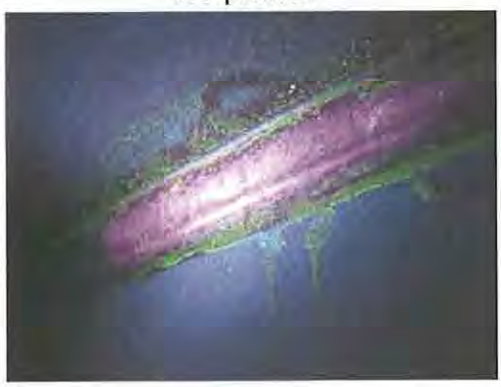
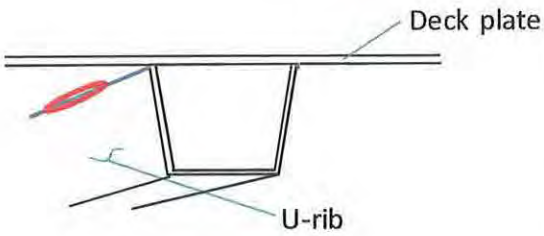
Inspection Photo D/B in the Suezu Cannal Bridge

No 15	Date 2011/12/07
connection name junction of 3-weld line U-rib and T. rib	MT result No crack
paint crack	Risk of fatigue crack
Location L3(1):W 61E R5S_6	Comment
Location map  	Picture paint removed
Picture with paint	MT picture 
Sketch  	

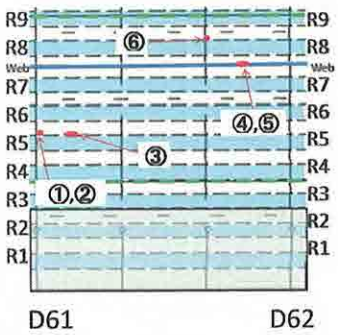
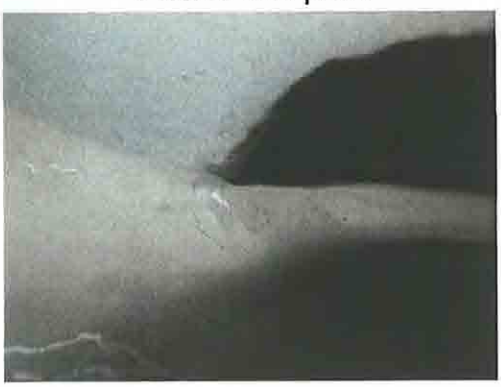
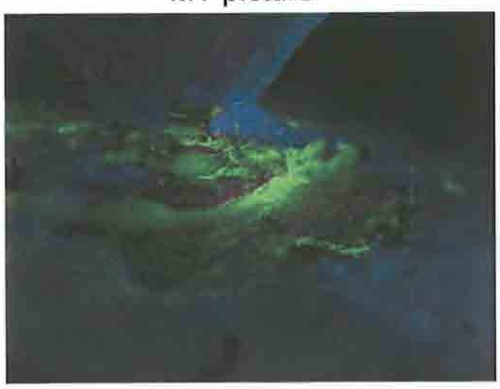
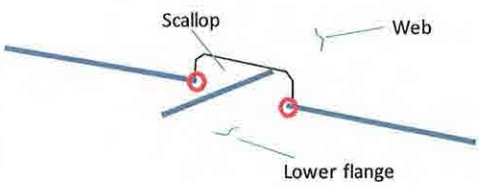
Inspection Photo D/B in the Suezu Cannal Bridge

No 16	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L3(2):W 61E R5S_6	Comment
Location map  	Picture paint removed 
Picture with paint	MT picture 
Sketch  	

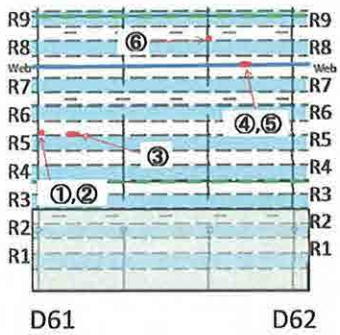
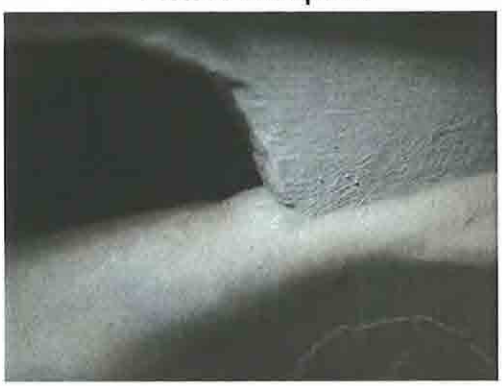
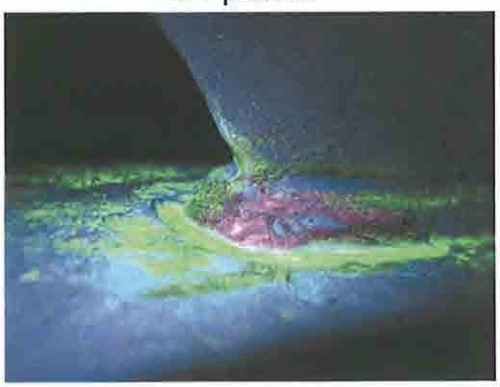
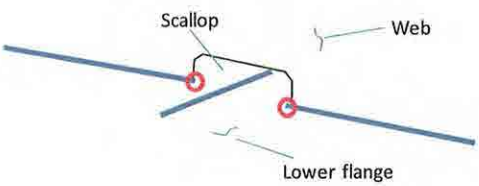
Inspection Photo D/B in the Suezu Cannal Bridge

No 17	Date 2011/12/07
connection name Weld between U-rib and Deck plate	MT result No crack
paint crack	Risk of fatigue crack
Location L3(3):W61(1) R5S_6	Comment
Location map  	Picture paint removed 
Picture with paint	MT picture 
Sketch  	

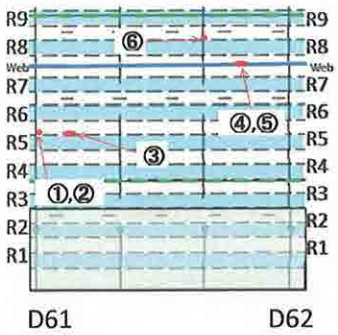
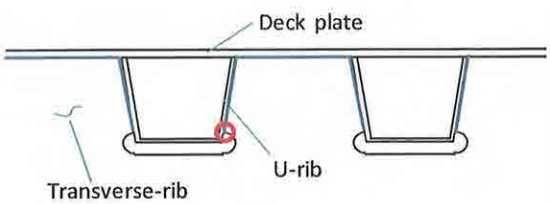
Inspection Photo D/B in the Suezu Cannal Bridge

No 18	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L3(4):W61(3) Web_S	Comment
Location map 	Picture paint removed 
Picture with paint 	MT picture 
Sketch 	

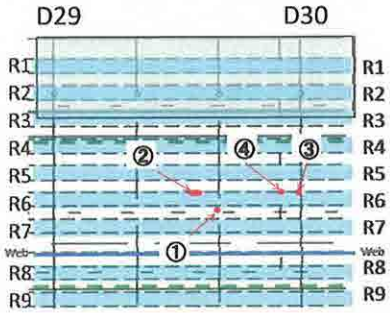
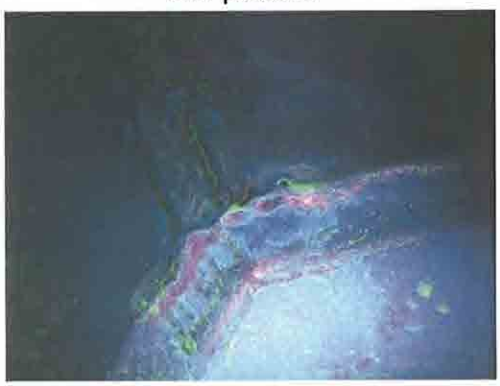
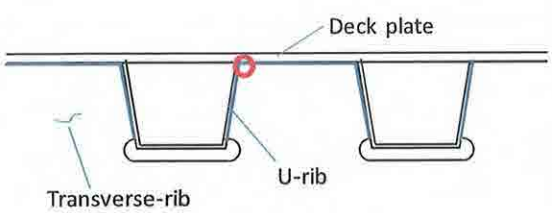
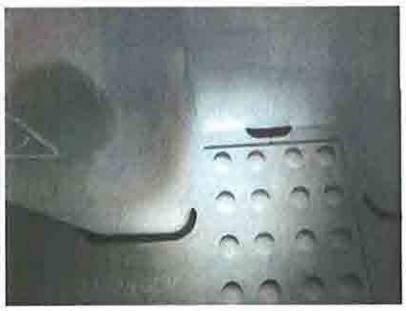
Inspection Photo D/B in the Suezu Cannal Bridge

No 19	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L3(5):W61(3) Web_S	Comment
Location map 	Picture paint removed 
Picture with paint 	MT picture 
Sketch 	

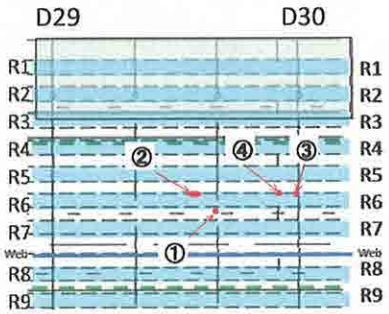
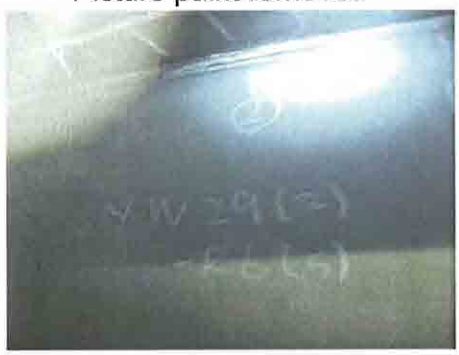
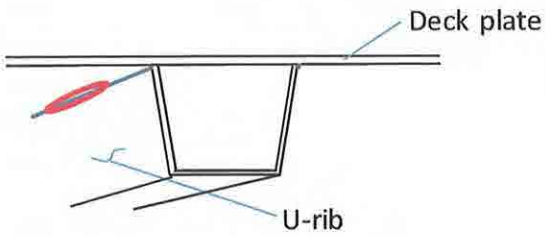
Inspection Photo D/B in the Suezu Cannal Bridge

No 20	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L3(6):W T61-2W R8W_9	Comment
Location map  	Picture paint removed 
Picture with paint	MT picture 
Sketch  	

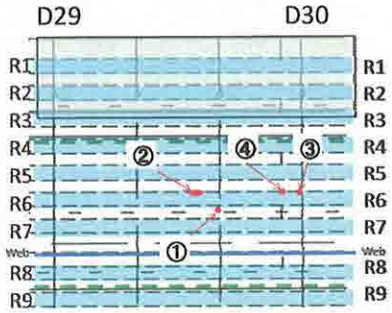
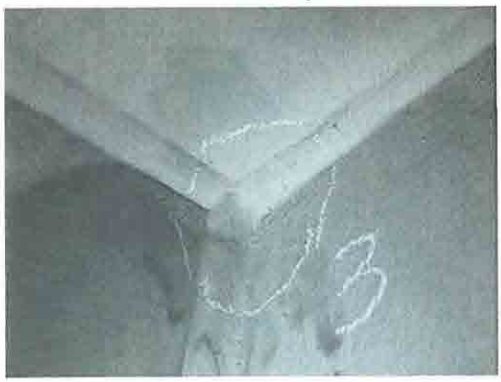
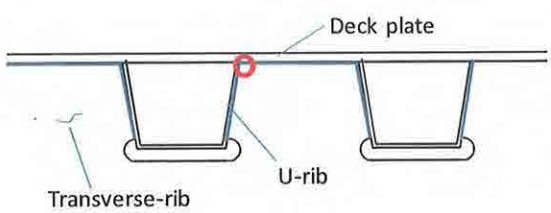
Inspection Photo D/B in the Suezu Cannal Bridge

No 21	Date 2011/12/06
connection name junction of 3-weld line U-rib and T. rib	MT result No crack
paint crack	Risk of fatigue crack
Location S1(1):W T29-2W R6N_7	Comment
Location map  	Picture paint removed 
Picture with paint	MT picture 
Sketch  	

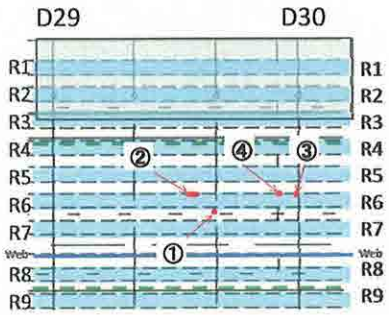
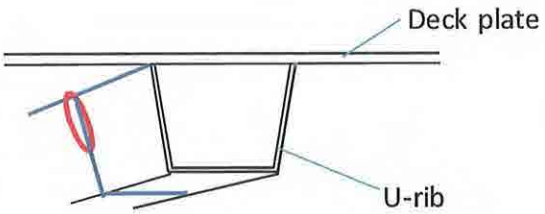
Inspection Photo D/B in the Suezu Cannal Bridge

No 22	Date 2011/12/06
connection name Weld between U-rib and Deck plate	MT result No crack
paint crack	Risk of fatigue crack
Location S1(2):W29(2) R6_5	Comment
Location map  	Picture paint removed 
Picture with paint 	MT picture 
Sketch  	

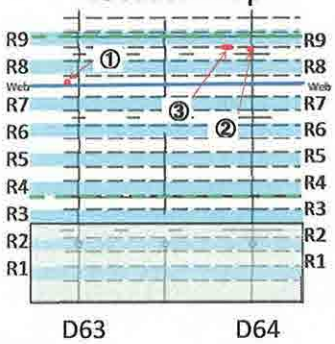
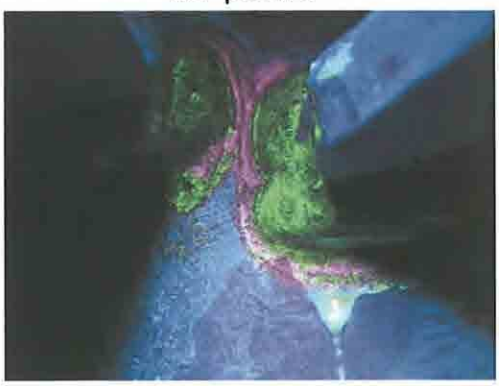
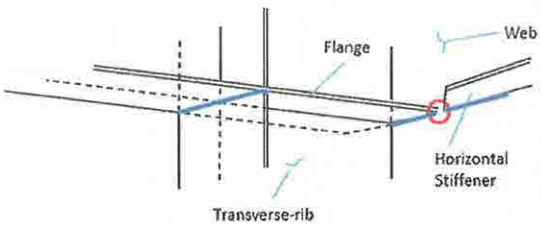
Inspection Photo D/B in the Suezu Cannal Bridge

No 23	Date 2011/12/06
connection name junction of 3-weld line U-rib and T. rib	MT result No crack
paint crack	Risk of fatigue crack
Location S1(3):W D30W R6N_5	Comment
Location map 	Picture paint removed 
Picture with paint 	MT picture 
Sketch 	

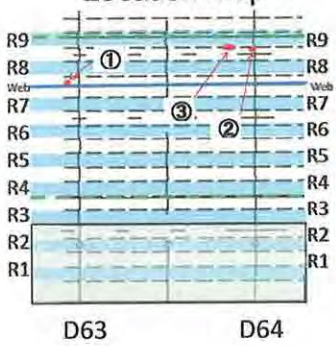
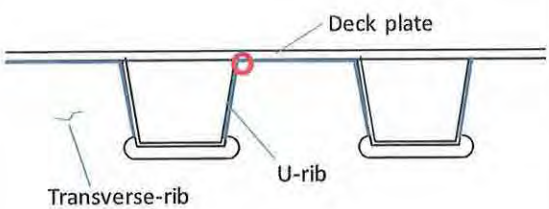
Inspection Photo D/B in the Suezu Cannal Bridge

No 24	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location S1(4):W29(3) R6_5	Comment
Location map 	Picture paint removed 
Picture with paint 	MT picture 
Sketch 	

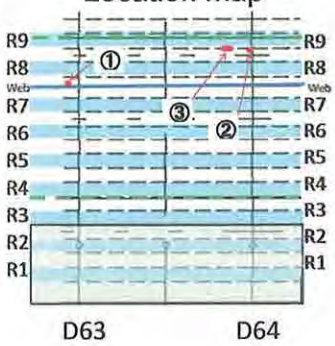
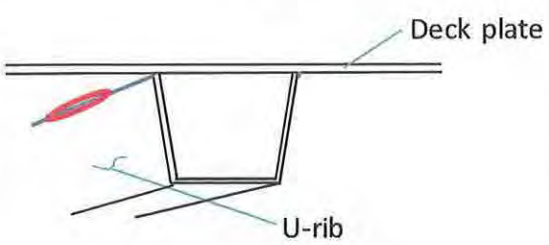
Inspection Photo D/B in the Suezu Cannal Bridge

No 25	Date 2011/12/07
connection name	MT result No crack
paint crack	Risk of fatigue crack
Location L4(1):W 62(3) WebS	Comment
Location map 	Picture paint removed 
Picture with paint	MT picture 
Sketch 	

Inspection Photo D/B in the Suezu Cannal Bridge

No 26	Date 2011/12/07
connection name junction of 3-weld line U-rib and T. rib	MT result No crack
paint crack	Risk of fatigue crack
Location L4(2):W D64W R9S_8	Comment
Location map  	Picture paint removed 
Picture with paint	MT picture 
Sketch  	

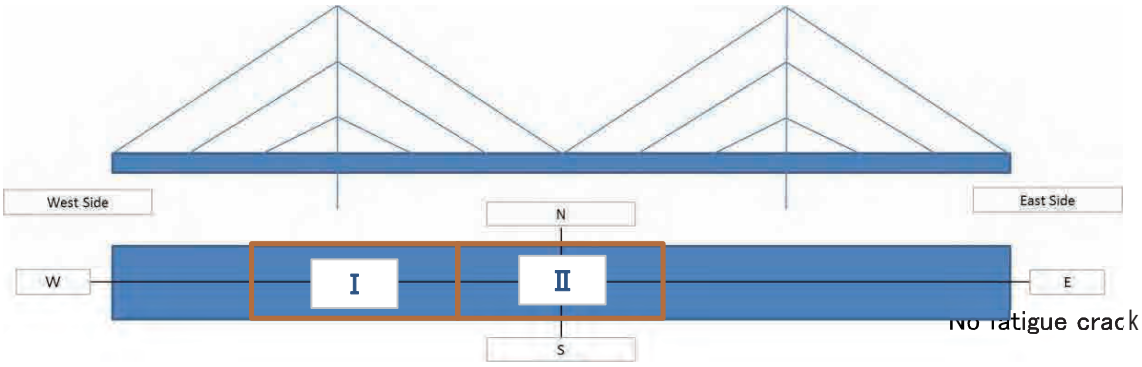
Inspection Photo D/B in the Suezu Cannal Bridge

No 27	Date 2011/12/07
connection name Weld between U-rib and Deck plate	MT result No crack
paint crack	Risk of fatigue crack
Location L4(3):W 63(2) R9S_8	Comment
Location map 	Picture paint removed 
Picture with paint	MT picture 
Sketch 	

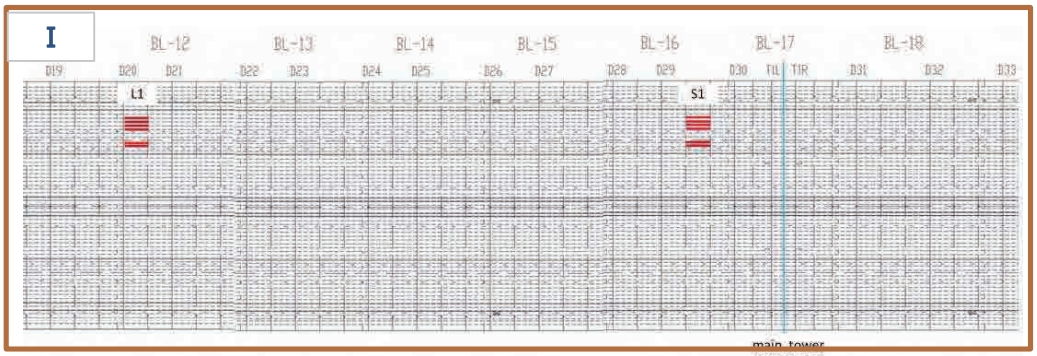
Appendix 3 Ultrasonic Inspection Data

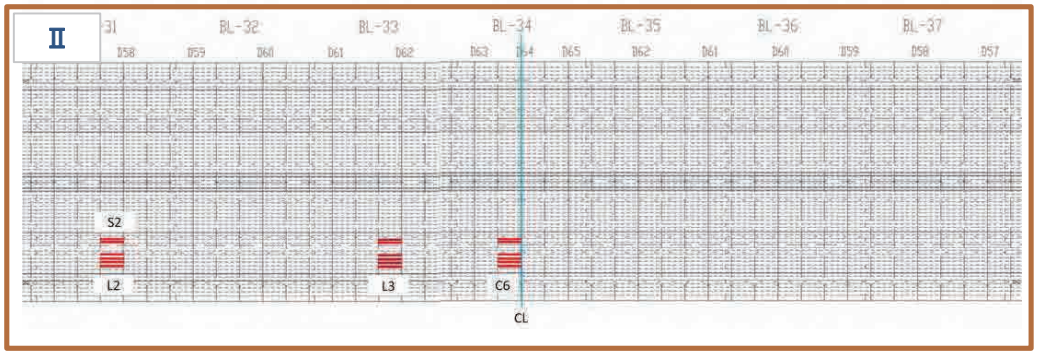
UT data

Location			Targets Rib	Weld Line	Result
North	L1	D20～Tr20-1	R5N,R6N,R8N	6	No fatigue crack
	S1	Tr29-1～Tr29-2	R5N,R6N,R8N	6	No fatigue crack
South	L2,S2	Tr57-2～D58	R5S,R6S,R8S	6	No fatigue crack
	L3	Tr61-1～D62	R5S,R6S,R8S	6	No fatigue crack
	C6	Tr63-1～D64	R5S,R6S,R8S	6	No fatigue crack

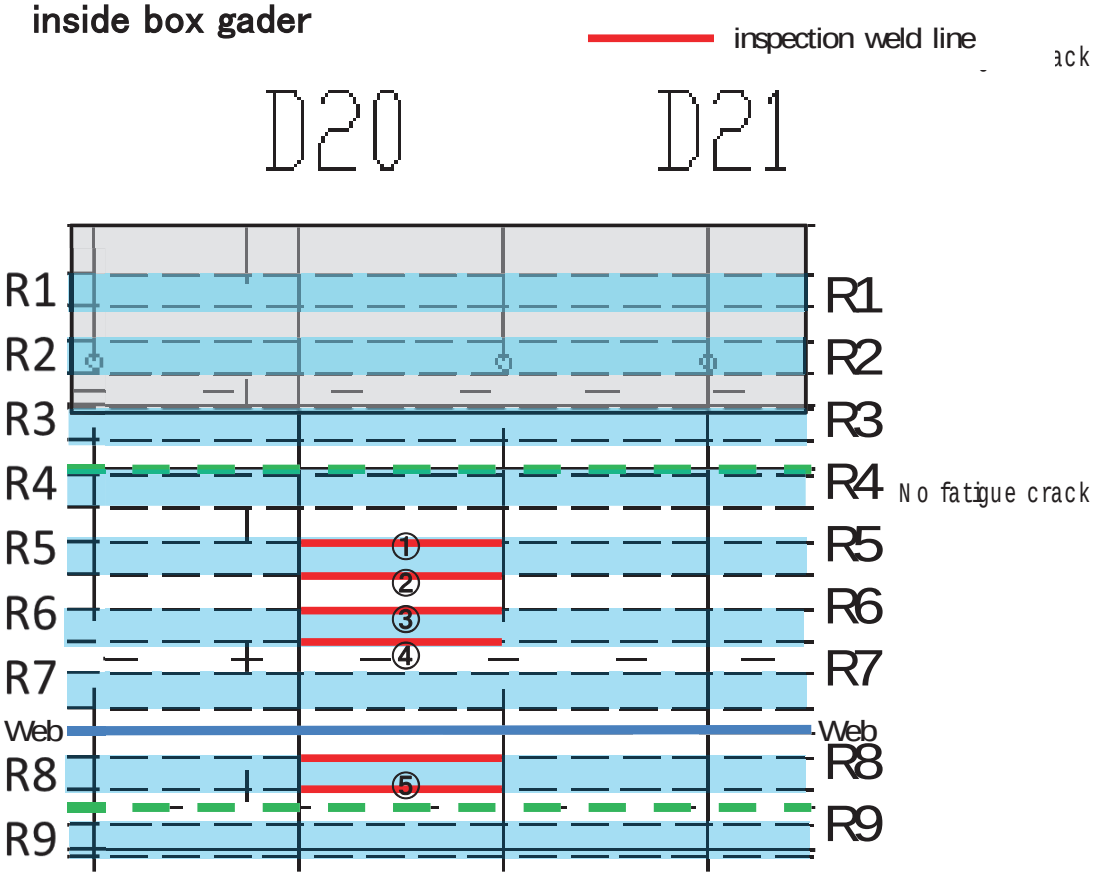


No fatigue crack

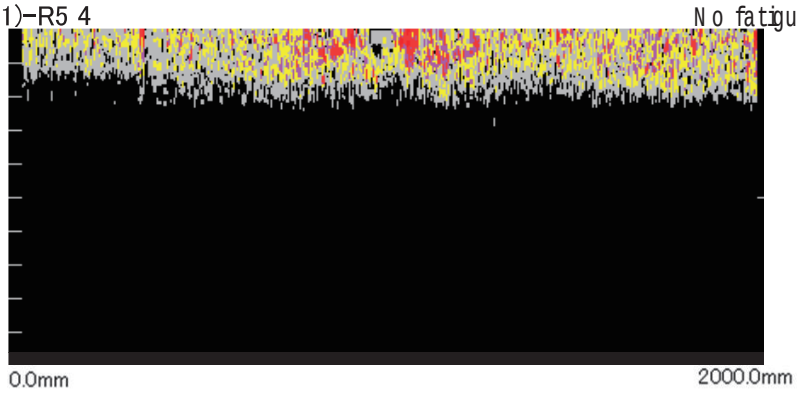




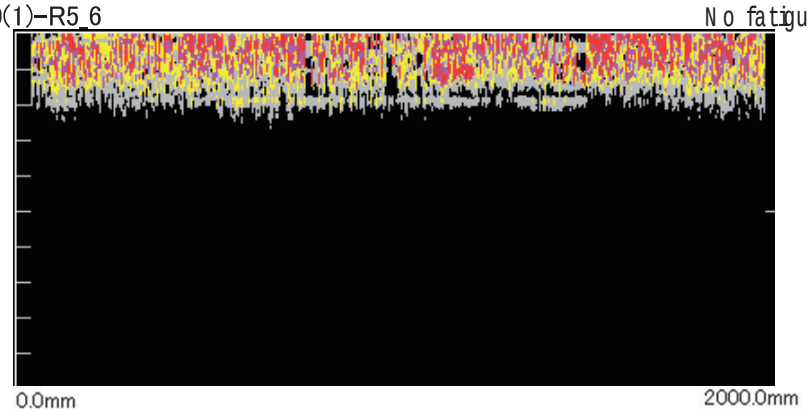
L1 inside box gader



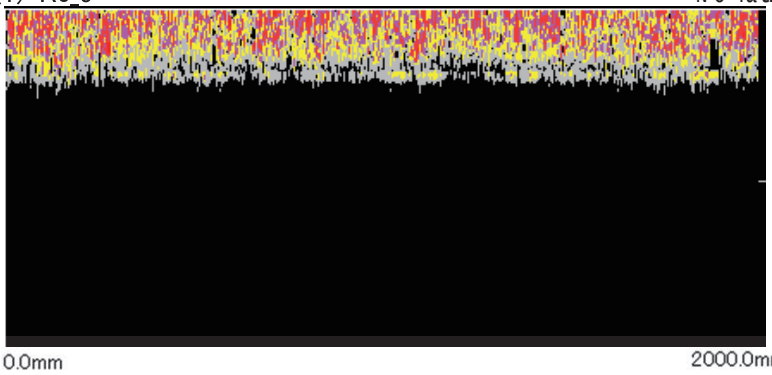
①N-W20(1)-R5_4 No fatigue crack



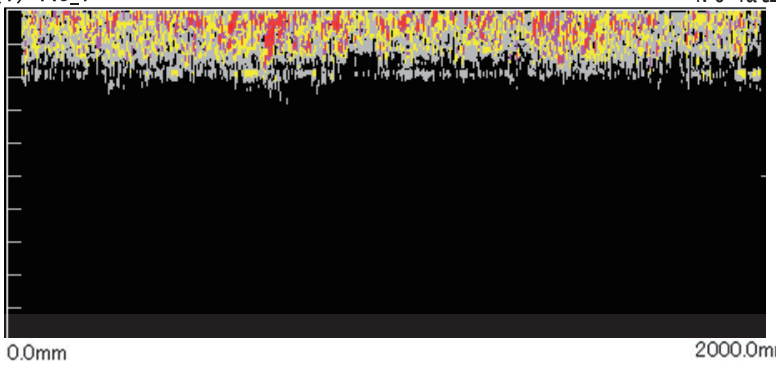
②N-W20(1)-R5_6 No fatigue crack



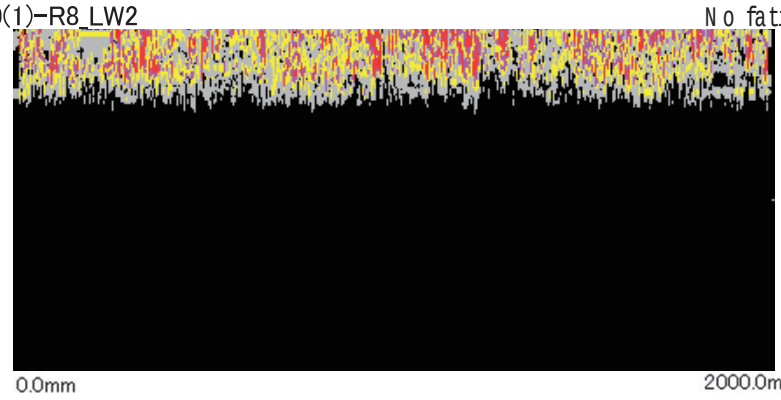
③N-W20(1)-R6_5 No fatigue crack



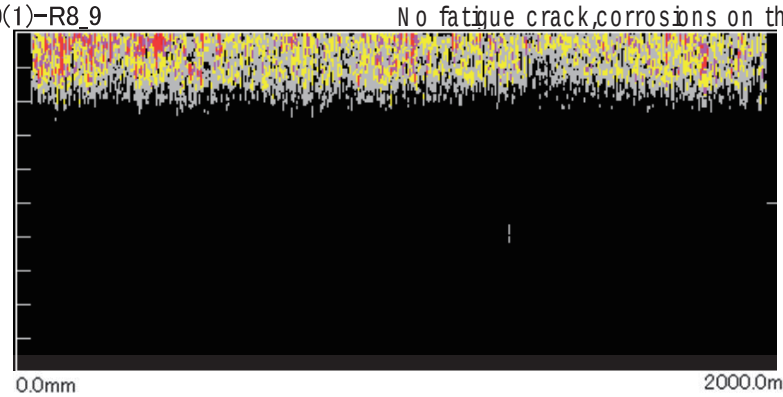
④N-W20(1)-R6_7 No fatigue crack



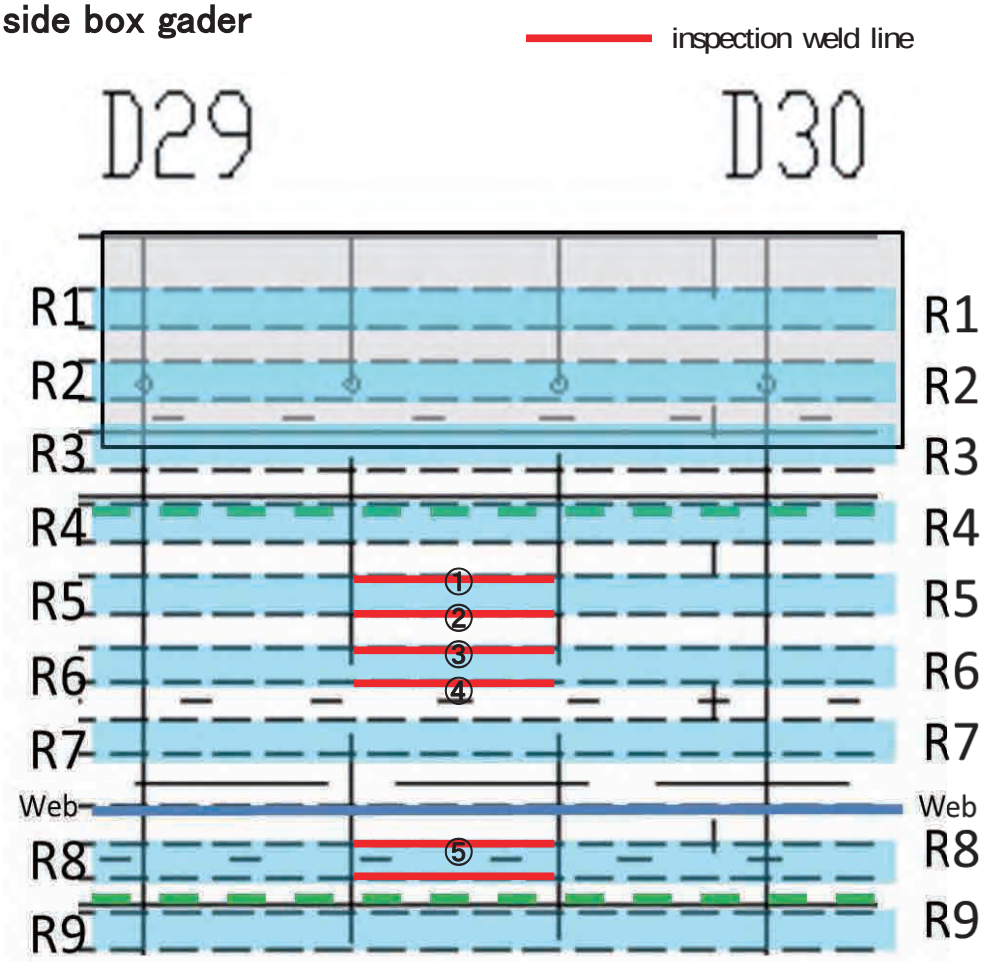
⑤N-W20(1)-R8_LW2 No fatigue crack



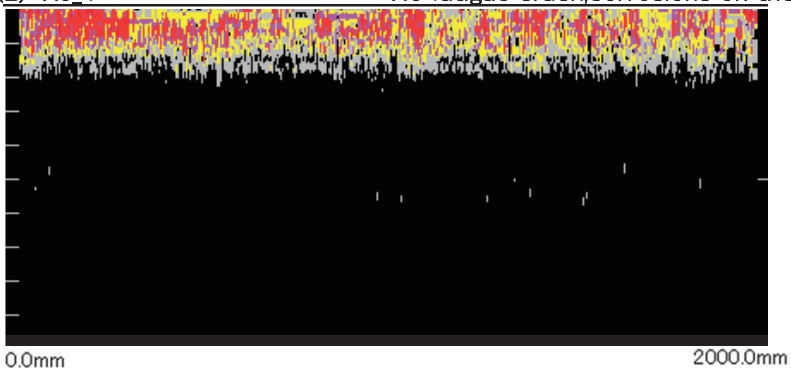
⑥N-W20(1)-R8_9 No fatigue crack,corrosions on the surface



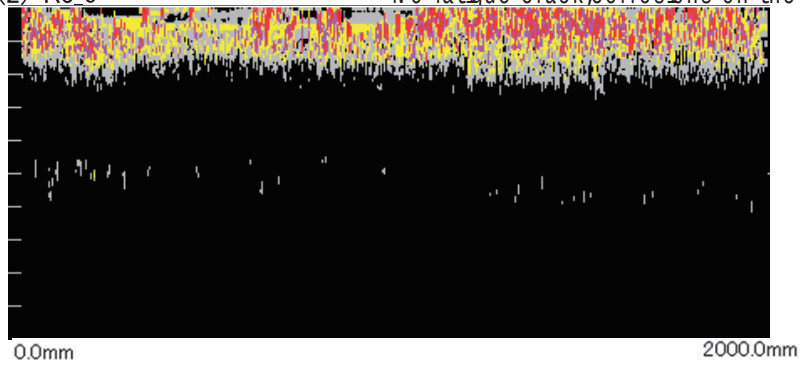
S1 inside box gader



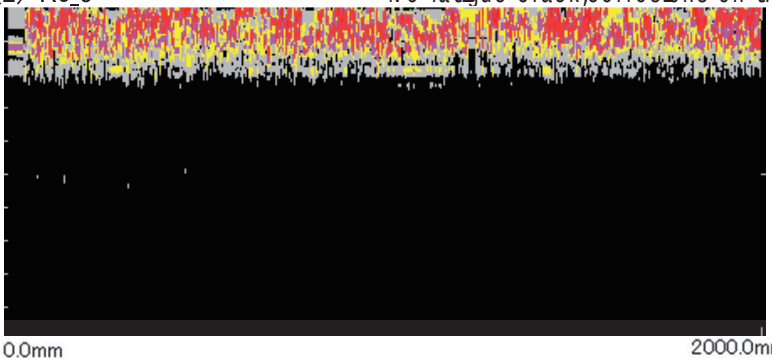
①N-W29(2)-R5_4 No fatigue crack,corrosions on the surface



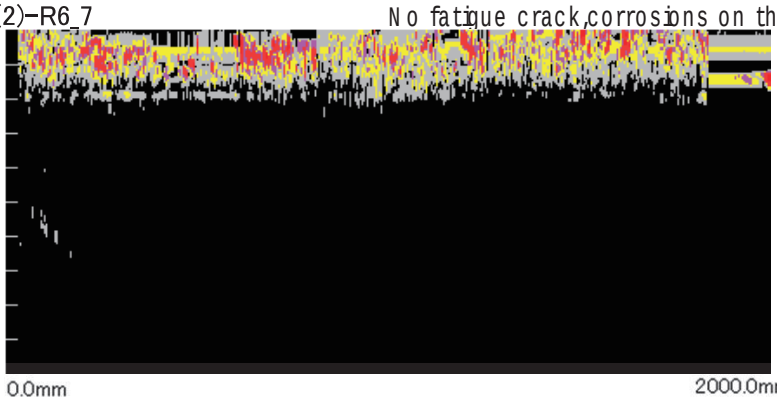
②N-W29(2)-R5_6 No fatigue crack,corrosions on the surface



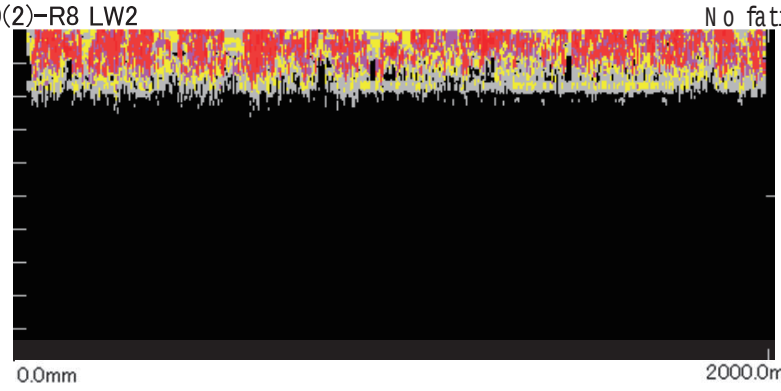
③N-W29(2)-R6_5 No fatigue crack,corrosions on the surface



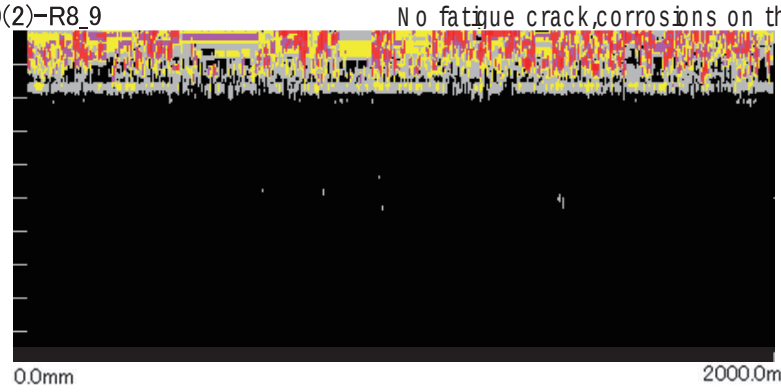
④N-W29(2)-R6_7 No fatigue crack,corrosions on the surface



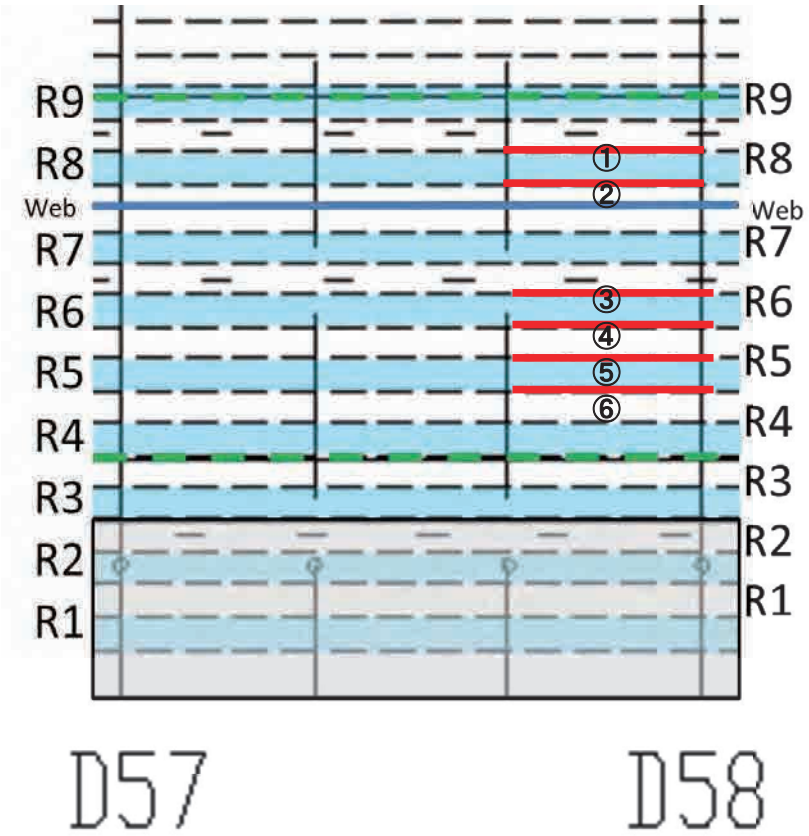
⑤N-W29(2)-R8_LW2 No fatigue crack



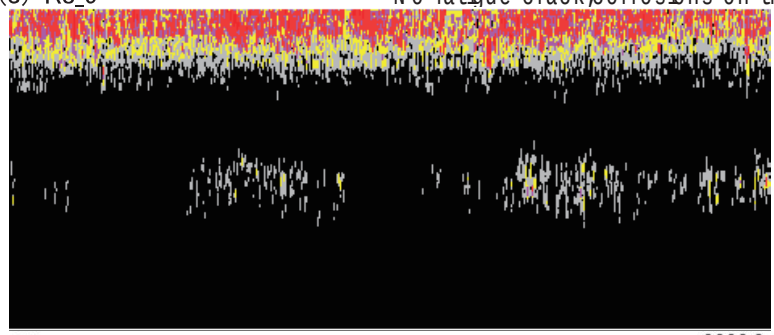
⑥N-W29(2)-R8_9 No fatigue crack,corrosions on the surface



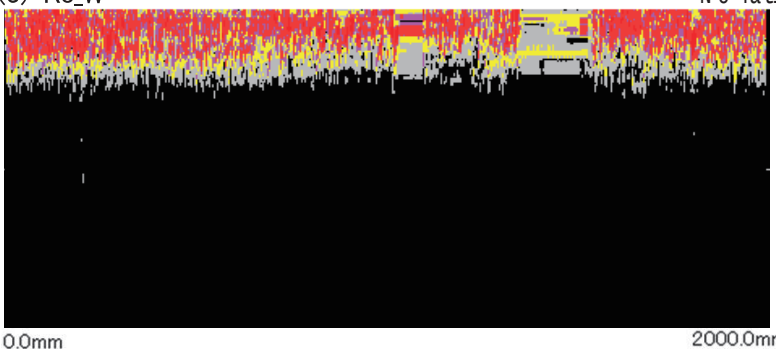
L2,S2 inside box gader



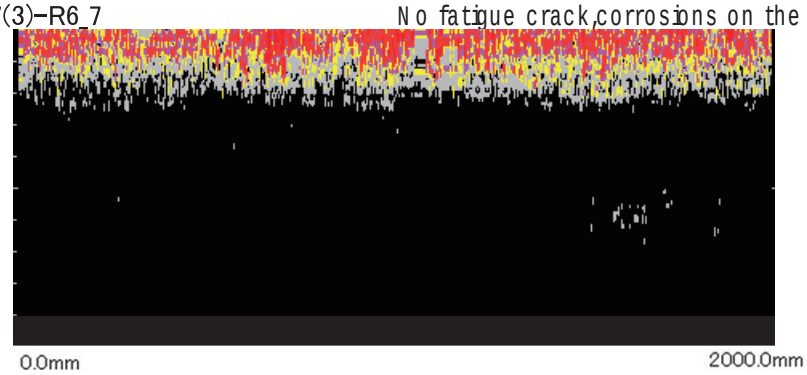
①N-W57(3)-R8_9 No fatigue crack,corrosions on the surface



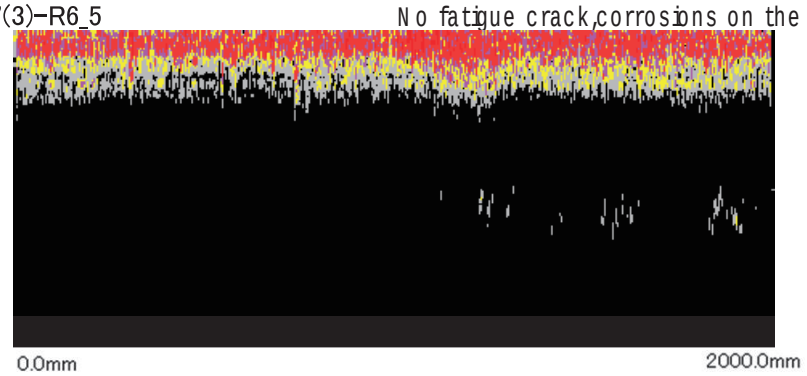
②N-W57(3)-R8_W No fatigue crack



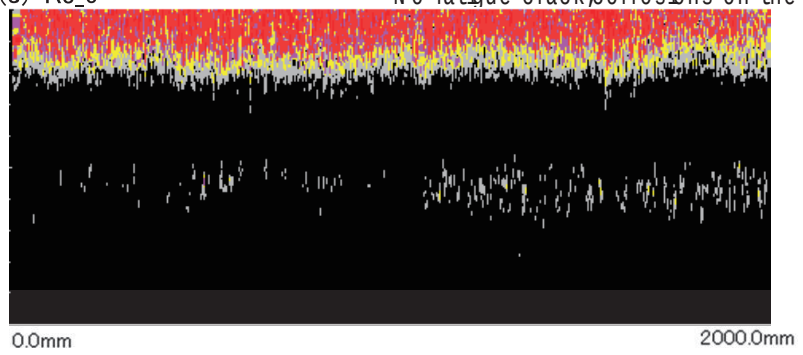
③N-W57(3)-R6_7 No fatigue crack,corrosions on the surface



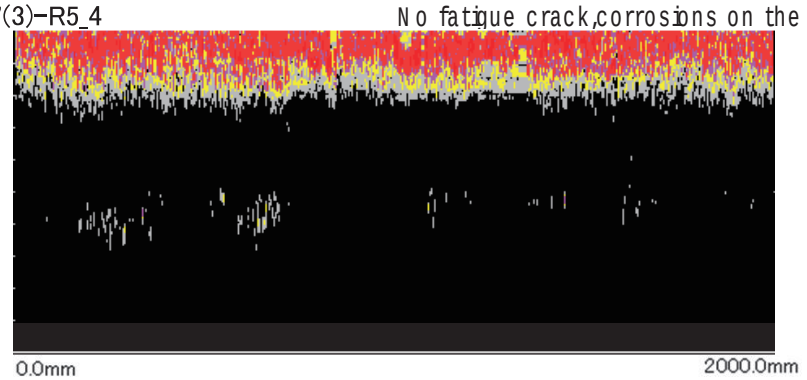
④N-W57(3)-R6_5 No fatigue crack,corrosions on the surface



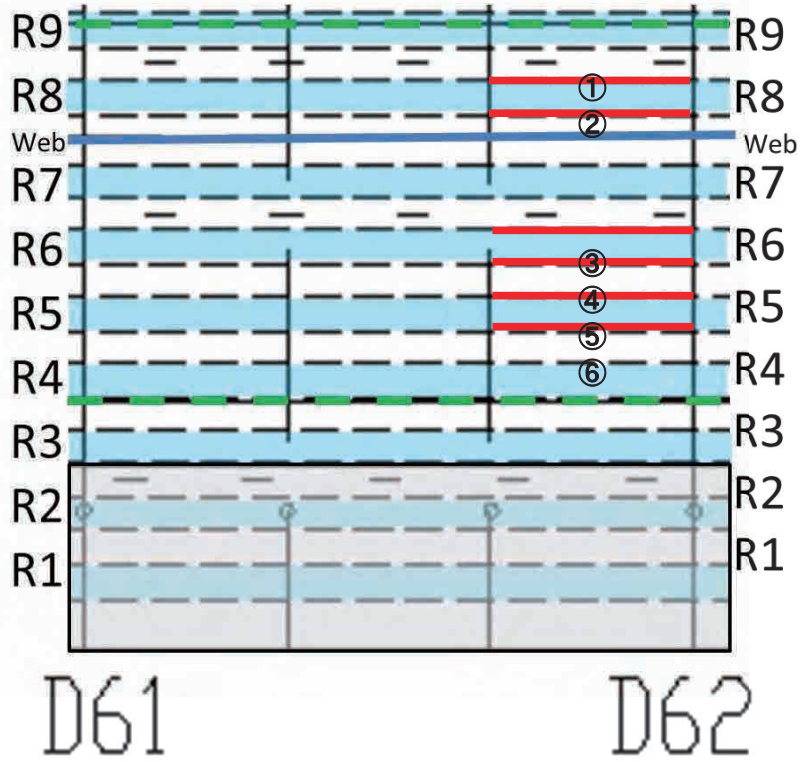
⑤N-W57(3)-R5_6 No fatigue crack,corrosions on the surface



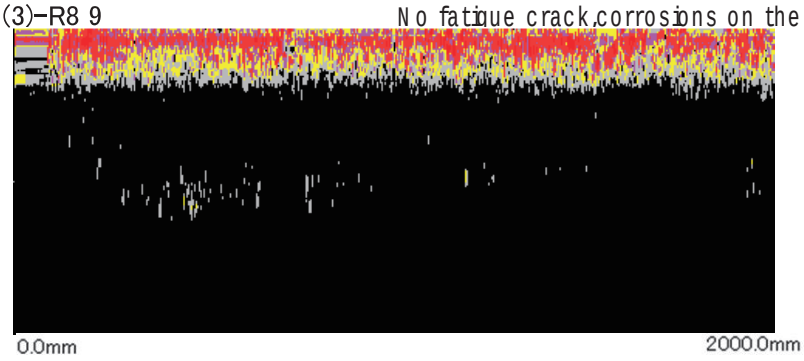
⑥N-W57(3)-R5_4 No fatigue crack,corrosions on the surface



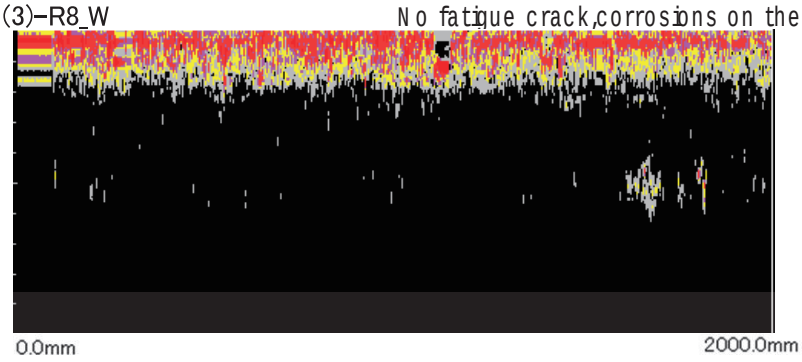
L3 inside box gader



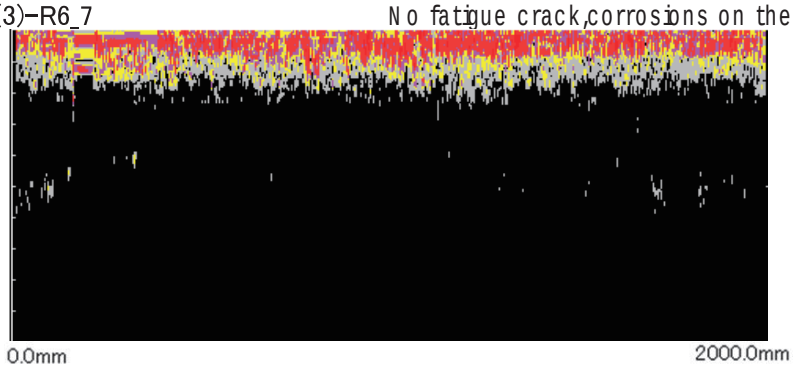
①N-W61(3)-R8_9 No fatigue crack,corrosions on the surface



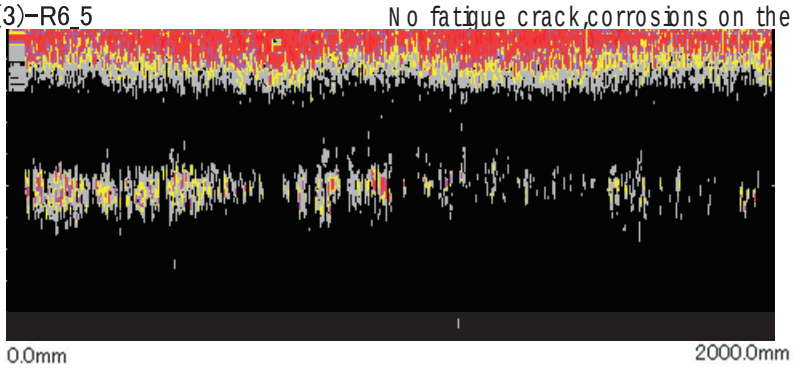
②N-W61(3)-R8_W No fatigue crack,corrosions on the surface



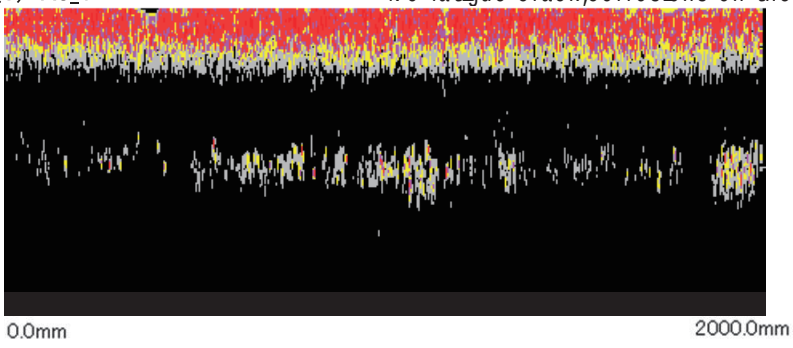
③N-W61(3)-R6_7 No fatigue crack,corrosions on the surface



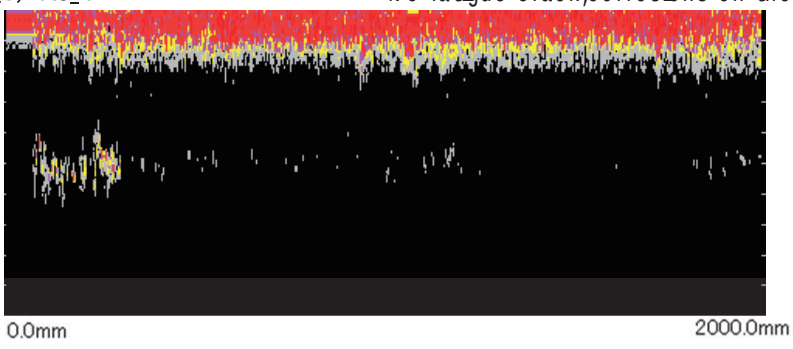
④N-W61(3)-R6_5 No fatigue crack,corrosions on the surface



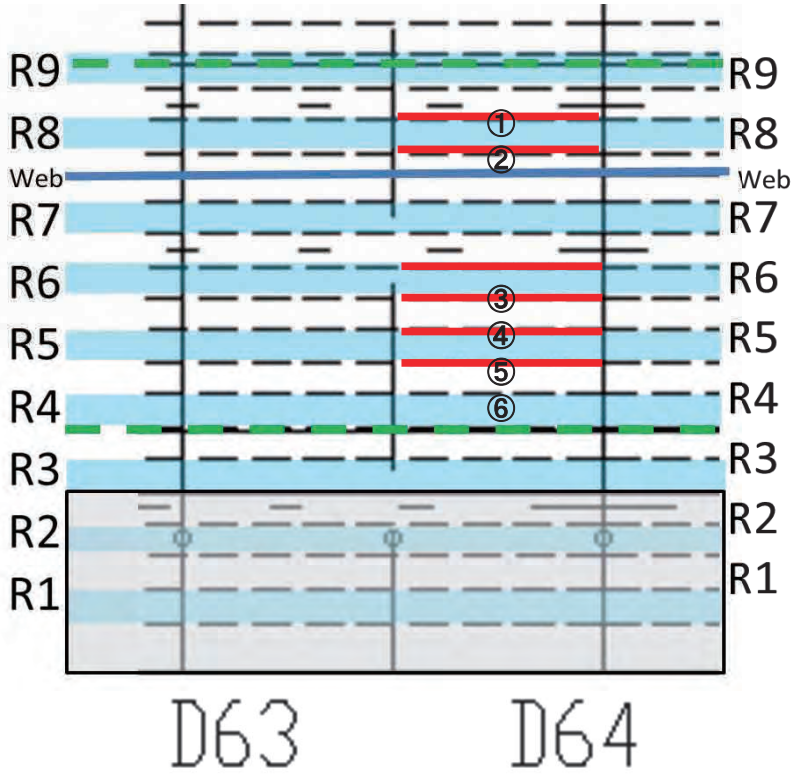
⑤N-W61(3)-R5_6 No fatigue crack,corrosions on the surface



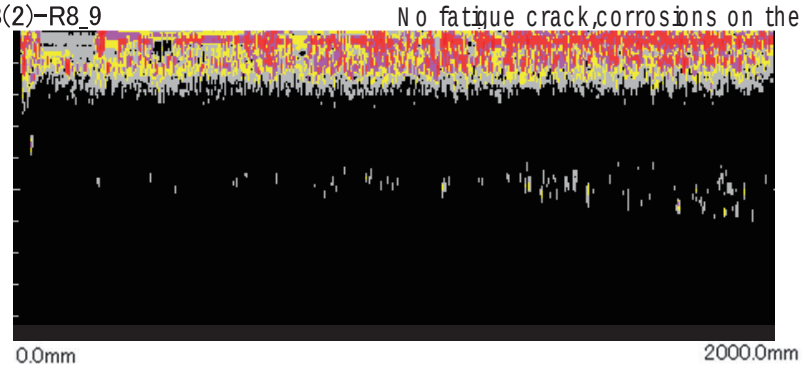
⑥N-W61(3)-R5_4 No fatigue crack,corrosions on the surface



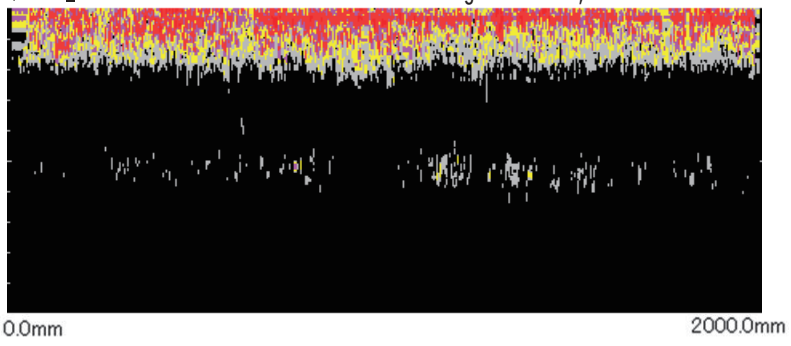
C6 inside box gader



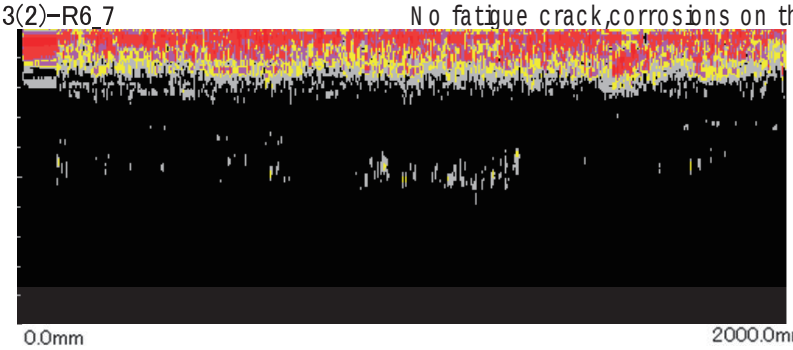
①N-W63(2)-R8_9 No fatigue crack,corrosions on the surface



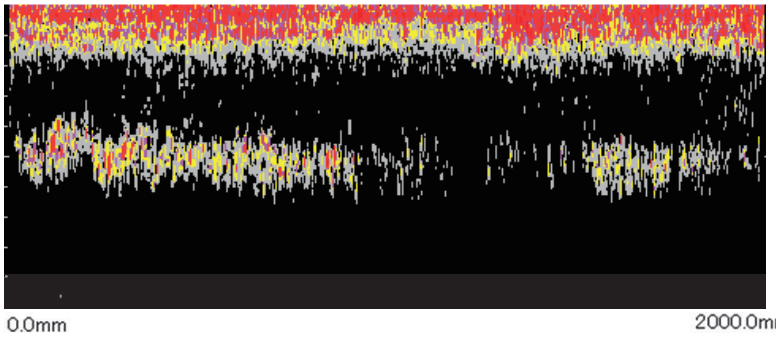
②N-W63(2)-R8_W No fatigue crack,corrosions on the surface



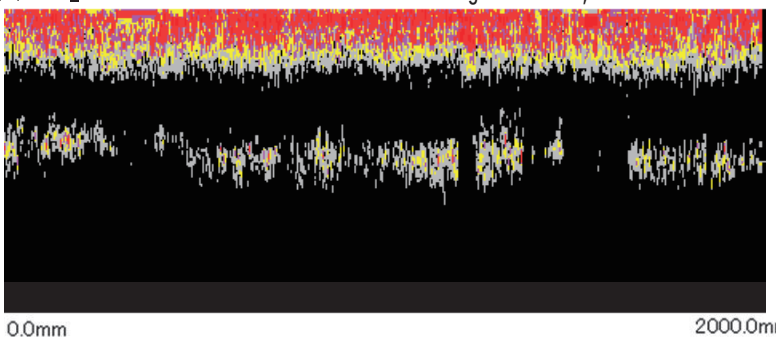
③N-W63(2)-R6_7 No fatigue crack, corrosions on the surface



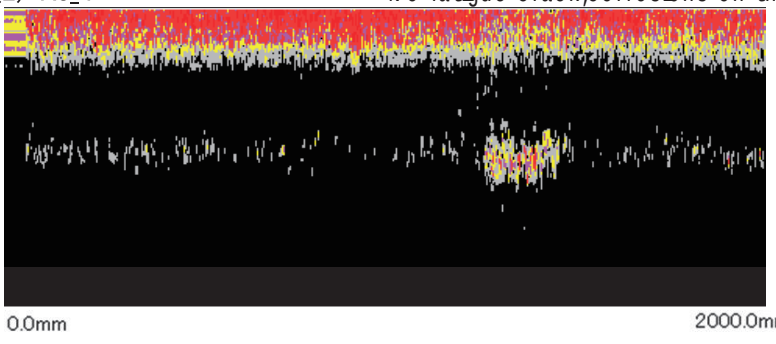
④N-W63(2)-R6_5 No fatigue crack, corrosions on the surface



⑤N-W63(2)-R5_6 No fatigue crack, corrosions on the surface



⑥N-W63(2)-R5_4 No fatigue crack, corrosions on the surface



Appendix 4 Temperature and Humidity Data of GARBLT

APPENDIX-4 Temperature and Humidity Data of GARBLT

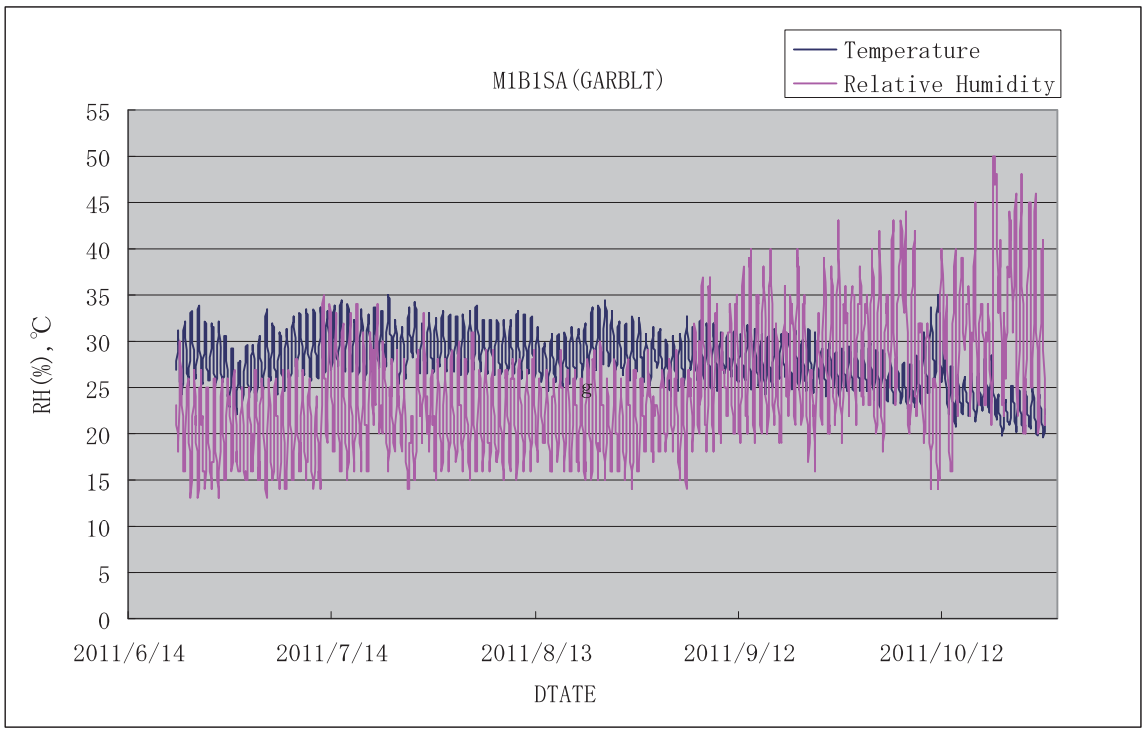


Figure A3-1 Temperature and relative humidity data of M1B1SA (GARBLT)

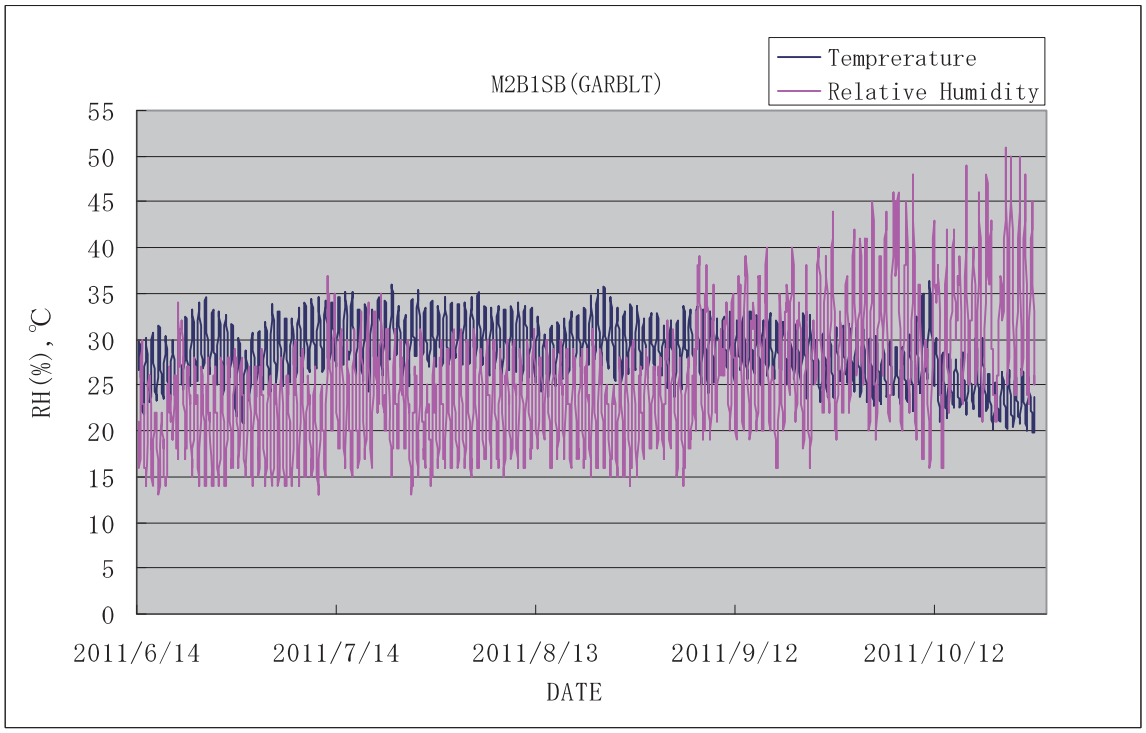


Figure A3-2 Temperature and relative humidity data of M2B1SB (GARBLT)

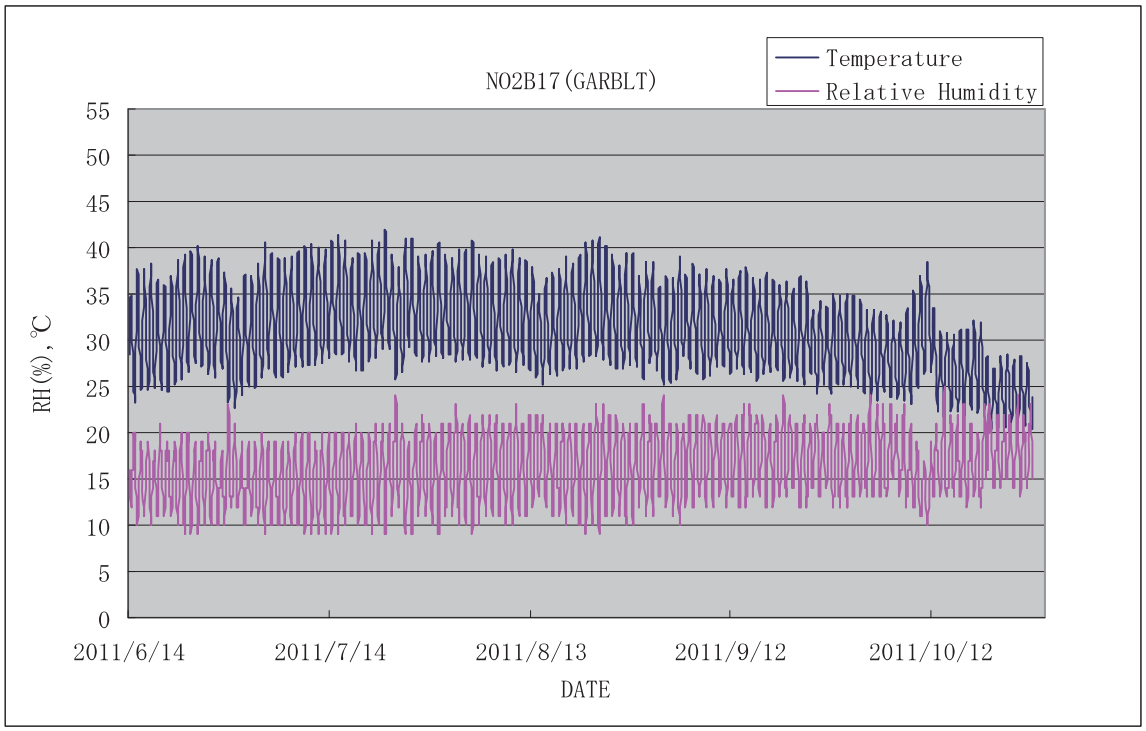


Figure A3-3 Temperature and relative humidity data of NO2N17 (GARBLT)

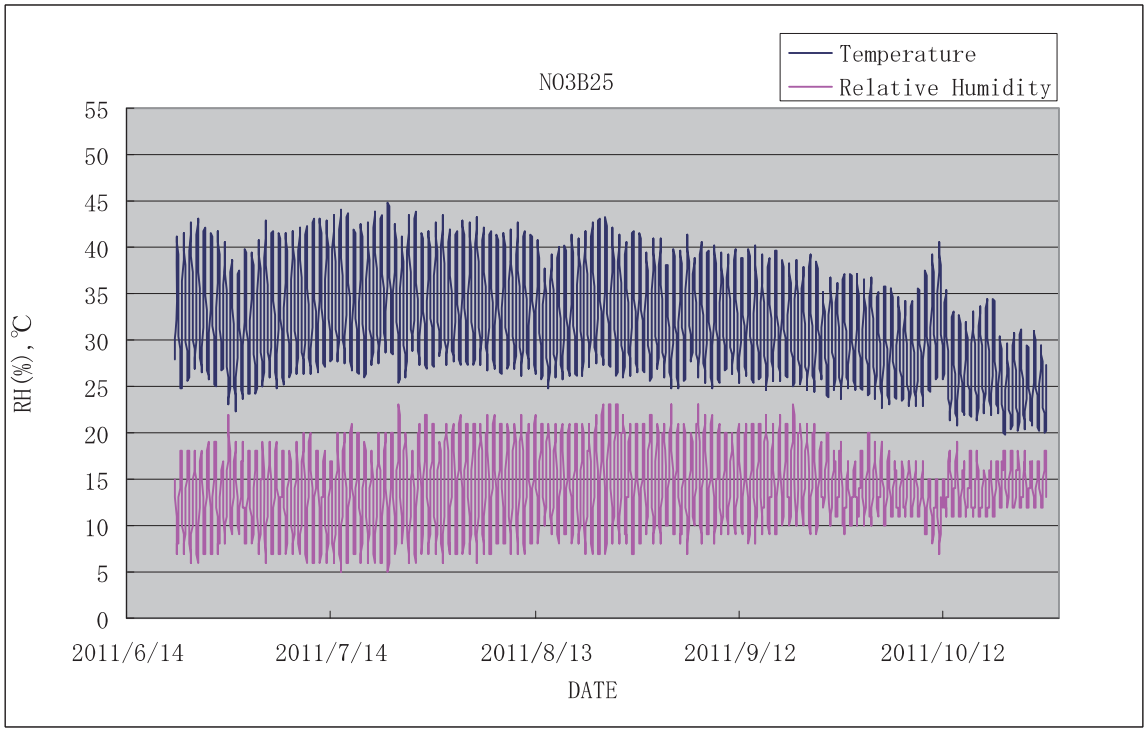


Figure A3-4 Temperature and relative humidity data of NO3B25 (GARBLT)

Appendix 5 Procedure of Injection Work

Standard Procedure	1. Preparing and heating of joint sealant	Page 1
Prepare the estimated use amount of CETOKOL200 for the day.  	Material: CETOKOL200 Equipment: Kettle for heating, Generator, Transformer, Thermometer, Light oil burner, Ladle, Milk pot - As the material is in the 20kg pack of paper box, remove the paper attached outside. - If papers are left, it will be trash in a kettle which disturbs the injection work. Remove them carefully.	
Put CETOKOL200 in a kettle and heat it. 	- It is desirable to use a electrothermal kettle because it is easy to control temperature. - If it is difficult to get it, an open fire kettle also can be used, but it is difficult to control temperature. As the material catches fire over 350°C, a cover (a steel plate etc.) for blocking air should be prepared. Prepare a fire extinguisher just in case. - As 180°C should be the standard as injection temperature, control heat in 200°C, expecting lowering temperature by carry.	
Carry of material 	- Ladle the melted joint sealant into milk pot. - Carry the milk pot containing the melted joint sealant to the injection area. - Leather gloves, protective grasses, and long sleeved clothes should be worn, as the melted joint sealant stays on skin upon contact, and cause burn.	

Standard Procedure	2. Injection work	Page 2
Preparing of injection area: cleaning of cracks 	Equipment: Compressor - With the air of compressor, blow out foreign material such as dirt or mud in the cracks. - To avoid re-entering of the removed foreign material, blow in the direction toward causing cracks.	
Injection work 	Equipment: Milk pot - Pour the joint sealant carried with the milk pot into the cracks in a direction toward causing cracks. - Not to waste the material, control the injection amount matching to the width of each crack. It will be controllable with experience. - The viscosity of the joint sealant increased under 160°C and will not go into crack. In that case, put back the left joint sealant into the kettle immediately and use well-heated material.	
Removal of redundant material and finishing 	Equipment: Scraper and gas burner - After the injection, remove redundant material with scraper and finish flatly. - The joint sealant begins hardening soon with decreasing in temperature, lowers to 100°C within about a minute, and can't be formed by a scraper after that. In that case, the joint sealant should be formed by heating with a gas burner etc. - Execute the injection and finishing work in pairs.	
Prevention of adhesion 	Material: Ordinary Portland cement Equipment: Deck brush - As the joint material is rubberized bitumen binder, the surface remains sticky after hardening in some degree. - So, before being opened to traffic, scatter stone powder or cement on the road and smooth them with a deck brush to prevent adhesion to tires.	

Appendix6. Member List of the Study Team

Appendix 6. Member List of the Study Team

Position	Name	Organization	Period
Team Leader / Planning Management	Tomoki KANENAWA	JICA Assistant Director, Grant Aid Project Management Division 1, Financing Facilitation and Procurement Supervision Department	Nov 13 – Nov 21(2011) Feb 21 – Feb 29(2012)
Technical Advisor (Pavement)	Masaru TERADA	Senior Researcher, Pavement Research Team, Road Technology Research Group,Public Works Research Institute	Nov 13 – Nov 21(2011) Feb 21 – Feb 29(2012)
Consultant Chief / Pavement / Rehabilitation Plan	Eiji YONEZAWA	Oriental Consultants Co., Ltd.	Nov 13 – Dec 22(2011) Feb 21 – Feb 29(2012) May 30 – Jun 6(2012) Aug 27 – Sep 10(2012)
Steel Plate Deck	Takehumi YAMAZAKI	Chodai Co., Ltd.	Nov 13 – Dec 22(2011) Feb 21 – Feb 29(2012)
Design of Pavement on Steel Deck	Takayuki HUJITA	Chodai Co., Ltd.	Nov 13 – Dec 22(2011) May 30 – Jun 6(2012)
Procurement Plan / Tender Document	Yasunori KAWAGUCHI	Oriental Consultants Co., Ltd.	Nov 13 – Dec 22(2011) Feb 21 – Feb 29(2012)
Construction Planning / Cost Estimate	Katsuya KUSANAGI	Oriental Consultants Co., Ltd.	Nov 13 – Dec 22(2011) Feb 21 – Feb 29(2012) May 30 – Jun 6(2012) Aug 27 – Sep 10(2012)

Appendix7. Study Schedule

Appendix 7. Study Schedule

Site Survey 1

			JICA Members		Consultant Members					Accommodation
			Team Leader / Planning Management	Technical Advisor (Pavement)	Consultant Chief / Rehabilitation Plan / Maintenance Plan	Steel Deck Plan	Design of Pavement Plan on Steel Deck	Procurement Plan/Tender document	Construction Plan/Cost Estimate	
			Tomoki KANENAWA	Masaru TERADA	Eiji YONEZAWA	Takehumi YAMAZAKI	Takayuki FUJITA	Yasunori KAWAGUCHI	Katsuya KUSANAGI	
1	13rd Nov.	Sun	22:00 Departure from Narita (EK 319)							Air
2	14th Nov.	Mon	04:15 Arrival in Dubai , 08:50 Departure from Dubai (EK 927) 10: 55 Arrival in Cairo PM:Meeting with JICA Egypt Office to explain the Inception Report							Air/Cairo
3	15th Nov.	Tue	Meeting with GARBLT to explain the Inspection Report							Cairo
4	16th Nov.	Wed	AM:Discussion and signing on M/D with GARBLT PM: Move to Ismailia							Ismailia
5	17th Nov.	Thu	Meeting with GARBLT Bridge Site Office to explain the Inception Report and Site Survey (arranged by Consultant)							Ismailia
6	18th Nov.	Fri	Internal meeting							Ismailia
7	19th Nov.	Sat	Internal meeting							Ismailia
8	20th Nov.	Sun	AM:Discussion and signing on M/D with GARBLT PM Report to JICA Egypt Office 19:00 Departure from Cairo		Tender for Pavement Test Company (Cairo)	Site survey				Ismailia
9	21st Nov.	Mon	(Via Dubai) PM 17:20 Arrival in Narita		Site survey					Ismailia
10	22nd Nov.	Tue			Site survey					Ismailia
11	23rd Nov.	Wed			Site survey					Ismailia
12	24th Nov.	Thu			Site survey					Ismailia
13	25th Nov.	Fri			Internal meeting					Ismailia
14	26th Nov.	Sat			Internal meeting					Ismailia
15	27th Nov.	Sun			Site survey					Ismailia
16	28th Nov.	Mon			Site survey					Ismailia
17	29th Nov.	Tue			Site survey					Ismailia
18	30th Nov.	Wed			Cairo Airport to pick up survey equipment	Site survey				Ismailia
19	1st Dec.	Thu			Site survey					Ismailia
20	2nd Dec.	Fri			Internal meeting					Ismailia
21	3rd Dec.	Sat			Internal meeting					Ismailia
22	4th Dec.	Sun			Site survey					Ismailia
23	5th Dec.	Mon			Site survey (Remove pavement)					Ismailia
24	6th Dec.	Tue			Site survey (Remove pavement)					Ismailia
25	7th Dec.	Wed			Site survey					Ismailia
26	8th Dec.	Thu			Site survey (with JICA Mr.Mizukusa, Mr.Ashlaf)					Ismailia
27	9th Dec.	Fri			Internal meeting					Ismailia
28	10th Dec.	Sat			Internal meeting					Ismailia
29	11th Dec.	Sun			Site survey					Ismailia
30	12th Dec.	Mon			Site survey					Ismailia
31	13th Dec.	Tue			Site survey / Analysis of survey result / Preparation of reports			Toll gate survey	Site survey	Ismailia
32	14th Dec.	Wed			Site survey / Analysis of survey result / Preparation of reports					Ismailia
33	15th Dec.	Thu			Site survey / Analysis of survey result / Preparation of reports					Ismailia
34	16th Dec.	Fri			Internal meeting					Ismailia
35	17th Dec.	Sat			Internal meeting					Ismailia
36	18th Dec.	Sun			Site survey / Analysis of survey result / Preparation of reports				Interview with Contractor (Cairo)	Ismailia
37	19th Dec.	Mon			AM Report to GARBLT bridge management office PM: Ismailia ⇒ Cairo					Cairo
38	20th Dec.	Tue			AM: Report to JICA Egypt Office (explain survey results)					Cairo
39	21st Dec.	Wed			AM 11:00: Report to EOJ PM: 13:30 Meeting with GARBLT to explain survey results 19:00 Departure from Cairo(EK924)					Cairo/ Air
40	22nd Dec.	Thu			00:30 Arrival in Dubai , 02:55 Departure from Dubai (EK 318) 17:20 Arrival in Narita					Air

Site Survey 2

			JICA Members		Consultant Members				Accomodation
			Team Leader / Planning Management	Technical Advisor (Pavement)	Consultant Chief / Pavement / Rehabilitation Plan	Steel Plate Deck	Procurement Plan / Tender Document	Construction Plan / Cost Estimate	
			Tomoki KANENAWA	Masaru TERADA	Eiji YONEZAWA	Takefumi YAMAZAKI	Yasunori KAWAGUCHI	Katsuya KUSANAGI	
1	21st February	Tue	EK319 Narita 21:20 => Dubai +04:15						Air
2	22nd February	Wed	EK927 Dubai 08:50 => Cairo 10:55 13:00 Meeting with JICA Egypt Office to explain result of the Study, 16:30 Meeting with EOJ					Survey for Cost estimation(cairo)	Cairo
3	23rd February	Thu	9:30 Meeting with MOT to result of the survey 10:00 Meeting with GARBLT to explain result of the survey, discussed about Minutes with chairman 14:00 Meeting with MOIC to explain result of the Survey					Survey for Cost estimation(cairo)	Cairo
4	24th February	Fri	Move to Ismailia					Survey for Cost estimation(cairo)	Ismailia
5	25th February	Sat	Internal Meeting					Survey for Cost estimation(cairo)	Ismailia
6	26th February	Sun	10:00 Meeting with GARBLT Bridge Site Office to explain result of the Survey PM: Move to Cairo					Survey for Cost estimation(cairo)	Cairo
7	27th February	Mon	9:00 Meeting with GARBLT to discuss about minutes 12:00 Meeting with MOT to explain about contents of minutes					Survey for Cost estimation(cairo)	Cairo
8	28th February	Tue	8:30 Report to JICA Egypt Office 16:00 Report to EOJ EK924 Cairo 19:00 => Dubai +00:30						Air
9	29th February	Wed	EK318 Dubai 02:55 => Narita 17:20						

Site Survey 3

			Consultant Members			Accomodation
			Consultant Chief / Pavement / Rehabilitation Plan	Design of Pavement Plan on Steel Deck	Construction Plan / Cost Estimate	
			Eiji YONEZAWA	Takayuki FUJITA	Katsuya KUSANAGI	
1	30th May	Wed	MS 965 Narita 21:20 =>			Air
2	31st May	Thu	MS 965 => Cairo 04:40 10:00 Meeting with GARBLT to the explain result of the Study			Cairo
3	1st Jun.	Fri	Internal Meeting			Cairo
4	2nd Jun.	Sat	Internal Meeting			Cairo
5	3rd Jun.	Sun	10:00 Meeting with GARBLT to explain result of the Study			Cairo
6	4th Jun.	Mon	9:00 Meeting with MOT to explain result of the Study 11:00 Meeting with MOIC to explain result of the Study Move to Ismailia			Ismailia
7	5th Jun.	Tue	10:00 Site (Inspection of Installing Monitoring Device on Pavement) Move to Cairo MS 964 Cairo 22:50 =>			Air
8	6th Jun.	Wed	MS 964 => Narita 18:00			

Site Survey 4

			Consultant Members		Accomodation
			Consultant Chief / Pavement / Rehabilitation Plan	Construction Plan / Cost Estimate	
			Eiji YONEZAWA	Katsuya KUSANAGI	
1	27th Aug.	Mon	MS 965 Narita 21:20 =>		Air
2	28th Aug.	Tu	MS 965 => Cairo 04:40 9:00 Meeting in JICA Egypt about the result of the Study 11:00 Meeting in GARBLT to explaing about the result of the Study and request matter		Cairo
3	29th Aug.	Wed	12:00 Meeting in GARBLT(Request to local contractotfor abot procurement condition and unit price for SFRC) 15:30 Meeting in JICA Egypt		Cairo
4	30th Aug.	Th	07:00 Move to Ismilia 10:00 GARBELT siite office to explain the result of Survey. Investigation about the condition of temporary injection on existing pavement and monitoring device		Ismailia
5	31st Aug.	Fri	Internal Meeting and Study		Ismilia
6	1st Sep.	Sat	10:00 GARBELT siite office to report the progress of meeting with GARBLT Headquarter Office. 14:00 Move to Cairo		Cairo
7	2nd Sep.	Sun	12:00 Meeting with local contractor about procurement condition and unit price for SFRC method		Cairo
8	3rd Sep.	Mon	Internal Meeting and Study		Cairo
9	4th Sep.	Tu	9:00 Meeting in JICA Egypt about TN(draft)		Cairo
10	5th Sep.	Wed	Internal Meeting and Study 16:00 Meeting in JICA Egypt		Cairo
11	6th Sep.	Th	11:00 Meetimg with GARBELT about the comparison Guus wiyth SFRC and TN(draft) 16:00 Meeting with JICA Egypt		Cairo
12	7th Sep.	Fri	Internal Meeting and Study		Cairo
13	8th Sep.	Sat	Internal Meeting and Study		Cairo
14	9th Sep.	Sun	10:00 Meetimg with GARBELT about the select of repair work. Exchange TN, Submissin of DFR and Draft Tender Document. MS 964 Cairo 22:50 =>		Air
15	10th Sep.	Mon	MS 964 => Narita 18:00		