Appendices

1. Member List of the Study Team

1. Member List of the Study Team

Position	Name	Organization	Period
Team Leader	Shigeru SUGIYAMA	JICA Financing Facilitation and Procurement Supervision Department Director of Grant Aid Project Management Division 1	Jan 22 – Jan 29 Aug 13 – Aug 20
Technical Advisor (Repair method)	Yasunobu KAKIHIRA	JICA Senior Technical Advisor	Jan 22 – Jan 31
Technical Advisor (Concrete)	Hiroshi WATANABE	Public Works Research Institute Senior Researcher	Jan 22 – Jan 29 Aug 13 – Aug 20
Planning Management	Tomoki KANENAWA	JICA Financing Facilitation and Procurement Supervision Department Grant Aid Project Management Division 1	Jan 22 – Jan 29 Aug 13 – Aug 20
Consultant Chief / Rehabilitation Plan / Maintenance Plan	Eiji YONEZAWA	Oriental Consultants Co., Ltd.	Jan 22 – Feb 4 Apr 4 – May 11 Aug 13 – Aug 20
Concrete	Itsuro SAKAI	Oriental Consultants Co., Ltd.	Jan 22 – Feb 4 Apr 4 – May 11 Aug 13 – Aug 20
Site Survey	Hideyuki SHIRAISHI	Chodai Co., Ltd.	Jan 22 – Feb 4 Apr 4 – May 11
Detailed Design	Seiji TAGUCHI	Oriental Consultants Co., Ltd.	Apr 18 – May 8 Aug 13 – Aug 20
Construction Planning / Cost Estimate	Takuma OGUNI	Oriental Consultants Co., Ltd.	Jan 22 – Feb 4 Apr 4 – May 11 Aug 13 – Aug 20

2. Study Schedule

2. Study Schedule

Site Survey 1

			JICA members				Consultant Menbers			
			Team Leader	Technical Advisor (Repair method)	Technical Advisor (Concrete)	Planning Management	Consultant Chief / Rehabilitation Plan / Maintenance Plan	Concrete	Site Survey	Construction Planning / Cost Estimate
			Shigeru SUGIYAMA	Yasunobu KAKIHIRA	Hiroshi WATANABE	Tomoki KANENAWA	Eiji YONEZAWA	Itsuro SAKAI	Hideyuki SHIRAISHI	Takuma OGUNI
1	22th Jan.	Sat	13:10 Departure from Narita(MS965) 19:40 Arrival in Cairo	17:20 Departure from Nairobi(KQ320) 22:35 Arrival in Cairo	13:10 Departure from Narita(MS965) 19:40 Arrival in Cairo					
2	23th Jan.	Sun	AM：Meeting with JICA Egypt Office & EOJ to explain result of post implementation status study and outline of follow-up cooperation study PM：Courtesy Call on MOT and MOIC							
3	24th Jan.	Mon	AM：Meeting with GARBLT to explain result of post implementation status study and outline of follow-up cooperation study PM：Discussion and signing on M/D with GARBLT							
4	25th Jan.	Tue	AM：Cairo ⇒ Ismailia PM：Site survey							
5	26th Jan.	Wed	Site survey							
6	27th Jan.	Thu	AM：Ismailia⇒Cairo PM：Report to JICA Egypt Office & EOJ	Site survey		AM：Ismailia⇒Cairo PM：Report to JICA Egypt Office & EOJ	Site survey			
7	28th Jan.	Fri	16:55 Departure from Cairo(MS964)	Internal meeting	AM：Ismailia⇒Cairo 16:55 Departure from Cairo(MS964)	16:55 Departure from Cairo(MS964)	Internal meeting			
8	29th Jan.	Sat	12:00 Arrival in Narita	Internal meeting	12:00 Arrival in Narita	12:00 Arrival in Narita	Internal meeting			
9	30th Jan.	Sun		Internal meeting			Internal meeting			
10	31th Jan.	Mon		23:25 Departure from Cairo(KQ321)			Internal meeting			
11	1st Feb.	Tue		07:00 Arrival in Nairobi			Site survey			
12	2nd Feb.	Wed					13:10 Departure from Cairo (AZ897) 15:30 Arrival in Rome			
13	3rd Feb.	Thu					10:40 Departure from Rome (AZ782)			
14	4th Feb.	Fri					07:00 Arrival in Narita			

Site Survey 2

			Consultant Menbers				
			Consultant Chief / Rehabilitation Plan / Maintenance Plan	Concrete	Site Survey	Construction Planning / Cost Estimate	Detailed Design
			Eiji YONEZAWA	Itsuro SAKAI	Hideyuki SHIRAISHI	Takuma OGUNI	Seiji TAGUCHI
1	4th Apr.	Mon	QR803 Narita20:50 =>				
2	5th Apr.	Tue	=> Doha05:15, QR514Doha13:50 => Cairo16:15				
3	6th Apr.	Wed	Courtesy Call on JICA Egypt Office and relevant Agency				
4	7th Apr.	Thu	AM: Cairo => Ismailia PM: Site survey				
5	8th Apr.	Fri	Internal meeting				
6	9th Apr.	Sat	Internal meeting				
7	10th Apr.	Sun	Site survey				
8	11th Apr.	Mon	Site survey				
9	12th Apr.	Tue	Site survey				
10	13th Apr.	Wed	Site survey				
11	14th Apr.	Thu	Site survey				
12	15th Apr.	Fri	Internal meeting				
13	16th Apr.	Sat	Internal meeting				
14	17th Apr.	Sun	Site survey				
15	18th Apr.	Mon	Site survey				QR803 Narita20:50=>
16	19th Apr.	Tue	Site survey				=>Doha05:15, QR514 Doha13:50 =>Cairo16:15
17	20th Apr.	Wed	Site survey				
18	21st Apr.	Thu	Site survey				
19	22nd Apr.	Fri	Internal meeting				
20	23rd Apr.	Sat	Internal meeting				
21	24th Apr.	Sun	Site survey				
22	25th Apr.	Mon	Site survey				
23	26th Apr.	Tue	Site survey				
24	27th Apr.	Wed	Site survey				
25	28th Apr.	Thu	Site survey				
26	29th Apr.	Fri	Internal meeting				
27	30th Apr.	Sat	Internal meeting				
28	1st May.	Sun	Site survey				
29	2nd May.	Mon	Site survey				
30	3rd May.	Tue	Site survey				
31	4th May.	Wed	Site survey				
32	5th May.	Thu	Site survey				
33	6th May.	Fri	Internal meeting				
34	7th May.	Sat	Site survey				QR515 Cairo8:45=> Doha22:00
35	8th May.	Sun	Site survey				QR802 Doha00:50=> Narita19:20
36	9th May.	Mon	Report to JICA Egypt Office & GARBLT				
37	10th May.	Tue	QR515 Cairo18:45 => Doha22:00				
38	11th May.	Wed	QR802 Doha 00:50 => Narita19:20				

Presentation / Discussion on Site Survey Report

JICA Members			Consultant Members				Accomodation
Team Leader	Technical Advisor (Concrete)	Planning Management	Consultant Chief / Rehabilitation Plan / Maintenance Plan	Concrete	Detailed Design	Construction Planning / Cost Estimate	
Shigeru SUGIYAMA	Hiroshi WATANABE	Tomoki KANENAWA	Eiji YONEZAWA	Itsuro SAKAI	Seiji TAGUCHI	Takuma OGUNI	
EK319 Narita 22:00 => Dubai +03:50			OZ105 Narita 19:00 => EK323 Incheon 23:55 => Dubai				Air
EK927 Dubai 08:50 => Cairo 10:40 13:00 Meeting with JICA Egypt Office to explain result of the Study							Cairo
10:00 Meeting with GARBLT to explain result of the Study							Ismailia
10:00 Meeting with GARBLT Bridge Site Office to explain result of the Study							Cairo
10:00 Discussion and signing on S/W with GARBLT							Cairo
10:00 Report to JICA Egypt Office 13:30 Report to EOJ							Cairo
14:45 Leaving for Cairo Airport EK924 Cairo 17:50 => Dubai +00:10							Air
EK318 Dubai 02:50 => Narita 17:35			EK322 Dubai 03:30 => OZ108 Incheon 18:50 => Narita 21:00				

3. List of Parties Concerned in the Recipient Country

3. List of Parties Concerned in the Recipient Country

(1) GARBLT（General Authority For Roads, Bridges And Land Transport）

Hon. Eng.Mahmoud Ezz El-Din	Chairman
Hon. Eng.Mahmoud Atef Albelok	Chairman
Mr. Ibrahim Ismail Amer	Head sector for Bridge section
Eng. (Ms.) Hala Sayed Helmy	H.G.M. for Bridge Maintenance
Mr. Aly Elsafty Abdalla	G.M. for Bridge Maintenance
Eng. (Ms.) Wafaa Mubarak	G.M. for Bridge Construction
Mr. Ibrahim Khalil Ibrahim	G.M. for Bridges Design
Mr. Mohamed Gouda	G.M. for Maintenance Researches of Bridge
Mr. Ashraf Hammad	G.M. for Building
Mr. Usama Ali Fahmy	G.M. for Excuting of Bridges
Eng. Desoky Osman Desoky	Peace Bridge Manager
Eng. Ahmed Mohamed Hassan	Bridges Researches Sector

(2) Embassy of Japan

Eng. Maruaki Hisada	First Secretary

(3) JICA Egypt Office

Nobuhiro Ikuro	Chief Representative
Shigeru Otake	Senior Representative
Taro Azuma	Senior Representative
Tatsuya Yanagi	Representative
Tetsuo Takahashi	Representative
Koichi Mizukusa	Representative

4. Minutes of Discussions

4. Minutes of Discussions

(1) Site Survey 1 (January 27, 2011)

MINUTES OF DISCUSSIONS
ON THE FOLLOW-UP COOPERATION STUDY
ON
THE PROJECT FOR CONSTRUCTION OF THE SUEZ CANAL BRIDGE

In response to a request from the Government of the Arab Republic of Egypt (hereinafter referred to as "Egypt"), the Japan International Cooperation Agency (hereinafter referred to as "JICA") decided to conduct a Follow-up Cooperation Study (hereinafter referred to as "the Study") on "the Project for Construction of the Suez Canal Bridge" and "the Project for Expansion of the Suez Canal Bridge" (hereinafter referred to as "the Original Project").

JICA dispatched the Follow-up Cooperation Study Team (hereinafter referred to as "the Team") headed by Mr. Shigeru SUGIYAMA, Director, Grant Aid Project Management Division 1, Financing Facilitation and Procurement Supervision Department, JICA, and the Team is scheduled to conduct the study from January 22 to March 7, 2011.

The Team held a series of discussions with the officials concerned of the Government of Egypt and conducted a field survey.

In the course of discussions and field survey, both sides confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Final Report.

Cairo, January 27, 2011

Shigeru SUGIYAMA
Team Leader
Follow-up Cooperation Study Team
Japan International Cooperation Agency
JAPAN

Hon. Eng. Mahmoud Atef Albelok
Chairman
General Authority for Roads, Bridges,
and Land Transport
Arab Republic of Egypt

ATTACHMENT

1. Outline of the Follow-up Cooperation Project

1-1. The objective of the Follow-up Cooperation Project ("the Project") is to repair the damages having occurred in the piers of the Suez Canal Bridge (Mubarak Peace Bridge) constructed with assistance of Japanese grant aid, "the Project for Construction of the Suez Canal Bridge" in 1997 and "the Project for Expansion of the Suez Canal Bridge" in 2000.

1-2. The viability of the implementation of the Follow-up Cooperation Project will be determined after further analysis in Japan. In principle, Follow-up Cooperation Project can be applied to the Japanese grant aid portion under the projects, "the Project for Construction of the Suez Canal Bridge" in 1997 and "the Project for Expansion of the Suez Canal Bridge" in 2000.

1-3. The objectives of the Study are as follows;

- To conduct further investigations on damages having occurred in the piers of the Suez Canal Bridge to identify extent of damages and their causes, to evaluate soundness of all piers, and to determine appropriate repair and maintenance method
- To carry out the detailed design of repair works, and
- To suggest the necessary preventive measures for maintenance in the future

2. Schedule of the Study

2-1. The Team will proceed to further investigations in Egypt until 7th March, 2011.

2-2. JICA will prepare the draft Interim Report in English and dispatch a mission in order to explain and discuss its contents around June 2011.

2-3. Based on the results of discussions of the draft Interim Report, JICA will proceed to further examination of the study results and detailed design and the tender document on the Follow-up Cooperation.

2-4. JICA will finalize the Final Report including the detailed design by September 2011 and hand it to Egyptian side through the JICA Egypt office.

3. Others

3-1. The Team explained the result of the first investigations implemented in March and April 2010 and the necessity of further investigations, described in the Inception Report, for in-depth identification and analysis of damages having occurred in the piers of the Suez Canal Bridge and in order to come up with appropriate measures, and Egyptian side agreed.

3-2. Both sides agreed to discuss the roles of both Egyptian and Japanese sides on repair works based on the draft Interim Report during the period of the next mission dispatched around June 2011.

3-3. The Egyptian side shall provide necessary numbers of counterpart personnel to the Team and conduct necessary coordination with concerned government authorities as required, for the smooth implementation of site survey, during the period of their studies in Egypt.

(2) Presentation / Discussion on Site Survey Report (August 17, 2011)

SCOPE OF WORK

ON FOLLOW-UP COOPERATION

FOR

THE PROJECT FOR CONSTRUCTION

OF THE SUEZ CANAL BRIDGE

AGREED UPON

BETWEEN

JAPAN INTERNATIONAL COOPERATION AGENCY

AND

THE GENERAL AUTHORITY FOR ROADS, BRIDGES,

AND LAND TRANSPORT,

THE ARAB REPUBLIC OF EGYPT

Cairo, August 17, 2011

杉山 茂

Mr. Shigeru SUGIYAMA
Team Leader
Follow-up Cooperation Study Team
Japan International Cooperation Agency
Japan

Amer Hala

Eng. Mahmoud Ezz El-Din
Chairman
General Authority for Roads, Bridges,
and Land Transport
Arab Republic of Egypt

17/08/2011

1. Introduction

In response to the request of the Government of the Arab Republic of Egypt (hereinafter referred to as "Egypt"), the Japan International Cooperation Agency (hereinafter referred to as "JICA") decided to extend the Follow-up Cooperation on the Project for Construction of the Suez Canal Bridge (hereinafter referred to as "the Work").

Accordingly, JICA will undertake the Work in cooperation with the General Authority for Roads, Bridges and Land Transport (hereinafter referred to as "GARBLT").

The present document sets forth the Scope of Work for the Work as agreed upon between JICA and GARBLT.

2. Portions to be repaired by JICA and Contractor

Both sides agreed portions to be repaired by JICA and Contractor (Kajima Corporation) as shown in Annex 1, and agreed that each agency should implement each repair work by each budget. After the conclusion of S/W, JICA will execute detailed design of repair works and will deliver the final report including documents of detailed design and maintenance manual of concrete substructure to GARBLT through JICA Egypt office by December, 2011.

3. Scope of Work

The Work shall cover the following:

1. Tender and contract of portions to be repaired by JICA
2. Repair work of portions to be repaired by JICA
3. Supervision of repair work by JICA

4. Work Schedule

The Work will be carried out in accordance with the tentative work schedule as shown in Annex 2.

5. Release of JICA's Defect Liabilities

Both sides agreed that JICA shall have no obligation for any defects on the Work.

6. Major Undertakings to be taken by JICA and GARBLT

Both sides confirmed that, for the smooth implementation of the Work, JICA and GARBLT should particularly implement major undertakings as described in Annex 3.

Furthermore, GARBLT agreed upon its proactive involvement and OJT (On-the-Job Training) of its officials directly involved through the repair work.

7. Mutual Consultations

Both sides shall consult with each other on any matters that may arise from or be connected with the Work prior to actual response to the matters.

8. Recommendations for Operation and Maintenance

JICA has proposed "Operation and Maintenance Plan for Concrete Substructure (Piers and Abutment) of the Suez Canal Bridge" (as shown in Annex 4) through the Follow-up Cooperation Study. For the safe and appropriate operation of the Suez Canal Bridge, it is recommended that GARBLT should follow this Operation and Maintenance Plan after repair works.

List of Annexes

Annex 1: Portions to be repaired by JICA and Contractor

Annex 2: Tentative Schedule

Annex 3: Major Undertakings to be taken by JICA and GARBLT

Annex 4: Operation and Maintenance Plan for Concrete Substructure (Piers and Abutment) of the Suez Canal Bridge

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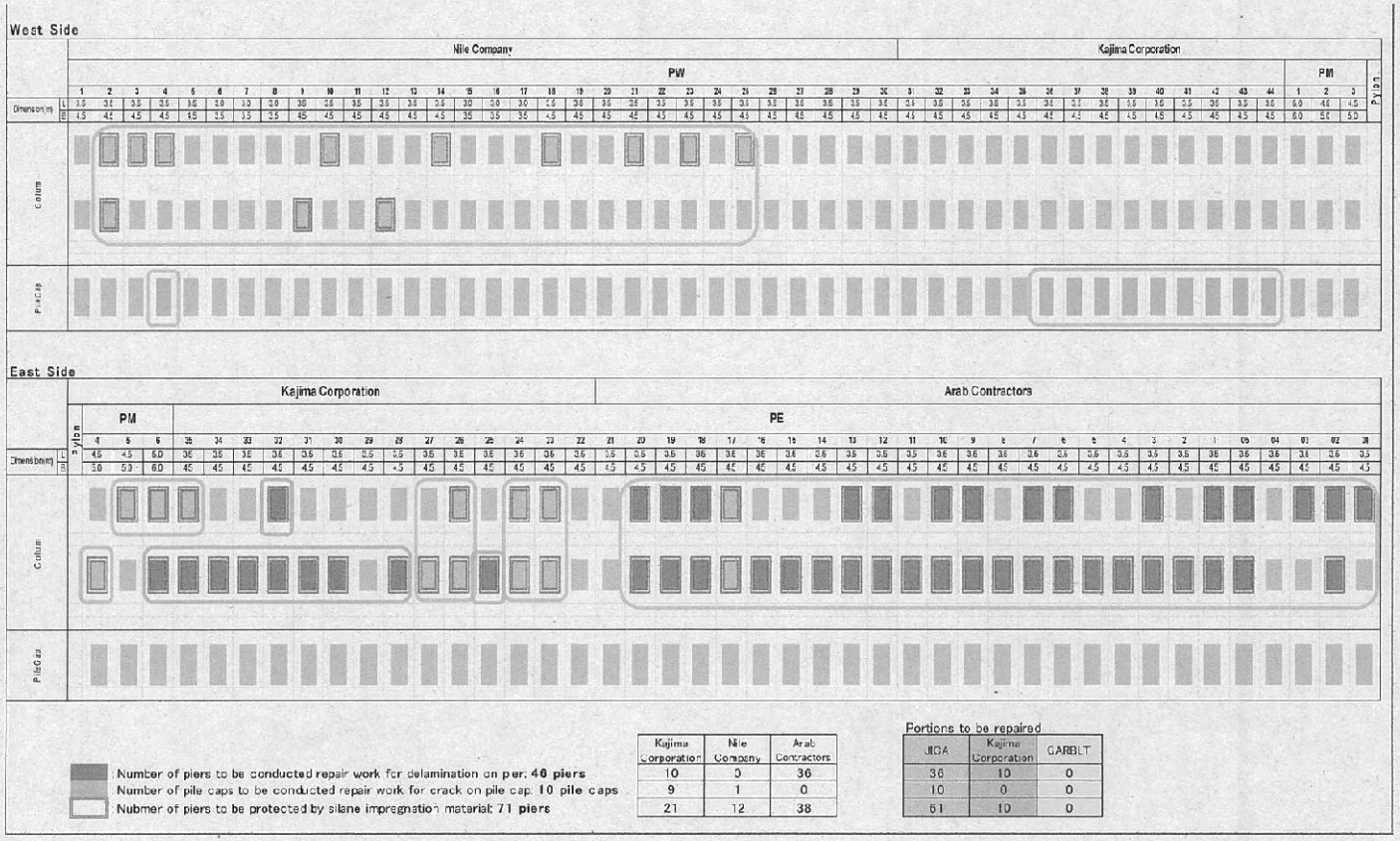
Annex 1. Portions to be repaired by JICA and Contractor

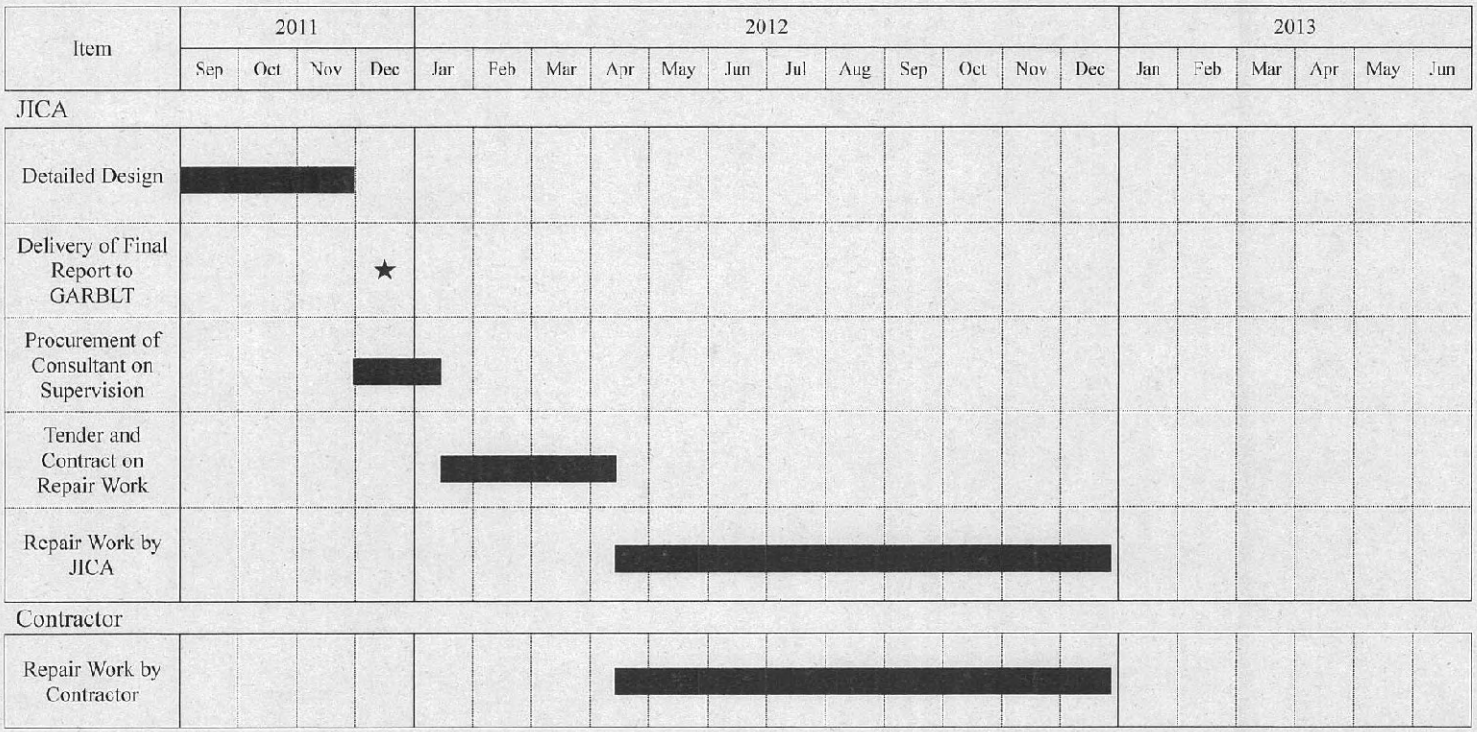


Kajima Corporation	Nile Company	Arab Contractors
10	0	36
9	1	0
21	12	38

Portions to be repaired

JICA	Kajima Corporation	GARBLT
36	10	0
10	0	0
51	10	0

Annex 2. Tentative Schedule



Annex 3. Major Undertakings to be taken by JICA and GARBLT

No.	Items	To be covered by JICA	To be covered by GARBLT
1	To ensure unloading and customs clearance at port of disembarkation in recipient country		
1)	Marine (Air) transportation of the products from Japan to the recipient country	●	
2)	Tax exemption and custom clearance of the products at the port of disembarkation		●
3)	Internal transportation from the port of disembarkation to the project site	●	
2	To accord Japanese nationals, whose service may be required in connection with the supply of the products and the services under the contract, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
3	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts		●
4	To maintain and use properly and effectively the facilities constructed and equipment provided under the Work		●
5	To bear all the expenses, other than those to be borne by the Work, necessary for the construction of the facilities as well as for the transportation and installation of the equipment		●
6	To provide necessary information, such as tender schedule of repair work by GARBLT, to JICA. Information which may affect the basic concept of the Work is especially important.		●
7	To acquire necessary permission, such as acquisition of permission to enter the project site.		●

Amer Hala

Annex 4: Operation and Maintenance Plan for Concrete Substructure (Piers and Abutment) of the Suez Canal Bridge

Method of Inspection

"OPERATION AND MAINTENANCE MANUAL", which was prepared by The Kajima-NKK Nippon Steel Consortium July 2001, has not described on the inspection methods for concrete structure therefore these are provided hereunder as the results of Study.

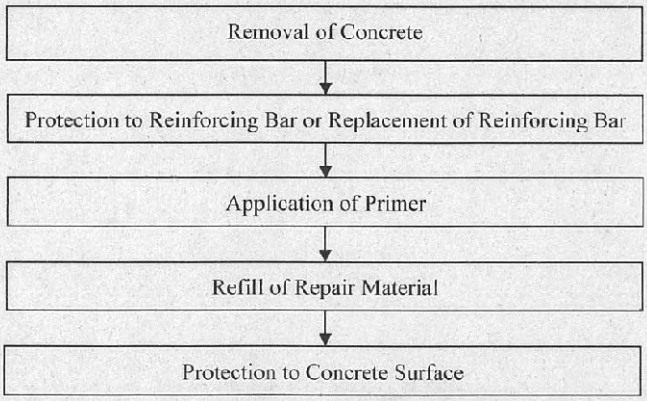
Object	To be inspected	Method of Inspection	Maintenance period
Concrete (Damage, Deterioration)	Efflorescence	Visual inspection	Daily/Periodical (every year)
	Delamination	Test hammering	Periodical (every five year)
	Carbonation	Chipping	Periodical (every five year)
	Chloride content	Drilling, Coring	Periodical (every five year)
	Generation of cracks	Crack scale	Periodical (every five year)
Reinforcement (Corrosion)	Rate of corrosion	Chipping, Half-cell potential	Special/Emergency

Method of Repair works

When delamination is observed at the inspection, the repair work shall be carried out based on the following work procedure.

In case the area of repair is larger than 300 mm x 300 mm, grout material shall be applied to refill repair material by form.

In case the area of repair is smaller than 300 mm x 300 mm, polymer cement mortar shall be applied to refill repair material by plastering.



Amer Hala

5. Material of Meeting

5. Material of Meeting

Site Survey Report Meeting (August 17, 2011)

ORIENTAL CONSULTANTS CO., LTD.
CHODAI CO., LTD.

Follow-up Cooperation Study on the the Project for Construction of the Suez Canal Bridge

SITE SURVEY REPORT (INTERIM REPORT)

17th August, 2011
Oriental Consultants Co., Ltd.
Chodai Co., Ltd.

1

ORIENTAL CONSULTANTS CO., LTD.
CHODAI CO., LTD.

Contents

1. Results of Survey
2. Cause of Deterioration
3. Evaluation of Structural Soundness
4. Place of Preventive Work
5. Method of Repair Work
6. Portions to be Repaired by JICA, GARBLT and Contractor
7. Work Schedule (Tentative)
8. Recommendation for Operation and Maintenance

2

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CHODAI CO., LTD.

1. Results of Survey (1/2)

(1) Delamination on Pier and Pile Cap (1/2)

- Number of damaged piers to be repaired was 46 out of 180.
- Insufficient concrete covers were approximately 50% of total.

(Only lowest parts of pier, less than 4 m)

=>It is difficult to blame contractor's responsibility for this insufficient concrete cover at this stage after 10 years of completion because;

- No critical impact on structural soundness
- Defects liability period was expired.

- No tendency of corrosion of reinforcing bar was found at all chipping points including with minimum cover depth and minimum natural potential.

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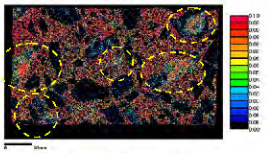
ORIENTAL CONSULTANTS CO., LTD.
CHODAI CO., LTD.

1. Results of Survey (2/2)

(1) Delamination on Pier and Pile Cap (2/2)

- Carbonation depths will not reach to the design cover depth of 70 mm in 100 years.
- Chloride contents in deeper than 60 mm were less than critical value of 1.2 kg/m3, approximately 1.0 kg/m3 in average.
- High chloride content of 1.5 kg/m3 in PE21 will not influence on corrosion of reinforcing bar because it is still stable inside coarse aggregates.



(2) Crack on Pile Cap

- Number of cracked pile cap to be repaired was 10.

4

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2. Cause of Deterioration

(1) Delamination on Pier and Pile Cap

- It is considered from following survey results that delaminations have occurred by chloride attack with water and oxygen supply from ground surface.
  - Chloride content on the concrete surface exceeds 1.2 kg/m3 by chloride attack.
  - Carbonation depth is deep, 15 to 20 mm.
  - Concrete cover is less than 50 mm at delamination points.

(2) Crack on Pile Cap

- It is considered from following survey results that cracks have occurred by thermal restraint with heat of cement hydration.
  - Cracks on upper surface have grillage-like regular pattern, namely, at orthogonal regular intervals (1 to 2 m).
  - Depth of crack exceeds 200 mm at the 0.5 mm width of crack.

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3. Evaluation of Structural Soundness

(1) Delamination on Pier and Pile Cap

- Damage on concrete surface ⇨ Grade III (Repair and preventive works are required.)
- No damage on concrete surface, but insufficient concrete cover ⇨ Grade I (No repair work) or Grade II (Preventive work is required.)
- No damage on concrete surface, and sufficient concrete cover ⇨ Grade I (No repair work)

→ Preventive work shall be determined according to the following pier conditions.

- Concrete Cover Depth (Measured by RC Radar)
- Chloride Content
- Carbonation Depth

(2) Crack on Pile Cap

- Repair work is required for cracks with wider than 0.35 mm.

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4. Place of Preventive Work

(1) Place to be prevented

Place of preventive work shall be determined according to the following pier conditions.

- Carbonation reaches existing reinforcing bar, and chloride content becomes more than 1.2 kg/m3 because of insufficient concrete cover in the following target years.
- As target years, 20, 50 and 100 years from completion of construction (10, 40 and 90 years from now) shall be considered.

(2) Options for Preventive Work

Option 1: Target years 20 (50 piers), 0.55 million USD

Option 2: Target years 50 (71 piers), 0.73 million USD => Most Recommendable

Option 3: Target years 100 (101 piers), 0.95 million USD

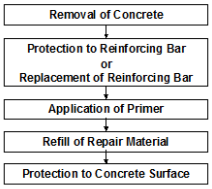
Option 4: All piers with insufficient concrete cover (172 piers), 1.51 million USD

* Durability of preventive work is assumed around 20 years.

5. Method of Repair Work

(1) Delamination on Pier and Pile Cap

- Repair work shall be conducted for damaged places based on the work procedure. (46 piers)
- Preventive work shall be applied on concrete surface using silane impregnation material which facilitates surface inspection with its transparency. (71 piers)



Repair Work Procedure

(2) Crack on Pile Cap

- Filling material shall be refilled in cracks after U-shape cut of cracks.(10 pile caps)

6. Portions to be Repaired by JICA, GARBLT and Contractor

(1) Portion to be Repaired

Original Contractor-wise

Sponsor of Original Construction	GOJ	GOE	GOE
Contractor	Kajima Corporation	Nile Company	Arab Contractors
Refill of Repair Material	10 piers	0 piers	36 piers
Repair of Crack	9 pile caps	1 pile caps	0 pile caps
Protection to Concrete Surface (Option 2)	21 piers	12 piers	38 piers

6. Portions to be Repaired by JICA, GARBLT and Contractor

(2) Demarcation of Repair(1/3)

Initial

Sponsor of Original Construction	GOJ	GOE
Implementing Organization for Repair	JICA	GARBLT
Refill of Repair Material	10 piers	36 piers
Repair of Crack	9 pile caps	1 pile caps
Protection to Concrete Surface (Option 2)	21 piers	50 piers
Cost (Draft)	0.20 Million USD (1.2 Million EGP)	0.53 Million USD (3 Million EGP)

(2) Demarcation of Repair(2/3)

1) GARBLT agreed that no significant violation by construction was found.

2) GARBLT requested JICA to undertake GARBLT portion because of technical difficulty (no experience, need Japanese expertise, financial difficulty, probably can not conduct).

=> JICA will accept it on the following conditions;

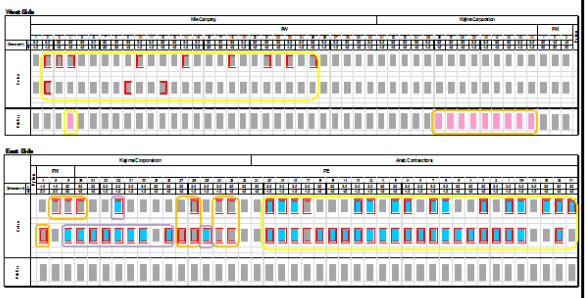
- Repair work to be conducted with proactive involvement and OJT of GARBLT officials, and
- Subsequent maintenance work to be committed by GARBLT.

3) Kajima offers that they repair damaged portion.

(2) Demarcation of Repair(3/3)

Final

Sponsor of Original Construction	GOJ	GOJ	GOE
Implementing Organization for Repair	JICA	Kajima Corporation	JICA
Refill of Repair Material	0 piers	10 piers (Damaged)	36 piers
Repair of Crack	9 pile caps	0 pile caps	1 pile caps
Protection to Concrete Surface (Option 2)	11 piers	10 piers	50 piers
Cost (Draft)	0.11 Million USD (0.7 Million EGP)	0.09 Million USD (0.5 Million EGP)	0.53 Million USD (3 Million EGP)

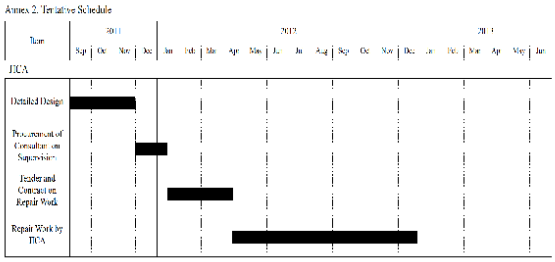


Refill of Repair Material Repair of Crack Protection to Concrete

JICA Kajima Corporation GARBLT => JICA

7. Work Schedule (Tentative)

Annex 2 Tentative Schedule



8. Recommendation for Operation and Maintenance

Method of Inspection

Object	To be inspected	Method of Inspection	Maintenance period
Concrete (Damage, Deterioration)	Efflorescence	Visual inspection	Daily/Periodical (every year)
	Delamination	Test hammering	Periodical (every five year)
	Carbonation	Chipping	Periodical (every five year)
	Chloride content	Drilling, Coring	Periodical (every five year)
	Generation of cracks	Crack scale	Periodical (every five year)
Reinforcement (Corrosion)	Rate of corrosion	Chipping, Half-cell potential	Special/Emergency