MEMO

Date: 4 June 2014

To: Messrs. YCDC Head Office and Site Office

From: LWTP Advisory Team dispatched by JICA

Subject:

JICA Assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Safety – Temporary Electrical Circuit

Further to the tragic incident happened in Nyunghnabyin on 30 May 2014, may we remind you that Safety on Site is the paramount objective for all stakeholders including staff and labours.

In order to improve your safety standard of the project (Lagunbyin Water Treatment Construction) we would like to draw your attention particularly to the temporary electrical circuit on site. Because the power supply to electrical tools connected by cables on the ground without switch boards, circuit breakers or waterproof plugs in rainy season has always potential risks of short circuit to the bare feet workers. Hence a serious incident could be happened at any time.

Temporary electrical wiring in Lagunbyin
NOT acceptable

Switch board

Waterproof plugs
Recommended to use on site

We should appreciate very much if you could spend a time for the temporary power supply and improve the standard of Safety on Site.

Yours Faithfully,

Signed by Akiba J

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Akiba J

Safety Check Record for the Lot 1 Project

Pre TEST

Date; 6 Oct	Location;	Kind of works;
Checker; PyiKyaw Hein		Witness; Zin Min Latt

No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	not	Need for wearing
	(b) Wear	Neat for work or not	Not	Need
	(c) Footwear	Neat for work or not	Not	need
2	With Heavy Machineries Work : Earth Work			
	(a)Maintenance	Implementation or not for all machines	Good	
	(b)Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
3	Earth Work			
	(a)Inclination	Protection for erosion	Good	
	(b)Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
4	Spruce-up of site		Good	But some place are needed to clean nail and wood
5	Prevention measures for third party incident		Good	
6	Emergency case			
	Provision or not	Preparation of First aid kit	Not	Not only all of the site people haven't not but also each group have
		Emergency contact network	Not	They haven't show contact ph number , so , I was suggested prepare for this informatoion
7	Others			

Safety Check Record for the Lot 1 Project

Date;9-10-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; PyiKyaw Hein			Witness; Zin Min Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	not	Need for wearing
	(b) Wear	Neat for work or not	Not	Need
	(c) Footwear	Neat for work or not	Not	need
2	With Heavy Machineries Work : Earth Work			
	(a)Maintenance	Implementation or not for all machines	Good	
	(b)Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
3	Earth Work			
	(a)Inclination	Protection for erosion	Good	
	(b)Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
4	Spruce-up of site		Good	
5	Prevention measures for third party incident		Good	
6	Emergency case			
	Provision or not	Preparation of First aid kit	Not	Need to work that next week I suggest to make
		Emergency contact network	Not	Find not ready to show emergency contact
7	Others			

Safety Check Record for the Lot 1 Project

Date;13-10-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; PyiKyaw Hein			Witness; Zin Min Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	not	Need for wearing
	(b) Wear	Neat for work or not	Not	Need for wearing
	(c) Footwear	Neat for work or not	Not	Need for wearing
2	With Heavy Machineries Work : Earth Work			
	(a)Maintenance	Implementation or not for all machines	Good	
	(b)Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
3	Earth Work			
	(a)Inclination	Protection for erosion	Good	
	(b)Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
4	Spruce-up of site		Good	
5	Prevention measures for third party incident		Good	
6	Emergency case			
	Provision or not	Preparation of First aid kit	Not	Need to work that next week I suggest to make
		Emergency contact network	Not	Find not ready to show emergency contact
7	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;20-10-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Zin Min Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Not	Need for wearing
	(b) Wear	Neat for work or not	Not	Need for wearing
	(c) Footwear	Neat for work or not	Not	Need for wearing
2	High place work	Height of position H= 8.45 m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Need	Need the platform for workers to safe and get workability
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Middle	Some place , nails are not safe to walk .
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Spruce-up of site		Good	
6	Prevention measures for third party incident		Good	
7	Emergency case			
	Provision or not	Preparation of First aid kit	Not	Need to work that next week I suggest to make it
		Emergency contact network	Not	Find not ready to show emergency contact
8	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;29-10-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Zin Min Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Not	Need for wearing
	(b) Wear	Neat for work or not	Not	Need for wearing
	© Footwear	Neat for work or not	Not	Need for wearing
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Improve	Some place are need to make platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Spruce-up of site		Good	
6	Prevention measures for third party incident		Good	
7	Emergency case			
	Provision or not	Preparation of First aid kit	Not	Need to work that next week I suggest to make it
		Emergency contact network	Not	Find not ready to show emergency contact
8	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;7-11-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Mr Tun Tun Hlaing	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Improve	Some people are need to wear
	(b) Wear	Neat for work or not	Not	Need for wearing
	© Footwear	Neat for work or not	Improve	Some people are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Improve	Some place are need to make platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Need	But they were made to safety in the site
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Not	Need to work that next week I suggest to make it
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;11-11-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Mr Tun Tun Hlaing	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Improve	Some place are need to make platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Not	Need to work that next week I suggest to make it
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;20-11-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Mr Zin Min Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Improve	Some place are need to make platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	A few place are need to hold nail at formwork for safety
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	They were prepare of first aid kit
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;26-11-2014	Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,		
Checker; Pyi Kyaw Hein		Witness; Mr Zin Min Latt		
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Improve	Some place are need to make platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	Some places are need to hold nail at formwork for safety
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;12 -12-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Mr Zin Min Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;19 -12-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Mr Zin Min Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	Some places are needed to clean weir nail
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;23 -12-2014		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Mr Zin Min Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	Some places are needed to clean weir nail and woods
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;2 -1-2015		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Mr Tun Tun Hlaing	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;7 -1-2015		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars ,	
Checker; Pyi Kyaw Hein			Witness; Mr Tun Tun Hlaing	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	But now, they are met bed earth sliding in lift pump and they try to protect this sliding by good facilities
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;14 -1-2015		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars , safe for worker	
Checker; Pyi Kyaw Hein			Witness; Mr Zin Minn Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	They have made enough sheet pile to protect erosion and they were stop erosion.
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			The temporary ladder is not safe to climb and down because it is not install railing.

Safety Check Record for the Lagunbyin WTP Project

Date;20 -1-2015		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars , safe for worker	
Checker; Pyi Kyaw Hein			Witness; Mr Zin Minn Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	But they were made to safety in the site
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;27 -1-2015		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars , safe for worker	
Checker; Pyi Kyaw Hein			Witness; Mr Zin Minn Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work	Height of position H= m		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	Need some place to safe
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			Improve concreting work, re-bars and maintain work of structure and platform

Safety Check Record for the Lagunbyin WTP Project

Date;4-2-2015	Location; Lagunbyin WTP	Kind of works; Formwork , re-bars , safe for worker		
Checker; Pyi Kyaw Hein		Witness; Mr Zin Minn Latt		
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work m	Height of position H= 10.5 and 8.4		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	Need some place to safe
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	Find not ready to show emergency contact
9	Others			Improve safety work in site and quality control

Safety Check Record for the Lagunbyin WTP Project

Date;10-2-2015		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars , safe for worker	
Checker; Pyi Kyaw Hein			Witness; Mr Than Win	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work m	Height of position H= 10.5 and 8.4		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	Need some place to safe
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	
9	Others			Take care some place for formwork.

Safety Check Record for the Lagunbyin WTP Project

Date;17-2-2015	Location; Lagunbyin WTP	Kind of works; Formwork , re-bars , safe for worker		
Checker; Pyi Kyaw Hein		Witness; Mr Saw That Naing Win		
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	Some workers are need to wear
2	High place work m	Height of position H= 10.5 and 8.4		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	Need some place to safe
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	
9	Others			

Safety Check Record for the Lagunbyin WTP Project

Date;24-2-2015		Location; Lagunbyin WTP	Kind of works; Formwork , re-bars , safe for worker	
Checker; Pyi Kyaw Hein			Witness; Mr Than Win, Mr Zin Minn Latt	
No.	Item	Check Point	Findings	Response/Comment
1	Worker's gear			
	(a) Helmet	Wearing or not	Good	
	(b) Wear	Neat for work or not	Good	
	© Footwear	Neat for work or not	Good	
2	High place work m	Height of position H= 10.5 and 8.4		
	(a) Workers	Appropriateness of skill.	Good	
	(b)Vertical works	Abidance of the prohibition works.	Good	They are making enough and good platform
	(c) Scaffolding	Appropriateness of facility.	Good	
	(d)Neglected materials	Spruce-up. (for fear of drop down from high place)	Good	
3	With Heavy Machineries Work : Earth Work			
	(a) Maintenance	Implementation or not for all machines	Good	
	(b) Handling tools	Appropriateness of the materials (strength enough)	Good	
	(c)Working position	Ground stability & appropriateness of the posturing	Good	
	(d)Working signal	Appropriateness of the cue between operator and worker	Good	
4	Earth Work			
	(a) Inclination	Protection for erosion	Good	
	(b) Dewatering	Working conditions	Good	
	-'do -	Wiring for pumps	Good	
5	Electrical work		Improve	Need some place to safe
6	Spruce-up of site		Good	
7	Prevention measures for third party incident		Good	
8	Emergency case			
	Provision or not	Preparation of First aid kit	Good	
		Emergency contact network	Not	
9	Others			

Maintenance Works before Full-Scale Operation

12 December 2016

JICA Advisor

1. Purpose

Lagunbyin Water Treatment Plant shall be maintained without operation for a few years until full-scale operation.

The maintenance works are to keep major equipment in better conditions until the Full-Scale operation.

2. Maintenance Works for Major Equipment

A. Mechanical Equipment

2-1. Intake Pump Station

a. Main Pump/Motor

(Pumps shall be disconnected from the motor to prevent damaging mechanical seals.)

No.	Maintenance Task	Weekly	Annually
1	Run all motor for 5-10 minutes	○	
2	Check/record motor current	○	
3	Check motor body/bearing temperature	○	
4	Check ventilation condition	○	
5	Check motor operating noise	○	
6	Check motor vibration	○	
7	Check any strange smell coming from the motor	○	
8	Check any damage/crack on the motor	○	
9	Check the tightening bolts of pump/motor		○
10	Check insulation resistance of motor		○
11	Make-up or replace grease of bearing		○
12	Check mechanical seal of pump		○

b. Motorized Butterfly Valve

No.	Maintenance Task	Weekly	Annually
1	Open/Close all Valves	○	
2	Check valve operating noise	○	
3	Check valve operating vibration	○	
4	Check actuator operating noise	○	
5	Check actuator operating vibration	○	
6	Check insulation resistance of valve actuator		○
7	Check Change-over mechanism of hand wheel		○

2-2. Lift Pump Station

a. Main Pump/Motor

(Pumps shall be disconnected from the motor to prevent damaging mechanical seals.)

No.	Maintenance Task	Weekly	Annually
1	Run all motor for 5-10 minutes	○	
2	Check/record motor current	○	
3	Check motor body/bearing temperature	○	
4	Check ventilation condition	○	
5	Check motor operating noise	○	
6	Check motor vibration	○	
7	Check any strange smell coming from the motor	○	
8	Check any damage/crack on the motor	○	
9	Check the tightening bolts of pump/motor		○
10	Check insulation resistance of motor		○
11	Make-up or replace grease of bearing		○
12	Check mechanical seal of pump		○

b. Motorized Butterfly Valve

No.	Maintenance Task	Weekly	Annually
1	Open/Close all Valves	○	
2	Check valve operating noise	○	
3	Check valve operating vibration	○	
4	Check actuator operating noise	○	
5	Check actuator operating vibration	○	
6	Check insulation resistance of valve actuator		○
7	Check Change-over mechanism of hand wheel		○

2-3. Filter

a. Motorized Butterfly Valve

No.	Maintenance Task	Weekly	Annually
1	Open/Close all Valves	○	
2	Check valve operating noise	○	
3	Check valve operating vibration	○	
4	Check actuator operating noise	○	
5	Check actuator operating vibration	○	
6	Check insulation resistance of valve actuator		○
7	Check Change-over mechanism of hand wheel		○

b. Backwash Water Pump

No.	Maintenance Task	Weekly	Annually
1	Run all pump/motor for 5-10 minutes	○	
2	Check/record motor current	○	
3	Check pump/motor bearing temperature	○	
4	Check pump/motor vibration	○	
5	Check pump/motor operating noise	○	
7	Check any strange smell coming from the motor	○	
6	Check insulation resistance of motor		○
7	Check grand packing of pump		○

c. Air Blower

(Discharge Valve and Air Valve shall be open for Air Blower operation to prevent Air Blower overloading.)

No.	Maintenance Task	Weekly	Annually
1	Open discharge valve	○	
2	Run all blower/motor for 5-10 minutes	○	
3	Check/record motor current	○	
4	Check blower/motor bearing temperature	○	
5	Check blower/motor vibration	○	
6	Check blower/motor operating noise	○	
7	Check leakage of lubricant	○	
8	Check any strange smell coming from the motor	○	
9	Check insulation resistance of motor		○
10	Check tension of V-belt		○
11	Clean suction air filter		○
12	Make-up or replace lubricant		○

B. Electrical Equipment

2-4. Intake Pump Station

a. Main Panel, Distribution Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Power indication lamp check	○		
3	Voltage and current check	○		
4	ACB status check	○		
5	Interior visual check		○	
6	MCCB status check		○	
7	Visual check of the wiring			○
8	Visual check of status of the devices			○

b. Pump Starter Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Power indication lamp check	○		
3	Voltage and current check	○		
4	Annunciator check	○		
5	Indication lamp check	○		
6	Interior visual check		○	
7	Visual check of the wiring			○
8	Visual check of status of the devices			○

c. Pump Control Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	HMI Indication check	○		
3	Indication Lamp check	○		
4	Lamp test check		○	
5	Interior visual check		○	
6	Visual check of the wiring			○
7	Visual check of status of the devices			○

d. Flow Meter

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior of Main Unit visual check	○		
2	Indication of Main Unit check	○		

3	Flow Rate Indication check (PCP)	○		
4	Exterior of Transducer (Sensor) visual check (FM Chamber)		○	
5	Check of Transducer installation			○

e. Water Level Switch (Pump Pit)

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior of Electrode visual check	○		
2	Selector Switch check (Tank 1 or Tank 2)	○		

f. Water Level Transmitter (river)

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Water Level Indication check (PCP)	○		

2-5. Lift Pump Station

a. Main Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Power indication lamp check	○		
3	Voltage and current check	○		
4	Main CB status check	○		
5	Interior visual check		○	
6	MCCB status check		○	
7	Visual check of the wiring			○
8	Visual check of status of the devices			○

b. Pump Starter Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Power indication lamp check	○		
3	Voltage and current check	○		
4	Annunciator check	○		
5	Indication lamp check	○		
6	Interior visual check		○	
7	Lamp test check		○	
8	Visual check of the wiring			○
9	Visual check of status of the devices			○

c. Distribution Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Power indication lamp check	○		
3	Main MCCB trip lamp			
4	Voltage and current check	○		
5	Interior visual check		○	
6	MCCB status check		○	
7	Visual check of the wiring			○
8	Visual check of status of the devices			○

d. Water Level Indicator Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Indication lamp check	○		
3	Selector Switch check	○		
4	Interior visual check		○	
5	Visual check of the wiring			○
6	Visual check of status of the devices			○

e. Water Level Switch

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		

f. Common Item

No.	Maintenance Task	Weekly	Monthly	Annually
1	Measuring of grounding resistance			○
2	Measuring of insulation resistance for all the electrical equipment			○

2-6. Filter

a. 400V Main Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Power indication lamp check	○		
3	Voltage and current check	○		
4	Interior visual check		○	
5	MCCB status check		○	
6	Visual check of the wiring			○

7	Visual check of status of the devices			○

b. Valve Starter Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Power indication lamp check	○		
3	Voltage and current check	○		
4	Indication lamp & MCCB check	○		
5	Interior visual check		○	
6	Visual check of the wiring			○
7	Visual check of status of the devices of each unit			○

c. Filter Local Control Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Indication lamp check	○		
3	Interior visual check(including fan)		○	
4	Indication lamp check of PLC local unit		○	
5	Visual check of the wiring			○
6	Visual check of status of the devices			○

d. Filter Control Panel

No.	Maintenance Task	Weekly	Monthly	Annually
1	Exterior visual check	○		
2	Power indication lamp check	○		
3	Fault lamp, Emergency lamp check	○		
6	Interior visual check (including fan)		○	
7	Alarm check of LCD unit		○	
8	Indication lamp of PLC check		○	
9	Visual check of the wiring			○
10	Visual check of status of the devices			○

e. Common Item

No.	Maintenance Task	Weekly	Monthly	Annually
1	Measuring of grounding resistance			○
2	Measuring of insulation resistance for all the electrical equipment			○

Weekly Record (Mechanical - Sample)

1-1. Intake Pump Station

a. Main Pump/Motor

(Pumps are disconnected from the motor to prevent damaging mechanical seals.)

[Pump No.]

No.	Maintenance Task	Check	Comment
1	Run all motor for 5-10 minutes		
2	Check/record motor current		
3	Check motor body/bearing temperature		
4	Check ventilation condition		
5	Check motor operating noise		
6	Check motor vibration		
7	Check any strange smell coming from the motor		
8	Check any damage/crack on the motor		

b. Motorized Butterfly Valve

[Pump No.]

No.	Maintenance Task	check	Comment
1	Open/Close all Valves		
2	Check valve operating noise		
3	Check valve operating vibration		
4	Check actuator operating noise		
5	Check actuator operating vibration		

1-2. Lift Pump Station

c. Main Pump/Motor

(Pumps are disconnected from the motor to prevent damaging mechanical seals.)

[Pump No.]

No.	Maintenance Task	Check	Comment
1	Run all motor for 5-10 minutes		
2	Check/record motor current		
3	Check motor body/bearing temperature		
4	Check ventilation condition		
5	Check motor operating noise		
6	Check motor vibration		
7	Check any strange smell coming from the motor		
8	Check any damage/crack on the motor		

d. Motorized Butterfly Valve

[Pump No.]

No.	Maintenance Task	check	Comment
1	Open/Close all Valves		
2	Check valve operating noise		
3	Check valve operating vibration		
4	Check actuator operating noise		
5	Check actuator operating vibration		

1-3. Filter

a. Motorized Butterfly Valve

[Filter No.]

[Inlet Valve] **[Outlet Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves				
2	Check valve operating noise				
3	Check valve operating vibration				
4	Check actuator operating noise				
5	Check actuator operating vibration				

[Air Valve] **[BW Water Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves				
2	Check valve operating noise				
3	Check valve operating vibration				
4	Check actuator operating noise				
5	Check actuator operating vibration				

[Drain Valve] **[Others]**

No.	Maintenance Task	Check	Comment	Comment
1	Open/Close all Valves			
2	Check valve operating noise			
3	Check valve operating vibration			
4	Check actuator operating noise			
5	Check actuator operating vibration			

b. Backwash Water Pump

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Run all pump/motor for 5-10 minutes				
2	Check/record motor current				
3	Check pump/motor bearing temperature				
4	Check pump/motor vibration				
5	Check pump/motor operating noise				
7	Check any strange smell coming from the motor				

c. Air Blower

(Discharge Valve and Air Valve shall be open for Air Blower operation to prevent Air Blower overloading.)

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Open discharge valve/air valve				
2	Run all blower/motor for 5-10 minutes				
3	Check/record motor current				
4	Check blower/motor bearing temperature				
5	Check blower/motor vibration				
6	Check blower/motor operating noise				
7	Check leakage of lubricant				
8	Check any strange smell coming from the motor				

Weekly Record (Electrical – Sample)

2-1. Intake Pump Station

a. Main Panel, Distribution Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)		
2	Power indication lamp check		
3	Voltage and current check	R-S V S-T V T-S V R A S A T A	
4	ACB status check (On/Off/Trip)		

b. Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	No.4	No.5	No.6
1	Exterior visual check (Damage, Smell, etc.)						
2	Power indication lamp check (R-S-T)						
3	Voltage (S-T phase)	/ V	/ V	/ V	/ V	/ V	/ V
	Current (S- phase)	A	A	A	A	A	A
	Power	kW	kW	kW	kW	kW	kW
4	Annunciator check						
5	Indication lamp check (ON/OFF,OPEN/CLOSE,FAULT Indication)						
Comment							

c. Pump Control Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)		
2	HMI Indication		
3	Indication lamp check		

d. Flow Meter

No.	Maintenance Task	Result	Comment
1	Main Unit Exterior visual check (Damage, Indication, etc.)		
2	Flow Rate Indication check (PCP)		

e. Water Level Switch

No.	Maintenance Task	Result	Comment
1	Exterior of Electrode visual check		
2	Selector Switch check (Tank 1 or Tank 2)		

f. Water Level Transmitter

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)		
2	Water Level Indication on PCP HMI		

2-2. Lift Pump Station

a. Main Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)		
2	MCCB status check (ON/OFF/TRIP)		

b. Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	No.4	No.5	No.6
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)						
2	Lamp test check						
Comment							

c. Distribution Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)		
2	MCCB status check (ON/OFF/TRIP)		

d. Water Level Indicator Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)		

2-3. Filter [No.]

a. 400V Main Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)		
2	MCCB status check (ON/OFF/TRIP)		

b. Valve Starter Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)		

c. Filter Local Control Panel

No.	Maintenance Task	1-1	1-2	1-3	1-4	1-5	1-6
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)						
2	Indication lamp check of PLC local unit						
No.	Maintenance Task	1-7	1-8	1-9	1-10	1-11	1-12
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)						
2	Indication lamp check of PLC local unit						
Comment							

2-2 Filter [No.]

a. 400V Main Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)		
2	Power indication lamp check		
3	Voltage and current check	R-S V S-T V T-S V R A S A T A	

b. Valve Starter Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)		
2	Power indication lamp check		
3	Voltage (S-T phase) V Current (S- phase) A		
4	Indication lamp & MCCB check for each unit		

c. Filter Local Control Panel

No.	Maintenance Task	1-1	1-2	1-3	1-4	1-5	1-6
1	Exterior visual check (Damage, Smell, etc.)						
2	Indication lamp check (OPEN/CLOSE/FAULT, ON/OFF etc.)						
No.	Maintenance Task	1-7	1-8	1-9	1-10	1-11	1-12
1	Exterior visual check (Damage, Smell, etc.)						
2	Indication lamp check (OPEN/CLOSE/FAULT, ON/OFF etc.)						
Comment							

d. Filter Control Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)		
2	Power indication lamp check		
3	Fault lamp, Emergency lamp check		

e. Backwash Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Exterior visual check (Damage, Smell, etc.)				
2	Power indication lamp check				
3	Voltage (S-T phase) Current (S- phase)	V A	V A	V A	

f. Backwash Pump Local Control Panel

No.	Maintenance Task	Result	comment
1	Exterior visual check		
2	Annunciator check		

g. Air Blower Starter Panel

No.	Maintenance Task	No.1	No.2	Comment
1	Exterior visual check (Damage, Smell, etc.)			
2	Power indication lamp check			
3	Voltage (S-T phase) Current (S- phase)	V A	V A	

h. Air Blower Local Control Panel

No.	Maintenance Task	Result	comment
1	Exterior visual check		
2	Annunciator check		

Capacity Development On Construction Of Lagunbyin Water Treatment Plant Under Greater Yangon Water Supply Improvement Project

Training course for Operation Work

Site Meeting Room (9-12-2016)

No	Name	Designation	Sign
	JICA		
1	Mr Koichi Naoi	Electrical Engineer	
2	Mr Shinichi Osaka	Mechanical Engineer	
3	Mr Pyi Kyaw Hein	Assistant Engineer	
	YCDC		
1	Mr Thit Lwin	SAE (Electrical Engineer)	
2	Mr Min Yan Htet	Work Check (Electrical)	
3	Mr Thet Yan Paing Oo	Work Check (Electrical)	
4	Mr Aung Ko Ko Win	SAE(Mechanical Engineer)	
5	Mr Aung Mor Kyaw	SAE(Mechanical Engineer)	
6	Mr Phone Thet Naing	SAE (Mechanical Engineer)	
	Contractors		
1	Mr Aung Si Hein	Han Sein Thant Co.,Ltd	
2	Mr Aye Lwin	*	
3	Mr Aung Kyaw Naing	Machinery & Solution	
4	Mr Tin Myint	*	
5	Mr Htay Aung	*	
6	Mr Win Hlaing	SWTS	
	Mr Min Thu Naing	*	

Date: 05 July 2017

Maintenance works before Full-Scale Operation

Weekly Record (Mechanical)

(1) Rapid Sand Filter (1)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✗	✓	✓
4	✓	✓	✗	✓	✓
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✗
8	✓	✓	✓	✓	✗
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓

Comment

(1) No (3 & 4) Drain valves cannot operate by control and manual.
(2) No (7 & 8) Air valves cannot operate by control and can operate by manual.

(3) Air Blower

No (2) Air blower has stopped just a moment after starting operate.

(2) Rapid Sand Filter (2)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✓
2	✓	✗	✓	✓	✓
3	✓	✓	✗	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✗
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✗
8	✓	✓	✓	✓	✗
9	✓	✓	✓	✓	✓
10	✓	✗	✗	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓

Comment

(1) In outlet main panel for no (2), switch is not operating to open and close.

(2) To open drain valve for no (3), it is showing fault signal and it cannot be operate by control and can only manual.

(3) In air valve of no (5), it can operate to open and it is not fully close which it can close half.

(4) In outlet valve of no (10), main panel is not showing open signal but it can operate of all.

(5) In outlet valve of no (11), it is not rotate shaft to operate open and close. In drain valve, main panel is showing open and close signals at the same time.

Date: 14 July 2017

Maintenance works before Full-Scale Operation

Weekly Record (Mechanical) (14-7-2017)

(1) Rapid Sand Filter (1)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✗	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✗
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓

Comment

(1) No (3) Drain valves has not work shaft although motor operate.
(2) No (8) Air valves, it is not show signal (open and close) of limit switch.

(2)Rapid Sand Filter (2)

Valve / Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✗	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✗
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✗	✗	✓	✓
12	✗	✓	✓	✓	✓

Comment

(1) In no (3) drain valve, open signal has not shown on LFCP board of panel.

(2) In no (5) air valve, open signal has not shown on LFCP board of panel.

(3) In no (11) outlet valve, shaft has not worked.
In no (11) drain valve, open and close signal are showing together at the same time. It is need to check limit switch.

(4) In inlet valve no (12), although motor has operated but valve has not operated.

Maintenance works before Full-Scale Operation

Weekly Record (Mechanical) (21-7-2017)

(1) Rapid Sand Filter (1)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✗
2	✓	✓	✓	✓	✗
3	✓	✓	✗	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✗
6	✓	✓	✓	✓	✗
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✗
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓

Comment

(1) No (1,2,5,6,8) air valves have not fully close and they have leakage.
(2) No (3) Drain valve has not work shaft although motor has work.
(3) No(5) Air valve also has not work shaft although motor has work.
(4) No (8) Air valve also has not work shaft although motor has work.
(5) Blower pump no (2) has breaker down while test operate and then it is operate reverse.

(2)Rapid Sand Filter (2)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✗
2	✓	✓	✓	✓	✗
3	✗	✓	✗	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✗
6	✓	✓	✓	✗	✗
7	✓	✓	✓	✓	✗
8	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✗
10	✗	✓	✓	✓	✓
11	✓	✗	✗	✓	✗
12	✗	✓	✓	✓	✗

Comment

(1) No (1,2,6,7,9,11) air valves have not fully close.

(2) No (3,10) inlet valves have not fully close.

(3) No (12) inlet valve has not work although motor has done.

(4) No (11) outlet and drain valve has not work shaft although motor has done.

(5) No (3) drain valve has not work shaft although motor has done.

(6) No (5) air valve also has not work shaft although motor has done.

(7) No (6) back wash valve has not work shaft although motor has done.

(8) No (7) panel has not good situation of switch of blower, backwash and open and close signal are not showing.

(9) Backwash pump no (3) has not operate and it is showing signal of over load trip.

Date: 3 August 2017

Maintenance works before Full-Scale Operation

Weekly Record (Mechanical) (3-8-2017)

(1) Rapid Sand Filter (1)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✗	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✗
6	✓	✓	✓	✓	✓
7	✓	✓	✗	✓	✓
8	✓	✓	✓	✓	✗
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓

Comment

(1) No (3) drain valve has not work shaft although motor has work.
(2) No (7) drain valve on main board slide, indicator signal has shown always.
(3) No(5) Air valve also has not work shaft although motor has work.
(4) No (8) Air valve also has not work shaft although motor has work.
(5) LFCP breaker and FCP breaker have trip and also spare breaker have trip.

(2)Rapid Sand Filter (2)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✗	✓	✗	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓

Comment

(1) No (3) drain valve, pinion has damage and so the contractor ordered new one from local industrial zone.

(2) No (3) inlet valve, rubber seal has not good situation and so, it is need to replace new one.

(3) No (11) drain valve, limit switch has not worked well and so, the contractor has done repair.

(4) Back wash pump no (3) has often over load trip.

(5) Blower no (1) has down breaker.

(6) Blower no (2) has appeared sound. YCDC contacted Han Sein Thant to check again.

Date: 14 August 2017

Maintenance works before Full-Scale Operation

Weekly Record (Mechanical) (14-8-2017)

(1) Rapid Sand Filter (1)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓

Comment

(1) Breakers in Main Panel have not good situation and these are trip.

(2)Rapid Sand Filter (2)

Valve Panel	Inlet valves	Outlet valves	Drain valves	Backwash valves	Air valves
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✗	✓	✓	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓

Comment

(1)No (3) inlet valve, rubber seal has not good situation and so, it is need to replace new one.

(1) Blower no (1) has down breaker when start to operate.

(2) Blower no (2) has sound appear inside. YCDC contacted Han Sein Thant to check again.

Weekly Record (Mechanical) (27-10-2017)

1-1. Lift Pump Station

a. Main Pump/Motor

(Pumps are disconnected from the motor to prevent damaging mechanical seals.)

[Pump No.]

No.	Maintenance Task	Check	Comme
1	Run all motor for 5-10 minutes	1,2,3,4,5&6	No-1 pump over start fault, No-3 pump fault & ELR trip, No-5 pump fault
2	Check/record motor current	〃	175 A
3	Check motor body/bearing temperature	〃	Normal
4	Check ventilation condition	〃	Normal
5	Check motor operating noise	〃	Normal
6	Check motor vibration	〃	Normal
7	Check any strange smell coming from the motor	〃	Normal
8	Check any damage/crack on the motor	〃	Normal

b. Motorized Butterfly Valve

[Pump No.]

No.	Maintenance Task	check	Comment
1	Open/Close all Valves	1,2,3,4,5&6	Normal
2	Check valve operating noise	〃	Normal
3	Check valve operating vibration	〃	Normal
4	Check actuator operating noise	〃	Normal
5	Check actuator operating vibration	〃	Normal

2-1. Filter

a. Motorized Butterfly Valve

[Filter No. 2]

[Inlet Valve] **[Outlet Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	-	1 to 12	No-12 has not operate shaft
2	Check valve operating noise	〃	No-7 has appeared noise sound	〃	No-8 has appeared noise sound
3	Check valve operating vibration	〃	No-8 has moving base	〃	No-9 has moving base
4	Check actuator operating noise	〃	Normal	〃	Normal
5	Check actuator operating vibration	〃	Normal	〃	Normal

[Air Valve] **[BW Water Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	No-12 fault signal	1 to 12	Normal
2	Check valve operating noise	〃		〃	
3	Check valve operating vibration	〃		〃	
4	Check actuator operating noise	〃		〃	
5	Check actuator operating vibration	〃		〃	

[Drain Valve] **[Others]**

No.	Maintenance Task	Check	Comment	Comment
1	Open/Close all Valves	1 to 12	No-9 ,12 has fault signal	
2	Check valve operating noise		No-7 has appear noise sound from shaft	
3	Check valve operating vibration		No-8 has moving base	
4	Check actuator operating noise		Normal	
5	Check actuator operating vibration		Normal	

b. Backwash Water Pump

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Run all pump/motor for 5-10 minutes	Normal	Normal	Normal	
2	Check/record motor current	23A	23A	23A	
3	Check pump/motor bearing temperature	Normal	Normal	Normal	
4	Check pump/motor vibration	Normal	Normal	Normal	
5	Check pump/motor operating noise	Normal	Normal	Normal	
7	Check any strange smell coming from the motor	Normal	Normal	Normal	

c. Air Blower

(Discharge Valve and Air Valve shall be open for Air Blower operation to prevent Air Blower overloading.)

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Open discharge valve/air valve				When Blower has started run , Ampere is increase and MCCB trip.
2	Run all blower/motor for 5-10 minutes				
3	Check/record motor current				
4	Check blower/motor bearing temperature				
5	Check blower/motor vibration				
6	Check blower/motor operating noise				
7	Check leakage of lubricant				
8	Check any strange smell coming from the motor				

Weekly Record (Electrical)

1-1.Lift Pump Station

a. Main Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check		
3	Voltage and current check	R-S 420 V S-T 420 V R - A S - A T - A	It is need to check Ammeter.
4	Main CB status check (On/Off/Trip)		

b. Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	No.4	No.5	No.6
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Power indication lamp check (R-S-T)	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal
3	Voltage (S-T phase)	- V	420 V	- V	420 V	- V	420 V
	Current (S- phase)	- A	175 A	- A	175 A	- A	175 A
4	Announciator check	Normal	Normal	Normal	Normal	Normal	Normal
5	Indication lamp check (ON/OFF,OPEN/CLOSE,POWER ON)	Normal	Normal	Normal	Normal	Normal	Normal
Comment		Cannot run because has fault		Cannot run because has fault		Cannot run because has fault	

c. Distribution Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	N	
2	Power indication lamp check	S.Phase pilot lamp has not shown signal	
3	Voltage (S-T phase) Current (S- phase)	420 V - A	It is need to check Ammeter .
4	Main MCCB trip lamp		

d. Water Level Indicator Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Indication lamp check (HWL,LWL,LLWL)	Normal	
3	Selector Switch check (Tank 1 or Tank 2)	Normal	

e. Water Level Switch

No.	Maintenance Task	Result	Comment
1	Exterior visual check	Normal	

2-1 Filter [No. 2]

a. 400V Main Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check	Normal	
3	Voltage and current check	R-S 420V S-T 420 V T-S 420 V R 0 A S 0 A T 0 A	

b. Valve Starter Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check	Normal	
3	Voltage (S-T phase) Current (S- phase)	420 V 0 A	
4	Indication lamp & MCCB check for each unit	Normal	

c. Filter Local Control Panel

No.	Maintenance Task	1-1	1-2	1-3	1-4	1-5	1-6
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Indication lamp check (OPEN/CLOSE/FAULT, ON/OFF etc.)	Normal	Normal	Normal	Normal	Normal	Normal
No.	Maintenance Task	1-7	1-8	1-9	1-10	1-11	1-12
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Indication lamp check (OPEN/CLOSE/FAULT, ON/OFF etc.)	Normal	Normal	Normal	Normal	Normal	Normal
Comment							

d. Filter Control Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check	Normal	
3	Fault lamp, Emergency lamp check	Common fault	

e. Backwash Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal			
2	Power indication lamp check	Normal			
3	Voltage (S-T phase) Current (S- phase)	420 V 23 A	V A	V A	

f. Backwash Pump Local Control Panel

No.	Maintenance Task	Result	comment
1	Exterior visual check	Normal	
2	Announciator check	Normal	

g. Air Blower Starter Panel

No.	Maintenance Task	No.1	No.2	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	
2	Power indication lamp check	Normal	Normal	
3	Voltage (S-T phase) Current (S- phase)	420 V A	420 V A	YCDC cannot see Ampere because Ampere has increased sudden and has done MCCB trip.

h. Air Blower Local Control Panel

No.	Maintenance Task	Result	comment
1	Exterior visual check	Normal	
2	Announciator check	Normal	

3-1. Filter

a. Motorized Butterfly Valve

[Filter No. 1]

***** YCDC has been doing installation work of nozzle strainers and so, they cannot doing back wash pump maintenance test operation for Filter No.1**

[Inlet Valve] **[Outlet Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	Normal	1 to 12	Normal
2	Check valve operating noise	〃	Normal	〃	Normal
3	Check valve operating vibration	〃	Normal	〃	Normal
4	Check actuator operating noise	〃	Normal	〃	Normal
5	Check actuator operating vibration	〃	Normal	〃	Normal

[Air Valve] **[BW Water Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	No-8 fault signal	1 to 12	Normal
2	Check valve operating noise	〃	Normal	〃	Normal
3	Check valve operating vibration	〃	Normal	〃	Normal
4	Check actuator operating noise	〃	Normal	〃	Normal
5	Check actuator operating vibration	〃	Normal	〃	Normal

[Drain Valve] **[Others]**

No.	Maintenance Task	Check	Comment	Comment
1	Open/Close all Valves	1 to 12	Normal	Although motors of valves can operate, Outlet valves (1,7,9,10,11,12), Inlet valves (2,6,8,9), Drain valves (5,6,8,12) and Air valves (9,11) are not fully close and they have leakage.
2	Check valve operating noise		No-6 drain valve has appeared sound	
3	Check valve operating vibration		No-7 drain valve shaft has moving	
4	Check actuator operating noise		Normal	
5	Check actuator operating vibration		Normal	

b. Backwash Water Pump

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Run all pump/motor for 5-10 minutes	-	-	-	
2	Check/record motor current	-	-	-	
3	Check pump/motor bearing temperature	-	-	-	
4	Check pump/motor vibration	-	-	-	
5	Check pump/motor operating noise	-	-	-	
7	Check any strange smell coming from the motor	-	-	-	

c. Air Blower

(Discharge Valve and Air Valve shall be open for Air Blower operation to prevent Air Blower overloading.)

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Open discharge valve/air valve	Normal	Normal	Normal	
2	Run all blower/motor for 5-10 minutes	Normal	Normal	Normal	
3	Check/record motor current	-	-	-	It is need to check ammeter of blower.
4	Check blower/motor bearing temperature	Normal	Normal	Normal	
5	Check blower/motor vibration	Normal	Normal	Normal	
6	Check blower/motor operating noise	Normal	Normal	Normal	
7	Check leakage of lubricant	Normal	Normal	Normal	
8	Check any strange smell coming from the motor	Normal	Normal	Normal	

Monthly Record (Electrical – Sample)
31-10-2017

1-1.Lift Pump Station

a. Main Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	
2	MCCB status check (ON/OFF/TRIP)	Normal	

b. Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	No.4	No.5	No.6
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Lamp test check	Normal	Normal	Normal	Normal	Normal	Normal
Comment							

c. Distribution Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	
2	MCCB status check (ON/OFF/TRIP)	Normal	

d. Water Level Indicator Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	

2-1 Filter [No. 2]

a. 400V Main Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	
2	MCCB status check (ON/OFF/TRIP)	Normal	

b. Valve Starter Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	

c. Filter Local Control Panel

No.	Maintenance Task	1-1	1-2	1-3	1-4	1-5	1-6
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Indication lamp check of PLC local unit						
No.	Maintenance Task	1-7	1-8	1-9	1-10	1-11	1-12
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Indication lamp check of PLC local unit						
Comment							

d. Filter Control Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	
2	Alarm check of LCD unit	-	
3	Indication lamp of PLC check	Common Fault	

e. Backwash Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	Normal	Normal	

f. Backwash Pump Local Control Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	

g. Air Blower Starter Panel

No.	Maintenance Task	No.1	No.2	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Nromal		

h. Air Blower Local Control Panel

No.	Maintenance Task	Result	Comment
1	Interior visual check (Damage, Smell, Foreign Materials, etc.)	Normal	

Weekly Record (Mechanical) (8-11-2017)

1-1. Lift Pump Station

a. Main Pump/Motor

[Pump No. 1,2,3,4,5,6]

No.	Maintenance Task	Check	Comme
1	Run all motor for 5-10 minutes	1,2,3,4,5&6	Normal
2	Check/record motor current	〃	175 A
3	Check motor body/bearing temperature	〃	Normal
4	Check ventilation condition	〃	Normal
5	Check motor operating noise	〃	Normal
6	Check motor vibration	〃	Normal
7	Check any strange smell coming from the motor	〃	Normal
8	Check any damage/crack on the motor	〃	Normal

b. Motorized Butterfly Valve

[Pump No. 1,2,3,4,5,6]

No.	Maintenance Task	check	Comment
1	Open/Close all Valves	1,2,3,4,5&6	Normal
2	Check valve operating noise	〃	Normal
3	Check valve operating vibration	〃	Normal
4	Check actuator operating noise	〃	Normal
5	Check actuator operating vibration	〃	Normal

Weekly Record (Electrical)

1-1.Lift Pump Station

a. Main Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check		
3	Voltage and current check	R-S 420 V S-T 420 V R - A S - A T - A	It is need to check Ammeter.
4	Main CB status check (On/Off/Trip)		

b. Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	No.4	No.5	No.6
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Power indication lamp check (R-S-T)	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal	S-phase& P-Lamp has not shown signal
3	Voltage (S-T phase) Current (S- phase)	420 - V 175 - A	420 V 175 A	420 – V 175 - A	420 V 175 A	420 - V 175 - A	420 V 175 A
4	Announciator check	Normal	Normal	Normal	Normal	Normal	Normal
5	Indication lamp check (ON/OFF,OPEN/CLOSE,POWER ON)	Normal	Normal	Normal	Normal	Normal	Normal
Comment							

c. Distribution Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	N	
2	Power indication lamp check	S.Phase pilot lamp has not shown signal	
3	Voltage (S-T phase) Current (S- phase)	420 V - A	It is need to check Ammeter .
4	Main MCCB trip lamp		

d. Water Level Indicator Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Indication lamp check (HWL,LWL,LLWL)	Normal	
3	Selector Switch check (Tank 1 or Tank 2)	Normal	

e. Water Level Switch

No.	Maintenance Task	Result	Comment
1	Exterior visual check	Normal	

3-1. Filter

a. Motorized Butterfly Valve

[Filter No. 1]

***** YCDC has been doing installation work of nozzle strainers and so, they cannot doing back wash pump maintenance test operation for Filter No.1**

[Inlet Valve] **[Outlet Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	Normal	1 to 12	Normal
2	Check valve operating noise	〃	Normal	〃	Normal
3	Check valve operating vibration	〃	Normal	〃	Normal
4	Check actuator operating noise	〃	Normal	〃	Normal
5	Check actuator operating vibration	〃	Normal	〃	Normal

[Air Valve] **[BW Water Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	No-8 fault signal	1 to 12	Normal
2	Check valve operating noise	〃	Normal	〃	Normal
3	Check valve operating vibration	〃	Normal	〃	Normal
4	Check actuator operating noise	〃	Normal	〃	Normal
5	Check actuator operating vibration	〃	Normal	〃	Normal

[Drain Valve] **[Others]**

No.	Maintenance Task	Check	Comment	Comment
1	Open/Close all Valves	1 to 12	Normal	Although motors of valves can operate, Outlet valves (1,7,9,10,11,12), Inlet valves (2,6,8,9), Drain valves (5,6,8,12) and Air valves (9,11) are not fully close and they have leakage.
2	Check valve operating noise		No-6 drain valve has appeared sound	
3	Check valve operating vibration		No-7 drain valve shaft has moving	
4	Check actuator operating noise		Normal	
5	Check actuator operating vibration		Normal	

b. Backwash Water Pump

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Run all pump/motor for 5-10 minutes	-	-	-	
2	Check/record motor current	-	-	-	
3	Check pump/motor bearing temperature	-	-	-	
4	Check pump/motor vibration	-	-	-	
5	Check pump/motor operating noise	-	-	-	
7	Check any strange smell coming from the motor	-	-	-	

c. Air Blower

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Open discharge valve/air valve	Normal	Normal	Normal	
2	Run all blower/motor for 5-10 minutes	Normal	Normal	Normal	
3	Check/record motor current	-	-	-	It is need to check ammeter of blower.
4	Check blower/motor bearing temperature	Normal	Normal	Normal	
5	Check blower/motor vibration	Normal	Normal	Normal	
6	Check blower/motor operating noise	Normal	Normal	Normal	
7	Check leakage of lubricant	Normal	Normal	Normal	
8	Check any strange smell coming from the motor	Normal	Normal	Normal	

2-1. Filter

a. Motorized Butterfly Valve

[Filter No. 2] (*Inlet valves cannot test because YCDC has been doing installation work of strainer nozzles)**

[Outlet Valve]

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	-	1 to 12	No-12 has not operated shaft
2	Check valve operating noise	〃	-	〃	No-8 has appeared noise sound
3	Check valve operating vibration	〃	-	〃	No-9 has moving base
4	Check actuator operating noise	〃	-	〃	Normal
5	Check actuator operating vibration	〃	-	〃	Normal

[Air Valve] **[BW Water Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	No-12 fault signal	1 to 12	Normal
2	Check valve operating noise	〃	No-2,5,6,8,9,10 have appeared noise	〃	Normal
3	Check valve operating vibration	〃	No-1,9 has moved base	〃	Normal
4	Check actuator operating noise	〃	Normal	〃	Normal
5	Check actuator operating vibration	〃	Normal	〃	Normal

[Drain Valve] **[Others]**

No.	Maintenance Task	Check	Comment	Comment
1	Open/Close all Valves	1 to 12	No-3,9,12 has fault signal	
2	Check valve operating noise		No-7 has appear noise sound from shaft	
3	Check valve operating vibration		No-8 has moving base	
4	Check actuator operating noise		Normal	
5	Check actuator operating vibration		Normal	

b. Backwash Water Pump

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Run all pump/motor for 5-10 minutes	Normal	Normal	Normal	
2	Check/record motor current	23A	23A	23A	
3	Check pump/motor bearing temperature	Normal	Normal	Normal	
4	Check pump/motor vibration	Normal	Normal	Normal	
5	Check pump/motor operating noise	Normal	Normal	Normal	
7	Check any strange smell coming from the motor	Normal	Normal	Normal	

c. Air Blower

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Open discharge valve/air valve				When Blower has started run , Ampere is increase and MCCB trip.
2	Run all blower/motor for 5-10 minutes				
3	Check/record motor current				
4	Check blower/motor bearing temperature				
5	Check blower/motor vibration				
6	Check blower/motor operating noise				
7	Check leakage of lubricant				
8	Check any strange smell coming from the motor				

2-1 Filter [No. 1, 2]

a. 400V Main Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check	Normal	
3	Voltage and current check	R-S 420V S-T 420 V T-S 420 V R 0 A S 0 A T 0 A	

b. Valve Starter Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check	Normal	
3	Voltage (S-T phase) Current (S- phase)	420 V 0 A	
4	Indication lamp & MCCB check for each unit	Normal	

c. Filter Local Control Panel

No.	Maintenance Task	1-1	1-2	1-3	1-4	1-5	1-6
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Indication lamp check (OPEN/CLOSE/FAULT, ON/OFF etc.)	Normal	Normal	Normal	Normal	Normal	Normal
No.	Maintenance Task	1-7	1-8	1-9	1-10	1-11	1-12
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Indication lamp check (OPEN/CLOSE/FAULT, ON/OFF etc.)	Normal	Normal	Normal	Normal	Normal	Normal
Comment							

d. Filter Control Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check	Normal	
3	Fault lamp, Emergency lamp check	Common fault	

e. Backwash Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal			
2	Power indication lamp check	Normal			
3	Voltage (S-T phase) Current (S- phase)	420 V A	V A	V A	

f. Backwash Pump Local Control Panel

No.	Maintenance Task	Result	comment
1	Exterior visual check	Normal	
2	Announciator check	Normal	

g. Air Blower Starter Panel

No.	Maintenance Task	No.1	No.2	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	
2	Power indication lamp check	Normal	Normal	
3	Voltage (S-T phase) Current (S- phase)	420 V A	420 V A	YCDC cannot see Ampere because Ampere has increased sudden and has done MCCB trip.

h. Air Blower Local Control Panel

No.	Maintenance Task	Result	comment
1	Exterior visual check	Normal	
2	Announciator check	Normal	

Weekly Record (Mechanical) (9-5-2018)

1-1. Lift Pump Station

a. Main Pump/Motor

[Pump No. 1,2,3,4,5,6]

No.	Maintenance Task	Check	Comme
1	Run all motor for 5-10 minutes	1,2,3,4,5&6	Normal
2	Check/record motor current	〃	175 A
3	Check motor body/bearing temperature	〃	Normal
4	Check ventilation condition	〃	Normal
5	Check motor operating noise	〃	Normal
6	Check motor vibration	〃	Normal
7	Check any strange smell coming from the motor	〃	Normal
8	Check any damage/crack on the motor	〃	Normal

b. Motorized Butterfly Valve

[Pump No. 1,2,3,4,5,6]

No.	Maintenance Task	check	Comment
1	Open/Close all Valves	1,2,3,4,5&6	Normal
2	Check valve operating noise	〃	Normal
3	Check valve operating vibration	〃	Normal
4	Check actuator operating noise	〃	Normal
5	Check actuator operating vibration	〃	Normal

Weekly Record (Electrical)

1-1.Lift Pump Station

a. Main Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Power indication lamp check		
3	Voltage and current check	R-S 420 V S-T 420 V R - A S - A T - A	It is need to check Ammeter.
4	Main CB status check (On/Off/Trip)		

b. Pump Starter Panel

No.	Maintenance Task	No.1	No.2	No.3	No.4	No.5	No.6
1	Exterior visual check (Damage, Smell, etc.)	Normal	Normal	Normal	Normal	Normal	Normal
2	Power indication lamp check (R-S-T)	-	-	-	-	-	-
3	Voltage (S-T phase) Current (S- phase)	420 - V 175 - A	420 V 175 A	420 – V 175 - A	420 V 175 A	420 - V 175 - A	420 V 175 A
4	Announciator check	Normal	Normal	Normal	Normal	Normal	Normal
5	Indication lamp check (ON/OFF,OPEN/CLOSE,POWER ON)	Normal	Normal	Normal	Normal	Normal	Normal
Comment							

c. Distribution Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	N	
2	Power indication lamp check	-	
3	Voltage (S-T phase) Current (S- phase)	420 V - A	
4	Main MCCB trip lamp		

d. Water Level Indicator Panel

No.	Maintenance Task	Result	Comment
1	Exterior visual check (Damage, Smell, etc.)	Normal	
2	Indication lamp check (HWL,LWL,LLWL)	Normal	
3	Selector Switch check (Tank 1 or Tank 2)	Normal	

e. Water Level Switch

No.	Maintenance Task	Result	Comment
1	Exterior visual check	Normal	

3-1. Filter

a. Motorized Butterfly Valve

[Filter No. 1]

***** YCDC has been filling filter media not finish yet and so, they cannot doing back wash pump maintenance test operation for Filter No.1**

[Inlet Valve] **[Outlet Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	Need to check valves fully close and open	1 to 12	Need to check valves fully close and open
2	Check valve operating noise	〃	Normal	〃	Normal
3	Check valve operating vibration	〃	Normal	〃	Normal
4	Check actuator operating noise	〃	Normal	〃	Normal
5	Check actuator operating vibration	〃	Normal	〃	Normal

[Air Valve] **[BW Water Valve]**

No.	Maintenance Task	Check	Comment	Check	Comment
1	Open/Close all Valves	1 to 12	Normal	1 to 12	Normal
2	Check valve operating noise	〃	Normal	〃	Normal
3	Check valve operating vibration	〃	Normal	〃	Normal
4	Check actuator operating noise	〃	Normal	〃	Normal
5	Check actuator operating vibration	〃	Normal	〃	Normal

[Drain Valve] **[Others]**

No.	Maintenance Task	Check	Comment	Comment
1	Open/Close all Valves	1 to 12	Normal	Although motors of valves can operate, Outlet valves (1,7,9,10,11,12), Inlet valves (2,6,8,9) are not fully close and they have leakage.
2	Check valve operating noise		Normal	
3	Check valve operating vibration		Normal	
4	Check actuator operating noise		Normal	
5	Check actuator operating vibration		Normal	

b. Backwash Water Pump

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Run all pump/motor for 5-10 minutes	-	-	-	
2	Check/record motor current	-	-	-	
3	Check pump/motor bearing temperature	-	-	-	
4	Check pump/motor vibration	-	-	-	
5	Check pump/motor operating noise	-	-	-	
7	Check any strange smell coming from the motor	-	-	-	

c. Air Blower

No.	Maintenance Task	No.1	No.2	No.3	Comment
1	Open discharge valve/air valve	Normal	Normal	Normal	
2	Run all blower/motor for 5-10 minutes	Normal	Normal	Normal	
3	Check/record motor current	-	-	-	.
4	Check blower/motor bearing temperature	Normal	Normal	Normal	
5	Check blower/motor vibration	Normal	Normal	Normal	
6	Check blower/motor operating noise	Normal	Normal	Normal	
7	Check leakage of lubricant	Normal	Normal	Normal	
8	Check any strange smell coming from the motor	Normal	Normal	Normal	

Name List for Seminar (Civil) Attendence

No	Name	Designation	Seminar	1	2	3	4	5	6	7	8	9	10	11	12	13	14
			Year	2014										2015			
			Month	Mar	Mar	Mar	Mar	Mar	May	Jul	Sep	Oct	Nov	Jan	Mar	May	Jul
			Day	10	11	12	14	18	21	15	17	10	12	21	18	27	10
	HO=Head Office	S=Site		S	S	S	S	S	S	S	HO	HO	HO	HO	HO	HO	ME
	TECI																
1	Minoru IKEI	Chief		*	*	*	*	*		*	*					*	*
2	Junjiro AKIBA	Civil		*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	Koichi NAOI	Electrical										*					
4	Shinichi OSAKA	Mechanical							*			*					
5	U Pyi Kyaw Hein	AE-Civil							*	*	*	*	*	*	*	*	*
	YCDC																
6	U Myint Oo	CE									*						
7	U Myint Zaw Than	DCE		*	*									*	*		*
8	U Myo Thein	DCE										*					
9	U Thet Lwin	ACE										*	*	*	*	*	
10	U Khin Mg Phu	ACE										*					
11	U Myint Sein	ACE											*				
12	U Aung Khin Zaw	ACE													*		
13	Daw Thwe Naing Oo	ACE												*			
14	Daw Myint Myint Aye	ACE												*			
15	U Than Han	EE		*	*	*	*	*			*		*	*	*	*	*
16	U Zaw Minn	EE						*					*	*		*	*
17	U Soe Kyaing	EE							*				*	*	*	*	*
18	U Htin Kin Kha	EE										*		*			*
19	U Wai Lwin	EE											*	*			
20	Daw Myint Myint Soe	EE										*	*				*
21	U Tint Zaw	AE		*	*								*		*		
22	U Phone Naing	AE		*	*	*			*						*		*
23	U Min Thu	AE							*								
24	U Htay Naing	AE										*					
25	U Pyone Cho	AE											*				
26	U Zaw Oo	AE							*				*		*		
27	U Aung Htut Lin	AE													*	*	
28	Daw Ei Khing Mon	AE														*	
29	Daw Yu Yu Hla Baw	AE										*			*		*
30	U Zaw Min Htut	SAE		*	*										*	*	
31	U Aung Ko Ko Tin	SAE		*	*												
32	U Tun Tun Hlaing	SAE		*	*	*	*		*				*				*
33	U Kyaw Swar Min	SAE		*	*	*		*	*		*				*	*	*
34	U Tun Win	SAE		*	*	*											
35	U Than Wynn	SAE			*	*	*	*	*				*	*	*	*	
36	U Zin Min Latt	SAE					*	*	*	*	*		*	*	*	*	*
37	U Min Htut Naing	SAE								*	*			*			
38	U Aung Moe Kyaw	SAE												*			
39	U Mg Mg Thant	SAE												*			
40	U Zaw Win Aung	SAE														*	
41	U Saw Than Naing Oo	SAE												*	*	*	*
42	Daw Nyunt Nyunt Lwin	SAE															
43	Daw Khin San Win	SAE												*			*
44	Daw Zin Mar Aung	SAE										*					
45	Daw Su Su Aung	SAE										*		*			
46	Daw Ya Min	SAE										*					
47	Daw Khin Than Oo	SAE										*					
48	Daw San San Htwe	SAE											*				
49	Daw Myat Hsu Hlaing	SAE											*				
50	Daw Naw Ehlinder	SAE												*			
51	Daw Khin Aye Aye Thet	SAE												*			
52	Daw Thin Thin Htoo	SAE												*			
53	U Aye Min	JE							*								
54	U Aung Kyaw Khing	Watches		*							*	*					
55	U Phyo Thar Kyaw	Watches		*		*	*	*	*								
56	U Sa Soe Min Soe	Watches									*						
57	U Nyein Chan Aung	Watches				*	*	*	*								
58	U Kyaw Myo Aung	Watches				*	*	*	*		*						
59	U Myo Thaw Tun	Watches				*	*	*	*	*							
60	U Ye Win Htun	Watches							*								
61	U Min Thet Zaw Oo	Watches								*							
62	U Thura Htwe	Watches								*							
63	U Mg Mg Aye	SAE															*
64	Daw Hwe Ni Aung	JE													*		
65	Daw Moh Moh San	WA													*		
66	Daw Phyo Po Po Thet												*				
67	Daw Aye Cho Sann	JE													*		
68	Daw Ei Ei Nyein	WA															*
				11	10	10	8	9	14	5	8	12	15	20	15	12	19

Questionnaires at Seminar (14) 10-7-2015

(A) Other Subjects You want to study

(1) want to study mechanical & electrical works ---------- 2 peoples
(2) want to study planning and programing ---------- 2 peoples
(3) want to study safety and project management ---------- 2 peoples
(4) want to study environmental facts, finance and construction project ---------- 1 people
(5) want to study techniques and management of water resources ---------- 2 peoples
(6) want to study Japanese guide line for civil work, engineering manual book and "code" of works, design drawings and water resource management ---------- 1 people
(7) want to study technique of water and sanitation in Japan ---------- 1 people
(8) want to study quality control of water ---------- 1 people
(9) no comments ---------- 9 peoples

(B) Comment on the Seminar

(1) very valuable and beneficial experience for YCDC ---------- 3 peoples
(2) get general knowledge ---- ---------- 5 peoples
(3) want to study more and more from adviser ---------- 1 people
(4) knowing true and false, and good and bad for site engineers ---------- 1 people
(5) very effective and precious for the project ---------- 1 people
(6) come to complete and systemic engineering and know about safety first ---------- 1 people
(7) want to explain not only civil work but also mechanical and electrical works ----- 1 people
(8) hope to distribute and share about technique and experience of JICA advisers --- 1 people
(9) presentation level may be higher for YCDC engineers and they have started work on site with new knowledge ---------- 1 people
(10) completely valuable to YCDC ---------- 1 people
(11) site engineers had best information from presentation ---------- 1 people
(12) no comments ---------- 4 peoples

(C) Any Other Comment

(1) YCDC wants JICA advisers to hold the same seminar frequently ---------- 1 people
(2) presentation may be better if there was a translator ---------- ---------- 1 people
(3) want to attend many times likely this seminar ---------- 3 peoples
(4) thank you for the presentation ---------- 2 peoples
(5) no comments ---------- 14 peoples

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under
Greater Yangon Water Supply Improvement Project implemented by YCDC

The Faculty of Civil Engineering by the School of JICA Advisors

This is to certify that

U Pyi Kyaw Hein

has completed Seminars

in the discipline of

Project Management

held during March 2014 to July 2015

YCDC in Yangon, Myanmar
10 July 2015

Sakurai Noriko
JICA Myanmar Office

Ikei Minoru
Chief Advisor

Akiba Junjiro
Civil Advisor

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

10 March 2014
TEC International
Akiba Junjiro
Head of Project Management Office

CONTENTS

I Comment from the site visit (1/3) on 7 March 2014

- Drawings
  - General Arrangement or Flow Chart
  - Re-Bar Arrangement or Diagram
  - Details
- Specification
  - General, Particular and Technical Specification or Materials and Workmanship
- Reinforcement Bar
  - High Yield Reinforcement Bar
  - Cover of Re-Bar and Concrete (Plastic) Spacer

I Comment from the site visit (2/3) on 7 March 2014

- Concrete Structure
  - Vertical Construction Joint and Scabbling
  - Horizontal Construction Joint and Kicker
  - Expansion (Movement) Joint and Re-Bar detail
  - Joints and Water Bar
  - Waterproofing
  - Concreting sequence and Cold Joint
  - Panel size and Shrinkage Crack
  - Curing (Water and Curing Mat)

I Comment from the site visit (3/3) on 7 March 2014

- Formworks
  - Plywood Shutter and Timber Support
  - Tie Rod (Bar) and Cone Spacer
  - Propping and Scaffolding
- Piling
  - Removal of Pile Head and Lean Mix Concrete
  - Bentonite and Slurry Water
  - Cleaning and Blinding Concrete
  - Temporary Access Road

II Site Photos

II Site Photos

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TEC International 10 09/03/2015

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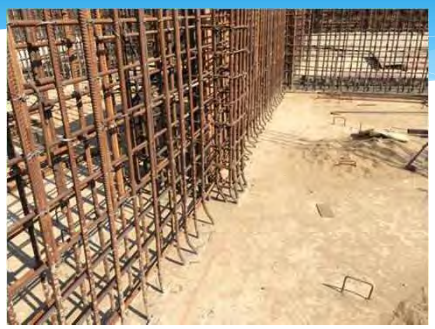

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II Site Photos

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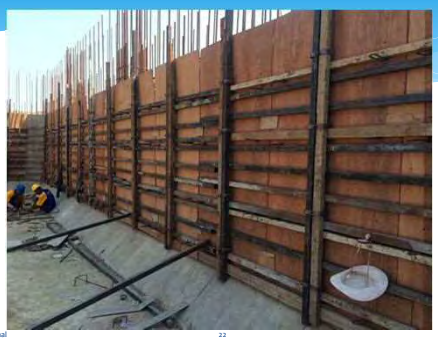

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II Site Photos

TEC International 29 09/03/2015

II Site Photos

TEC International 30 09/03/2015

II Site Photos

II Site Photos

III Project Management (1/4)

* Technical
  - Basic Design (Permanent Works and Construction Technique)
  - Detail Design (Structures, Plant and Temporary Works)
  - Programme (Overall and Detail)
  - Construction Method (Permanent and Temporary Works)
  - Construction Supervision (SQE, Production and Progress)
* Support
  - Procurement (Services and Materials)
  - Logistics
  - Safety, Quality Assurance and Environmental Protection

III Project Management (2/4)

* Commercial
  - Financial (Payment and Cost Control)
  - Contractual (Variations and Claims)
* Administration
  - General Affairs
  - Finance and Accountant
  - Human Relations
  - Public Relations

III Project Management (3/4)

* Project is alive.
  = The Site is changing every day!
  ⇨ Daily Site Meeting is necessary on Site.
* Steady production is required.
  = Progress review against Programme.
  ⇨ Weekly Progress Meeting to be held in the Project Office is useful to monitor site progress.

III Project Management (4/4)

* Bad news as well as good news are awaited by the Senior Management of the Head Office.
  = Report assist the decision of Top Management.
  ⇨ Project Manager submit Monthly Report for updating Senior Management.
  Then,
  The Senior Management review the Project with Project Manager by Monthly Meeting.

IV Review YCDC Management (1/5) Planning and Procurement

* Design and Standard
* Specification
* Drawings
* Method Statement
* Overall Programme
* Procurement of Services, Materials and Plant
* Health and Hygiene (OHSAS)
* Quality Assurance (QA) and Document Control
* Environmental Management System (EMS)

IV Review YCDC Management (2/5) Site Management

* Safety
* Quality Control
* Environmental Protection
* Construction Method and Sequence
* Weekly Programme and Three Month Programme
* Daily, Weekly and Monthly Meetings
* Monthly Report

IV Review YCDC Management (3/5) Financial

* Bill of Quantities
* Payment Application
* Payment Assessment
* Cash Flow
* Budget
* Cost
* Final Forecast

IV Review YCDC Management (4/5) Organisation

Who does What?

* Stake Holders
* Staff Organisation Chart

IV Review YCDC Management (5/5) Mission and Policy

YCDC and TECI work together for the Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project

Kyae Zu Par!

and

Arigato!

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Seminar No 2, 11 March 2014
TEC International
Project Management Office
Akiba Junjiro

CONTENTS

I Comment from the site visit on 11 March 2014
II Site Photos
III What is and Who does Project Management?
for further discussion;
IV Review YCDC Project Management

TEC International 2 09/03/2015

Comment from the site visit 11 March 2014

- Concreting Sequence and Cold Joint
- Concreting Method
  - Arrangement for Concrete Pump, Vibrators and Workers
  - Kickers
  - Expansion Joint
- Concreting Workmanship
  - Finish Levels and Finishing
- Concrete Materials
  - Temperature and Slump
- Re-Bar Arrangement
  - Spacing, Cover and Fixing Wire

TEC International 3 09/03/2015

II Site Photos

TEC International 4 09/03/2015

II Site Photos

TEC International 5 09/03/2015

II Site Photos

TEC International 6 09/03/2015

II Site Photos

TEC International 7 09/03/2015

II Site Photos

TEC International 09/03/2015

II Site Photos

TEC International 9 09/03/2015

II Site Photos

TEC International 09/03/2015

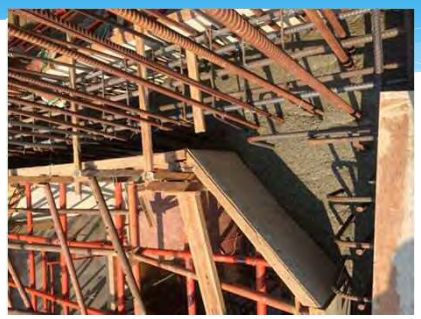
II Site Photos

TEC International 11 09/03/2015

II Site Photos

TEC International 09/03/2015

II Site Photos



TEC International 13 09/03/2015

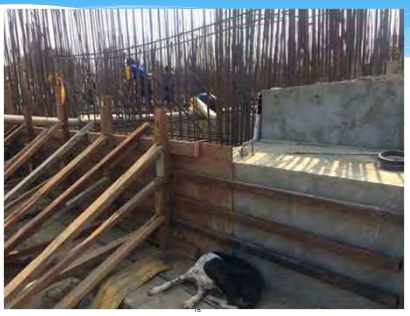
II Site Photos

TEC International 09/03/2015

II Site Photos

TEC International 09/03/2015

II Site Photos



TEC International 09/03/2015

II Site Photos

TEC International 17 09/03/2015

II Site Photos

TEC International 09/03/2015

III Project Management (1/4)

* Technical
  - Basic Design (Permanent Works and Construction Technique)
  - Detail Design (Structures, Plant and Temporary Works)
  - Programme (Overall and Detail)
  - Construction Method (Permanent and Temporary Works)
  - Construction Supervision (SQE, Production and Progress)
* Support
  - Procurement (Services and Materials)
  - Logistics
  - Safety, Quality Assurance and Environmental Protection

III Project Management (2/4)

* Commercial
  - Financial (Payment and Cost Control)
  - Contractual (Variations and Claims)
* Administration
  - General Affairs
  - Finance and Accountant
  - Human Relations
  - Public Relations

III Project Management (3/4)

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  Then,
  The Senior Management review the Project with Project Manager by Monthly Meeting.

IV Review YCDC Management (1/5) Planning and Procurement

* Design and Standard
* Specification
* Drawings
* Method Statement
* Overall Programme
* Procurement of Services, Materials and Plant
* Health and Hygiene (OHSAS)
* Quality Assurance (QA) and Document Control
* Environmental Management System (EMS)

IV Review YCDC Management (2/5) Site Management

* Safety
* Quality Control
* Environmental Protection
* Construction Method and Sequence
* Weekly Programme and Three Month Programme
* Daily, Weekly and Monthly Meetings
* Monthly Report

IV Review YCDC Management (3/5) Financial

- Bill of Quantities
- Payment Application
- Payment Assessment
- Cash Flow
- Budget
- Cost
- Final Forecast

IV Review YCDC Management (4/5) Organisation

Who does What?

- Stake Holders
- Staff Organisation Chart

IV Review YCDC Management (5/5) Mission and Policy

YCDC and TECI work together for the Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project

Kyae Zu Par!

and

Arigato!

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Seminar No 3, 13 March 2014
TEC International
Project Management Office
Akiba Junjiro

CONTENTS

Comment from the site visit on 12 March 2014

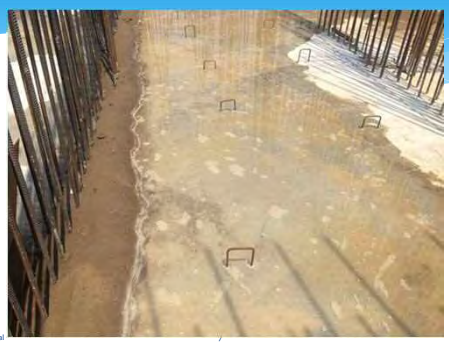
- Concreting Workmanship
  - Curing and Finish Levels
- Reinforced Concrete Structures
  - Construction Joints and Scabbling
  - Kicker and Chamfer
- Formworks
  - Form Tie and Support
- Propping and Scaffolding
  - Walls and Roof Slab

II Site Photos

II Site Photos

II Site Photos

II Site Photos

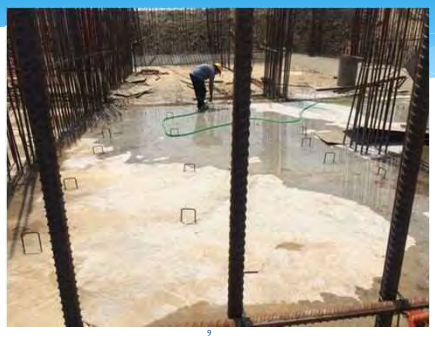


TEC International 7 09/03/2015

II Site Photos

TEC International 8 09/03/2015

II Site Photos



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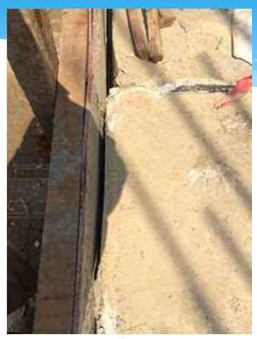
II Site Photos



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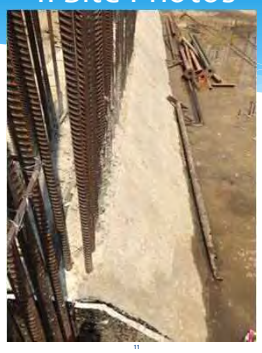

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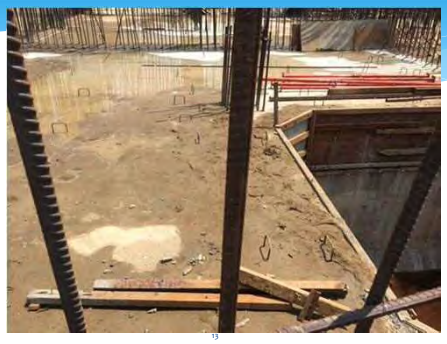
II Site Photos

TEC International 12 09/03/2015

II Site Photos



II Site Photos

II Site Photos

II Site Photos

II Site Photos

II Site Photos

IV Review YCDC Management (1/5) Planning and Procurement

- Design and Standard
- Specification
- Drawings
- Method Statement
- Overall Programme
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IV Review YCDC Management (3/5) Financial

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- Budget
- Cost
- Final Forecast

IV Review YCDC Management (4/5) Organisation

Who does What?

- Stake Holders
- Staff Organisation Chart

IV Review YCDC Management (5/5) Mission and Policy

YCDC and TECI work together for the Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project

Kyae Zu Par!

and

Arigato!

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Seminar No 4, 14 March 2014
TEC International
Project Management Office
Akiba Junjiro

CONTENTS

Comment from the site visit on 13 March 2014

* Temporary Access Road and its maintenance
* Bored Pile Technique and Workmanship
  - Excavation and Slurry Water
  - Mad or Bentonite (Density and Viscosity)
  - Cleaning of the Bottom of Piles and Desanding
  - Re-Bar Steel Cage
  - Tremie Concrete

II Site Photos

II Site Photos

II Site Photos

II Site Photos

II Site Photos

II Site Photos

II Site Photos

II Site Photos

II Site Photos

II Site Photos

TEC International 13 09/03/2015

II Site Photos

TEC International 14 09/03/2015

IV Review YCDC Management (1/5) Planning and Procurement

- Design and Standard
- Specification
- Drawings
- Method Statement
- Overall Programme
- Procurement of Services, Materials and Plant
- Health and Hygiene (OHSAS)
- Quality Assurance (QA) and Document Control
- Environmental Management System (EMS)

TEC International 15 09/03/2015

IV Review YCDC Management (2/5) Site Management

- Safety
- Quality Control
- Environmental Protection
- Construction Method and Sequence
- Weekly Programme and Three Month Programme
- Daily, Weekly and Monthly Meetings
- Monthly Report

TEC International 16 09/03/2015

IV Review YCDC Management (3/5) Financial

- Bill of Quantities
- Payment Application
- Payment Assessment
- Cash Flow
- Budget
- Cost
- Final Forecast

TEC International 17 09/03/2015

IV Review YCDC Management (4/5) Organisation

Who does What?

- Stake Holders
- Staff Organisation Chart

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IV Review YCDC Management (5/5)
Mission and Policy
YCDC and TECI work together for the Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project
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09/03/2015


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JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Seminar No 5, 18 March 2014
TEC International
Project Management Office
Akiba Junjiro

CONTENTS

I Review Site Management (1/7)
1-1 Safety

OHSAS 18000
(Occupational Health and Safety Assessment Series)

An occupational health and safety (OH & S) management system is able to eliminate or minimise risk to employees and other interested parties who may be exposed to OH & S risks associated its activities.

I Review Site Management (2/7)
1-2 Quality Assurance

ISO 9000

Quality Assurance management system is enable for stakeholders to get consistent, good quality products and services which in turn brings many benefits to not only YCDC but also to Myanmar and its people.

I Review Site Management (3/7)
1-3 Environmental Protection

ISO 14000

* Reduce cost of waste (rubbish, slurry and etc.) management
* Savings in consumption of energy (power, water and etc.) and materials
* Lower distribution costs
* Improve YCDC image among villagers, the public and other stakeholders

I Review Site Management (4/7)
2 Construction Details

Please see Appendix!

I Review Site Management (5/7)
3-1 Daily Meeting

* Where and When: Site Office, Afternoon
* Who : Subcontractors (Site Agent and/or Foreman)
  YCDC Site (Production) Engineer and/or Supervisor
* What : Discuss site activities carried out today
  Agree site activities for tomorrow
  Which activities?
  When do it?
  Why do it now?
  How to do it?

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I Review Site Management (6/7)
3-2 Weekly Meeting

* Where and When: Project Office, Morning
* Who : Subcontractors (Boss and/or Site Agent)
  YCDC Section Manager and/or Site Engineer
* What : Review design issues
  Review progress and programme
  Construction Matters

Problems and/or Bad Progress!!
CHECK 1 Information, 2 Access, 3 Materials and Plant, 4 Workers
still problems, then it should be a Financial Difficulty!

TEC International 8 09/03/2015

I Review Site Management (7/7)
3-3 Monthly Meeting

* Where and When: Head Office, Morning
* Who : Head of Department and Deputy Head of Department
  Assistant Chief Engineer, Site Manager
  and Executive Engineer
* What : Review Progress and Programme
  Review SQE
  Financial issues
  Contractual issues
  Other Stakeholders

TEC International 9 09/03/2015

II Review YCDC Management (1/5)
Planning and Procurement

* Design and Standard
* Specification
* Drawings
* Method Statement
* Overall Programme
* Procurement of Services, Materials and Plant
* Health and Hygiene (OHSAS)
* Quality Assurance (QA) and Document Control
* Environmental Management System (EMS)

TEC International 10 09/03/2015

II Review YCDC Management (2/5)
Site Management

* Safety
* Quality Control
* Environmental Protection
* Construction Method and Sequence
* Weekly Programme and Three Month Programme
* Daily, Weekly and Monthly Meetings
* Monthly Report

TEC International 11 09/03/2015

II Review YCDC Management (3/5)
Financial

* Bill of Quantities
* Payment Application
* Payment Assessment
* Cash Flow
* Budget
* Cost
* Final Forecast

TEC International 12 09/03/2015

II Review YCDC Management (4/5)
Organisation

Who's Who?

Stakeholders

and

Who in charge of Which activity?

Site Staff Organisation Chart

II Review YCDC Management (5/5)
Our Mission and Policy

YCDC and TECI work together for the Development on
Lagunbyin Water Treatment Plant under Greater Yangon
Water Supply Improvement Project

Kyae Zu Par!

and

Arigatoh!

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Discussion No 6, 15 May 2014
JICA Advisors
for Monitoring of LWTP Construction

CONTENTS (1/2)

CONTENTS (2/2)

I Review the Project Management (1/6)
1 Standard and Specifications

1 Which standard do you use when you design the works?
2 Do you have specifications for the Lagunbyin project?
3 Do you have the tender document for the Lagunbyin project?

I Review the Project Management (2/6)
2 Drawings and Method of Construction

1 Do you have a study on the method and sequence of the works?
2 How do you select the construction method?

I Review Project Management (3/6)
3 Programmes

1 Do you have an over all Programme?
2 How do you monitor the works against your plan?

I Review Project Management (4/6)
4 BOQ and Price Schedule

1 Do you have a measurement or a lump sum contract?
2 Do you have a standard Method of Measurement?
3 Do you have a price escalation or a fixed contract?

TEC International 7 09/03/2015

I Review Project Management (5/6)
5 Procurement and Budget Control

1 Do you have any procedures for procurement of services, materials and plant?
2 How do you control the budget?

TEC International 8 09/03/2015

I Review Project Management (6/6)
6 Organisation of the Team

1 How do you make a decision on issues (problems) raising up during the course of the Works?

TEC International 9 09/03/2015

II Review Site Management (1/6)
1 Safety (Repeated)

OHSAS 18000
(Occupational Health and Safety Assessment Series)
An occupational health and safety (OH & S) management system is able to eliminate or minimise risks to employees and other interested parties who may be exposed to OH & S risks associated their activities.

TEC International 10 09/03/2015

II Review Site Management (2/6)
2 Quality Assurance (Repeated)

ISO 9000
Quality Assurance management system is enable for stakeholders to get consistent, good quality products and services which in turn brings many benefits to not only YCDC but also to Myanmar and its people.

TEC International 11 09/03/2015

II Review Site Management (3/6)
3 Environmental Protection (Repeated)

ISO 14000
* Reduce cost of waste (rubbish, slurry and etc.) management
* Savings in consumption of energy (power, water and etc.) and materials
* Lower distribution costs
* Improve YCDC image among villagers, the public and other stakeholders

TEC International 12 09/03/2015

II Review Site Management (4/6)
4-1 Progress Meetings

How do you arrange Materials?
How do you arrange Labour?
How do you arrange Equipment?
How do you manage Subcontractors?

II Review Site Management (5/6)
4-2 Progress Meetings

How do you control quality of the works?
How do you control progress of the works?
How do you control the budget?
How do you purchase what you need?
How do you record the activities on Site?

II Review Site Management (6/6)
5 Site Organisation

Who does what?
Authority and Responsibility
of the Site Office

Our Mission and Policy to the Lagunbyin Project

YCDC and TECI work together for the betterment of
Lagunbyin Water Treatment Plant
under Greater Yangon
Water Supply Improvement Project

Kyae Zu Par!
and
Arigatoh!

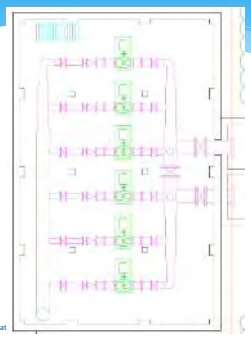
JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Discussion No 7, 10 July 2014
JICA Advisors
for Monitoring of LWTP Construction

CONTENTS

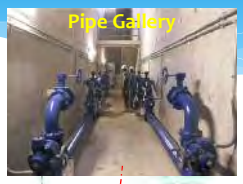
TEC International 2 09/03/2015

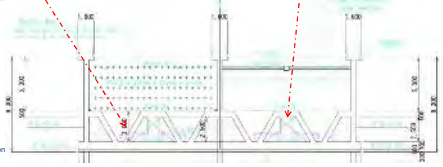
1 Intake P/S



TEC Internat

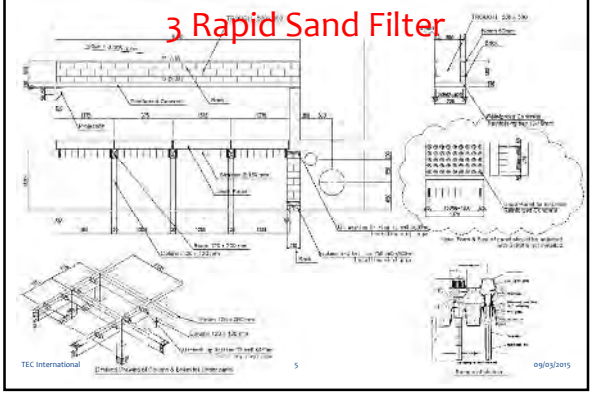
2 Sedimentation Basin





TEC Internation 09/03/2015

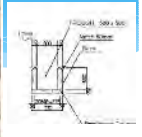
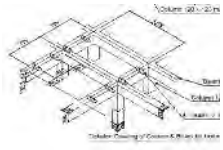
3 Rapid Sand Filter



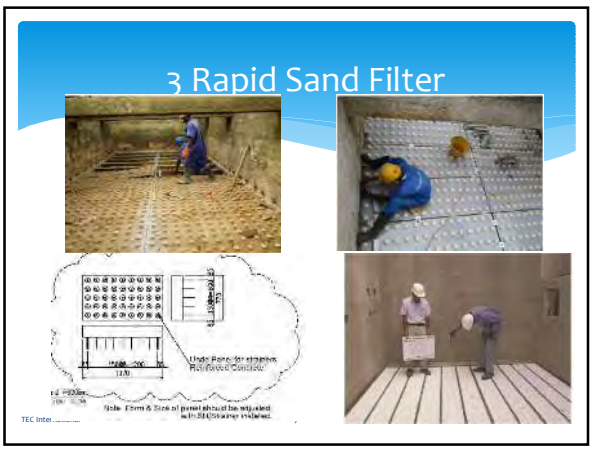
TEC International 5 09/03/2015

3 Rapid Sand Filter

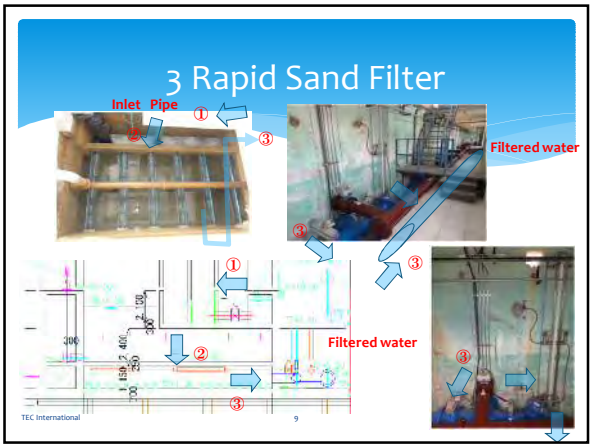


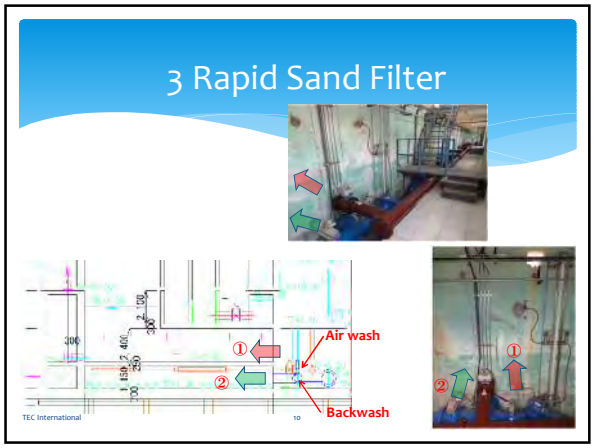




TEC International 6 09/03/2015

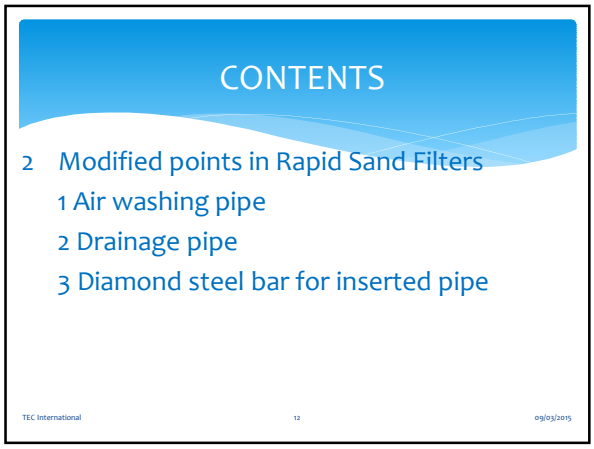

3 Rapid Sand Filter


3 Rapid Sand Filter


3 Rapid Sand Filter
Inlet Pipe
Filtered water
Filtered water
TEC International
9

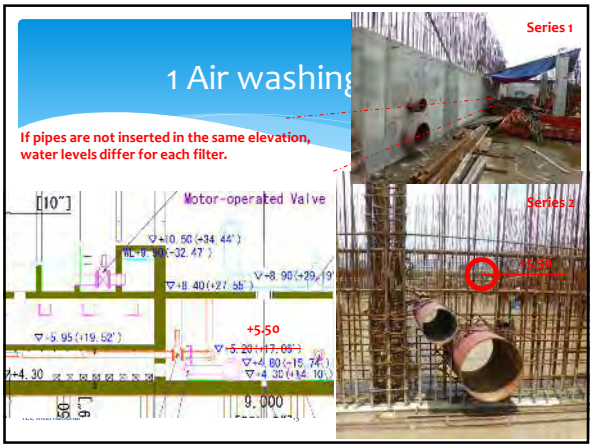

3 Rapid Sand Filter
Air wash
Backwash
TEC International
10


4 Others
Blower
Backwash Pump
Handle for valves
TEC International
09/03/2015

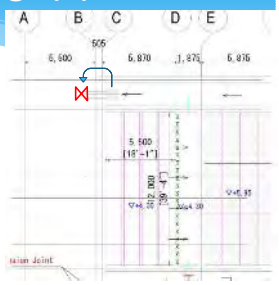

CONTENTS
2 Modified points in Rapid Sand Filters
1 Air washing pipe
2 Drainage pipe
3 Diamond steel bar for inserted pipe
TEC International
12
09/03/2015

1 Air washing

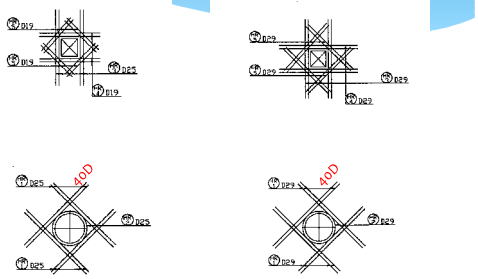
If pipes are not inserted in the same elevation, water levels differ for each filter.



2 Drainage pipe



3 Diamond steel bar for Open area



Kyae Zu Par!
and
Arigatoh!

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Discussion No 7, 27 May 2014
JICA Advisors
for Monitoring of LWTP Construction

CONTENTS (1/2)

CONTENTS (2/2)

I Review the Project Management (1/6)
1 Standard and Specifications

1 Which standard do you use when you design the works?
2 Do you have specifications for the Lagunbyin project?
3 Do you have the tender document for the Lagunbyin project?

I Review the Project Management (2/6)
2 Drawings and Method of Construction

1 Do you have a study on the method and sequence of the works?
2 How do you select the construction method?

I Review Project Management (3/6)
3 Programmes

1 Do you have an over all Programme?
2 How do you monitor the works against your plan?

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4 BOQ and Price Schedule

1 Do you have a measurement or a lump sum contract?
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2 How do you control the budget?

I Review Project Management (6/6)
6 Organisation of the Team

1 How do you make a decision on issues (problems) raising up during the course of the Works?

II Review Site Management (1/6)
1 Safety (Repeated)

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(Occupational Health and Safety Assessment Series)
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II Review Site Management (2/6)
2 Quality Assurance (Repeated)

ISO 9000
Quality Assurance management system is enable for stakeholders to get consistent, good quality products and services which in turn brings many benefits to not only YCDC but also to Myanmar and its people.

II Review Site Management (3/6)
3 Environmental Protection (Repeated)

ISO 14000
* Reduce cost of waste (rubbish, slurry and etc.) management
* Savings in consumption of energy (power, water and etc.) and materials
* Lower distribution costs
* Improve YCDC image among villagers, the public and other stakeholders

II Review Site Management (4/6)
4-1 Progress Meetings

How do you arrange Materials?
How do you arrange Labour?
How do you arrange Equipment?
How do you manage Subcontractors?

II Review Site Management (5/6)
4-2 Progress Meetings

How do you control quality of the works?
How do you control progress of the works?
How do you control the budget?
How do you purchase what you need?
How do you record the activities on Site?

II Review Site Management (6/6)
5 Site Organisation

Who does what?
Authority and Responsibility
of the Site Office

Our Mission and Policy to the Lagunbyin Project

YCDC and TECI work together for the betterment of
Lagunbyin Water Treatment Plant
under Greater Yangon
Water Supply Improvement Project

Kyae Zu Par!
and
Arigatoh!

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

FIDIC CONDITIONS OF CONTRACT Multilateral Development Bank Harmonised Edition

Seminar No 8, 17 September 2014
JICA Advisors for Monitoring of LWTP Construction

Tender Documents (JICA)

* Part 1 Tender Procedures
  - Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
* Part 2 Works Requirements
  - Specifications
  - Drawings
  - Bills of Quantities
  - Other Information
* Part 3 Conditions of Contract and Contract Forms

CONTENTS

What's FIDIC ? (1/2)

Fédération Internationale Des Ingénieurs-Conseils
= International Federation of Consulting Engineer

FIDIC is an international standards organisation for the construction industry.

FIDIC was founded by Belgium, French and Switzerland in 1915 and 86 participants in 2010.

FIDIC provides family of contract templates, so called rainbow books of FIDIC General Conditions.

GCC issued by FIDIC (2/2)

Red Book - Construction

Yellow Book - Plant & Design Build

Silver Book - EPC/Turnkey

(Gold, White, Green, Blue and Pink books)

Multilateral Development Bank (MDB) Harmonised Edition (1/5)

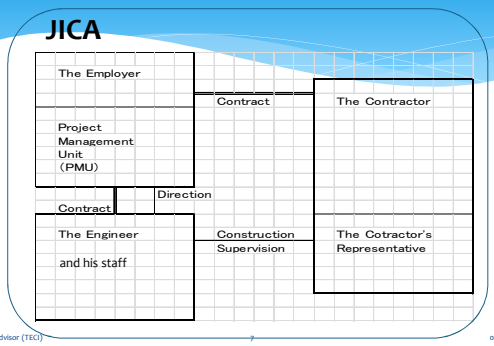
Pink Book – Designed by the Employer

* MDB Harmonised Edition 2006 is edited for development banks basing on the red book 1999 version and revised in 2010.

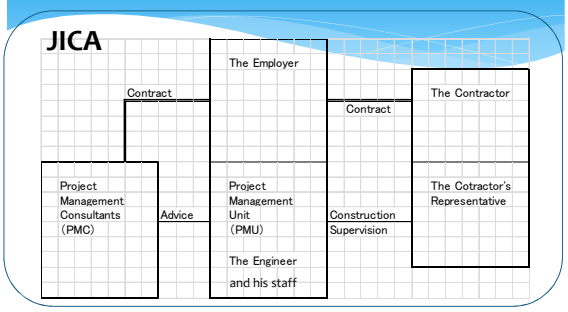
Particular Sub-Clauses added are:-

* Sub-Clause 1.15 Inspections and Audit by the Bank.
* Sub-Clauses for Drugs, Arms, Religious Customs, Funerals, Forced Labour, Child Labour, Worker' Organisation, Non-Discrimination and Equal Opportunity.

Concept of MDB (2/5)



Modified Concept of MDB (3/5)



Priority of Documents (4/5)

GCC Sub-Clause 1.5

- the Contract Agreement (if any),
- the Letter of Acceptance,
- the Letter of Tender,
- the Particular Conditions – Part A,
- the Particular Conditions – Part B,
- these General Conditions,

MDB Version

- the Specification,
- the Drawings, and
- the Schedules and any other documents forming part of the Contract.

STRUCTURE OF GC (5/5)

- GC: General Conditions
  - Text
  - Appendix: General Conditions of Dispute Board Agreement
  - Annex: Procedural Rules
- PC: Particular Conditions
  - Part A: Contract Data
  - Part B: Specific Provisions
- Sample Forms
  - Annexes: Forms of Securities
  - Letter of Tender etc.

DETAILS OF GENERAL CONDITIONS (1/20) Sheet 1 of 2

Clause 1 General Provisions

- 1.1 Definitions
  1.1.1.6 "Drawings" means •••issued by (or on behalf of) the Employer •••)
- 1.1.4.3 "Cost" means all expenditure reasonably incurred by the Contractor, whether on or off the Site, including overhead and similar charges, but not include profit.
- 1.1.4.10 " Provisional Sum" means ••• for the execution of any part of the Works••• under Sub-Clause 13.5•••
- 1.1.6.8 "Unforeseeable" means not reasonably foreseeable by an experienced contractor by the Base Date.

DETAILS OF GENERAL CONDITIONS (1/20) Sheet 2 of 2

Clause 1 General Provisions

- 1.2 Interpretation
- 1.3 Communications
- 1.4 law and language
- 1.5 Priority of Documents
- 1.6 Contract Agreement
- 1.8 Care and Supply Documents
- 1.13 Compliance with Laws
- 1.14 Joint and Several Liability
- 1.15 Inspections and Audit by the Bank

DETAILS OF GENERAL CONDITIONS (2/20)

Clause 2 The Employer

* 2.1 Right of Access to the Site
* 2.2 Permits, Licenses or Approval
  The Employer shall provide •••reasonable assistance ••• (b) (ii) for the delivery of Goods, including clearance through customs,•••
* 2.3 Employer's Personnel
* 2.5 Employer's Claim

DETAILS OF GENERAL CONDITIONS (3/20)

Clause 3 The Engineer

* 3.1 Engineer's Duty and Authority
  The Employer shall appoint the Engineer who shall carry out the duties assigned to him in the Contract.
  the Engineer shall have no authority to amend the Contract.
  (a) •••the Engineer shall be deemed to act for the Employer.
* 3.2 Delegation by the Engineer
* 3.5 Determinations
  ••• the Engineer shall make a fair determination in accordance with the Contract•••

DETAILS OF GENERAL CONDITIONS (4/20)

Clause 4 The Contractor

* 4.1 Contractor's General Obligations
  The Contractor shall design •••, execute and complete the Works in accordance with the Contract •••
* 4.3 Contractor's Representative
* 4.4 Subcontractors
* 4.9 Quality Assurance
* 4.18 Protection of the Environment
* 4.21 Progress Report
* 4.22 Security of the Site

DETAILS OF GENERAL CONDITIONS (5/20)

Clause 5 Nominated Subcontractors

* 5.1 Definition of "Nominated Subcontractor"
* 5.2 Objection to Nomination
  The Contractor could object NSC with reasonable reasons.
* 5.3 Payments to Nominated Subcontractors
* 5.4 Evidence of Payments

* 4.4 The Contractor shall be responsible for the acts or defaults of any subcontractors •••

DETAILS OF GENERAL CONDITIONS (6/20)

Clause 6 Staff and Labour

* This Clause specified Wages, Working Hours, Conditions, Facilities, Health, Safety, Personal Records, Foreign Personnel, Foodstuffs, Supply Water and Insect and Pest Nuisance.
* Also specified , Alcohol, Drugs, Arms, Festivals, Religious Customs, Funerals, Forced Labour, Child Labour, Worker's Organisation, Non-Discrimination and Equal Opportunity.

DETAILS OF GENERAL CONDITIONS (7/20)

Clause 7 Plants, Materials and Workmanship

* 7.1 Manner of Execution
* 7.2 Samples
* 7.3 Inspection
* 7.4 Testing
* 7.5 Rejection
* 7.6 Remedial Work
* 7.7 Ownership of Plant and Materials
* 7.8 Royalties

DETAILS OF GENERAL CONDITIONS (8/20)

Clause 8 Commencement, Delays and Suspension

- 8. 1 Commencement of Works
- 8.2 Time for Completion
- 8.3 Programme
- 8.4 Extension of Time for Completion
  (a) to (e) 5 reasons for EOT
- 8.5 Delay Caused by Authorities
- 8.6 Rate of Progress
- 8.7 Delay Damages
- 8.8 Suspension of Work

DETAILS OF GENERAL CONDITIONS (9/20)

Clause 9 Tests on Completion

- 9.1 Contractor's Obligation
- 9.2 Delayed Tests
- 9.3 Retesting
- 9.4 Failure to Pass Tests on Completion

DETAILS OF GENERAL CONDITIONS (10/20)

Clause 10 Employer's Taking Over

- 10.1 Taking Over of the Works and Sections
  Confirm the Site conditions to prepare a snag list for outstanding works.
  Confirm documents, such as as-built drawings, O & M Manuals, Guarantees etc.
  Then,
  Issue the Taking-Over Certificate.
  Final Payment
  Release Retention Money

DETAILS OF GENERAL CONDITIONS (11/20)

Clause 11 Defects Liability

- 11.1 Completion of Outstanding Work and Remedying Defects
- 11.2 Cost of Remedying Defects
- 11.3 Extension of Defects Notification Period
- 11.4 Failure to Remedy Defects
- 11.5 Removal of Defective Work
- 11.9 Performance Certificate
- 11.10 Unfulfilled Obligations
- 11.11 Clearance of Site

DETAILS OF GENERAL CONDITIONS (12/20)

Clause 12 Measurement and Evaluation

- 12.1 Works to be Measured
- 12.2 Method of Measurement
- 12.3 Evaluation
- 12.4 Omissions

DETAILS OF GENERAL CONDITIONS (13/20)

Clause 13 Variations and Adjustments

- 13.1 Right to Vary
- 13.2 Value Engineering
  Saving will be shared by the Employer and the Contractor
- 13.3 Variation Procedure
- 13.5 Provisional Sums
- 13.6 Daywork
- 13.7 Adjustments for Changes in Legislation
- 13.8 Adjustments for Changes in Cost

DETAILS OF GENERAL CONDITIONS (14/20)

Clause 14 Contract Price and Payment

- 14.1 The Contract Price
- 14.2 Advance Payment
- 14.3 Application for Interim Payment Certificates
- 14.6 Issue of Interim Payment Certificates
- 14.7 Payment
- 14.8 Delayed Payment
- 14.9 Payment of Retention Money
- 14.10 Statement of Completion
- 14.13 Issue of Final Payment Certificate

DETAILS OF GENERAL CONDITIONS (15/20)

Clause 15 Termination by Employer

- 15.1 Notice to Correct
- 15.2 Termination by Employer
- 15.3 Valuation at Date of Termination
- 15.4 Payment after Termination
- 15.6 Corrupt or Fraudulent Practices

DETAILS OF GENERAL CONDITIONS (16/20)

Clause 16 Suspension and Termination by Contractor

- 16.1 Contractor's Entitlement to Suspend Work
- 16.2 Termination by Contractor

DETAILS OF GENERAL CONDITIONS (17/20)

Clause 17 Risk and Responsibility

- 17.1 Indemnities
- 17.2 Contractor's Care of the Works
- 17.3 Employer's Risks
- 17.5 Intellectual and Industrial Property Rights
- 17.7 Use of Employer's Accommodation/Facilities

DETAILS OF GENERAL CONDITIONS (18/20)

Clause 18 Insurance

- 18.1 General Requirements for Insurances
  - Contractor's All Risks (CAR)
  - Third Party's Loss (TPL, TPI)
  - Employer's (Worker's) Compensation Insurance (ECI, WCI)
  - Professional Indemnity (Liability) Insurance (PII, PLI)
  - Marine Cargo
  - Plant
  - Vehicles
  - etc.

DETAILS OF GENERAL CONDITIONS (19/20)

Clause 19 Force Majeure

- 19.1 Definition of Force Majeure
  - Beyond a Party's Control
  - e.g. war, terrorism, riot, earthquake, cyclone etc.

DETAILS OF GENERAL CONDITIONS (20/20)

Clause 20 Claims, Disputes and Arbitration

- 20.1 Contractor's Claims
- 20.2 Appointment of the Dispute Board
- 20.4 Obtaining Board's Decision
- 20.5 Amicable Settlement
- 20.6 Arbitration

Particular Conditions Part A

- Contract Data
  - Name of the Contract
  - Loan Agreement Number
  - The Employer
  - The Engineer
  - The Bank
  - The Borrower
  - Completion Date
  - Defect Notification Period
  - etc.

Particular Conditions Part B

- Specific Provisions are intended to address country, project, and contract specific requirements not covered by General Conditions.
- Very careful consideration and/or legal advice is recommended when amending provisions or drafting new clauses.

JICA Sample Forms

- A: Latter of Tender
- B: Letter of Acceptance
- C: Contract Agreement
- D: Dispute Board Agreement (For a one-person DB)
- E: Dispute Board Agreement (For a three-persons DB)
- F: Performance Security (Demand Guarantee, Bond)
- G: Advance Payment Security (Bond)
- H: Retention Money Security (Bond)
- I: Parent Company Guarantee
- J: Tender Security (Bond)

Extension of Time (EOT) and Variation Order (VO) (1/2)

- SC 1.9 Delayed Drawings or Instructions
- SC 2.1 Right of Access to the Site
- SC 4.7 Setting Out
- SC 4.12 Unforeseeable Physical Conditions
- SC 4.24 Fossils
- SC 7.4 Testing
- SC 8.4 Extension of Time for Completion (5 causes)
- SC 8.5 Delays Caused by Authorities
- SC 8.9 Consequences of Suspension

Extension of Time (EOT) and Variation Order (VO) (2/2)

- SC 10.2 Taking Over of Parts of the Works
- SC 10.3 Interference with Tests on Completion
- SC 11.8 Contractor to Search
- SC 12.4 Omissions
- SC 13.7 Adjustments for Changings in Legislation
- SC 16.1 Contractor's Entitlement to Suspend Work
- SC 17.4 Consequences of Employer's Risks
- SC 19.4 Consequences of Force Majeure

The Employer and The Contractor

and The Engineer (Consultant)

and JICA
and Subcontractors
and all stakeholders

Work Together
For the Successful Completion !

Question and Answer

Ever Forward

We are Civil Engineers !

Kyae Zue Thin Bar Taē

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Specifications for Civil Projects including M and E Works under International Tender

Seminar No 9, 10 October 2014
JICA Advisors for Monitoring of LWTP Construction

JICA Advisors

welcome to the YCDC School of Engineers.

No Entrance Examination ☺

Review

Do you have questions about the FIDIC Conditions of Contract ? (MDB Harmonised Edition) (Pink Book)

Tender Documents (JICA Sample)

* Part 1 Tender Procedures
  - Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
* Part 2 Works Requirements
  - Specifications
  - Drawings
  - Bills of Quantities
  - Other Information
* Part 3 Conditions of Contract and Contract Forms

CONTENTS

1. What's Specification
2. General Specification
3. Particular Specification
4. Technical Specifications
   (Materials and Workmanship)
   - Civil, Building, BS and M and E
5. Question and Answer

GENERAL CONDITIONS (FIDIC MDB Harmonised Edition)

Clause 1 General Provisions

* 1.1.4.10 **"Specification"** means the document entitled specification, as included in the Contract, and any additions and modifications to the specification in accordance with the Contract. Such document specifies the Works.
* 1.8 The Specification and Drawings shall be in the custody and care of the Employer.

GENERAL CONDITIONS (FIDIC MDB Harmonised Edition)

Clause 1 General Provisions

- 1.4 law and language
- 1.5 Priority of Documents
- 1.6 Contract Agreement
- 1.8 Care and Supply Documents
- 1.13 Compliance with Laws

Priority of Documents

GCC Sub-Clause 1.5

- the Contract Agreement (if any),
- the Letter of Acceptance,
- the Letter of Tender,
- the Particular Conditions – Part A,
- the Particular Conditions – Part B,
- these General Conditions,

MDB Version

- the Specification,
- the Drawings, and
- the Schedules (BOQ etc.) and any other documents forming part of the Contract.

Tender Price

Clause 1 General Provisions

- **1.1.1.8 "Tender"** means the Letter of Tender and all other documents which the contractor submitted with the Letter of Tender, as included in the Contract.
- **1.1.4.1 "Accepted Contract Amount"** means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.

Tenderer prices his Tender based on the Specification, Drawings and Programme.

GENERAL CONDITIONS (FIDIC MDB Harmonised Edition)

Clause 2 The Employer

- 2.1 Right of Access to the Site •••••(?) means 'Provide Construction Site'
- 2.2 Permits, Licenses or Approval The Employer shall provide •••reasonable assistance ••• (b) (ii) for the delivery of Goods, including clearance through customs,•••

GENERAL CONDITIONS (FIDIC MDB Harmonised Edition)

Clause 3 The Engineer

- 3.1 Engineer's Duty and Authority
  The Employer shall appoint the Engineer who shall carry out the duties assigned to him in the Contract.
  (a) •••the Engineer shall be deemed to act for the Employer. •••••(?)
  ••• the Engineer shall make a fair determination in accordance with the Contract•••

GENERAL CONDITIONS (FIDIC MDB Harmonised Edition)

Clause 4 The Contractor

- 4.1 Contractor's General Obligations
  The Contractor shall design•••, execute and complete the Works in accordance with the Contract •••
  (b) these Contractor's Documents shall be in accordance with the Specification and Drawings,
- 4.18 Protection of the Environment
  the Contractor's activities shall not exceed the values stated in the Specification

GENERAL CONDITIONS (FIDIC MDB Harmonised Edition)

Clause 6 Staff and Labour

* 6.1 Engagement of Staff and Labour
  Expect as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, feeding, transport, and, when appropriate, housing.

GENERAL CONDITIONS (FIDIC MDB Harmonised Edition)

Clause 7 Plants, Materials and Workmanship

* 7.2 Samples
* 7.3 Inspection
* 7.4 Testing
* 7.5 Rejection
* 7.6 Remedial Work
* 7.7 Ownership of Plant and Materials

GENERAL CONDITIONS (FIDIC MDB Harmonised Edition)

Clause 9 Tests on Completion

* 9.1 Contractor's Obligation
* 9.2 Delayed Tests
* 9.3 Retesting
* 9.4 Failure to Pass Tests on Completion

Works Requirements

Sample Specifications

* General Specification
* Particular Specification
* Technical Specification (Materials and Workmanship)
  - Civil
  - Building (Architectural Building Works and Finishes)
  - Building Services (General and Particular)
  - Mechanical and Electrical including SCADA
    General and Particular

General Specification (1/2)

* General
* The Site
* Planning, Programming and Progress Monitoring
* Health and Safety
* Environmental Requirements
* Quality Management
* Contractor's Organisation and Superintendence
* The Works

General Specification (2/2)

* Traffic and Roads
* Plant Materials
* Temporary Utility (Electricity) Supply
* ABWF and Building Services
* Document Management
* Testing and Commissioning
* Supply of Spare Parts
* Training
* Risk Management

General Specification (1/17)
General

* GS1.2 Definitions
* GS1.4 Materials and Workmanship
  The Works shall be carried out in accordance with the Specification and the Drawings.
* GS1.8 Initial Land Record Survey
* GS1.9 As-Built Record Survey
* GS1.11 Standards
* GS1.12 Employer's Drawings
* GS1.16 Design Requirement

General Specification (2/17)
The Site

* GS2.1 Site Availability
* GS2.3 Site Services
* GS2.4 Site and Work to be kept Clean
* GS2.6 Site Security
* GS2.9 Work in the Dry
* GS2.11 Fences and Signs on the Site
* GS2.15 Control of Pests, Vermin and Mosquitoes
* GS2.19 Drinking Water
* GS2.20 Toilet Facilities
* GS2.23 Workers' Rest Area

General Specification (3/17)
Planning, Programming & Monitoring

* GS3.1 Planning and Programming
* GS3.2 Progress Monitoring
* GS3.4 General Programme Requirements
* GS3.5 Works Programme
* GS3.7 Monthly Progress Report
  executive summary
  safety, quality and environmental aspect
  programme and progress
  financial and contractual matters
* GS3.8 Progress Meeting

General Specification (4/17)
Health and Safety

* GS4.6 Health and Safety Plan
* GS4.9 Safety Inspections
* GS4.10 Reporting of Incidents and Accidents
* GS4.13 Safety Meetings
* GS4.14 Emergency Procedures and Facilities
* GS4.15 First Aid Facilities
* GS4.16 Lifting Appliances and Lifting Gears
* GS4.17 Fire Precaution
* GS4.18 Dangerous Goods and Substances
* GS4.19 Excavation and Floor Openings
* GS4.23 Personnel Protective Equipment

General Specification (5/17)
Environmental Requirements

* GS5.2 Environmental Management Plan
* GS5.3 Air Quality
* GS5.4 Water Quality
* GS5.5 Waste Management
* GS5.6 Noise Control
* GS5.7 Protection on Existing Streams or Rivers

General Specification (6/17)
Quality Management

* GS6.2 Quality Plan
* GS6.3 Quality Audit
* GS6.4 Manufacturer's Quality Assurance
* GS6.5 Inspection and Testing Plan
* GS6.7 Samples for Testing
* GS6.9 Quality Control Requirements
* GS6.10 Quality Hold Point
* GS6.11 Quality Control Point
* GS6.14 Testing Agencies and Equipment
* GS6.15 Reports of Tests

General Specification (7/17)
Contractor's Organisation

- GS7.1 Contractor's Organisation
- GS7.2 Surveyor
- GS7.3 Safety Personnel
- GS7.4 Planning and Programming Engineer
- GS7.5 Contractor's Representative

General Specification (8/17)
The Works

- GS8.1 Methods of Construction
- GS8.2 Temporary Works
- GS8.3 Normal Working Hours
- GS8.5 Construction Restrains
- GS8.8 Protection of Work
- GS8.10 Watercourses and Drainage Systems
- GS8.11 Utilities
- GS8.17 the Engineer's Site Accommodation
- GS8.18 the Contractor's Site Accommodation

General Specification (9/17)
Traffic and Roads

- GS9.2 Access to and from Areas of the Site
- GS9.4 Temporary Traffic Diversion Schemes
- GS9.6 Dust Control
- GS9.7 Pedestrian Requirements
- GS9.8 Temporary Street Lighting
- GS9.9 Reinstatement of Roads and Footpaths

General Specification (10/17)
Plant and Materials

- GS10.3 Places of Manufacture
- GS10.4 Submission of Particulars
- GS10.7 Standard Specifications
- GS10.8 Testing and Sampling
- GS10.9 Tolerances
- GS10.12 Removal of Materials or Plant from Site

General Specification (11/17)
Utilities

- GS11.1 Works on Site
- GS11.5 Types of Distribution Supply
- GS11.6 Protection of Circuit
- GS11.7 Earthing
- GS11.8 Plugs, Socket Outlets and Couplers
- GS11.9 Cables
- GS11.10 Lighting Installation
- GS11.14 Payment of Charges

General Specification (12/17)
ABWF and Building Services

- GS12.3 Coordination
- GS12.4 Structural E & M Drawings (SEM)
- GS12.5 Design and Documentation
- GS12.7 Delivery Route Drawings

General Specification (13/17) Document Management

* GS13.2 As-Built Drawings
* GS13.3 O & M Manuals
* GS13.4 Project Records

General Specification (14/17) Testing and Commissioning

* GS14.2 Testing and Commissioning Services
* GS14.3 System Acceptance Tests
* GS14.4 Completion Tests

General Specification (15/17) Supply of Spare Parts

* GS15.1 Supply of Parts
* GS15.2 Packaging and Storage

General Specification (16/17) Training

* a) schedule of training course;
* b) objective, class size and duration of each training courses;
* c) training materials and facilities
* d) qualifications and experience level necessary for the training;
* e) instructor's qualifications; and
* f) recommendation.

General Specification (17/17) Risk Management

* GS16.1 Design for Safety and Constructability
* GS16.2 System Assurance Requirements

Particular Specification (1/5)

* Project Information
* Geotechnical Information
* Specification and Drawings
* Design Responsibility
* Coordination of Works
* Preliminary Works
* Availability and Use of Site

Particular Specification (2/5)

- Construction Programme
- Construction Sequence and Method
- Temporary Site Facilities
- Soil Disposal and Borrow Pits
- Reinstatement and Reconstruction
- Statutory Authorities
- Utilities

Particular Specification (3/5)

- Traffic and Pedestrian Requirements
- Engineer's Site Accommodation
- Requirements for Health and Safety
- Environmental and Quality Management
- Submissions and Records
- Temporary Works
- As-built Drawings

Particular Specification (4/5)

- Operating and Maintenance Manual
- Testing and Commissioning
- Training
- Laboratory Equipment
- Access to Property
- Public Relations

Particular Specification (5/5) Appendix

- A: List of Drawings
- B: Engineer's Preliminary Programme
- C: Works Area Plans
- D: Fencing Plan for the STP Works Area
- E: Schedule of Access Dates for Works Areas
- F: Engineer's and Employer's Site Accommodation, Facilities and Equipment

Technical Specifications (Materials and Workmanship)

- Civil
- Building (Architectural Building Works and Finishes)
- Building Services (General and Particular)
  - Mechanical (Air Conditioning),
  - Electrical (Lighting),
  - Fire Services and
  - Hydraulics (Water supply and Sanitary)
- Mechanical and Electrical Plant including SCADA
  - General and Particular

The Contractor, The Engineer (Consultant), YCDC,

Subcontractors, JICA and all stakeholders

Work Together for the Successful Future !

Question and Answer

Ever Forward, Step by Step


We are Civil Engineers !

Next Seminar in November

- Part 1 Tender Procedures
  - Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
- Part 2 Works Requirements
  - Specifications
  - Drawings
  - Bills of Quantities
  - Other Information
- Part 3 Conditions of Contract and Contract Forms
- Programme, Project Management including Safety

Kyae Zue Thin Bar Taē

Arigatou gozaimashita

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Project Management

Seminar No 10, 12 November 2014
JICA Advisors for Monitoring of LWTP Construction

Faculty of Civil Engineering

JICA Advisors welcome
YCDC colleagues
to the School of Engineers.

Subject of Seminar and JICA Sample Tender Documents

- Part 1 Tender Procedures
  - Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
- Part 2 Works Requirements
  - Specifications (October)
  - Drawings
  - Bills of Quantities
  - Other Information
- Part 3 Conditions of Contract and Contract Forms (September)
- Programme, Project Management including Safety (November)

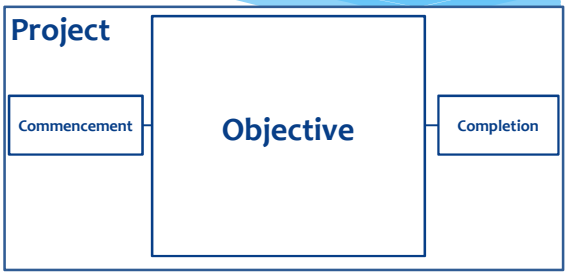
Review

Do you have questions about the Contract Documents including FIDIC Conditions of Contract (MDB Harmonised Edition) and Specifications ?

CONTENTS

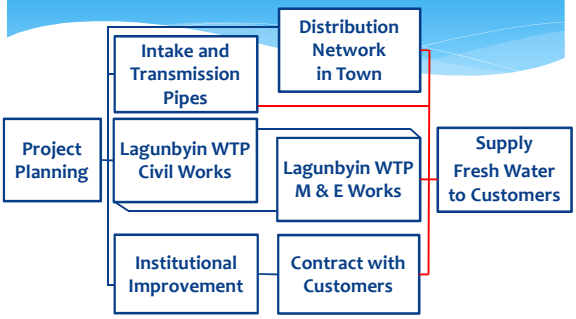
- Project ?
- Project Management under FIDIC Contract
- Safety, Quality and Environment
- Scope and Method of Construction
- Time, Planning and Programming
- Cost and Financial Control
- Reporting and Meeting
- Staff
- Question and Answer

What's 'Project' ?



For Example… Su Mee's Birthday

In the case of Lagunbyin WTP



What's Project Management

The Employer, The Engineer and The Contractor under FIDIC Contract

The Employer prepare the requirements for his objective.
Also the Employer appoint the Engineer
and employ the Contractor.

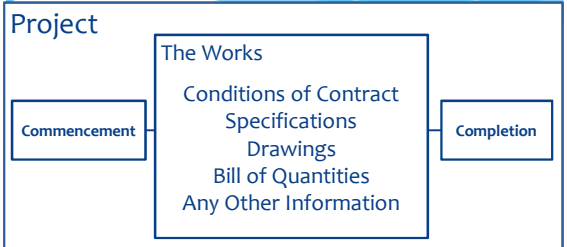
The Engineer will administer the Works
in accordance with the Contract.

The Contractor will execute and complete the Works
in accordance with the Contract.

The Employer

- 2.1 … The Employer shall give the Contractor right of access to, and possession of, all parts of the Site within the time stated in the Contract Data … ;
- 2.2 … The Employer shall provide, at the request of the Contractor, such reasonable assistance as to allow the Contractor to obtain property … ;
- 2.3 (a) … co-operate with the Contractor … ; and
- 2.3 (b) take actions similar to those which the Contractor is required to take Safety Procedures and Protection of the Environment ….

Project Management by The Employer



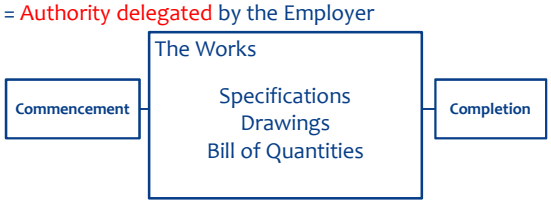
The Engineer

* 1.1.2.4 … the person appointed by the Employer…
* 3.1 (a) … the Engineer shall be deemed to act for the Employer.
* 3.5 … the Engineer shall make a fair determination in accordance with the Contract…

The Engineer administer the Contract
In accordance with the Contract

Project Management by The Engineer

Project within the Contract = FIDIC MDB (Pink Book)
= Authority delegated by the Employer



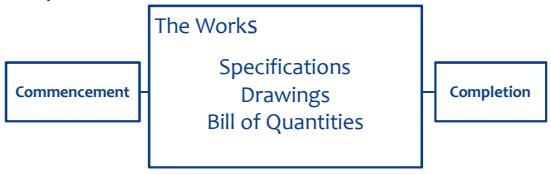
The Engineer administer the Works
in accordance with Specifications and Drawings

The Contractor

* 1.1.2.3 … the person(s) named as contractor…
* 4.1 Contractor's General Obligations
  The Contractor shall design…,
  execute and complete the Works
  in accordance with the Contract…

Project Management by The Contractor

Project



The Contractor execute and complete the Works
in accordance with Specifications and Drawings

Management of Safety, Quality and Environment

International Standards

* OHSAS 18001
  Occupational Health and Safety Assessment Series
  ⇒ "Safety Plan"
* ISO 9001
  Quality Assurance
  ⇒ "Quality Assurance Manual"
* ISO 14001
  Environmental Manage System (EMS)
  ⇒ "Environmental Management Plan"

Health and Safety

* Risks and Measures
  Review the method of construction and identify potential risks and preventive measures to be taken.
* Identify responsibility in the Organisation
  The senior management of the organisation should be responsible for Health and Safety of its staff and workers.
* Minimise risk to employees
  Health and Safety is an interest of the organisation.

Safety on Site (1/5)

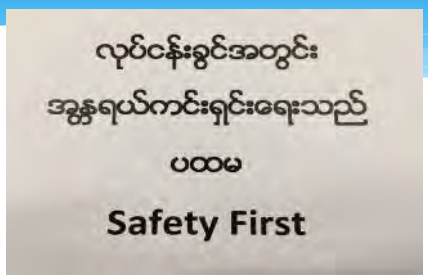
Good Practice

JICA Advisor (TECI) 19 06/04/2015

Safety on Site (2/5)

JICA Advisor (TECI) 20 06/04/2015

Safety on Site (3/5)



Recommended Writing on Sign Board

JICA Advisor (TECI) 21 06/04/2015

Safety on Site (4/5)

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Safety on Site (5/5)

Acetylene Cylinder to be stand while
Oxygen Cylinder can be laid down.
Back fire arrestor should be installed.

Good Safety Practice

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Quality Management

Components
Quality Planning
Quality Control
Quality Assurance
Quality Improvement

Principle
1. Leadership
2. Customer Focus
3. Process Approach
4. Involvement of People
5. Continual Improvement
6. System approach to Management
7. Factual approach to Decision Making
8. Mutual Beneficial Supplier Relationships

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Quality Control

* The observation techniques and activities used to fulfill requirements for quality.

Quality Assurance:
the planned and systematic activities implemented in a quality system so that quality requirements for services will be fulfilled.

Quality Assurance

1. Organisation's Guarantee that the services it offers meets the accepted quality standards;
2. Focused on providing confidence that quality requirements will be fulfilled;
3. Process and procedures for ensuring that qualifications, assessment and programme meet the standards;
4. Assess and improve the merit and its compliance with the standards; and
5. Process by which the achievement of the standard is measured.

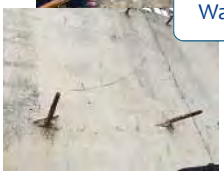
Quality Improvement (1/2)

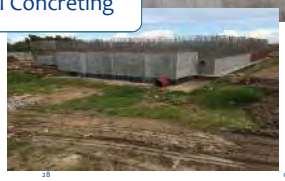
Curing

Kickers

Quality Improvement (2/2)

Wall Concreting





Document Control

* Correspondences including Meeting Minutes (Notes)
  - Master Files (going out and incoming in sequential order)
  - General Files (subject by subject)
  - Working Files (particular topics)
* Programme and Method Statement
* Material Submissions (including samples)
* Tests and Inspection Sheets (including survey reports)
* Measurement Sheets (including bending schedules)
* Drawings and their revisions (Ao and A3 sizes)

Environmental Protection

* Sustainable Improvement of Environmental Protection
* Minimise affection to environment as a result of activities
* Plan – Do – Check – Act

* Provide "EMP" (Environmental Management Plan)

Air Pollution

Cement Storage at the Batching Plant

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Noise Control

Low Noise Breakers

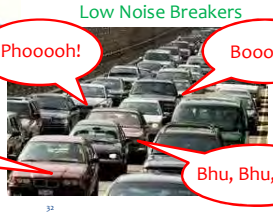
Low Noise Generator

Phooooh!

Booooh!

Phu, Phu, Phu!

Bhu, Bhu, Bhu!



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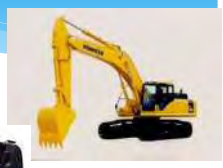
Vibration Control



Low Vibration Construction Equipment

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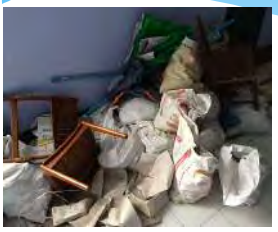
Water Pollution

Ngamoeyeik Creek in Town

Intake at Ngamoeyeik Creek for Lagunbyin WTP

JICA Advisor (TECI)m 34 06/04/2015

Waste Treatment



Before **After**

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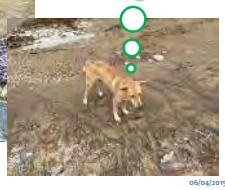
Health and Environment

I am worry about my health and environment around here・・・.



Swimming ?

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A first step for Environmental Friendly Action



Store reusable materials in order

Maintain Access Road

Scope Control

* The Scope of Works are specified in the Tender Document. They are described in:-
  1 Specifications;
  2 Drawings; and
  3 Bill of Quantities.
* If the Scope is changed, Time and Cost will be changed.

Construction Methods

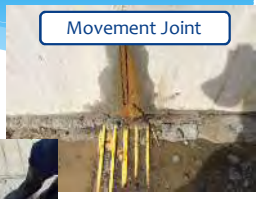
Temporary Works
- Earth Work
- Cofferdam
- Support
- Form Work
- Trenchless
- Tunnels
- etc.

Permanent Works
- Foundation
- Reinforcement Bar
- Concrete
- ABWF
- Building Services
- Plant
- Steel Structure
- Pipes
- etc.

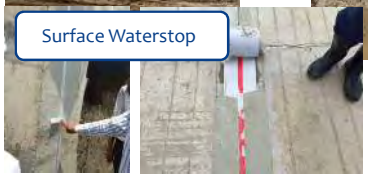
Areas of Concern - Waterproofing

Waterproof Painting

Movement Joint



Surface Waterstop



Water retaining structures must be watertight.

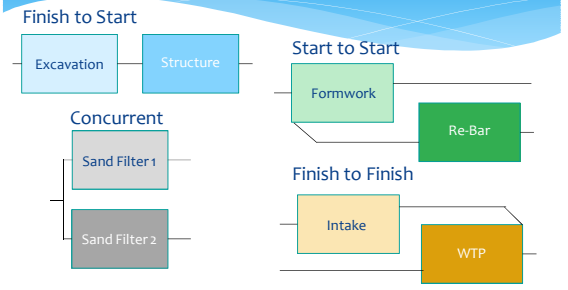
Time Control

* Establish a baseline programme based on the information available at the time of Tender;
* Record actual progress of the works;
* Identify a reason why the actual progress is different from the planned progress (delay or ahead of the baseline programme);
* Review sequence, methods and resources of the works;
* Revise the programme to minimise delay; and
* Monitor the progress of the Works based on the revised PGM.

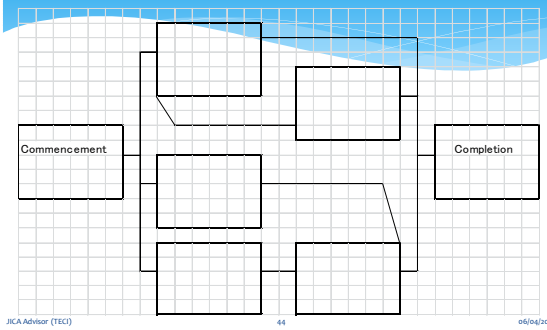
Planning and Programming (1/3)

1 Identify Activities
  Review method of construction
2 Calculate quantity of each activity
  m3, m2, m, ton, no etc.
3 Assess progress rate of each activity
  per month, per week, per day etc.
4 Check Relationship between Activities
  Review the sequence of the works
5 Draw strategic plans in every 3 to 6 month
  Check performance and access on site

Planning and Programming (2/3)



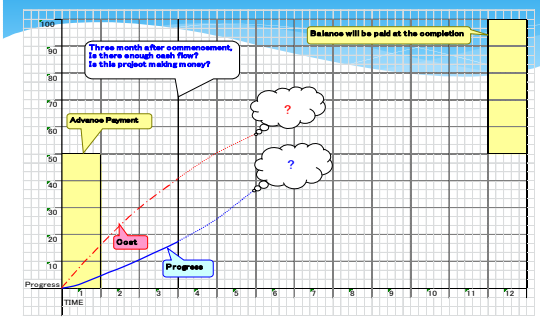
For Example… (3/3)



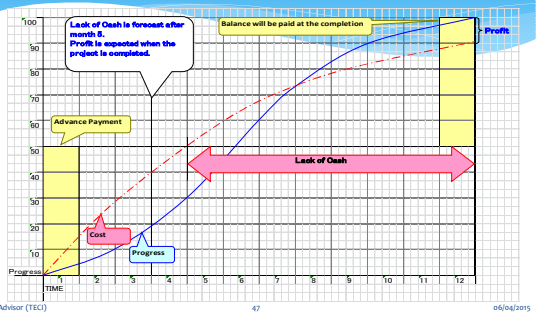
Cost Control

- Principle of Cost Control
  - Budget vs Cost
- Information required for Cost Control
  - Prepare Bill of Quantities based on the requirements in Specifications and Drawings
  - Price BOQ by estimating each activity
  - Plan monthly budget in accordance with the PGM
  - Forecast monthly cost and prepare S-Curve
  - Cost keeping in accordance with Cost Centre
  - Check Cash Flow
- Final Forecast

Financial Forecast (1/2)



Financial Forecast (2/2)



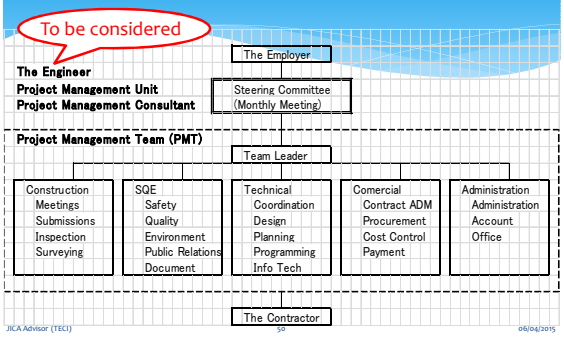
Reporting

- Monthly Report
  - Executive Summary (Status of the Project)
  - Safety, QA and Environmental Protection (How perform)
  - Design (Scope Control)
  - Construction (Method Control)
  - Progress and Programme (Time Control)
  - Suppliers and Contractors (Quality Control)
  - Commercial
    - Cost and Final Forecast (Cost Control)
    - Variations and Claims (Contract Administration)
    - Cash Flow (Financial Control)
  - Staff (Human Resources)

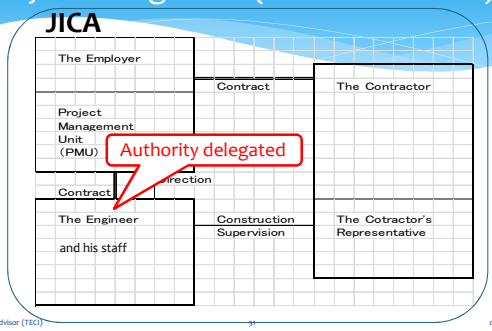
Meetings

- Daly Meeting
  - Site meeting among site staff from each party
- Weekly Meeting
  - Progress review meeting between engineers from each party
- Monthly Meeting
  - Technical and commercial review meeting between management of each party
- Steering Committee Meeting
  - between senior management and Project Office

Organisation and Staff Management



Contract Administration by the Engineer (FIDIC Contract)



Contract Administration by the Employer and his Staff

The Contractor, The Engineer, YCDC, Subcontractors, JICA and all stakeholders

Strive to be Successful with Team Work !

Question and Answer

Ever Forward, a Step by a Step

Next Seminar

* Part 1 Tender Procedures
  - Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
* Part 2 Works Requirements
  - Specifications (October)
  - Drawings
  - Bills of Quantities
  - Other Information
* Part 3 Conditions of Contract and Contract Forms (September)
* Programme, Project Management including Safety (November)

JICA Advisor (TECI) 55 06/04/2015

ကျေးဇူးတင်ပါတယ်

Arigatou gozaimashita

JICA Advisor (TECI) 56 06/04/2015

JICA Advisors welcome
YCDC colleagues
to the Faculty of Civil Engineering.

1

JICA assisted Capacity Development on
Lagunbyin Water Treatment Plant under
Greater Yangon Water Supply Improvement Project
implemented by YCDC

Programming and Water Retaining Structures

Seminar No 11, 21 January 2015
JICA Advisors for Monitoring of LWTP Construction

Subject of Seminars and JICA Sample Tender Documents

* Part 1 Tender Procedures
  Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
* Part 2 Works Requirements
  Specifications (October), Drawings, Bills of Quantities and Other Information
* Part 3 Conditions of Contract and Contract Forms (September)
* Project Management including Safety (November)
* Programming and Water Retaining Structures (January)
* PQ Document and Instruction to Tenderers

Back Number

1 Safety, Quality and Environmental (on site)
2, 3 Workmanship (on site)
4, 5 Construction Details (on site)
6 Site Management (on site)
7 Meetings and Reports (on site)
8 Conditions of Contract (at HO)
9 Specifications (at HO)
10 Project Management (at HO)

Review of Previous Seminars

The Employer, The Engineer and The Contractor under the FIDIC Contract

The Employer prepare the requirements for his objective.
Also the Employer appoint the Engineer
and employ the Contractor.

The Engineer will administer the Works
in accordance with the Contract.

The Contractor will execute and complete the Works
in accordance with the Contract.

The Employer

* 1.8 The Specification and Drawings shall be…;
* 2.1 … The Employer shall give the Contractor right of access to, and possession of, … the Site…;
* 2.3 (a) … co-operate with the Contractor …; and
* 2.3 (b) take actions similar to those which the Contractor is required to take Safety Procedures and Protection of the Environment ….

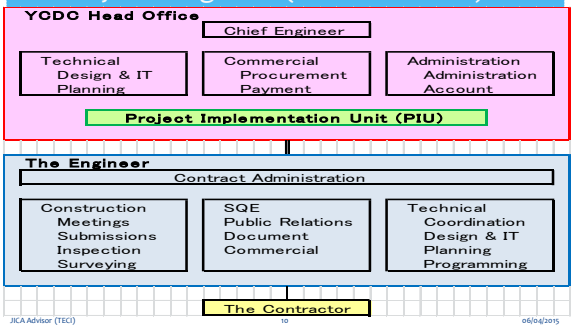
The Engineer

* 1.1.2.4 … the person appointed by the Employer…
* 3.1 (a) … the Engineer shall be deemed to act for the Employer.
* 3.5 … the Engineer shall make a fair determination in accordance with the Contract…

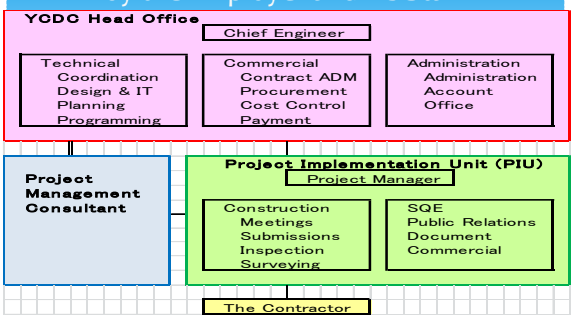
The Contractor

* 1.1.2.3 … the person(s) named as contractor…
* 4.1 Contractor's General Obligations
  The Contractor shall design…, execute and complete the Works in accordance with the Contract…

Contract Administration by the Engineer (FIDIC Contract)



Contract Administration by the Employer and his Staff



Are you ready for JICA Loan Project?

Do you have questions about the Contract, Specifications, Project management and Construction Details or anything ?

Topics of Today

* Planning and Programming
* Time Control
* Structures at Water Treatment Plant
* Waterproofing and Construction Joints
* Remedial Works
* Question and Answer and Next Topics

Planning and Programming

Construction Methods

Establish method of construction for each activity

Temporary Works
- Earth Work
- Cofferdam
- Support
- Form Work
- Trenchless Technique
- Tunnels
- Traffics and Utilities
- etc.

Permanent Works
- Foundation
- Structures
- ABWF
- Building Services
- Plant (M & E)
- Pipe Works
- Road Works
- Landscape
- etc.

Construction Sequence

* General construction sequence shall be :-
  1 from the far end to the near end, because of availability of accesses (must maintain two);
  2 from the deeper section to the shallower portion, because of ground water;
  3 from RC structures, because of coordination between Civil, ABWF, BS and M & E; and
  4 external works and landscape as the last activities, because of possible damages.

Earth Work – Initial and Last Activities

Pre-Sedimentation Pond to be excavated 3m more

Backfilling suitable or unsuitable materials

External Works in Early Stage ?

External works in early days may be damaged by construction activities.

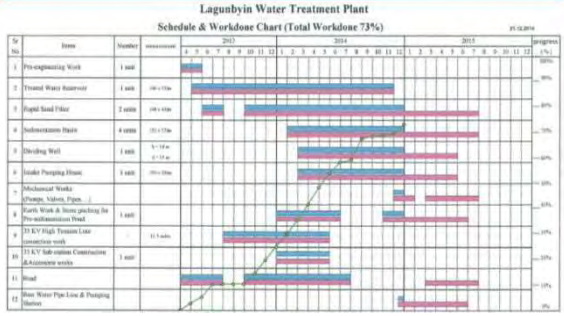
Planning of Each Activity

1 Identify activities
- Review method of construction

2 Calculate quantity of each activity
- m3, m2, m, ton, no etc.

3 Assess progress rate of each activity
- per month, per week, per day etc.

Bar Chart Programme of LGB WTP



Planning of Each Activity

1 Identify activities
- Review method of construction

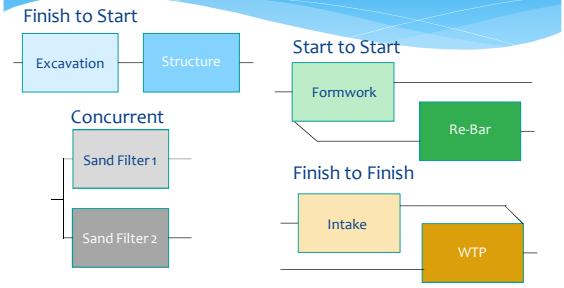
2 Calculate quantity of each activity
- m3, m2, m, ton, no etc.

3 Assess progress rate of each activity
- per month, per week, per day etc.

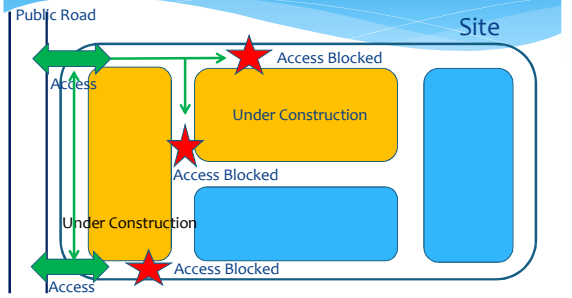
4 Check relationship between activities
- Review the sequence of the works

5 Draw strategic plans in every 3 to 6 month
- Check performance and access on site

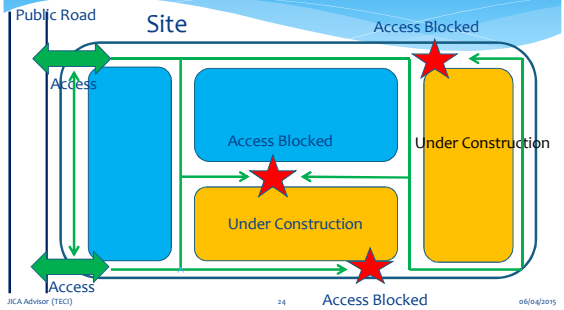
Elements of Flow Chart

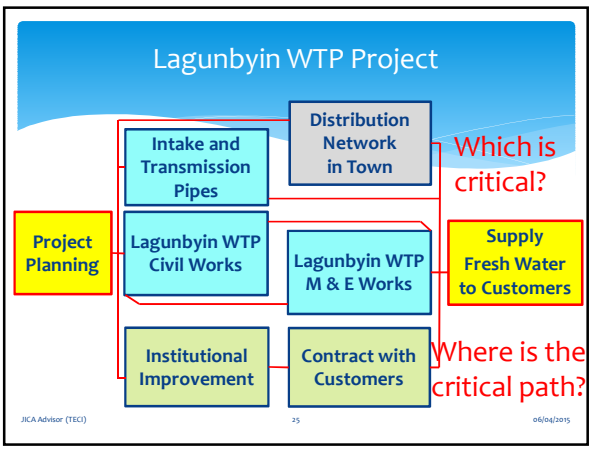


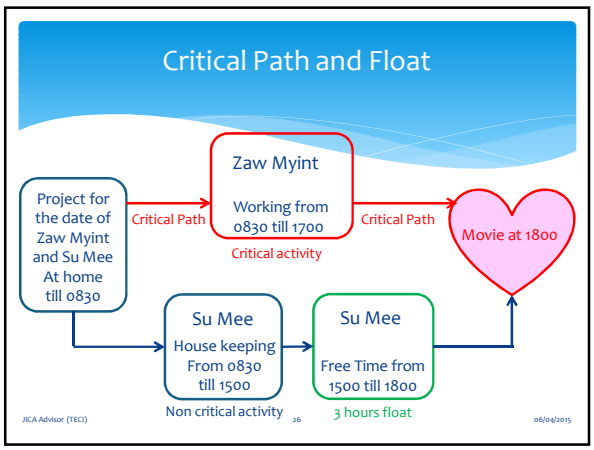
Strategic Plan (1/2)

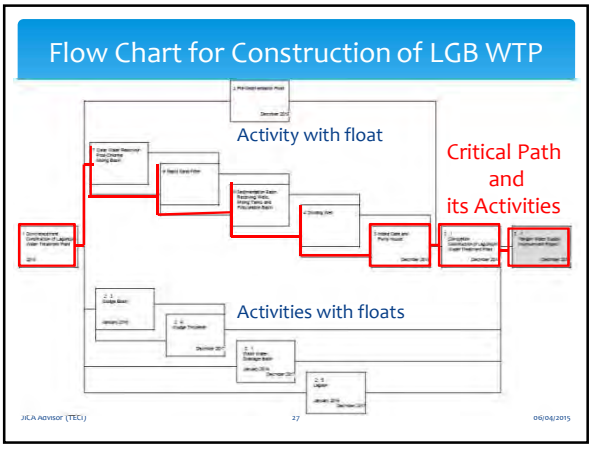


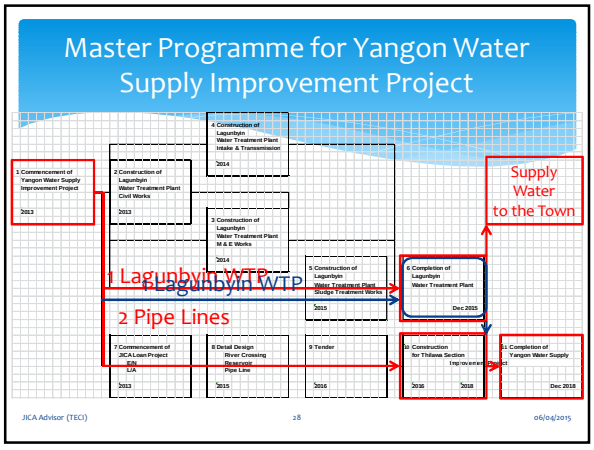
Strategic Plan (2/2)

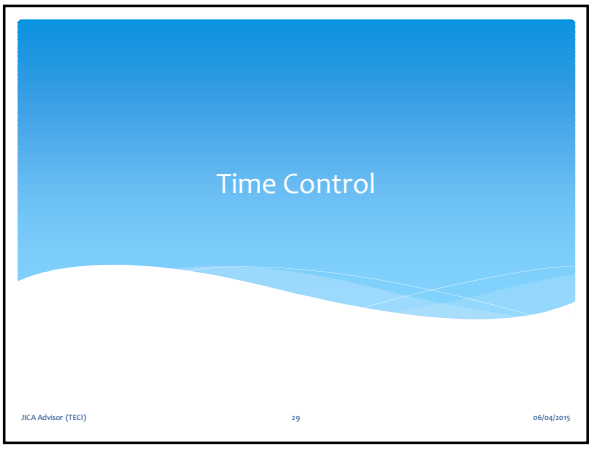


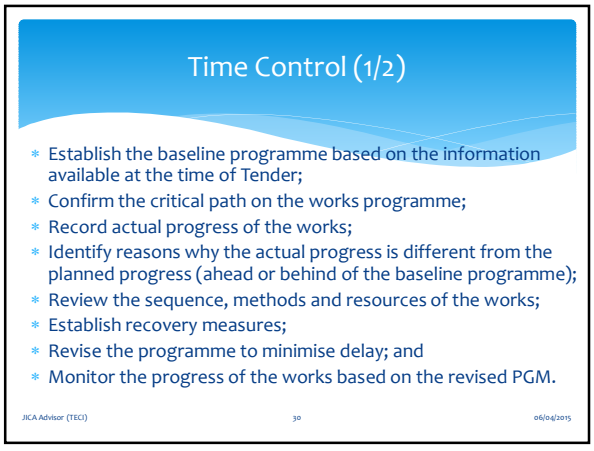

Lagunbyin WTP Project
Distribution Network in Town
Intake and Transmission Pipes
Project Planning
Lagunbyin WTP Civil Works
Lagunbyin WTP M & E Works
Supply Fresh Water to Customers
Institutional Improvement
Contract with Customers
Which is critical?
Where is the critical path?
JICA Advisor (TECI)
25
06/04/2015


Critical Path and Float
Project for the date of Zaw Myint and Su Mee At home till 0830
Critical Path
Zaw Myint
Working from 0830 till 1700
Critical Path
Movie at 1800
Critical activity
Su Mee
House keeping From 0830 till 1500
Su Mee
Free Time from 1500 till 1800
Non critical activity
3 hours float
JICA Advisor (TECI)
26
06/04/2015


Flow Chart for Construction of LGB WTP
Activity with float
Critical Path and its Activities
Activities with floats
JICA Advisor (TECI)
27
06/04/2015


Master Programme for Yangon Water Supply Improvement Project
Supply Water to the Town
1 Lagunbyin WTP
2 Pipe Lines
JICA Advisor (TECI)
28
06/04/2015


Time Control
JICA Advisor (TECI)
29
06/04/2015


Time Control (1/2)
Establish the baseline programme based on the information available at the time of Tender;
Confirm the critical path on the works programme;
Record actual progress of the works;
Identify reasons why the actual progress is different from the planned progress (ahead or behind of the baseline programme);
Review the sequence, methods and resources of the works;
Establish recovery measures;
Revise the programme to minimise delay; and
Monitor the progress of the works based on the revised PGM.
JICA Advisor (TECI)
30
06/04/2015

Time Control (2/2)

During course of the works:-
1 Review activities on the critical path; and
2 Review other activities against their floats.

If activities on the critical path are behind the planned timings:-
1 accelerate activities on the critical path; or
2 change sequence of the works and confirm new critical path.

If other activities are delayed against the planned scedules:-
1 accelerate activities; or
2 change sequence of the works
and confirm they are out of critical path.

For Better Progress (1/2)

Maintain Access Road

Provide Safety Access

Improve Temporary Works

For Better Progress (2/2)

Before

After

Improve Temporary Works - Working Platform

Engineer's Magic Hand

- Information (Specification and Drawings);
- Access (Physical way to the Site);
- Plant and Materials (Are they available?);
- Workers (Do we have enough people?); and
- Money (Making money? About cash flow?).

Structures at Water Treatment Plant

Water Retaining Structures

* Watertightness of the structure
  = the flow of water from inside the structure to outside, and the infiltration of water from the surrounding areas into the structure are effectively prevented.
* Watertight concrete is achieved by :-
  1 design
  2 materials and
  3 construction method and good workmanship

Design (1/2)

Study and Review:-

- Requirements (by The Employer)
- Serviceability (Capability and Performance)
- Design (including Architectural Design)
- Durability (Materials, Specifications)
- Loads (Design Criteria, Structural Design)
- Joints Details (Watertightness)

Design (2/2)

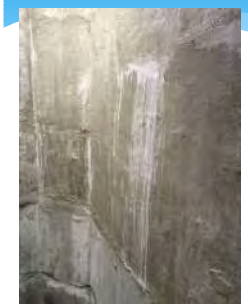
Consider to avoid cracks and leakages:-

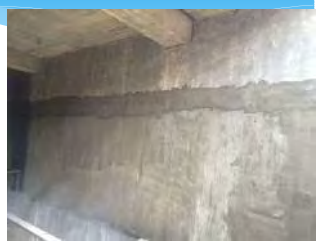
1 Movements due to shrinkage and creep;
2 Movements due to temperature and humidity;
3 Movements due to dissipation during hydration;
4 Damage to the concrete due to percolation of chemically aggressive liquid from outside;
5 Damage due to uneven settlement of foundations
6 Cracking of concrete caused by rusting bars; and
7 Hydrostatic uplift force

Workmanship

- Care of waterproofing membrane
- Installation of water bar and water stops
  - Center bulb water bar
  - Surface water bar
  - Hydrophilic water stops
- Installation of joint filler and preparation of construction joints
- Maintaining concrete cover (50~75mm)
- Operation of vibrators (enough but not too much)
- Scrabbling of concrete surface at construction joints
- Apply joint sealant and protection measures

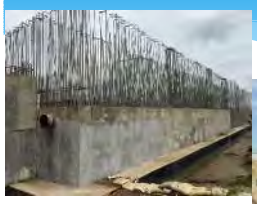
Cosmetic Finish on Walls (1/2)





Inside of the Structure

Cosmetic Finish on Walls (2/2)



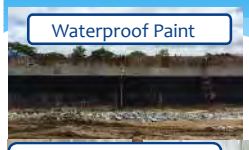
Outside of the Structure

Waterproofing Paint

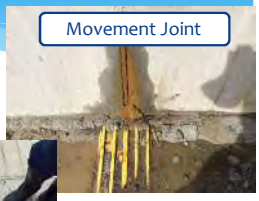
Do you know how much this black paint is efficient for the flow of water from inside the structure to outside?

Actual Site Conditions

Waterproof Paint



Movement Joint



Surface Water stops

Water retaining structures must be watertight.

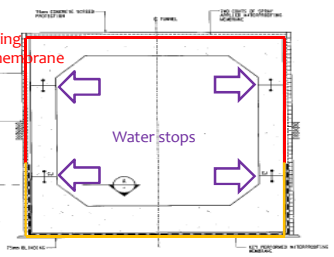
Waterproofing and Construction Joints

Cross Section of Box Culvert

Two coats of spray applied waterproofing or waterproofing membrane

Water stops

Key performed waterproofing

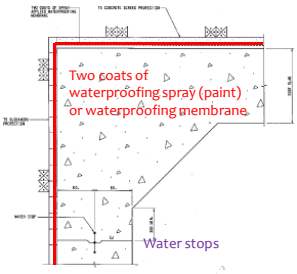


TYPICAL TUNNEL SECTION

Typical Waterproofing

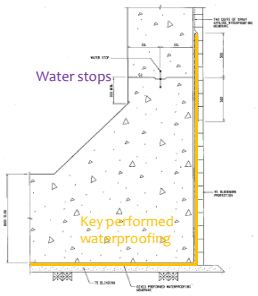
Two coats of waterproofing spray (paint) or waterproofing membrane

Water stops



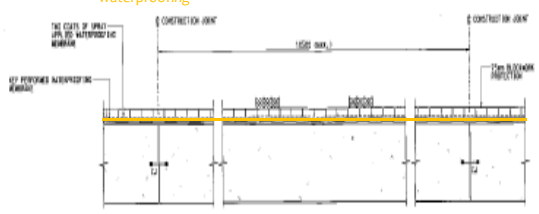
Water stops

Key performed waterproofing

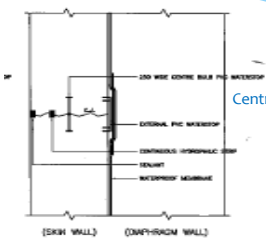


Roof Slab

Key performed waterproofing



Wall and Base Slab



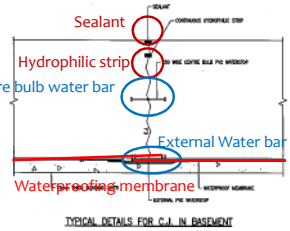
Sealant

Hydrophilic strip

Centre bulb water bar

External Water bar

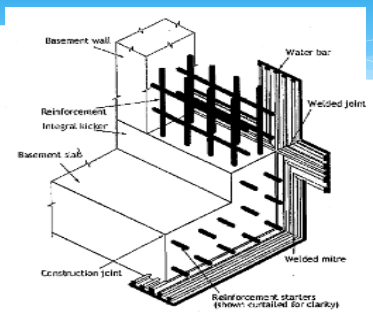
Waterproofing membrane



TYPICAL DETAILS FOR C.J. IN BASEMENT

TYPICAL DETAILS FOR C.J. IN SKIN WALL

Typical Construction Joint 1



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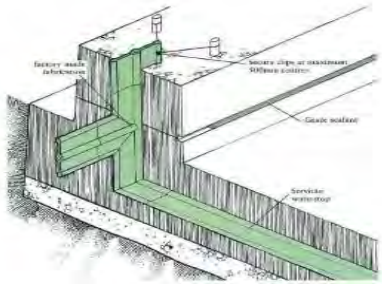
Typical Construction Joint 2



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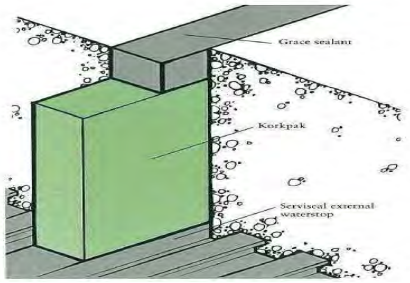
Typical Movement Joint 1



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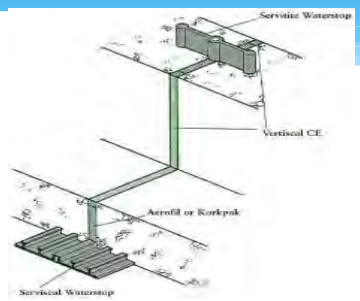
Typical Movement Joint 2



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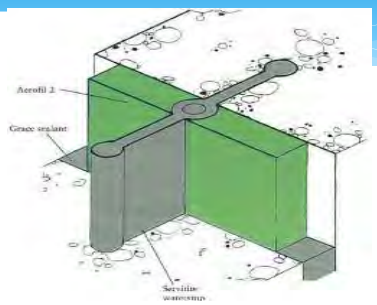
Typical Movement Joint 3



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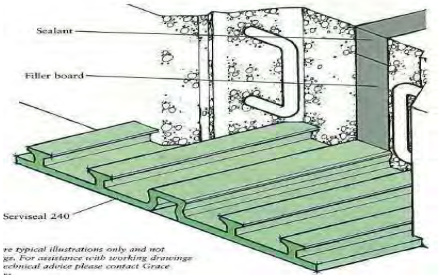
External (Surface) Water Bar at Movement Joint



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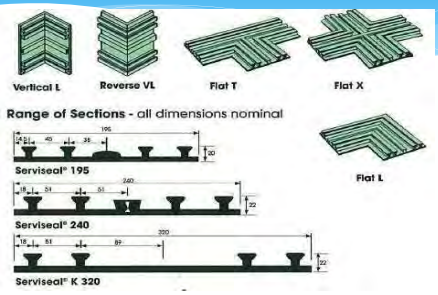
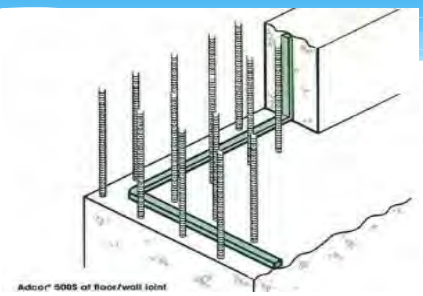
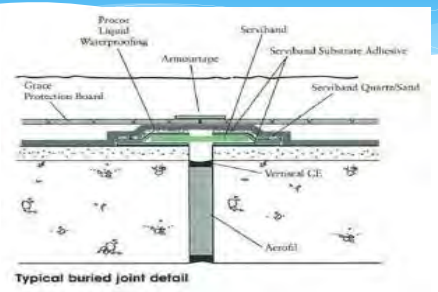
Details of External Water Bar



Hydrophilic Strip (Waterstops)



Typical Buried Joint

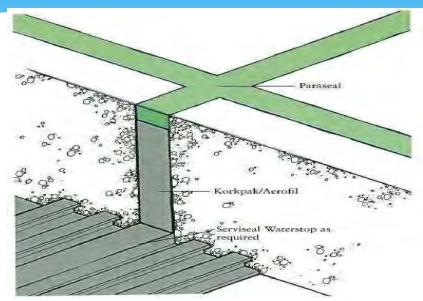


Remedial Works

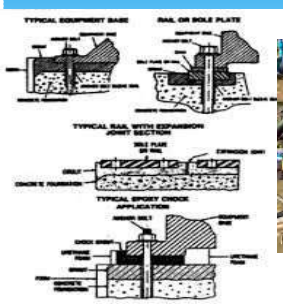
Stop Water !

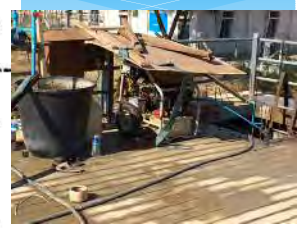
* Form inside
  - any finishing to the internal surface of the structures ?
  - epoxy coating
  - apply joint sealant at the movement joints
  - cement milk and/or epoxy grouting
* From outside
  - cement milk and/or epoxy grouting
  - apply water stops (plug)

Apply Joint Sealant



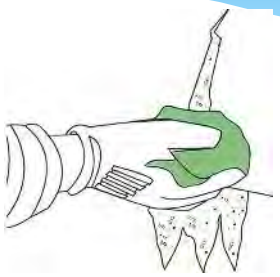
Epoxy or Cement Milk Grout





Remedial grouting
at Clear Water Reservoir

Rapid-setting Plugging Mortar



Recommendations

Remedial works and/or double handing does not help not only progress of the works but also they damage the financial aspect of the project.

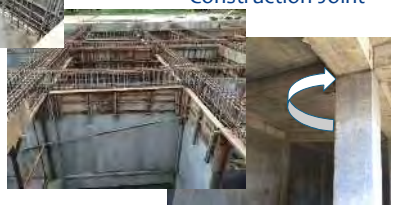
Therefore,

1 proper design and proper planning;
2 proper materials and proper construction method; and
3 proper workmanship under proper supervisions
are highly recommended.

Design and Planning

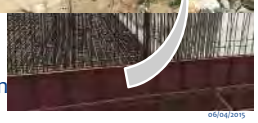
Location of
Construction Joint

Structure Design
1 Beam support
or
2 Slab and Wall



Planning and Materials

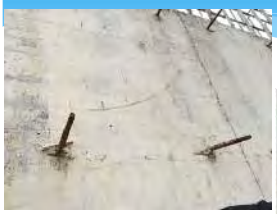
Steel Form
or
Timber Form



Materials and Method

plywood shutter, t=18mm

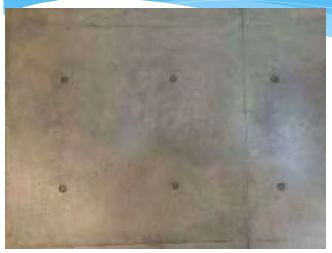
Method and Workmanship



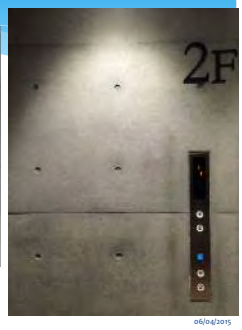
Before

After

Workmanship and Supervision



A sample of concrete finish



Supplier of Building Materials

For example, 'resapol' of UK handles:-

* GRACE (US);
* Fosroc (UK);
* Sika (Swiss);
* BASF (Germany).

and

* Many other building materials suppliers are available on the internet.

Question and Answer and Next Topics

Question and Answer

Ever Forward, a Step by a Step

The Contractor, The Engineer, YCDC, Subcontractors, JICA and all stakeholders

Strive to be Successful with Team Work !

Subject of Seminar and JICA Sample Tender Documents

- Part 1 Tender Procedures
  Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
- Part 2 Works Requirements
  Specifications (October), Drawings, Bills of Quantities and Other Information
- Part 3 Conditions of Contract and Contract Forms (September)
- Project Management including Safety (November)
- Programme and Water Retaining Structures (January)
- PQ Document and Instruction to Tenderers

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ကျေးဇူးတင်ပါတယ်

Arigatou gozaimashita

Thank You

Safety First

JICA Advisor (TECI) 74 06/04/2015

JICA Advisors welcome
YCDC colleagues
to ~~the School of Magic~~
the Faculty of Civil Engineering.

1

JICA assisted Capacity Development on
Lagunbyin Water Treatment Plant under
Greater Yangon Water Supply Improvement Project
implemented by YCDC

Prequalification, Instructions to Tenderers and Bill of Quantities

Seminar No 12, 18 March 2015
JICA Advisors for Monitoring of LWTP Construction

Review of Previous Seminars

Engineer's Magic Hand

Engineers manage projects with five fingers!

- Information (Specification and Drawings);
- Access (Physical way to the Site);
- Plant and Materials (Are they available?);
- Workers (Do we have enough people?); and
- Money (Making money? About cash flow?).

The Employer, The Engineer and The Contractor under FIDIC Contracts

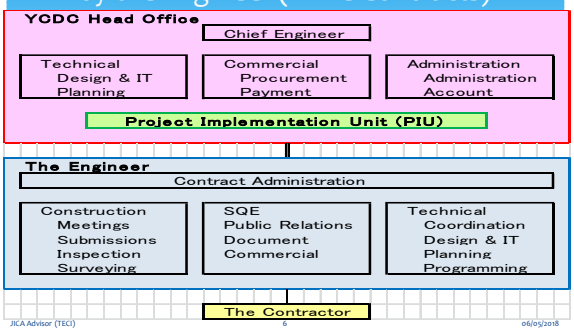
Three Partners of Projects:-

The Employer prepare the requirements for his objective. Also the Employer appoint the Engineer and employ the Contractor.

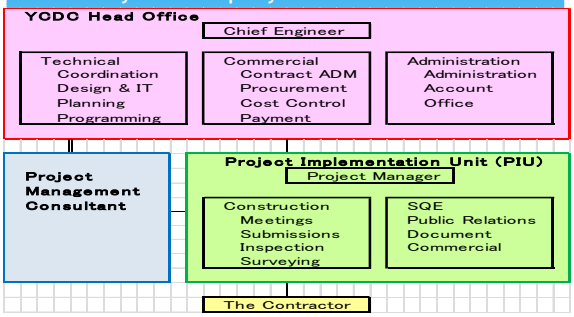
The Engineer will administer the Works in accordance with the Contract.

The Contractor will execute and complete the Works in accordance with the Contract.

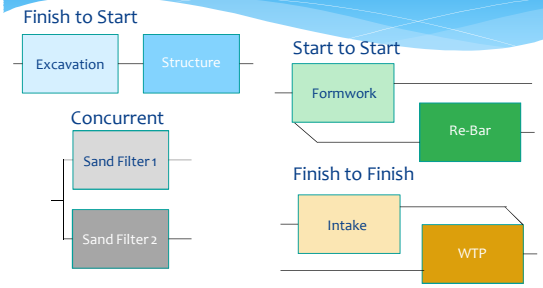
Contracts Administration by the Engineer (FIDIC Contracts)



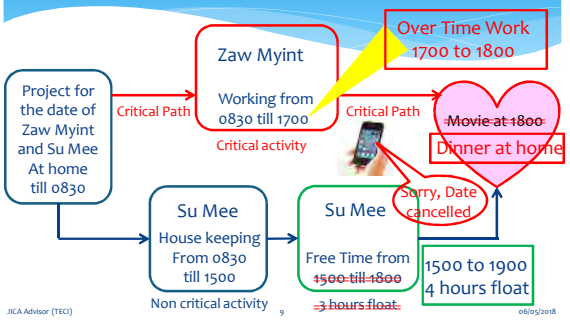
Contracts Administration by the Employer and his Staff



Elements of Flow Chart
Identify relationships between activities!



Critical Path and Float
Delay on critical activities leads EOT!



Are you ready for JICA Loan Projects?

Do you have any questions about the Contract, Specifications, Project management, Programme or Construction Details ?

Subject of Seminars and JICA Sample Tender Documents

- Part 1 Tender Procedures
  Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
- Part 2 Works Requirements
  Specifications (October), Drawings, Bill of Quantities and Other Information
- Part 3 Conditions of Contract and Contract Forms (September)
- Project Management including Safety (November)
- Programming and Water Retaining Structures (January)
- PQ Document and Instructions to Tenderers
- Construction Supervision and Contracts Administration

Topics of Today

- Prequalification
- Instructions to Tenderers
- Type of Contracts
- Bill of Quantities
- Question and Answer
- Next Topics

Prequalification

Objective of Prequalification

* The prequalification is to identify those who are interested and capable of undertaking the contract and to keep tendering cost minimum.
* Tenderers will only be invited from the list of pre-qualified contractors.
* The qualification requirements shall be limited to those which are essential to ensure that prequalified tenderers are capable of executing the contract.
* There shall be no discrimination against local or overseas contractors.

Type of Prequalification

* There are two types of prequalification:
  a) prequalifying only a limited number of contractors (say 3 or 4) i.e. those scoring the highest marks in the prequalification exercise; or
  b) prequalifying all contractors who meet the qualification requirements.
* The Express of Interest may be asked from potential tenderers prior to the prequalification.

Sample Prequalification Documents under Japanese ODA Loans, issued by JICA

PART 1 Prequalification Procedures
- Section I Instructions to Applicants
- Section II Prequalification Data Sheet – General Information
- Section III Prequalification Criteria and Requirements
- Section IV Application Forms
- Section V List of Eligible Countries of Japanese ODA Loans

PART 2 Works Requirements
- Section VI Scope of Works

Note for Prequalification Documents Part 1 Section III

In addition to JICA sample, the followings may be asked:
1 Eligibility - Ownership to be asked;
2 Historical Contract Non-Performance - Conviction record to be asked;
3 Financial Situation; and
4 Experience - Resources
Safety, Quality Assurance, Environmental Management and Status of PII Insurance to be asked.

Instructions to Tenderers

JICA Sample Tender Documents under Japanese ODA Loans

* Part 1 Tender Procedures
  Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
* Part 2 Works Requirements
  Specifications (October), Drawings, Bill of Quantities and Other Information
* Part 3 Conditions of Contract and Contract Forms (September)

Details of Sample Bidding Documents

PART 1 Bidding Procedures
- Section I Instructions to Bidders (ITB)
- Section II Bid Data Sheet (BDS)
- Section III Evaluation and Qualification Criteria
- Section IV Bidding Forms
- Section V List of Eligible Countries of Japanese ODA Loans

PART 2 Works Requirements
- Section VI Works Requirements

PART 3 Conditions of Contract and Contract Forms
- Section VII General Conditions (GC), FIDIC MDB version
- Section VIII Particular conditions
- section IX Annex to the Particular Conditions – Contract Forms

Note for Instructions to Tenderers

In addition to JICA sample, the followings may be clarified:
* Tenderer to visit Site;
* Information available for Inspection;
  Utility Services
  Soil Information
  Traffic Information, etc.
* Method of Construction;
* Tender Programme;
* Safety, Quality and Environmental Management; and
* Alternative Tender.

Type of Contracts

FIDIC MDB version of Conditions of Contract

* Contract Types
  1 measurement or lump sum;
  2 with fluctuation or fixed; and
  3 the Employer's design or the Contractor's design.
* Clause 4.1 Contractor's General Obligation
  The Contractor shall design (to the extent specified in the Contract), execute and complete the Works in accordance with the Contract and with the Engineer's instructions, and shall remedy any defects in the Works.
* FIDIC MDB version Conditions of Contract could cover any type of contracts.

Priority of Documents

GCC Sub-Clause 1.5

* the Contract Agreement (if any),
* the Letter of Acceptance,
* the Letter of Tender,
* the Particular Conditions – Part A,
* the Particular Conditions – Part B,
* these General Conditions,

MDB Version

* the Specification,
* the Drawings, and
* the Schedules and any other documents forming part of the Contract.

Particular Conditions Part B

- FIDIC MDB Version of Conditions of Contract could be tailor-made by the requirements and clarification described in Part B.
- Specific Provisions are intended to address country, project, and contract specific requirements not covered by General Conditions.
- Very careful consideration and/or legal advice is recommended when amending provisions or drafting new clauses.

FIDIC MDB Version for JICA Loan Projects under Japanese ODA

The contract under the Pink Book (FIDIC MDB Version) is a remeasurement contract with approximate Bill of Quantities.

The quantities in the Bill of Quantities are approximate only and are subject to remeasurement upon completion of works on site.

Items could be lump sum if the accurate quantities for the activities measured from the fully completed design in the pre-contract stage.

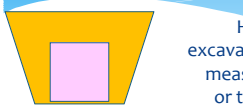
Lump sum items with drawings and specification are applicable to the electrical and mechanical works. However, measurement is required to assist in valuation of the variations.

Bill of Quantities

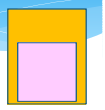
Definition of Bill of Quantities

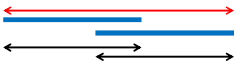
- The term Bill(s) of Quantities is defined in the method of measurement as a list of items giving brief identifying descriptions and estimated quantities of the works to be performed.
- Quantity is simple but one of the biggest risk not only for the Contractor but also for the Employer.
- BOQ (BQ) forms a part of the contract documents and is the basis of payment to the Contractor.

Method of Measurement

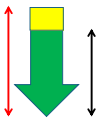


How to measure
excavation or filling volume?
measure actual volume?
or theoretical volume?





How to measure reinforcement bar?
measure lap length?
or ignore lapping?



How to measure piling length?
measure actual length?
or bored length?

Objectives of Bill of Quantities

The BOQ should be prepared correctly.

The following four main objectives of the document should always be kept in mind during preparation of BOQ.

a) to enable tenders to be obtained from tenderers;
b) to form the basis for tender comparison;
c) to provide means of valuing the works; and
d) to form a basis for fixing any rates not included in the BOQ or valuing any variations.

Preambles for Bill of Quantities

* General Preambles

They provide the tenderers with the information needed for pricing the bill items and must be included in the contract documents.

* Particular Preambles

They provide details of any amendments to the method of measurement to meet specific needs of the Contract.

(For example)

The item of the Bills of Quantities are not to be remeasured for payment unless those items marked with "*" which will be remeasured.

Sample Preamble (1/2)

1		This is a lump sam fixed price contract.
2		The Drawings show the design intent of the Works. The Drawings will be deemed to have been the basis of the lump sum fixed price.
3		The Contractor is required to allow within his prices and sums for the development and full coordination of the Specification and the Drawings into the Works to enable the Works to be carried out on the Site.
4		The Contractors attention is specifically drawn to the requirements of the continuous operation of the existing pumping station during the Works.
5		The Contractor's attention is drawn to the requirements for the responsibility of completing the Works as required by the Contract.
6		The quantities in the pricing documents are computed from the Drawings, but they are not guaranteed nor remeasured. The Contractor will be deemed to have reviewed and determined for himself the extent of the Works consisting of removal of the existing facilities and installation of the new facilities from the Specification and the Drawings.

Sample Preamble (2/2)

7		The Drawings do not show the extent of any additional service runs and fittings required to the rehabilitation works. These additional service runs or fittings and the development and coordination of the Works are to be allowed for by the Contractor in his prices and sums.
8		Adjustment item may be a lump sum addition or deduction in the Grand Summary in adjustment of the total of the priced parts Summaries.
9		The price and sums for items are to include providing and installing concrete thrust blocks, anchor blocks and the like, as necessary.
10		Testing and any commissioning shall include the cost of all necessary power, fuel and consumables, the provision of all instruments and the provision of all things necessary to carry out the testing and commissioning, as described, including the preperation of test certificates and the witnessing of the testing and commissioning by the Engineer.

Prime Cost Items

The estimated price of work to be carried out by a Nominated Sub-Contractor shall be given in the BOQ as a Prime Cost Item

* Contractor's General Attendance (could be included)
* Contractor's Special Attendance (could be included)
* Contractor's profit and overheads

Provisional Sums and Other Items

* A Provisional Sum means a sum provided for works or expenditure which has not been quantified or detailed at the time of tender documents are issued, which sum may include provision for works to be executed or for materials or services to be supplied by a Nominated Sub-Contractor.
* Daywork (could be one of the method to reserve budget)
* Adjustment Item (to be proposed by the Tenderers)
* Contingency (around 3% is suggested)

Grand Summary of BOQ

1 Bill No 1 Preliminaries
2 Bill No 2 Construction/Structures
3 Bill No n Construction/Structures
4 Bill No X Prime Cost (by Nominated Sub-Contractors)
5 Bill No Y Provisional Sums
6 Bill No Z Daywork

Total

7 Adjustment Item
8 Contingency

Grand Total (Tender Price)

Bill No 1 Preliminaries

BILL NO. 1 PRELIMINARIES AND GENERALS

Item Code	Item Description	Unit	Quantity	Rate JPY	Amount JPY
	GENERAL ITEMS				
	CONTRACTUAL REQUIREMENTS				
020110	Performance Security	sum			
020110	Advance Payment Guarantee	sum			
	Contractor's Insurances				
020130	Contractor's All Risks Insurance for the Works	sum			
020130	Third Party Insurance against injury to persons and damage to properties	sum			
020130	Employees' Compensation Insurance for Contractor's personnel	sum			
020130	Professional Indemnity Insurance	sum			
020130	Contractor's Equipment Insurance	sum			

Bill No 2 ~ n Construction/Structures

Bill No. 2 GENERAL CIVIL WORKS

Item Code	Item Description	Unit	Quantity	Rate JPY	Amount JPY
	GENERAL CIVIL WORKS				
	SEWAGE TREATMENT PLANT (STP) SITE				
	SITE CLEARANCE				
150210	Works Areas for the Sewage Treatment Plant Site	sum			
	TEMPORARY WORKS				
	Temporary Access Roads				
100210	Access road A from Tirana Municipality toward Kashar Commune to the Sewage Treatment Plant Site including provisions of existing stream crossings in Works Area A	sum			
100210	Alternative access mad B from Rruga 28 Nentori at Mëzez to the Sewage Treatment Plant Site including provisions of existing stream crossings in Works Area B, if necessary	sum			
	Temporary Roads within the SPT Site				
100220	Temporary roads with hardcore materials including temporary stream crossings within the Sewage Treatment Plant Site	sum			
	Temporary Diversion of Streams				
100230	Streams in the vicinity of the Sewage Treatment Plant Site	sum			

Temporary Works

	TEMPORARY WORKS				
100310	Temporary cofferdam with support system	sum			0.00
100330	Other Temporary Works required for the Contractor's proposed construction method including their removal from the Site on Completion	sum			0.00
	EARTHWORK				
	Excavation for Structure				
200311	Excavate materials other than top soil or artificial hard materials and/or fill to the formation levels including preparation for blinding and deposit surplus materials to Works Area STP-3	m3	17,864	0.00	0.00
	Filling				
200331	Suitable materials from Works Area STP-3	m3	5,997	0.00	0.00
200331	Gravel (0 - 75mm) to receive blinding concrete	m3	1,084	0.00	0.00

Formwork

	FORM WORK				
	Plywood Finish including box out up to 500 x 500mm, construction joints, propping, support, scaffolding and the like				
400311	Base slab	m2	225		
400311	Slabs and beams other than base slab	m2	2,789		
400311	Columns	m2	907		
400311	Walls	m2	7,829		
400311	Stairs	m2	162		

Reinforcement Bars

	REINFORCEMENT WORK				
	Supply, fabricate and install deformed high yield steel bars to DIN 488				
450311*	Nominal size 8mm	kg	469		
450311*	Nominal size 10mm	kg	35,306		
450311*	Nominal size 12mm	kg	810		
450311*	Nominal size 14mm	kg	6,413		
450311*	Nominal size 16mm	kg	2,506		
450311*	Nominal size 20mm	kg	148,234		
450311*	Nominal size 25mm	kg	511,713		

Concrete

	CONCRETE WORK				
	Provision of Concrete				
300611	Class C 16/20	m3	159		
300611	Class C 30/37	m3	1,295		
	Placing of Concrete				
	Placing, finishing with trowel and curing of concrete including scabbling to construction joints				
300621	Blinding layer (Class C 16/20) including stop end forms	m3	159		
300621	Slabs and beams (Class C 30/37)	m3	1,004		
300621	Walls (Class C 30/37)	m3	289		
300621	Stairs (Class C 30/37)	m3	2		

Pipe Works

	PIPE WORKS IN SEWAGE TREATMENT PLANT				
	Design, supply, fabricate and install pipes including embedding in accordance with requirements of the Specification and the Drawings				
	SEWAGE PIPE WORKS BETWEEN FACILITIES				
	Sewage Pipes from Suction Chamber of Lift Pumps to Main Distribution Tank				
701911	Ductile Iron Pipe - DN 400mm	m	15		
701911	Ductile Iron Pipe - DN 500mm	m	21		
701911	Ductile Iron Pipe - DN 1200mm	m	58		
701911	Ductile Iron Pipe - DN 1800mm	m	1		
701921	Flexible Joint - DN 1200mm, Shear Deflection 100mm	nr	2		

Microtunnelling

	TRUNK SEWER & MAIN SEWER				
	Supply and install sewer pipes by microtunnelling technique with the Contractor's proposed temporary works, including traffic diversion, decking and pedestrian bridges and the like, which shall be removed from the Site on Completion and reinstate to the original conditions and to the acceptance of the Relevant Authorities				
	MICROTUNNELLING MACHINES				
	Deliver and operate microtunnelling machines to install sewers in accordance with the construction programme including intermediate jacking system, as necessary, maintenance, spare parts and insurance and removal from the Site on completion.				

Design and Build Item

752630	Design, supply and install the New South Interceptor from overflow structure L-07 in the vicinity of the Ballet School to Shaft #12 in Area 507 along the Southern part of Bulevardi Bajram Curri for about 2,990m by microtunnelling technique including launching shafts and arrival shafts, connections of the existing 16 numbers of sewer pipes and culverts by overflow structures and manholes, a connection of the Existing South Interceptor, which collects the rest of sewage and stormwater flow from the area located South of the ESI, an overflow structure that discharges the dry weather flow to Shaft #12 and the excess flow to Lana River including the connection to shaft #12 and the outlet structure to Lana River with the Contractor's proposed temporary works, such as cofferdam, sheet piling, trial excavation, utility sounding, traffic diversion, decking and pedestrian bridges and the like, which shall be removed from the Site on Completion and reinstate to the original conditions and to the acceptance of the Relevant Authorities.	sum			0.00
	The design shall be subject to the Approval of the Engineer shall comply in all aspects with the Employer's Requirements of the New South Interceptor contained in the Specification and the Drawings.				

Mechanical Works

Bill No. 20 MECHANICAL WORKS

Item Code	Item Description	Unit	Quantity	Rate JPY	Amount JPY
	PLANT INSTALLATION				
	Design, manufacture, supply and install mechanical works in accordance with requirements of the Specification and the Drawings				
	GRIT CHAMBER AND PUMP STATION				
	Plant for Grit Chamber				
902011	Inlet gate	nr	2		
902021	Coarse screen	nr	2		
902021	Fine screen	nr	2		
902041	Screening conveyor (1)	nr	1		

Electrical Works

Bill No. 21 ELECTRICAL WORKS

Item Code	Item Description	Unit	Quantity	Rate JPY	Amount JPY
	ELECTRICAL INSTALLATION				
	Design, manufacture, supply and install electrical works in accordance with requirements of the Specification and the Drawings				
	35kVA SUBSTATION AND GENERATOR HOUSE				
	35kV System				
	MV Line Arrival, AR-1				
952110	40(24)kV, 400A, 12.5kA	sum			
	MV Line Departure, AR-2				
952110	40(24)kV, 400A, 12.5kA	sum			

Architectural Builder's Works and Finishes

	ARCHITECTURAL BUILDER'S WORKS AND FINISHES (ABWF)				
	Design, manufacture, supply and install ABWF works in accordance with requirements of the Specification and the Drawings				
	Rendering				
602311	Horizontal surface	m2	1,477		
	Plastering				
602311	Internal walls (PL-1, t=20mm)	m2	1,598		
602311	Perimeter walls (PL-2, t=20mm)	m2	449		
602311	Perimeter walls (PL-3, t=35mm)	m2	91		
	Tiling				
602321	TL-01 (glazed porcelain tiles, class 3, 12 x 400 x 400mm)	m2	188		

Building Services

	BUILDING SERVICES					
	Design, manufacture, supply and install Building Services works in accordance with requirements of the Specification and the Drawings					
652310	Mechanical works	sum				
652320	Electrical works	sum				
652330	Fire services	sum				
652340	Hydraulic works	sum				

Prime Cost – Nominated Sub-Contractor

	PRIME COST, PROVISIONAL AND CONTINGENCY SUMS	
	PRIME COST SUM FOR WORK TO BE CARRIED OUT BY NOMINATED SUB-CONTRACTORS	
	Building Services Installations	
	Allow the Prime Cost Sum of HK$ 7,500,000.00 for	
A	electrical, fire service, towngas and air conditioning and mechanical ventilation installations	7,500,000.00
	Add for profit	
B	_____ %	
	Allow for attendance as detailed in Bill Nr. 1 and for cutting away for and making good in all trades after the installation of the following:-	

Provisional Sums

	BILL No. 30A PROVISIONAL SUMS					
	Provide the following Provisional Sums to be expended in whole or in part or omitted in total if not required upon written instruction of the Engineer in accordance with Clause 13.5 and of the General Conditions of Contract.					
	PROVISIONAL SUMS					
013010	Allow the Provisional Sum of JPY 26,000,000 for Utility Diversions by the Contractor	sum				26,000,000
013030	Allow the Provisional Sum of JPY 3,000,000 for furnitures in the Administration Building and other buildings in the Sewage Treatment Plant	sum				3,000,000
013040	Allow the Provisional Sum of JPY 4,000,000 for equipments in the workshop and store room in the Sewage Treatment Plant	sum				4,000,000

Daywork (1/3)

	BILL 30B DAYWORKS					
	Daywork Rates shall be used for valuation of the Daywork instructed by the Engineer in accordance with Clause 13.6 of the General Conditions of Contract					
	LABOUR					
	Rates shall include on and off overhead of the Contractor, supervision, taxes, insurance, general allowance and the like during normal working hours including meal break and rest periods. Also rates shall include hand tools, ladders, trestles, protective clothing, safety equipment, use of existing services, temporary works and normal travelling time to and from the Site.					

Daywork (2/3)

	PLANT					
	Rates shall include on and off overhead of the Contractor, operator, supervision, taxes, insurance, general allowance and the like including standing time. Also rates shall include fuel, oil, consumable stores, repairs, maintenance and normal travelling time to and from the Site.					
	MATERIALS					
	Rates shall include on and off overhead of the Contractor, taxes, insurance, general allowance and the like including waste and surplus materials. Also rates shall include transportation, delivery, unloading, unpacking, storing and protecting.					

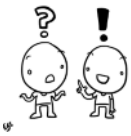
Daywork (3/3)

013015	General Labour	h	10			
013015	Carpenter	h	10			
013015	Steel fixer	h	10			
013025	Hydraulic backhoe (0.8m3)	h	10			
013025	Compressor (7.5m3/min) with two breakers	h	10			
013025	Mobile crane (20ton)	h	10			
013035	Concrete (30/37)	m3	1			
013035	Deformed reinforcement bars (10 - 20mm)	t	1			
013035	Plywood (18 x 1200 x 2400)	nr	1			

Contingency Sum

	CONTINGENCY SUM	
	Provide the following sums to be expended wholly or in part as directed by the Architect or wholly deducted from the Contract Sum if not required	
	Allow a Contingency Sum for	
A	General Contingencies	2,700,000 00
B	Contract Price Fluctuation	3,800,000 00

Question and Answer and Next Topics



Question and Answer

Ever Forward, a Step by a Step

The Contractor, The Engineer, YCDC, Subcontractors, JICA and all stakeholders

Strive to win with Team Work !

Back Numbers

1 Safety, Quality and Environmental (on Site)
2 & 3 Workmanship (on Site)
4 & 5 Construction Details (on Site)
6 Site Management (on Site)
7 Meetings and Reports (on Site)
8 Conditions of Contract (at HO)
9 Specifications (at HO)
10 Project Management (at HO)
11 Programme and Water Retaining Structures (at HO)

Subject of Seminar and JICA Sample Tender Documents

- Part 1 Tender Procedures
  Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA) (March)
- Part 2 Works Requirements
  Specifications (October), Drawings,
  Bill of Quantities (March) and Other Information
- Part 3 Conditions of Contract and Contract Forms (September)
- Project Management including Safety (November)
- Programme and Water Retaining Structures (January)
- PQ Document and Instruction to Tenderers (March)
- Construction Supervision and Contracts Administration

Appendix - Chamfer

Appendix – Shutter form

Appendix – Fill Materials

Appendix - Safety

Lessons we leaned from the Site

* Temporary Works, such as access road, working platform, formwork and safety measures are key activities for good progress and quality products.
* Better Permanent Works are depending on the standard of Temporary Works!!

ကျေးဇူးတင်ပါတယ်

Arigatou gozaimashita

Thank You

Safety First

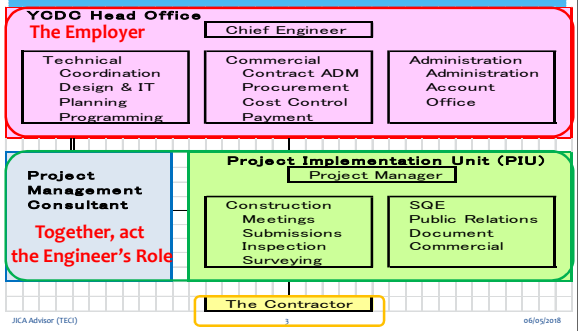
YCDC colleagues are welcome
to
the Project Management Seminar

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Drawings, Other Information, Construction Supervision and Contract Administration

Seminar No 13, 27 May 2015
JICA Advisors for Monitoring of LWTP Construction

Contracts Administration by the Employer
All in the same Boat!



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Review of Previous Seminars

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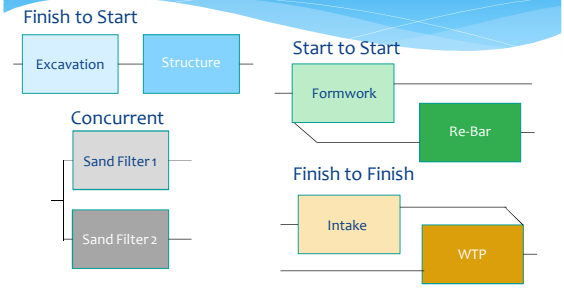
Elements of Flow Chart
Identify relationships between activities!



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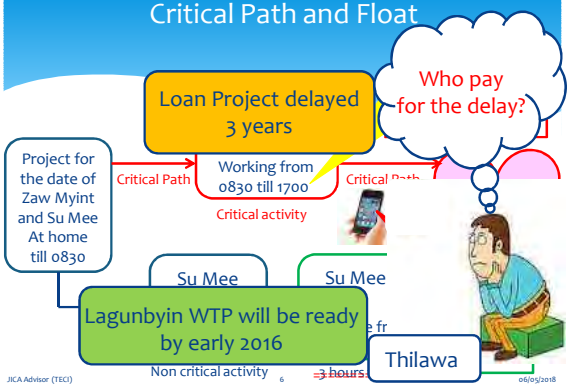
Critical Path and Float



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FIDIC MDB version of Conditions of Contract

Risk Demarcation depends on the type of Contract

Risk	Type of Contract
1 Quantity	1 measurement or lump sum
2 Inflation or Exchange	2 with fluctuation or fixed
3 Design Responsibility	3 the Employer's design or the Contractor's design.

Requirements	Conditions
1 Performance	1 Fitness of Purpose
2 Programme	2 Liquidated Damages

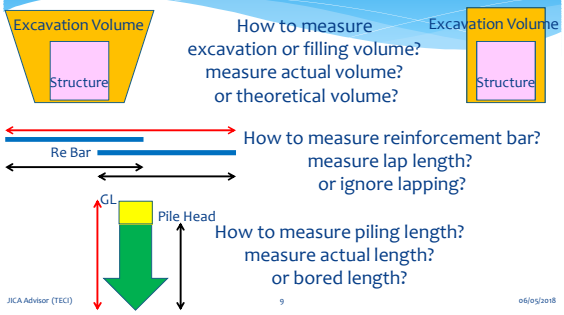
Type of Prequalification

* There are two types of prequalification:-
  a) prequalifying only a limited number of contractors (say 3 or 4) i.e. those scoring the highest marks in the prequalification exercise; or
  b) prequalifying all contractors who meet the qualification requirements. (JICA Guideline)

Good Contractor from Good Requirements in PQ

Method of Measurement

Establish Measurement Standard



Lessons learned from the Site

Temporary Works, such as access road, working platform, formwork and safety measures are key activities for good progress and quality products!

Permanent Works are depending on the quality of Temporary Works!!

Are you ready for JICA Loan Projects?

Do you have questions
about
the FIDIC type contracts
or construction details ?

Subject of Today

* Part 1 Tender Procedures
  Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
* Part 2 Works Requirements
  Specifications (October), Drawings, Bill of Quantities and Other Information
* Part 3 Conditions of Contract and Contract Forms (September)
* Project Management including Safety (November)
* Programming and Water Retaining Structures (January)
* PQ Document and Instructions to Tenderers
* Construction Supervision and Contract Administration

Contents

* Drawings
* Other Information
* Construction Supervision
* Contract Administration
* Questions and Answers

Drawings

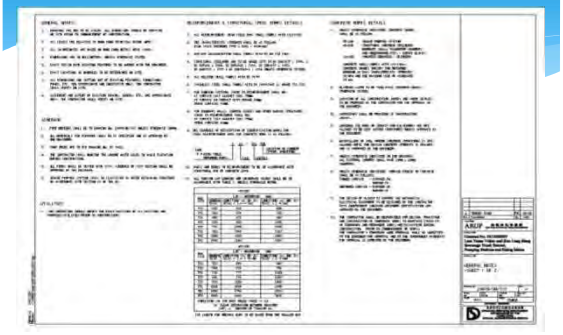
Drawings for Construction (A-0 and A-3 sizes)

1 List of Drawings, General Notes and Legends
2 Location Plan and General Layout Plan
3 General Arrangement for Structures
4 Reinforcement Bar Arrangement
5 Architectural Building Works and Finishes (ABWF)
6 Building Services (Mechanical, Electrical, Hydraulic and Fire Services)
7 Pipe Work
8 Earth Work and Foundation Works
9 Road Works, Landscape and Miscellaneous Works
10 Process Flow Diagram and Mechanical Work
11 Single Line Diagram and Electrical Work

Drawing List

DRAWING NO.	REV.	TITLE
1108/T/344/MHK/C01/041	B	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) Civil & Structural Drawing List
1108/T/344/MHK/C01/141	B	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) General Notes
1108/T/344/MHK/C01/241	B	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) Location Plan
1108/T/344/MHK/C02/041	B	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) General Layout Plan
1108/T/344/MHK/C10/041	A	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) Loading Key Plan
1108/T/344/MHK/C10/141	B	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) Framing Plans Sheet 1 of 4
1108/T/344/MHK/C10/142	A	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) Framing Plans Sheet 2 of 4
1108/T/344/MHK/C10/143	A	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) Framing Plans Sheet 3 of 4
1108/T/344/MHK/C10/144	B	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) Framing Plans Sheet 4 of 4
1108/T/344/MHK/C10/941	B	Contract 1108 Kai Tak Station and Associated Tunnels Emergency Egress Point (SUA) Sections of Emergency Egress Point (Sheet 1 of 2)

General Notes



General Notes (General)

GENERAL NOTES :

G1. THESE NOTES ARE FOR GENERAL INFORMATION ONLY. FOR ANY PARTICULAR REQUIREMENTS, REFER TO INDIVIDUAL DRAWINGS.

G2. ALL MATERIAL AND WORKMANSHIP REQUIREMENTS SHALL BE READ IN CONJUNCTION WITH THE M&W SPECIFICATIONS.

G3. THE STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE ARCHITECTURAL, E&M AND OTHER RELEVANT DRAWINGS.

G4. NO DIMENSIONS SHALL BE OBTAINED FROM SCALING DRAWINGS.

G5. STRUCTURAL LEVELS ARE IN METRES ABOVE HONG KONG PRINCIPAL DATUM (mPD), AND ARE GIVEN TO THE TOP OF STRUCTURAL CONCRETE UNLESS NOTED OTHERWISE.

G6. ALL DIMENSION ARE IN mm UNLESS OTHERWISE STATED.

G7. CONSTRUCTION STANDARDS AND TECHNICAL ACCEPTANCE CRITERIA SHALL BE IN COMPLIANCE WITH THE PERFORMANCE REQUIREMENTS AS SET OUT IN THE BUILDING (CONSTRUCTION) REGULATIONS AND ALLIED CODE OF PRACTICES OR M&W SPECIFICATIONS WHENEVER IT IS MORE STRINGENT UNLESS OTHERWISE STATED.

General Notes (Concrete)

CONCRETE :

C1. STRUCTURAL CONCRETE SHALL BE A "DESIGNED MIX" UNLESS NOTED OTHERWISE. THE DESIGNED CONCRETE SHALL BE IN ACCORDANCE WITH M&W SPECIFICATION FOR CIVIL ENGINEERING WORKS VOLUMES 1 TO 3.

STRUCTURAL ELEMENT	CONCRETE DESIGN MIX
ALL ELEMENTS UNLESS NOTED OTHERWISE	40D/20
MASS CONCRETE	20D/20
BLINDING	20D/20

C2. ALL FORMWORK AND PROPPING UNDER SUSPENDED CONCRETE WORKS SHALL BE REMOVED BEFORE MASONRY WORK IS BUILT ABOVE.

C3. THE REQUIREMENTS FOR DIFFERENT PARTS OF THE WORKS TO INCORPORATE POLYPROPYLENE FIBRES IN ACCORDANCE WITH THE M&W SPECIFICATION ARE AS FOLLOWS:

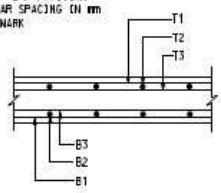
General Notes (Reinforcement Bar)

R7. NOTATION OF BAR REINFORCEMENT IS AS FOLLOWS :

5 T 16 – 01 – 200 T1

- 5 — NO. OF BARS
- T — TYPE OF BAR
- 16 — BAR DIAMETER IN mm
- 01 — BAR MARK
- 200 — BAR SPACING IN mm
- T1 — BAR POSITION

SUFFIX
- T1 = TOP (1ST LAYER)
- B1 = BOTTOM (1ST LAYER)
- NF = NEAR FACE
- FF = FAR FACE
- EF = EACH FACE
- RL = RANDOM LAP
- V = VARIES
- ABR = ALTERNATE BAR REVERSED
- ABS = ALTERNATE BAR STAGGERED
- AP = ALTERNATE PLACED
- L = LAP / ANCHORAGE
- SS = SINGLE STIRRUP
- DS = DOUBLE STIRRUP
- TS = TRIPLE STIRRUP



General Notes (Abbreviations)

GENERAL ABBREVIATIONS

MIN.	– MINIMUM
mm	– MILLIMETRE
MPa	– MEGAPASCAL
NTS	– NOT TO SCALE
UNO	– UNLESS NOTED OTHERWISE
SFL	– STRUCTURAL FLOOR LEVEL
SSL	– STRUCTURAL SLAB LEVEL
FFL	– FINISHED FLOOR LEVEL
SOP	– SETTING OUT POINT
FGL	– FINISHED GROUND LEVEL
FL	– FINISHED LEVEL
NSOE	– NOT SHOWN ON ELEVATION
NSOP	– NOT SHOWN ON PLAN
TAL	– TENSION ANCHORAGE LENGTH
TLL	– TENSION LAP LENGTH
THK.	– THICK
TYP.	– TYPICAL
UB	– UNIVERSAL BEAM
UBP	– UNIVERSAL BEARING PILE
UC	– UNIVERSAL COLUMN

General Notes (Legend)

LEGEND

L1. STRUCTURAL LEVELS SHOWN THUS ON PLAN : – +2.000 SFL

L2. EXISTING LEVELS SHOWN THUS ON PLAN : – +2.000

L3. FINISHED LEVELS SHOWN THUS ON PLAN : – +2.000 FFL

L4. STRUCTURAL LEVELS SHOWN THUS ON ELEVATION AND SECTION : – +2.000 SFL

L5. FINISHED LEVELS SHOWN THUS ON ELEVATION AND SECTION : – +2.000 FFL

L6. COLUMN SHOWN THUS ON PLAN : – (B x D)

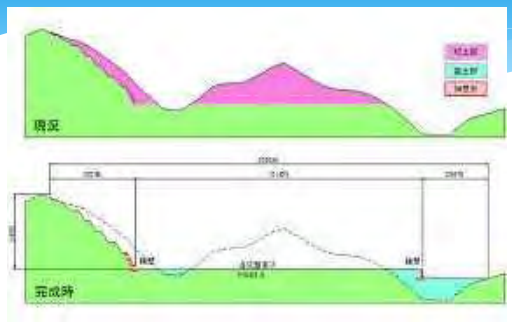
L7. DOWNSTAND BEAMS INDICATED ON PLAN THUS : – 500 x 750 (WIDTH) (OVERALL DEPTH FROM TOP OF SLAB)

Location Plan and Key Plan

Location Plan

Earth Work (Plan)

Earth Work (Section)



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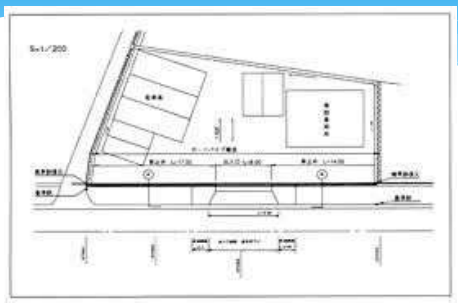
Utility Information



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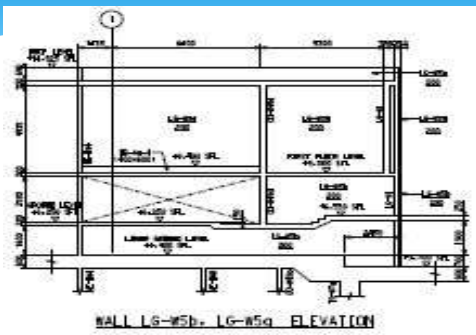
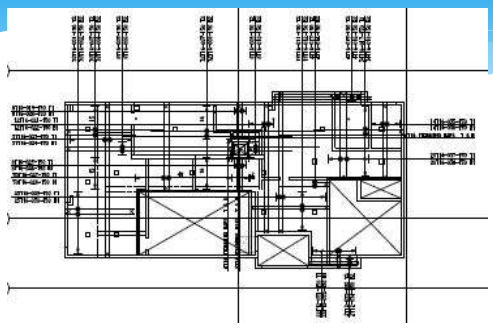
General Arrangement for Structure



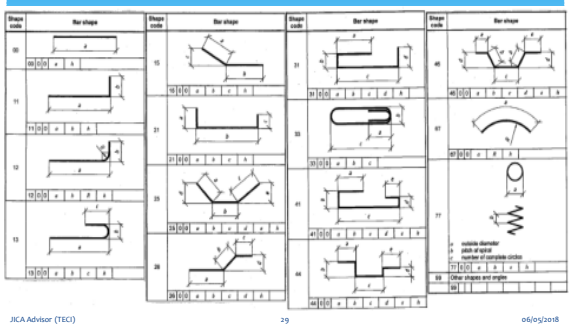
JICA Advisor (TECI) 27 06/05/2018

Reinforcement Bar Arrangement



JICA Advisor (TECI) 28 06/05/2018

Bar Shape (BS EN ISO 3766:2003)



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Bar Schedule (BS EN ISO 3766:2003)

Table 6 — Example for shape schedule without title block

Member	Bar mark	Type of steel	Bar diameter mm	Length of each bar (Method A) m	Number of members	Number of bars in each member	Total number	Total length m	Shape code	End hook		Bending dimensions mm							Index
												a	b	c	d	e	R	h	
Slab 1	01	BST 500 S	28	3,60	1	10	10	36,00	00	0	0	3 600							
Slab 2	02	BST 500 S	28	3,94	1	20	20	78,80	11	1	1	2 400	1 000						270
Slab 3	03	BST 500 S	28	3,17	1	2	2	6,34	12	1	1	1 520	1 320				472	270	
Corbel	04	BST 500 S	16	3,27	5	3	15	49,05	13	1	1	1 320	640	1 320					130
Wall	05	BST 500 S	28	6,34	2	4	8	50,72	15	1	1	1 000	4 800	1 600					270
Beam 1	06	BST 500 S	16	2,16	4	14	56	120,96	21	-1	-1	800	300	800					130
Beam 2	07	BST 500 S	20	3,32	3	21	63	209,16	25	2	2	800	1 000	800	740	775			360
Beam 3	08	BST 500 S	28	3,14	3	6	18	56,52	26	1	1	700	700	1 200	500				270
Beam 4	09	BST 500 S	12	2,40	1	13	13	31,20	31	1	1	800	550	400	450				100
Beam 5	10	BST 500 S	10	3,24	1	26	26	84,24	41	1	1	1 280	700	500	300	300			80
Foundation slab 1	11	BST 500 S	12	1,80	2	300	600	1 080,00	44	1	1	200	450	300	450	200			100
Foundation slab 1	12	BST 500 S	28	4,96	2	12	24	119,04	46	1	1	1 000	710	800	500	1 200		270	

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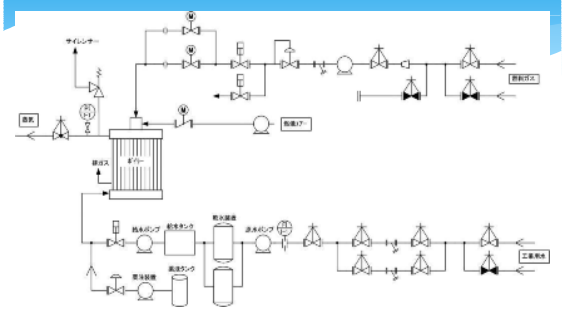
Pipe Line Diagram



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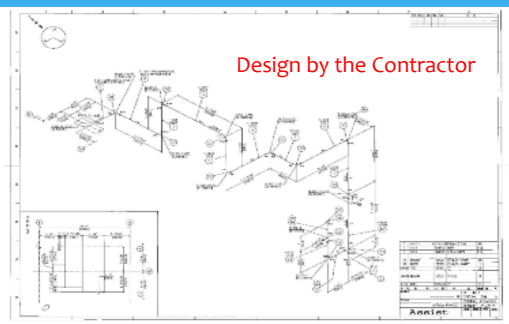
Pipe Arrangement Diagram

Design by the Contractor



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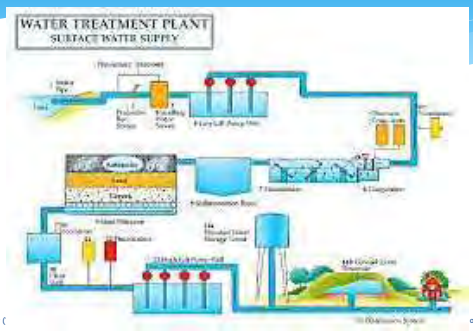
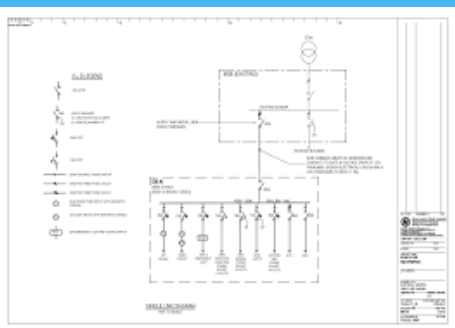
Process Flow Diagram



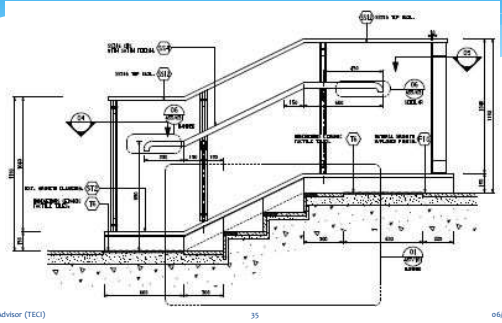
JICA Advisor (06/05/2018

Single Line Diagram (Electric)



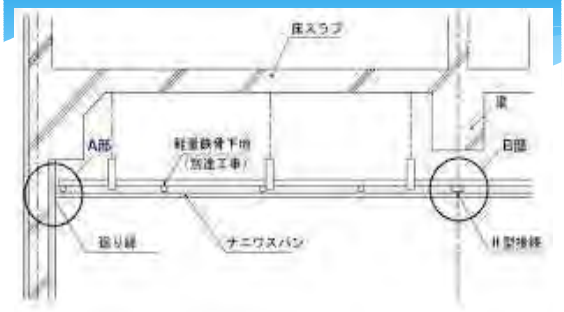
JICA Advisor 06/05/2018

Architectural Building Works and Finishes (ABWF)



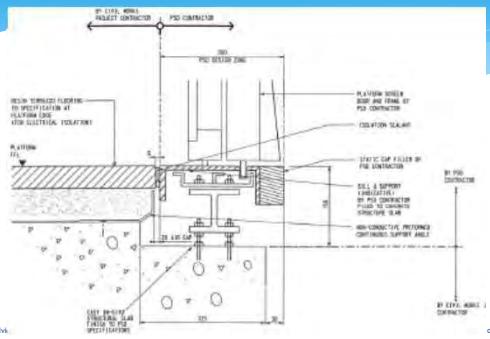
JICA Advisor (TECI) 35 06/05/2018

ABWF - Ceiling

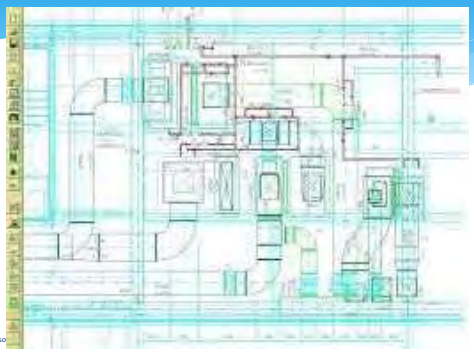


JICA Advisor (TECI) 36 06/05/2018

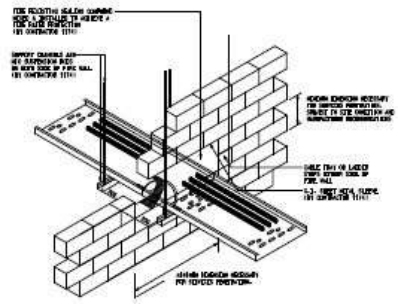
ABWF - Floor and Wall



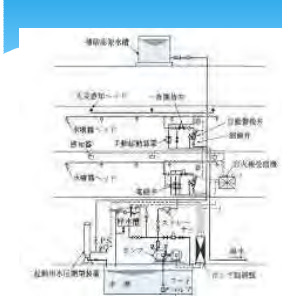
Building Services (Air Conditioning)



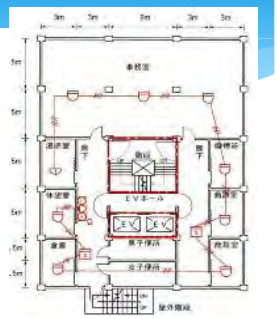
Building Services (Electric Cables)



Building Services (Fire Services)



Sprinkler System

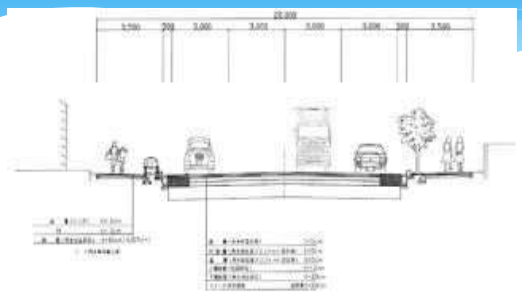


Smoke Detectors

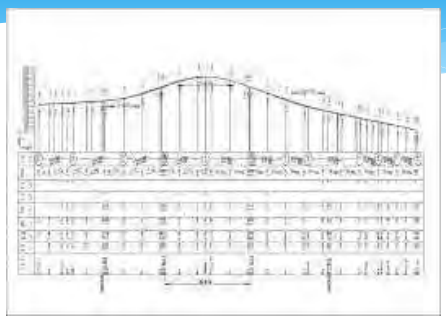
Building Services (Hydraulics) Water Supply, Drainage and Sanitation

Landscape (Hard and Soft) and Planting

Road Works (Section)



Road Alignment (Longitudinal Section)



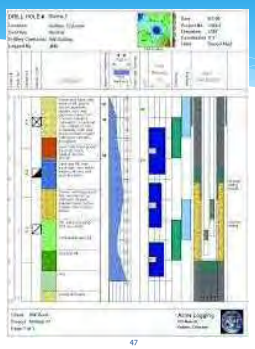
Other Information

Information available at Tender

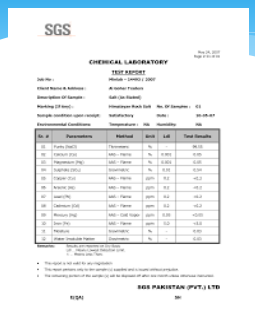
1 Essential information should be included in the tender document.
2 Reference information could be available for inspection.

- Site Investigation Report
- Laboratory Tests Report
- Utility Information
- Foundation Information
- As-built Information
- Any Other Information related to the project

Site Investigation (Bore Hole Logs)

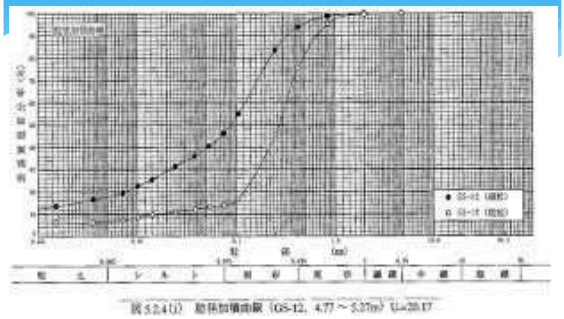


Laboratory Test Reports

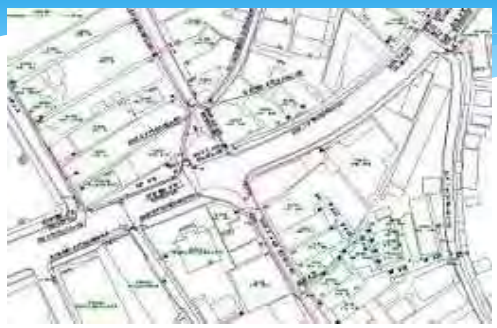

SGS
CHEMICAL LABORATORY
TEST REPORT


SOILINDX SOLUTIONS
SOILINDX TEST CERTIFICATE

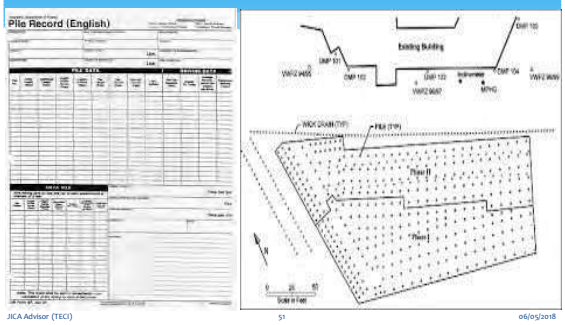
Laboratory Test Reports (Sieve analysis)



Utility Information



Foundation Information



AS-Built Information

Any Other Information Related to the Project

* Any Project related Reports
* Reports of Neighbour Sites
* etc.

These information are not necessary to include in the tender document, but may be available for inspection upon tenderers requests.

Construction Supervision

Construction Supervision Manual (CSM)

CSM provides references and guidelines of the site management. The CSM includes the following items:-

- Project implementation and organisation interfaces;
- General duties and responsibilities of the Engineer;
- Job description of the Engineer's staff; and
- Specific Duties, Roles and Responsibilities of the Contractor, the Engineer and the Employer.

CSM specify when, who does what and how to do it.

Specific Task of the Engineer's Staff (YCDC Site Staff)

Supervise, Monitor, Review, Test and Report:

- Safety (Safety Manual)
- Workmanship (Drawings and Specifications)
- Materials (Specifications and Method Statement)
- Labours (Trade and Numbers)
- Plant and Equipment (Method Statement)
- Planning and Programme (Works Programme)
- Environmental Issues (Site and Office)
- Payments (Assess Progress and Bill of Quantities)

To the Engineer (YCDC Head Office).

The Engineer's Staff to convene Meetings

- Daily Meeting on Site attended by the site staff:
  Review daily activities and forecast tomorrow
- Weekly Meeting attended by production engineers:
  Review design, method, progress and programme and forecast the following week
- Monthly Meeting attended by the management:
  Review technical and commercial status of the project
- Steering Committee Meeting by the senior management
  Decide policy of the project

Contract Administration

Tender Proposal is the Base Line of the Contractor's Intention

The Tender Proposal:

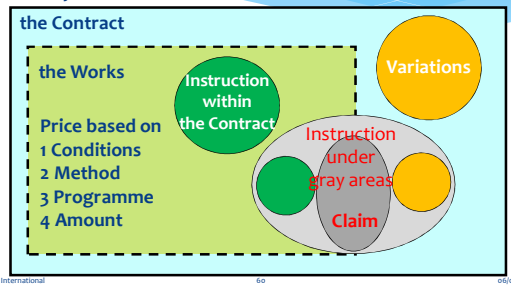
1 Construction Method
2 Tender Programme
3 Tender Price

Accepted

The Contract Execution:

1 Each Method Statement (Sequence, Materials, Plant etc.)
2 Works Programme
3 Contract Price

Risk and Problems after Honeymoon period passed



Extension of Time and Price Adjustment in FIDIC Contract (MDB, 1/2)

- 1.9 Delayed Drawings or Instructions (the Engineer)
- 2.1 Right of Access to the Site (the Employer)
- 4.7 Setting Out (the Employer)
- 4.12 Unforeseeable Physical Conditions
- 4.24 Fossils
- 7.4 Testing (the Engineer or the Employer)
- 8.4 Extension of Time for Completion (causes a to e)
- 8.5 Delays Caused by Authorities
- 8.9 Consequences of Suspension
- 10.2 Taking Over of Parts of the Works (the Employer)
- 10.3 Interference with Tests on Completion (the Employer)

Extension of Time and Price Adjustment in FIDIC Contract (MDB, 2/2)

- 11.8 Contractor to Search (the Engineer)
- 12.4 Omissions (the Employer)
- 13 Variations and Adjustment
- 13.1 Right to Vary (the Engineer or the Employer)
- 13.5 Provisional Sums (the Engineer or the Employer)
- 13.6 Daywork (the Engineer)
- 13.7 Adjustments for Changes in Legislation
- 16.1 Contractor's Entitlement to Suspend Work (the Employer)
- 17.4 Consequences of Employer's Risk (the Employer)
- 19.4 Consequences of Force Majeure

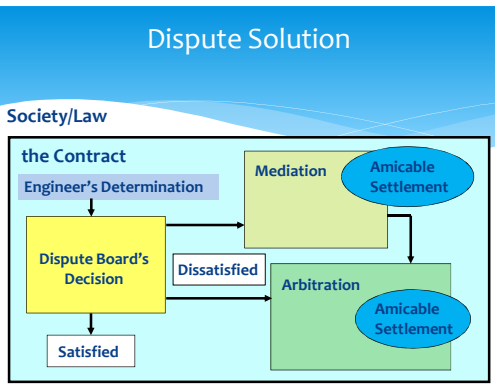
Conflict of Interest between the Employer and the Contractor

Target is a successful completion of the project.
All stakeholders are in the same boat.

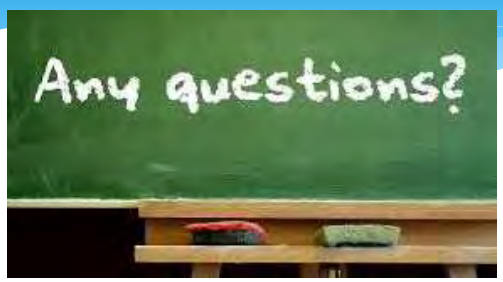
But

The Employer to pay vs The Contractor to be paid

Dispute Solution



Questions and Answers



Ever Forward, a Step by a Step

The Contractor, The Engineer, YCDC, Subcontractors, JICA and all Stakeholders

Strive to win with Team Work !

Back Numbers

1 Safety, Quality and Environmental (on Site)
2 & 3 Workmanship (on Site)
4 & 5 Construction Details (on Site)
6 Site Management (on Site)
7 Meetings and Reports (on Site)
8 Conditions of Contract (at HO)
9 Specifications (at HO)
10 Project Management (at HO)
11 Programme and Water Retaining Structures (at HO)
12 Prequalification, Instructions to Tenderers and BOQ (at HO)

JICA Sample Tender Documents

* Part 1 Tender Procedures
  Sample Bidding Documents under Japanese ODA Loans
  (October 2012 version 1.0, JICA) (March)
* Part 2 Works Requirements
  Specifications (October), Drawings (May),
  Bill of Quantities (March) and Other Information(May)
* Part 3 Conditions of Contract and Contract Forms (September)
* Project Management including Safety (November)
* Programme and Water Retaining Structures (January)
* PQ Document and Instruction to Tenderers (March)
* Construction Supervision and Contract Administration(May)

The Summary of the Seminar in July

Project Management
1 Safety and Workmanship
2 Method and Sequence of Construction
3 Planning and Programme
4 Progress Monitoring and Report
5 Contract Document
6 Budget and Cost Control

ကျေးဇူးတင်ပါတယ်

Arigatou gozaimashita

Thank You

JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Summary of the Seminar

"Project Management"

Seminar No 14, 10 July 2015
JICA Advisors for Monitoring of LWTP Construction

Engineer's Business always starts from Safety

Summary of the Seminar

Safety, Quality and Environment
Workmanship
Planning and Programming
Progress Monitoring and Report
Contracts Document
Budget and Cost Control
Project Management under FIDIC Contracts

Prologue

Saw

Japanese Saw

Pull to cut!

Saw in Myanmar

Push to cut

Plane

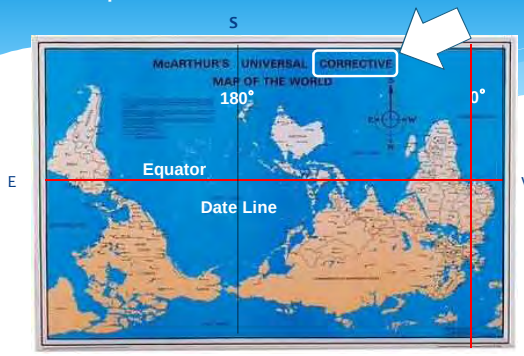
Japanese Plane

Pull to plane

How about Myanmar?

Push to plane?

Map of the World from Australia



Safety, Quality Assurance and Environmental Protection

Safety, Quality and Environment

International Standards

- OHSAS 18001
  Occupational Health and Safety Assessment Series
  ➡ "Safety Plan"
- ISO 9001
  Quality Assurance
  ➡ "Quality Assurance Manual"
- ISO 14001
  Environmental Manage System (EMS)
  ➡ "Environmental Management Plan"

Access on Site

Before

After

Excavation on Site

Before

After

Reusable Materials on Site

Before

After

Unsafe Cabling on Site must be improved

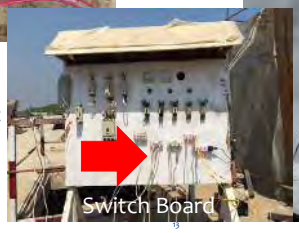
NOW!

Domestic Plugs

Cabling

Direct Connection

Good
Arrangement
But
Bad practice



Switch Board

Power Supply

Quality Management

Components

Quality Planning
Quality Control
Quality Assurance
Quality Improvement

Principle

1. Leadership
2. Customer Focus
3. Process Approach
4. Involvement of People
5. Continual Improvement
6. System approach to Management
7. Factual approach to Decision Making
8. Mutual Beneficial Supplier Relationships

Quality Control and Quality Assurance

Quality Control:

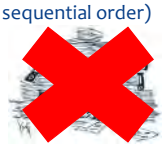
The observation techniques and activities used to fulfill requirements for quality.

Quality Assurance:

The planned and systematic activities implemented in a quality system so that quality requirements for services will be fulfilled.

Document Control (Base of Quality Assurance)

- Correspondences including Meeting Minutes (Notes)
  - Master Files (going out and incoming in sequential order)
  - General Files (subject by subject)
  - Working Files (particular topics)
- Programme and Method Statement
- Material Submissions (including samples)
- Tests and Inspection Sheets (including survey reports)
- Measurement Sheets (including bending schedules)
- Drawings and their revisions (A0 and A3 sizes)

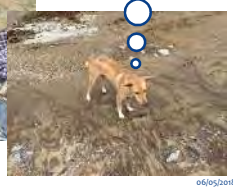


Site Conditions during Piling Work

Kappa – Japanese Fairy Tale

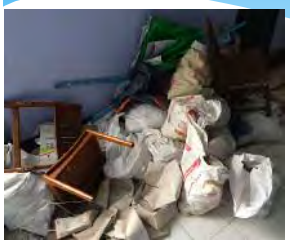
Rainy Season at Site

I am worry about my health and environment around here•••.



Kappa in Lagunbyin

Environmental Protection (Waste Treatment)



Before

After

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Environmental Protection (Air Pollution)

Cement Storage at the Batching Plant

JICA Advisor (TECI) 20 06/05/2018

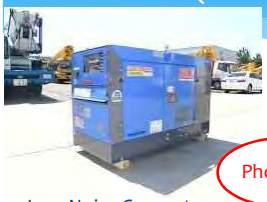
Environmental Protection (Water Pollution)

Ngamoeyeik Creek in Town

Ngamoeyeik Creek at Intake for Lagunbyin WTP

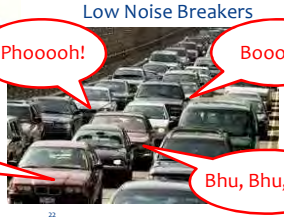
JICA Advisor (TECI) 21 06/05/2018

Environmental Protection (Noise Control)



Low Noise Generator

Low Noise Breakers



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Environmental Protection (Vibration Control)

Low Vibration Construction Equipment

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Workmanship

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Cover of Reinforcement Bar before Concreting

JICA Advisor (TECI) 25 06/05/2018

Cover of Reinforcement Bar during Concreting

JICA Advisor (TECI) 26 06/05/2018

Cover of Reinforcement Bar after Concreting

JICA Advisor (TECI) 27 06/05/2018

Concreting

JICA Advisor (TECI) 28 06/05/2018

Scabbling, Kicker and Curing

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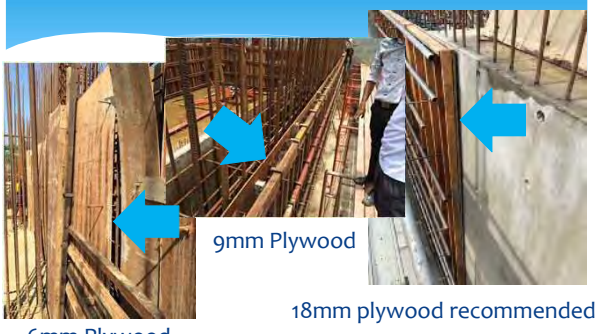
Plywood Shutter Form



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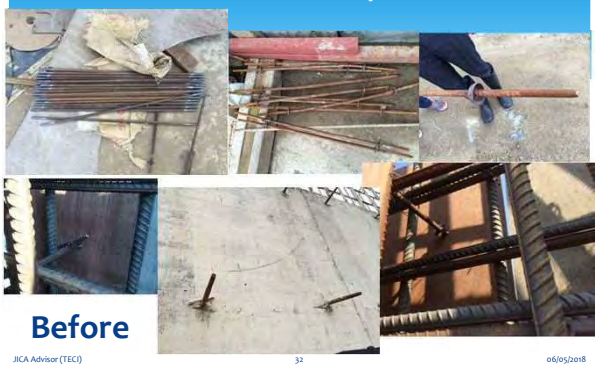
Chamfers

Form Ties and Separators



Before

Improved Rubber Cones

After

But not good enough!

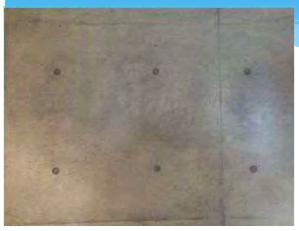
Cosmetic Finish on Walls (1/2)

Inside of Structures

Cosmetic Finish on Walls (2/2)

Outside of Structures

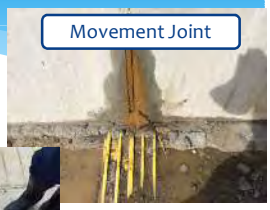
Our Objective = Produce the Best Structures



Target Finishes

Good Re Bar Fixing
Good Form Work
+) Good Concreting
Good Finishes!

Areas of Concern - Waterproofing



Water retaining structures must be watertight.

Fill Materials

Unsuitable Materials can not be compacted

River Sand

Lessons leaned from the Site

Temporary Works, such as access road, working platform, formwork and safety measures are key activities for good progress and quality products!

Better Permanent Works are from better Temporary Works!!

Planning and Programming

Planning Works

- Design and Standard
- Specification
- Drawings
- Method Statement
- Overall Programme
- Procurement of Services, Materials and Plant
- Health and Hygiene (OHSAS)
- Quality Assurance (QA) and Document Control
- Environmental Management System (EMS)

Planning Activities

1 Identify activities
Review method of construction
2 Calculate quantity of each activity
m3, m2, m, ton, no etc.
3 Assess progress rate of each activity
per month, per week, per day etc.
4 Check relationship between activities
Review the sequence of the works
5 Draw strategic plans in every 3 to 6 month
Check performance and access on site

Relationship between Activities

Finish to Start

Excavation → Structure

Start to Start

Formwork → Re-Bar

Concurrent

Sand Filter 1

Sand Filter 2

Finish to Finish

Intake → WTP

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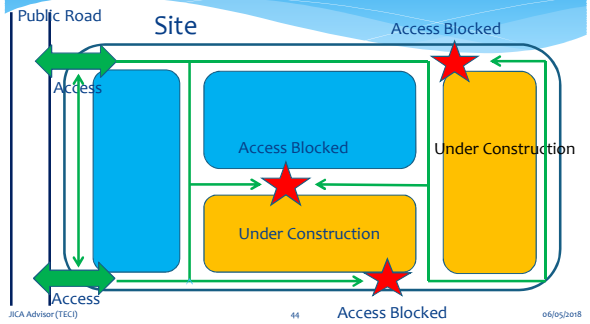
Plan ahead!



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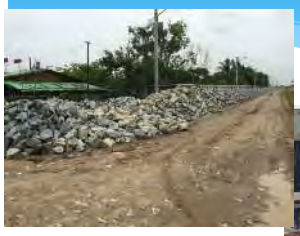
Plan Ahead!!



Double handling required due to no Access

Core Structures for Pipes

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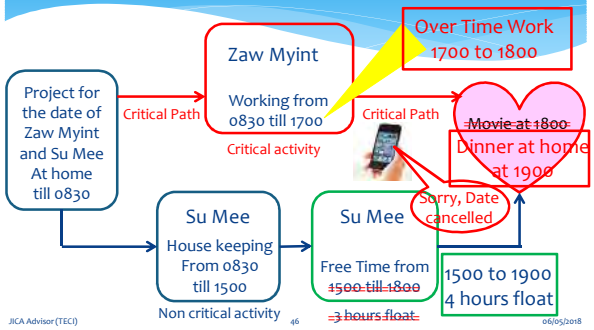
Delay on Critical Activities leads Extension of Time



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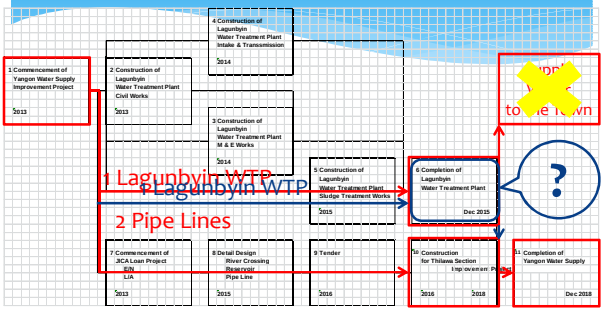
Master Programme for Yangon Water Supply Improvement Project



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Progress Monitoring and Report

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Task of Site Management

Supervise, Monitor, Review, Test and Report:

- Safety (Safety Manual)
- Workmanship (Drawings and Specifications)
- Materials (Specifications and Method Statement)
- Labours (Trade and Numbers)
- Plant and Equipment (Method Statement)
- Construction Method and Sequence
- Planning and Programme (Works Programme)
- Environmental Issues (Site and Office)
- Payments (Assess Progress and Bill of Quantities)
- Reports and Meetings

Time Control (1/2)

- Establish the baseline programme based on the information available at the time of Tender;
- Confirm the critical path on the works programme;
- Record actual progress of the works;
- Identify reasons why the actual progress is different from the planned progress (ahead or behind of the baseline programme);
- Review the sequence, methods and resources of the works;
- Establish recovery measures;
- Revise the programme to minimise delay; and
- Monitor the progress of the works based on the revised PGM.

Time Control (2/2)

During course of the works:-

1 Review activities on the critical path; and
2 Review other activities against their floats.

If activities on the critical path are behind the planned timings:-

1 accelerate activities on the critical path; or
2 change sequence of the works and confirm new critical path.

If other activities are delayed against the planned schedules:-

1 accelerate activities; or
2 change sequence of the works
and confirm they are out of critical path.

Reports

- Monthly Report
  - Executive Summary (Status of the Project)
  - Safety, QA and Environmental Protection (How perform)
  - Design (Scope Control)
  - Construction (Method Control)
  - Progress and Programme (Time Control)
  - Suppliers and Contractors (Quality Control)
  - Commercial
    - Cost and Final Forecast (Cost Control)
    - Variations and Claims (Contract Administration)
    - Cash Flow (Financial Control)
  - Staff (Human Resources)

Meetings

- Daily Meeting
  Site meeting among site staff from each party
- Weekly Meeting
  Progress review meeting between engineers from each party
- Monthly Meeting
  Technical and commercial review meeting between management of each party
- Steering Committee Meeting
  between senior management and Project Office

Engineer's Five Questions Before commencing the Works


Information (Specification and Drawings) available?


Physical access to the Site available?


Plant and Materials available?


Workers available?


Cash flow allows?

Contracts Document

Tender Documents (JICA)

* Part 1 Tender Procedures
  Sample Bidding Documents under Japanese ODA Loans (October 2012 version 1.0, JICA)
* Part 2 Works Requirements
  Specifications
  Drawings
  Bills of Quantities
  Other Information
* Part 3 Conditions of Contract (MDB Version) and Contract Forms

Multilateral Development Bank (MDB) Harmonised Edition

Pink Book – Designed by the Employer

* MDB Harmonised Edition 2006 is edited for development banks basing on the red book 1999 version and revised in 2010.

Particular Sub-Clauses added are:-

* Sub-Clause 1.15 Inspections and Audit by the Bank.
* Sub-Clauses for Drugs, Arms, Religious Customs, Funerals, Forced Labour, Child Labour, Worker' Organisation, Non-Discrimination and Equal Opportunity.

Arrangement of MDB Version

The contract under the Pink Book (FIDIC MDB Version) is a remeasurement contract with approximate Bill of Quantities.

The quantities in the Bill of Quantities are approximate only and are subject to remeasurement upon completion of works on site.

Items could be lump sum if the accurate quantities for the activities measured from the fully completed design in the pre-contract stage.

Lump sum items with drawings and specification are applicable to the electrical and mechanical works. However, measurement is required to assist in valuation of the variations.

Conditions of Contract can be adjusted

Risk	Type of Contract
1 Quantity	1 measurement or lump sum
2 Inflation or Exchange	2 with fluctuation or fixed
3 Design Responsibility	3 the Employer's design or the Contractor's design.
Requirements	**Conditions**
1 Performance	1 Fitness of Purpose
2 Programme	2 Liquidated Damages

Objective of Prequalification

* The prequalification is to identify those who are interested and capable of undertaking the contract and to keep tendering cost minimum.
* Tenderers will only be invited from the list of pre-qualified contractors.
* The qualification requirements shall be limited to those which are essential to ensure that prequalified tenderers are capable of executing the contract.
* There shall be no discrimination against local or overseas contractors.

Type of Prequalification

* There are two types of prequalification:
  a) prequalifying only a limited number of contractors (say 3 or 4) i.e. those scoring the highest marks in the prequalification exercise; or
  b) prequalifying all contractors who meet the qualification requirements.
* The Express of Interest may be asked from potential tenderers prior to the prequalification.

Budget and Cost Control

Cost Control

* Principle of Cost Control
  Budget vs Cost
* Information required for Cost Control
  - Prepare Bill of Quantities based on the requirements in the Specification and the Drawings
  - Price BOQ by estimating each activity
  - Plan monthly budget in accordance with the PGM
  - Forecast monthly cost and prepare S-Curve
  - Cost keeping in accordance with Cost Centre
  - Check Cash Flow
* Final Forecast

Definition of Bill of Quantities

* The term Bill(s) of Quantities is defined in the method of measurements as a list of items giving brief identifying descriptions and estimated quantities of the works to be performed.
* Quantity is simple but one of the biggest risks not only for the Contractor but also for the Employer.
* BOQ (BQ) forms a part of the contract documents and is the basis of payment to the Contractor.

Objective of Bill of Quantities

The BOQ should be prepared correctly.

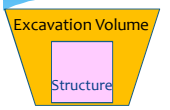
The following four main objectives of the document should always be kept in mind during preparation of BOQ.

a) to enable tenders to be obtained from tenderers;
b) to form the basis for tender comparison;
c) to provide means of valuing the works; and
d) to form a basis for fixing any rates not included in the BOQ or valuing any variations.

Grand Summary of BOQ

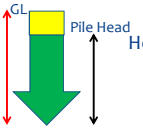
1	Bill No 1 Preliminaries
2	Bill No 2 Construction/Structures
3	Bill No n Construction/Structures
4	Bill No X Prime Cost (by Nominated Sub-Contractors)
5	Bill No Y Provisional Sums
6	Bill No Z Daywork
	Total
7	Adjustment Item
8	Contingency
	Grand Total (Tender Price)

Method of Measurement



How to measure
excavation or filling volume?
measure actual volume?
or theoretical volume?

How to measure reinforcement bar?
measure lap length?
or ignore lapping?



How to measure piling length?
measure actual length?
or bored length?

Project Management under FIDIC Contracts

Project Management (1/2)

- Technical
  - Basic Design (Permanent Works and Construction Technique)
  - Detail Design (Structures, Plant and Temporary Works)
  - Programme (Overall and Detail)
  - Construction Method (Permanent and Temporary Works)
  - Construction Supervision (SQE, Production and Progress)
- Support
  - Procurement (Services and Materials)
  - Logistics
  - Safety, Quality Assurance and Environmental Protection

Project Management (2/2)

- Commercial
  - Financial (Payment and Cost Control)
  - Contractual (Variations and Claims)
- Administration
  - General Affairs
  - Finance and Accountant
  - Human Relations
  - Public Relations

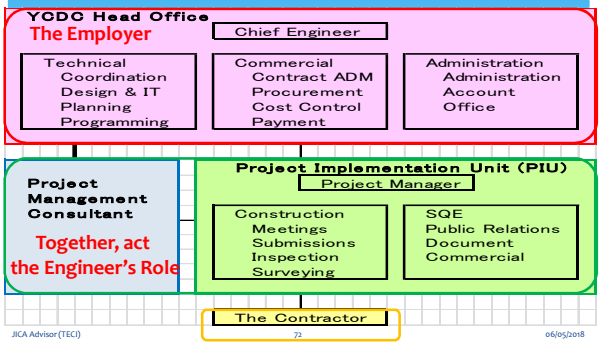
The Employer, The Engineer and The Contractor under FIDIC Contracts

The Employer prepare the requirements for his objective.
Also the Employer appoint the Engineer
and employ the Contractor.

The Engineer will administer the Works
in accordance with the Contract.

The Contractor will execute and complete the Works
in accordance with the Contract.

Contracts Administration by the Employer



Honeymoon Period started when the Contract signed

The Tender Proposal:

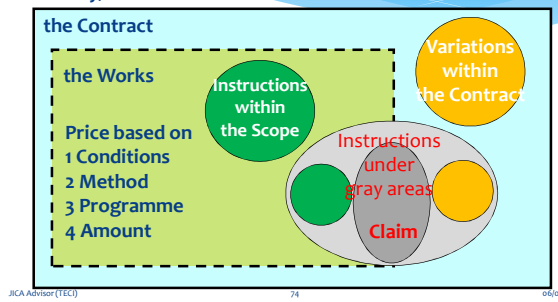
1 Construction Method
2 Tender Programme
3 Tender Price

Accepted

The Contract Execution:

1 Each Method Statement (Sequence, Materials, Plant etc.)
2 Works Programme
3 Contract Price

Problems come up when Honeymoon period passed

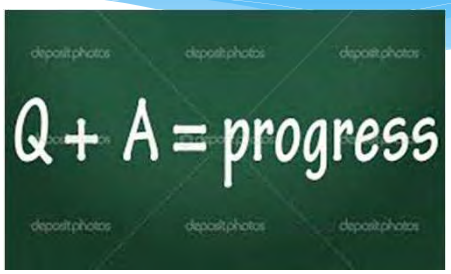


Conflict of Interest between the Employer and the Contractor

Objective is a successful completion of the project.
All stakeholders are in the same boat.

The Employer to pay vs The Contractor to be paid

Question and Answer



Ever Forward, a Step by a Step

Epilogue

The Contractor, The Engineer, YCDC, Subcontractors, JICA and all Stakeholders

Strive to win with Team Work !

Are you ready for JICA Loan Projects?

Yes, we are!

Wish you all the Best!

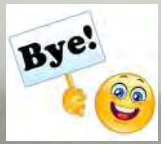
See you again!!

If not, please contact Akiba san of TECI.

ကျေးဇူးတင်ပါတယ်

Arigatou gozaimashita

Thank You



JICA assisted Capacity Development on Lagunbyin Water Treatment Plant under Greater Yangon Water Supply Improvement Project implemented by YCDC

Waterproofing of Water Retaining Structure and its Remedial Works

Seminar No 15, 17 January 2017
JICA Advisors for Monitoring of LWTP Construction

Engineer's Activities starts from Safety, always!

Subjects from the Previous Seminar

Safety, Quality and Environment
Workmanship
Planning and Programming
Progress Monitoring and Report
Contracts Document
Budget and Cost Control
Project Management under FIDIC Contracts

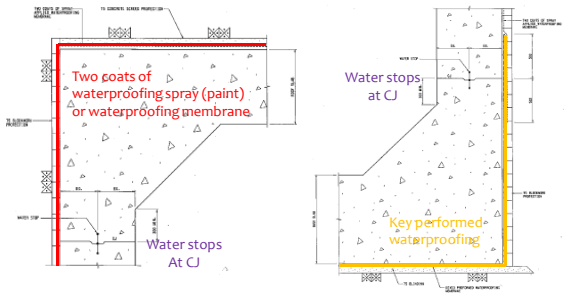
Design of Water Retaining Structure (WRS)

Design

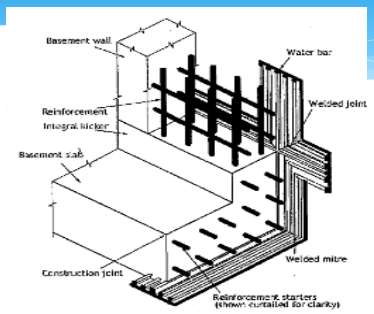
Consider to avoid cracks and leakages:-

1 Movements due to shrinkage and creep;
2 Movements due to temperature and humidity;
3 Movements due to dissipation during hydration;
4 Damage to the concrete due to percolation of chemically aggressive liquid from outside;
5 Damage due to uneven settlement of foundations
6 Cracking of concrete caused by rusting bars; and
7 Hydrostatic uplift force

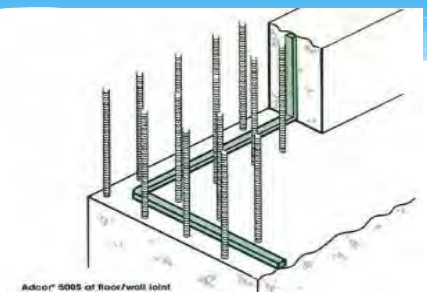
Typical Waterproofing and Water Bar (Stop)



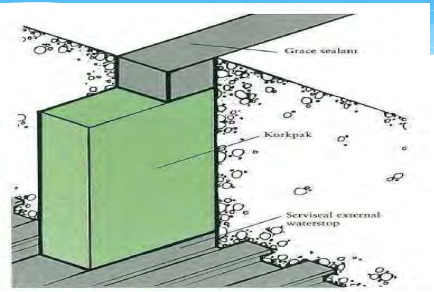
Surface Water Bar at Construction Joint



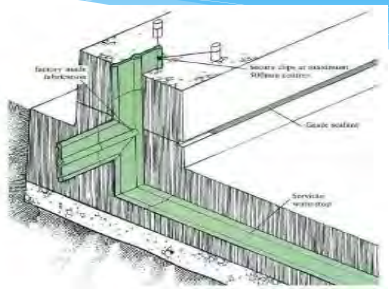
Hydrophilic Strip (Water stop) at Construction Joint



No Water Bar at Movement Joint



Centre Water Bar at Movement Joint



Conclusion

1. Collect information from construction material suppliers (specialist) in order to design better construction joint and movement joint.
2. Design thicker walls for long life and slabs with crack inducer to avoid cracking at random.
3. Design concrete mix and its admixture, water/cement ratio (55%), slump (less than 100mm), smaller spacing of distribution re-bar

Construction of WRS on Site

Workmanship

- Care of waterproofing membrane
- Installation of water bar and water stop at CJ, MJ and around pipes including separators
- Maintaining concrete cover (50~75mm)
- Concreting less than 1m high, slump < 100mm, temp. < 35°C
- Plan concreting sequence and avoid cold joint
- Continuous operation of vibrators (enough but not too much)
- Scrabbling of concrete surface at construction joint
- Curing of concrete (more than 7 days)

Concreting

Scabbling, Kicker and Curing

Remove Laitance

Kickers

Water Curing

You can do better!

Lessons leaned from the Site

Temporary Works, such as access road, working platform, formwork and safety measures are key activities for good progress and quality products!

Better Permanent Works are made from better Temporary Works!!

Existing Conditions

Walls Now!

Rapid Sand Filter 2

Sedimentation Basin 4

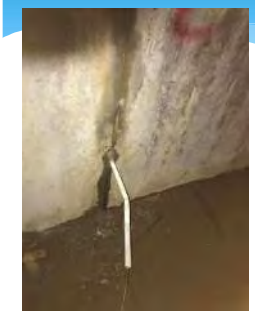
Waterproofing Paint

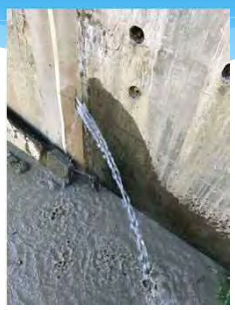
Before

After

JICA Advisor (TECI) 19 06/05/2018

Water Leakages from MJs





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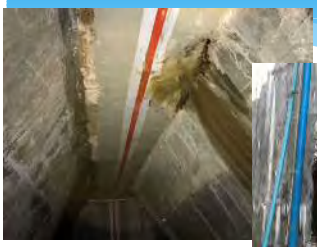
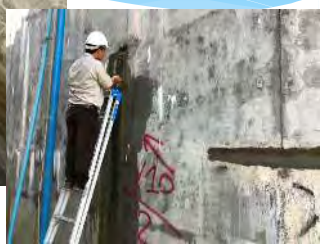
Water Leakages from Bad Concrete





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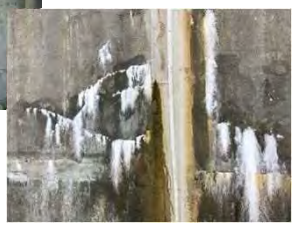
Seepage from Construction Joints

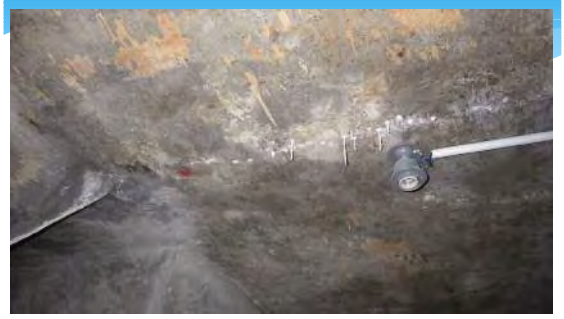
JICA Advisor (TECI) 22 06/05/2018

Seepages due to Lack of Vibrating, Cold Joint and Construction Joint



JICA Advisor (TECI) 23 06/05/2018

Trace at Hair Crack



JICA Advisor (TECI) 24 06/05/2018

Cause of Water Leakage

* Lack of Vibrator → Honeycomb
* Lack of Curing → Shrinkage Crack
* Lack of Scabbling or Laitance removal at CJ
* Improper Concreting Sequence → Cold Joint
* Improper Installation of Water bar (stop) at MJ and CJ

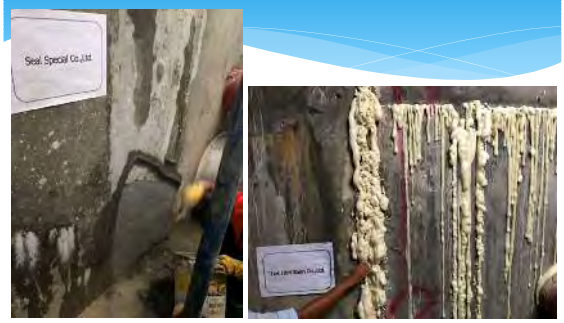
Water leakage is caused by bad workmanship, if design is correct.

Remedial Works

V – Cut (remove bad concrete) and Fill

Injection without V - Cut

After Remedial Works



Why Interview and Trial?

Interview

1 Review proposer's ability (workers, materials, plant and programme) to carry out the works in accordance with requirements; and

2 Confirm their conditions (technical and commercial) for proposal.

Trial

1 Review sequence and method of the works in accordance with their method statement; and

2 Review proposer's performance.

Seeing is believing
One seeing > 100 Listening

Triangle of Project Management

1 Amount of Money (Commercial)

2 Construction Method (Technical and Workmanship)

3 Construction Programme (Planning)

Question and Answer

ကျေးဇူးတင်ပါတယ်

Arigatou gozaimashita

Thank You

Name List for Seminar (Civil) Attandence

No	Name	Designation	2017
			Jan
			17
	HO=Head Office	S=Site	HO
	TECI		
1	Minoru IKEI	Chief	
2	Junjiro AKIBA	Civil	*
3	Koichi NAOI	Electrical	
4	Shinichi OSAKA	Mechanical	
5	U Pyi Kyaw Hein	AE-Civil	*
	YCDC		
15	U Than Han	EE	*
20	Daw Aye Pa Pa Nyo	EE	*
22	U Tint Zaw	AE	*
30	Daw Yu Yu Hla Baw	AE	*
32	U Aung Ko Ko Tin	SAE	*
33	U Tun Tun Hlaing	SAE	*
34	U Kyaw Swar Min	SAE	*
36	U Than Wynn	SAE	*
37	U Zin Min Latt	SAE	*
40	U Kaung Khant	SAE	*
41	U Aung Ko Ko Win	SAE	*
43	U Zaw Win Aung	SAE	*
48	Daw Su Su Aung	SAE	*
49	Daw Ya Min	SAE	*
55	Daw Myat Thet Khin	SAE	*
56	Daw Htike Htike Khine	SAE	*
62	U Nyein Chan Aung	Watches	*
69	Daw Hwe Ni Aung	JE	*
70	Daw Moh Moh San	WA	*
73	Daw Aye Aye Kyu	Flat	*
74	Daw Mi Htwe Lay	WA	*
75	Daw Khine Cho Win	WA	*
76	Daw Ei Thu Lwin	WA	*
77	U Ye Zay Ya	Flat	*
78	Daw Aye Myat Thu	Flat	*
79	Daw Thiri Win	Flat	*
80	Daw Phu Pwint Wai	Flat	*
81	Daw The Yu Nandar	WA	*
82	Daw Tin New Aye	WA	*
83	Daw Ei Ei Phyo Win	WA	*
84	Daw Zin Htet Oo	WA	*
			31

CAPACITY DEVELOPMENT ON CONSTRUANCTION OF LAGUNBYIN WATER TREATMENT PLANT UNDER GREATER YANGON WATER SUPPLY IMPROVEMNET ROJECT

Final Seminar

26th March 2018

TEC International Co., Ltd

Target of the Project

Advice to YCDC's construction supervision for Lagunbyin WTP construction

Intake Pump Station **WTP**

Purpose of the Project

Overall Goal

"Greater Yangon Water Supply Improvement Project" ('Phase 1 of ODA loan') is to promote the operation and the development effect.

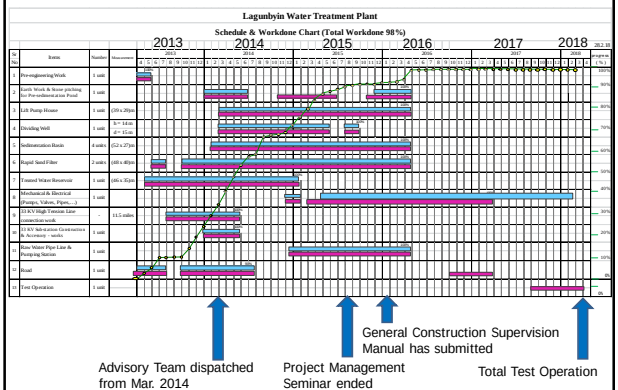
Project Goal

YCDC's capacity of construction supervision is developed.

Expected Outputs and Achievement

Nos.	Expected Outputs	Achievement
1)	To procure suitable materials and equipment on the detail design	Achieved by Completion of WTP
2)	To operate a proper quality control	Ditto
3)	To operate a safety control for workers	Achieved (No Accident)
4)	To operate a timely progress control on a construction schedule	Achieved except Intake pumps (See the next Slide)
5)	To operate a proper environmental monitoring	Achieved (No Accident)
6)	To improve YCDC's capacity development in terms of construction supervision (quality control, safety control, progress control, environmental monitoring, etc.)	Achieved by compile of the Manual through 14 times of Seminar
7)	To develop YCDC's understanding of environmental and social consideration	Ditto

Schedule of the Project



Outputs of the Project (1/4)

Project Management Seminar

14 times

General Construction Supervision Manual

Submitted in Jan. 2016

To be used for YCDC's constructions in the future

Issued Certificates for Participants

Outputs of the Project (2/4)

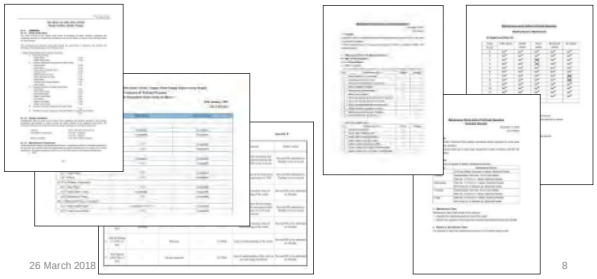
Design/As Built Drawings

Document of Construction Supervision

Outputs of the Project (3/4)

Specifications of Mechanical/Electrical Equipment, and its Evaluation in Biddings

Maintenance Records before Full-Scale Operation for Equipment, and its Trainings



Outputs of the Project (4/4)

Total Test Operation (Topic of This Seminar)

- Planning
- Preparation
- Manpower
- Results
- Recommendations

Total Test Operation

Planning

- Schedule: Preparation March 7 to 10
  Test Operation March 12 to 24
  48-hour operation x 4 batches
- Flow : 5 MGD (1/8 of design)/batch
- Facilities: Intake Pump Station, Dividing Well, Sedimentation Tank (No.3&4), Filter (2), Clear Water Tank, Waste Water Tank
- Check Points
  - ✓ Flow
  - ✓ Water Quality (turbidity, color, pH, temp.)
  - ✓ Visual Inspection (settled & filtered water)
  - ✓ Jar Test (floc formation etc.)
  - ✓ Filter sand sieve analysis

Total Test Operation

Preparation

- Intake Pump Station: flow setting
- ACH: temporary dosing tank
- ACH: approx.20L/hr for raw water 8-15 NTU
- pH meter, turbidity meter, color meter, Jar Tester
- Sieving machine
- Temporary stop logs for sedimentation tank

Total Test Operation

Manpower (At least)

- Intake pump station : 1 operator/24 hr
- ACH dosing : 2 operators/24 hr
- Filter : 2 operators/24 hr
- Water/Sieving analysis & Jar test : 2 persons/12hrs

Total Test Operation

Result 1: Flow

- **Intake Pump Station Operation**
  - ✓ **Operation hour : 48 hrs. x 4 batches**
  - ✓ **Actual operation hour : 187 hrs. / 192 hrs.**
  - ✓ **Total flow : 176,342 m3**
    Average : 22,043 m3/day (4.85MGD)
  - ✓ **Electricity : 10,240 kWh**
- **Power Outage**
  - ✓ **March 12 5:12-5:50AM (39 min)**
  - ✓ **March 13 6:29-7:50AM (82 min)**
  - ✓ **March 16 6:58-9:10AM (193 min)**

Total Test Operation

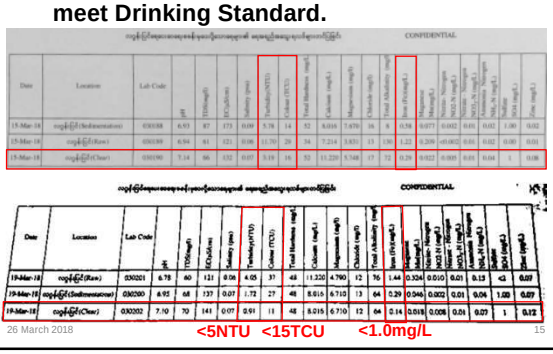
Result 2: Water Quality (1/3)

- **ACH dosages were determine by the results of Jar tests.**
- **Jar Test : 8 to 16 ppm**
- **Actual Dosage : 11 to 19 ppm**

Total Test Operation

Result 2: Water Quality (2/3)

- **Filtered water by the Laboratory's results meet Drinking Standard.**



CONFIDENTIAL

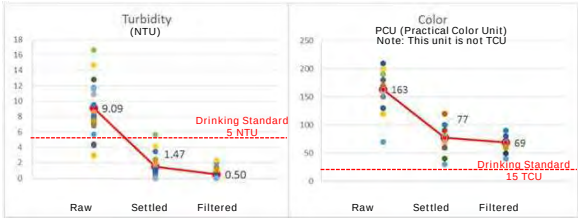
Date	Location	Lab Code	pH	TDS(mg/l)	EC(µS/cm)	Salinity (psu)	Turbidity(NTU)	Colour (TCU)	Total Hardness (mg/l)	Calcium (mg/L)	Magnesium (mg/l)	Chloride (mg/l)	Total Alkalinity (mg/l)	Iron (Fe)(mg/L)	Nitrate-Nitrogen (mg/L)	NO3-N (mg/L)	Ammonia-Nitrogen (mg/L)	NH3-N (mg/L)	Sulfate (mg/L)	Zinc (mg/L)
19-Mar-18	(Raw)	030201	6.78	60	121	0.06	4.05	37	48	11.220	4.790	12	76	1.44	0.304	0.010	0.01	0.13	<1	0.07
19-Mar-18	(Sedimentation)	030200	6.93	68	137	0.07	1.72	27	48	8.016	6.710	13	64	0.29	0.346	0.032	0.01	0.04	1.08	0.07
19-Mar-18	(Clear)	030202	7.10	70	141	0.07	0.91	11	48	8.015	6.710	12	64	0.14	0.018	0.008	0.01	0.07	1	0.12

 <5NTU <15TCU <1.0mg/L

Total Test Operation

Result 2: Water Quality (3/3)

- **Filtered water meet Drinking Standard.**
- **Some difficulties for Color removal**

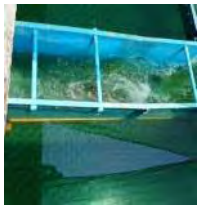


- **Chlorination and proper coagulant dosing will improve clear water.**

Total Test Operation

Result 3 : Floc and De-sludging in Sedimentation Tank

- **Proper floc are formulated and settled.**



- **Continuous de-sludging are required.**

Total Test Operation

Result 4: Filter (1/3)

- **Filtered water: Ave. 0.5 NTU < 5 NTU**
- **Filtration period: design 24 hrs.**

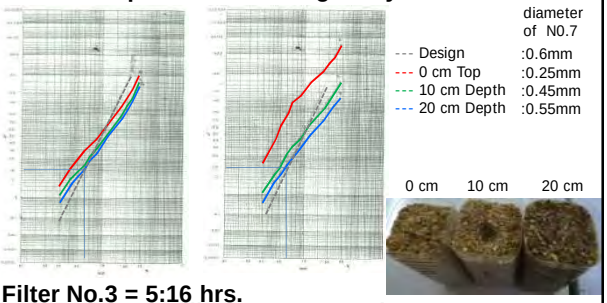
Batch 1 (hr)	No. 7	No. 8	No. 9
	02:47	03:19	02:45
Batch 2 (hr)	No. 10	No. 11	No. 12
	03:04	03:40	03:43
Batch 3 (hr)	No. 3	No. 4	No. 6
	05:16	05:12	03:35
Batch 4 (hr)	No. 1	No. 2	No. 3
	02:58	03:38	02:55
Batch 5 (hr)	No. 7	No. 9	No. 10
	05:52	04:30	04:07

- **Short filtration period: Small size of filter sand**

Total Test Operation

Result 4: Filter (2/3)

- **Comparison of sieving analysis**



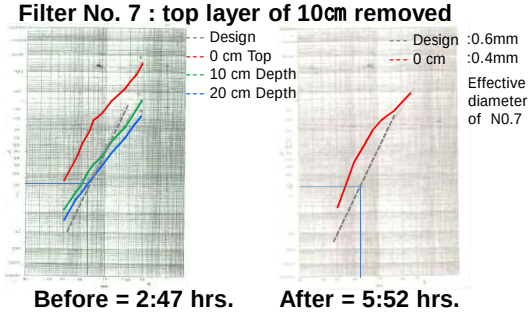
Filter No.3 = 5:16 hrs.

Filter No. 7 = 2:47 hrs.

Total Test Operation

Result 4: Filter (3/3)

- **Filter No. 7 : top layer of 10cm removed**



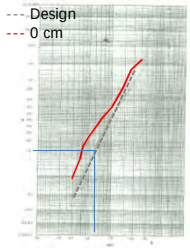
Before = 2:47 hrs. **After = 5:52 hrs.**

- **It is improved, but not enough. Fine sand moved from bottom layer to top layer.**

Total Test Operation

Recommendations (1/3)

- **For Filter sand improvement**



1. **Backwash filter sand : 5 times**
   - **Air + Water (2 pumps) : 5 min**
   - **Water (1 pump) : 10 min**
2. **Backwash filter sand : 3 times**
   - **Water (2 pump) : 10-15 min**
3. **Remove filter sand**
   - **Top 10 cm**
4. **Confirm no fine sand at top**

Sample:Filter-1's sand

Total Test Operation

Recommendations (2/3)

Maintenance Works before 40 MGD operation

- **Maintain mechanical/electrical equipment**
- **Motors: Operate 5 minutes every week**
- **Electrical panels: Supply electricity to keep space heaters ON**
- **Dividing Well/Clear Water Preserver: Drying**
- **Sedimentation Tanks: Drying and Cover inclined tubes by plastic sheet to avoid sun light**
- **Filters: Drying and Cover filter sand by plastic sheet**

Total Test Operation

Recommendations (3/3)

Final Start-up with 40 MGD before installation of transmission pumps under the Phase1 ODA loan.

- **Chemical dosing adjustment**
- **Adjusting "Automatic Backwash" of PLC by Machinery Solutions (SWTS)**
- **Get assistance from JICA advisors, if necessary.**

Name List for Seminar Attandence

No	Name	Designation	2018 March 26
	HO=Head Office	S=Site	HO
	TECI		
1	Minoru IKEI	Chief	
2	Junjiro AKIBA	Civil	*
3	Koichi NAOI	Electrical	
4	Shinichi OSAKA	Mechanical	*
5	U Pyi Kyaw Hein	AE-Civil	*
	YCDC		
7	U Myint Zaw Than	DCE	*
9	U Thet Lwin	ACE	*
15	U Than Han	EE	*
16	U Zaw Minn	EE	*
17	U Soe Kyaing	EE	*
22	U Tint Zaw	AE	*
23	U Phone Naing	AE	*
33	U Tun Tun Hlaing	SAE	*
			8

Status: ■Under Construction(▥Piles, ▨Basement, ▦Walls, ▩Roofs) and ■Completion

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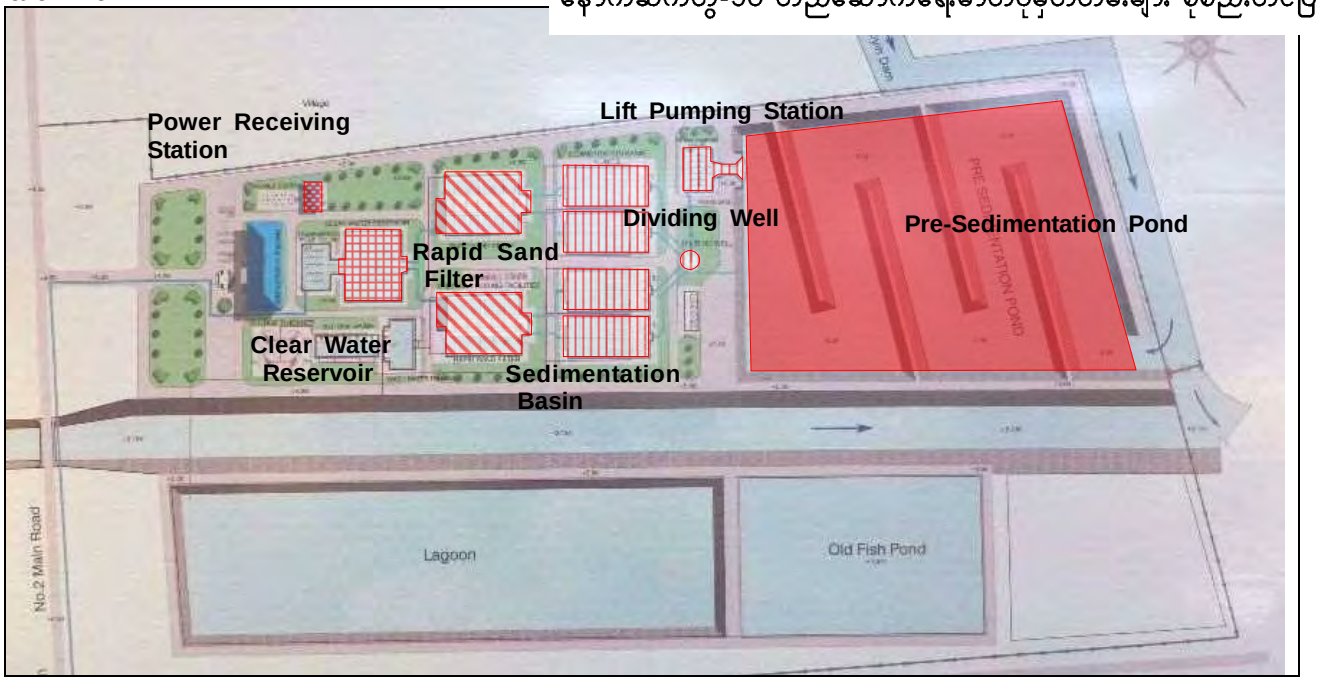
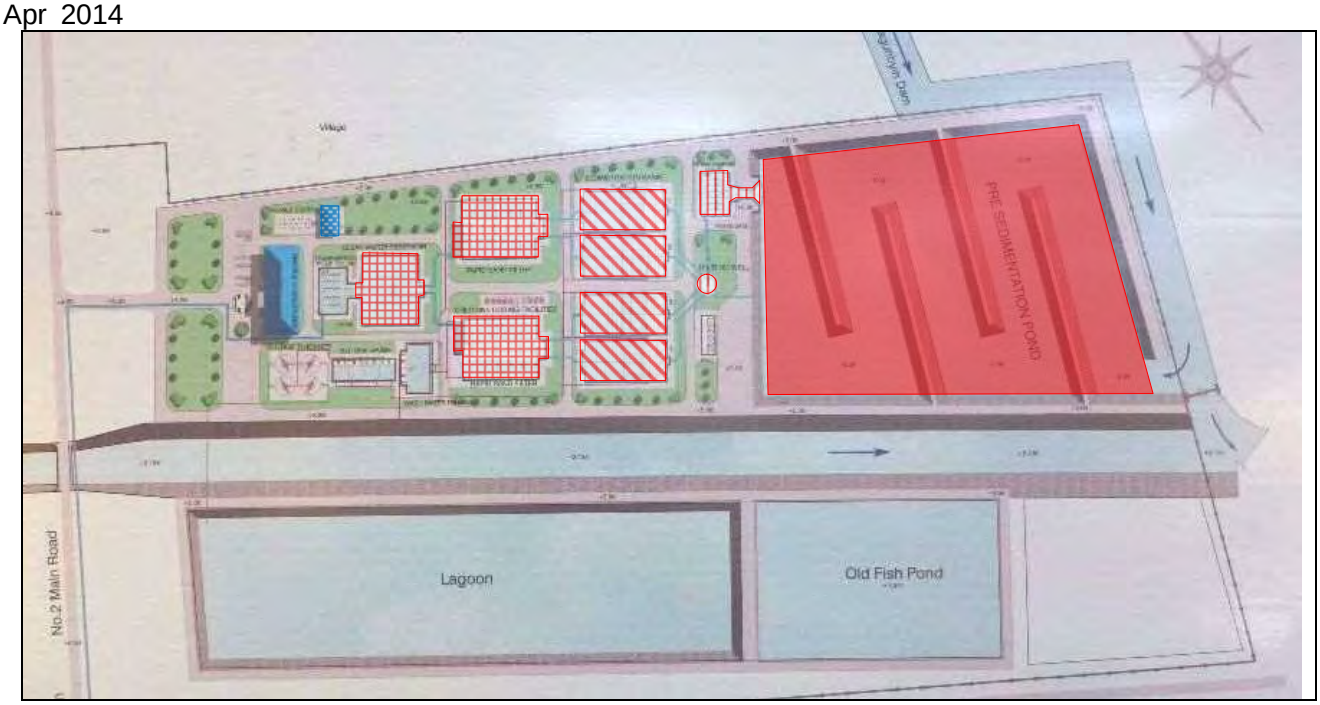
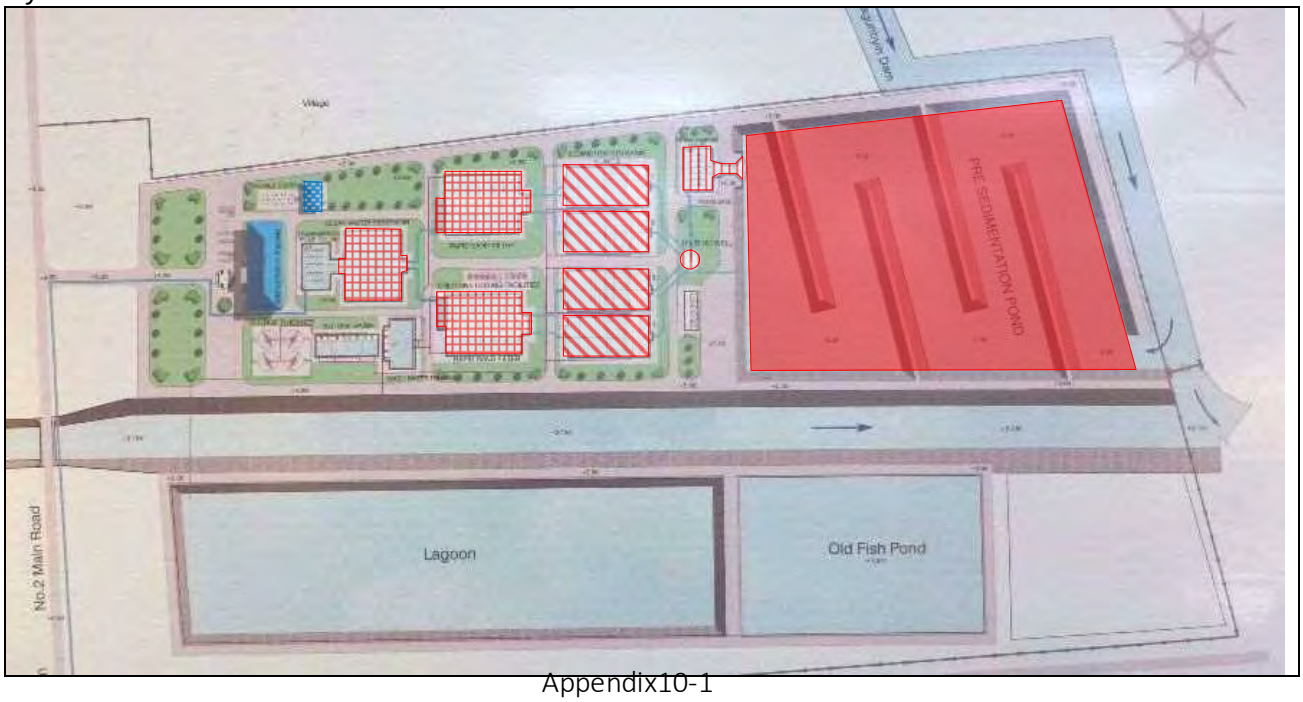
March 2014



Apr 2014

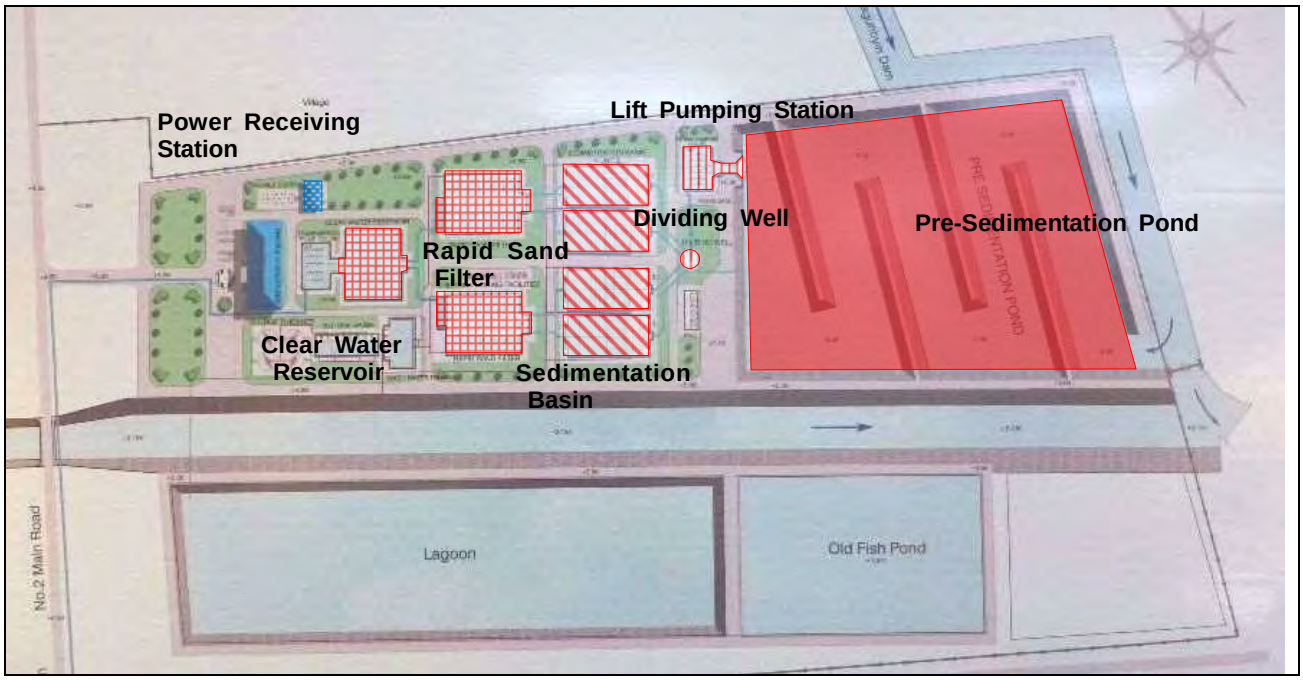


May 2014

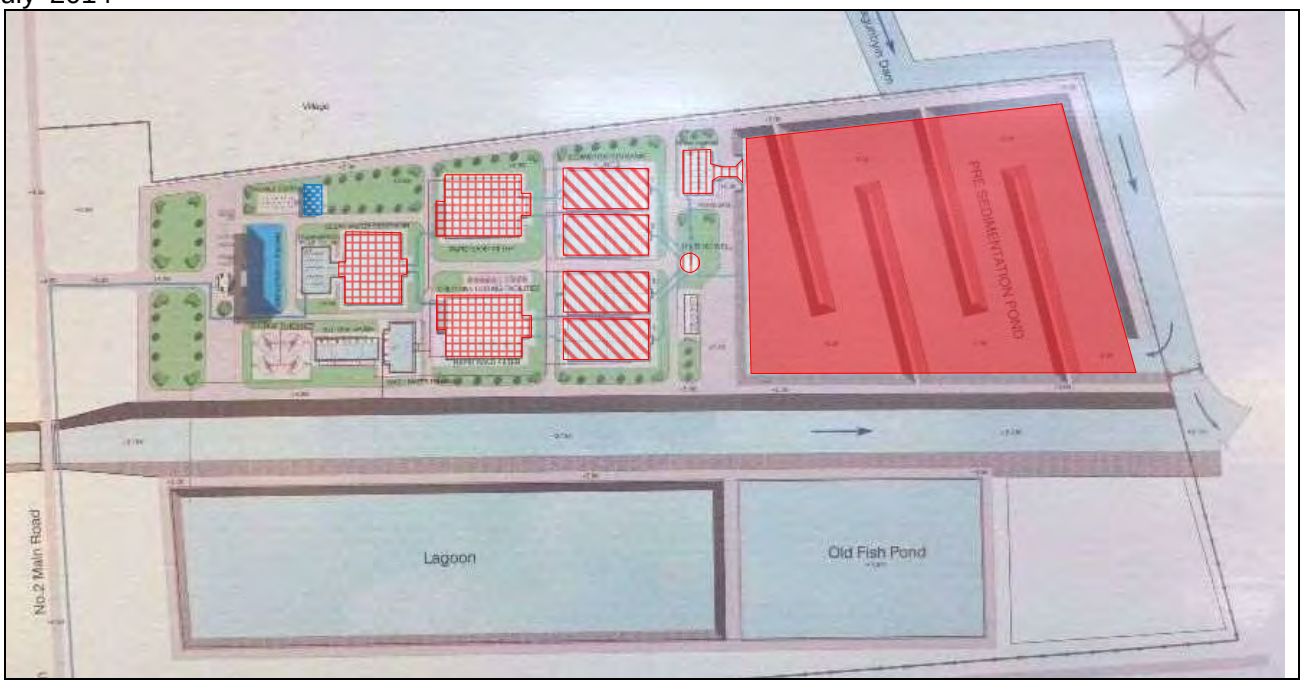


Status: ■Under Construction(▥Piles, ▨Basement, ▦Walls, ▩Roofs) and ■Completion

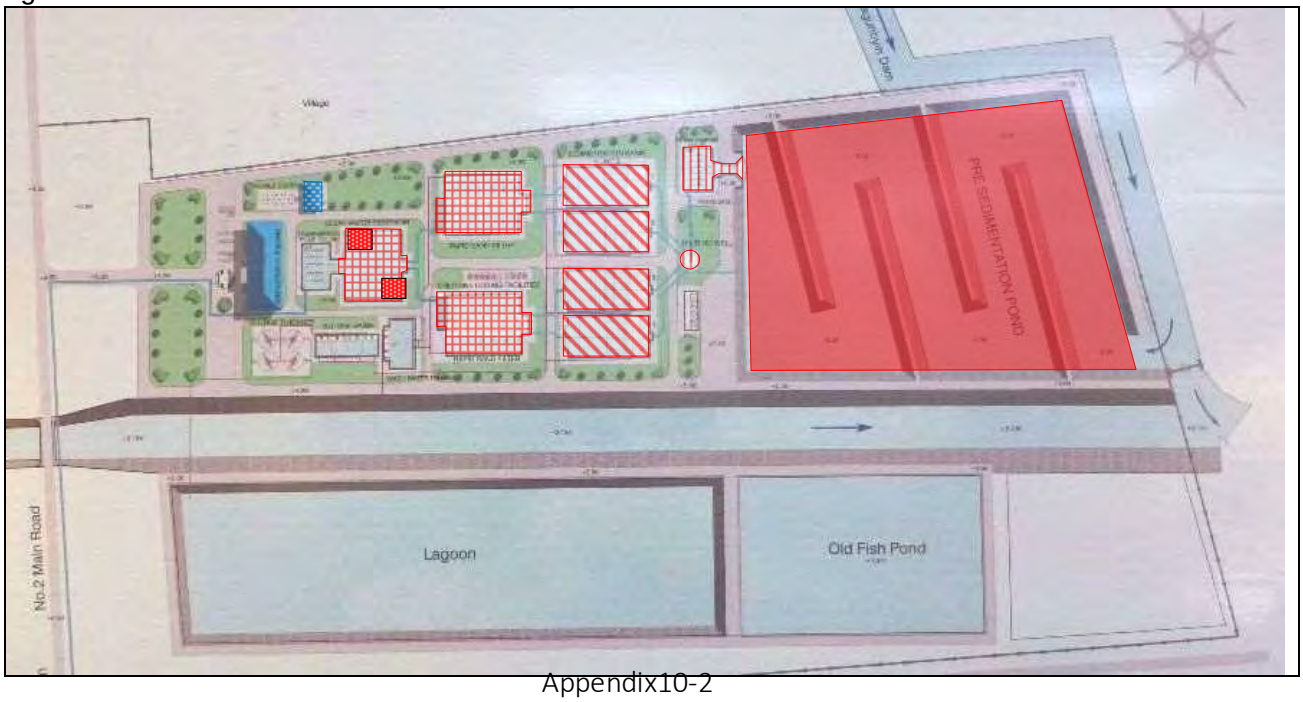
Jun 2014



July 2014

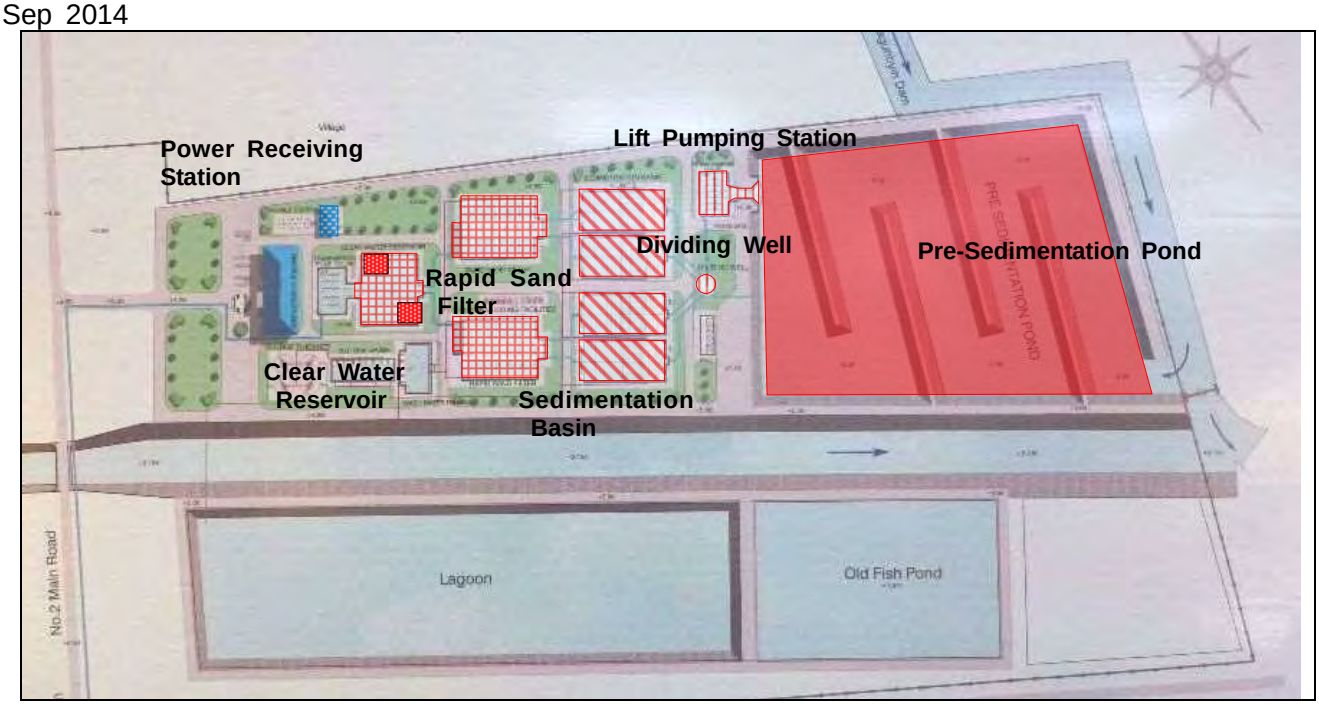


Aug 2014

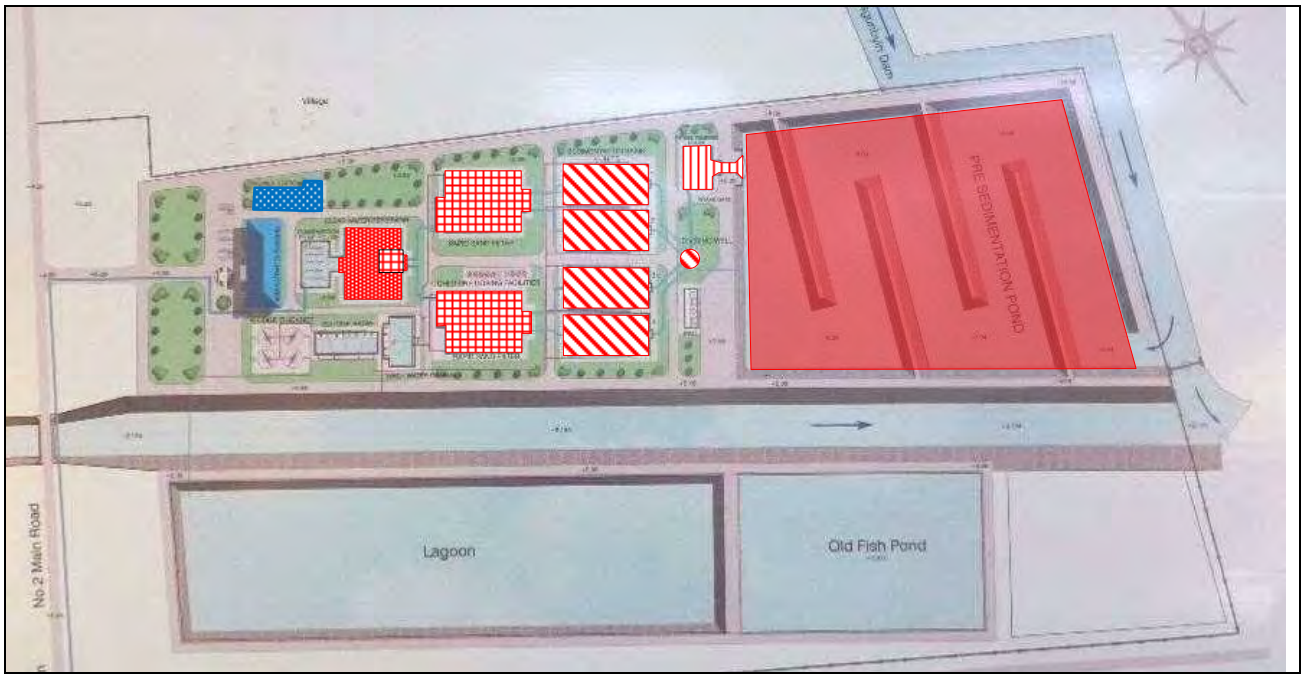


Status: ■Under Construction(▥Piles, ▨Basement, ▦Walls, ▩Roofs) and ■Completion

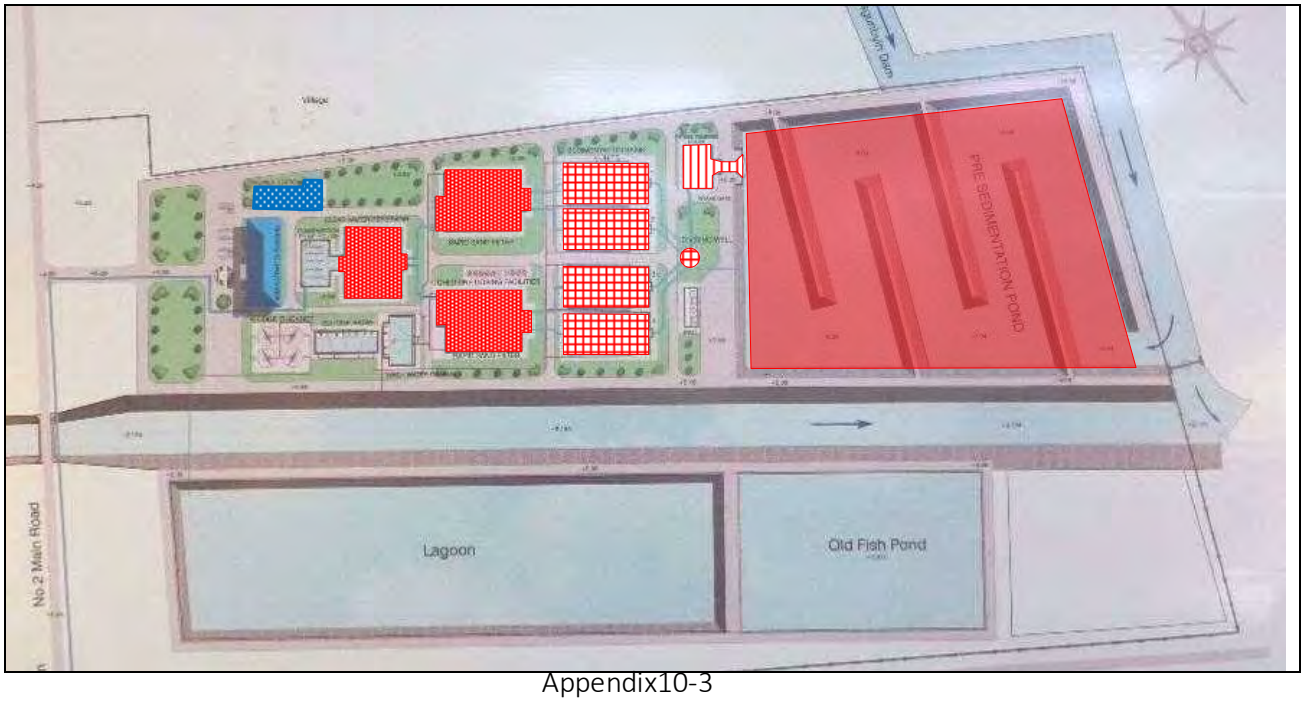
Sep 2014



Oct 2014

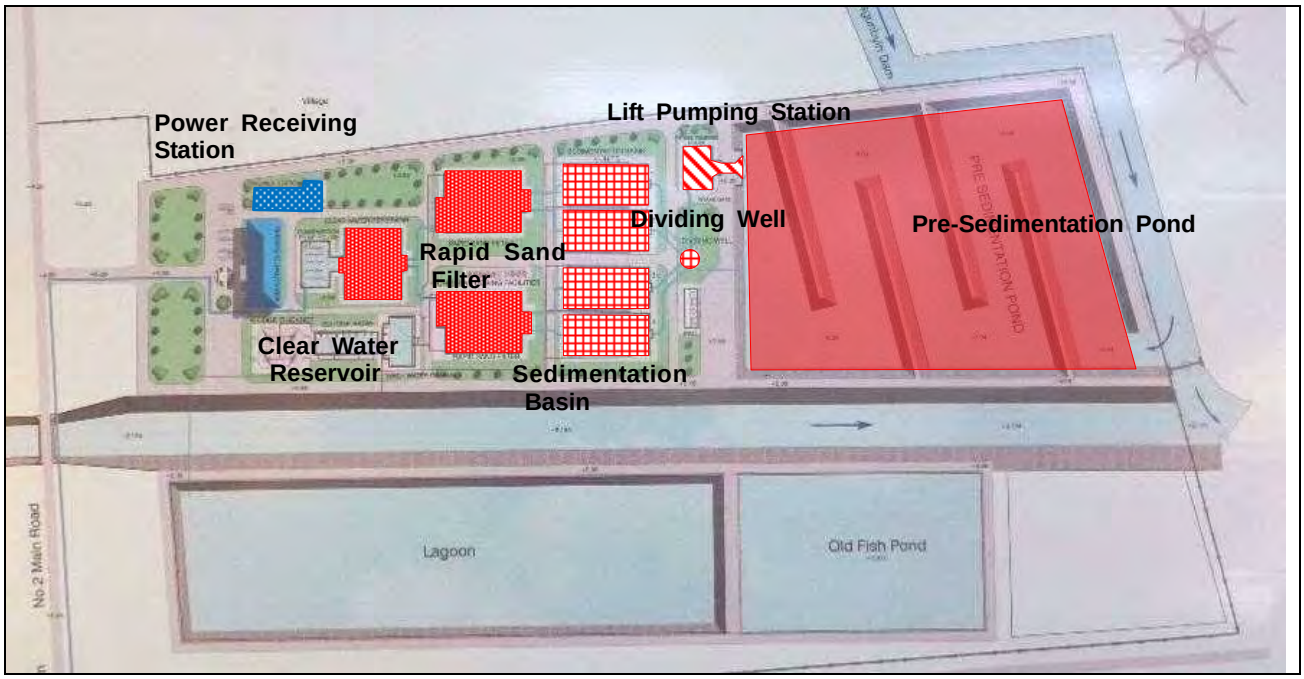


Nov 2014

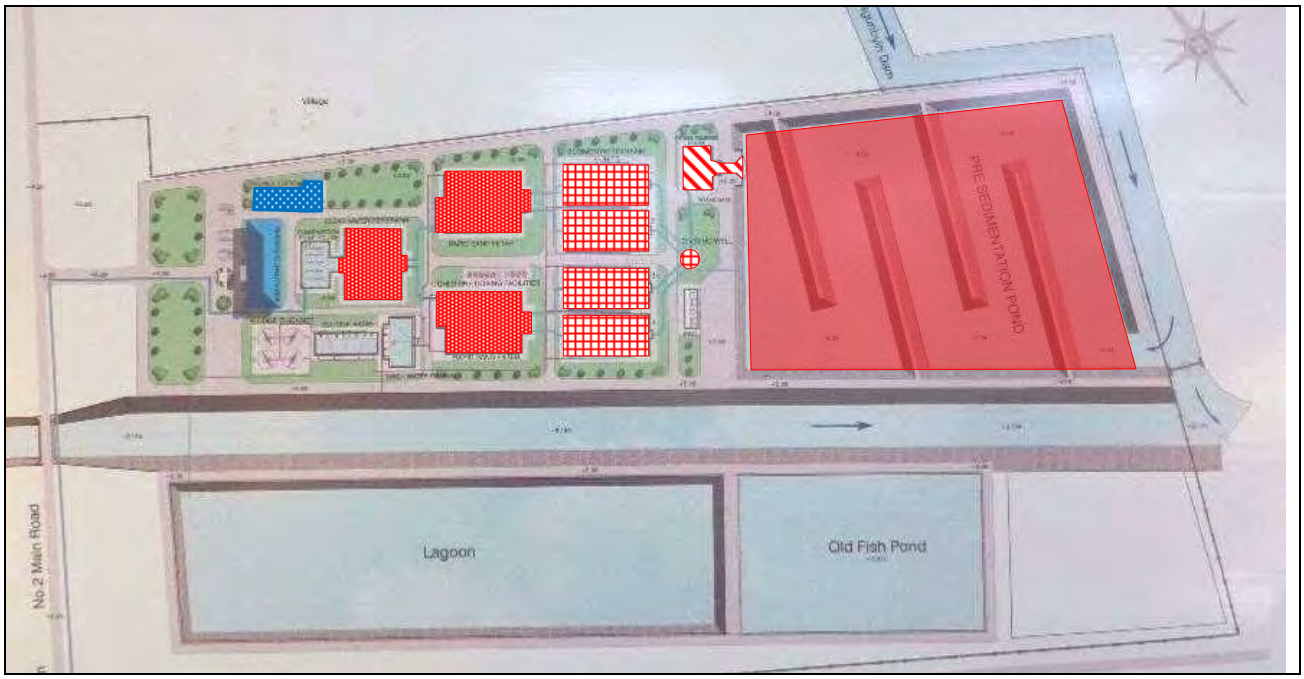


Status: ■Under Construction(▥Piles, ▨Basement, ▦Walls, ▩Roofs) and ■Completion

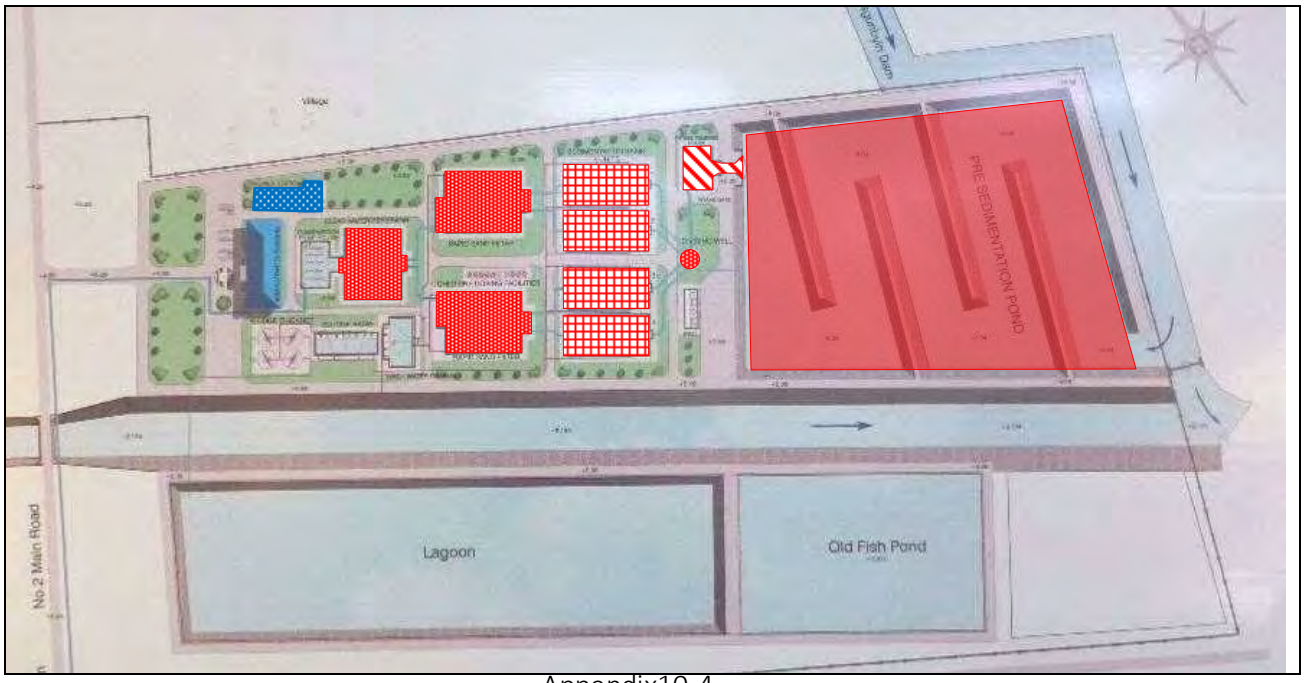
Dec 2014



Jan 2015

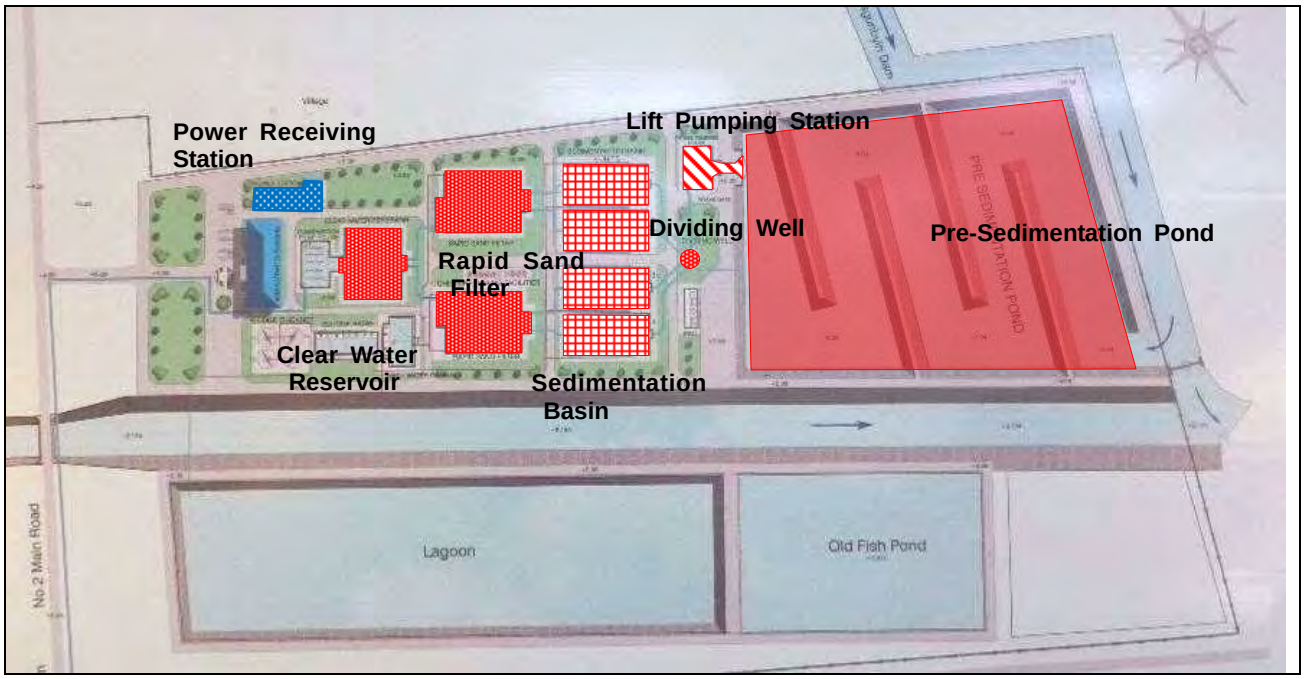


Feb 2015

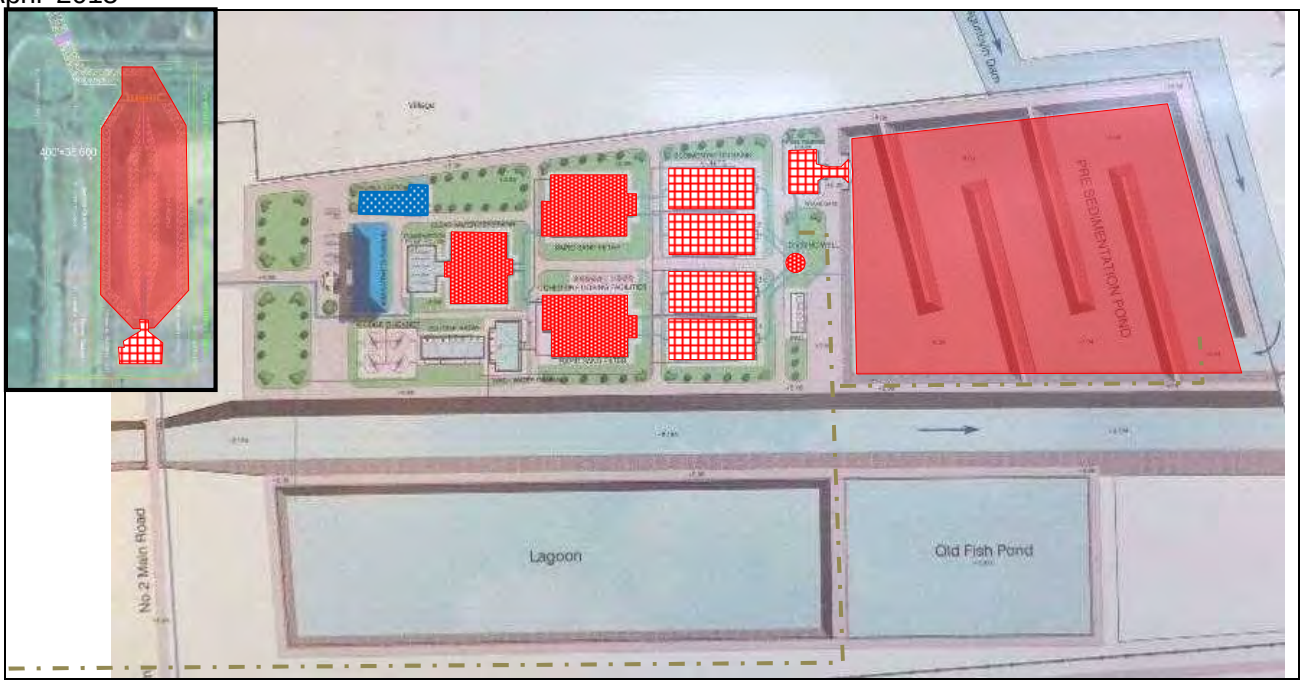


Status: ■Under Construction(Piles, Basement, Walls, Roofs) and ■Completion

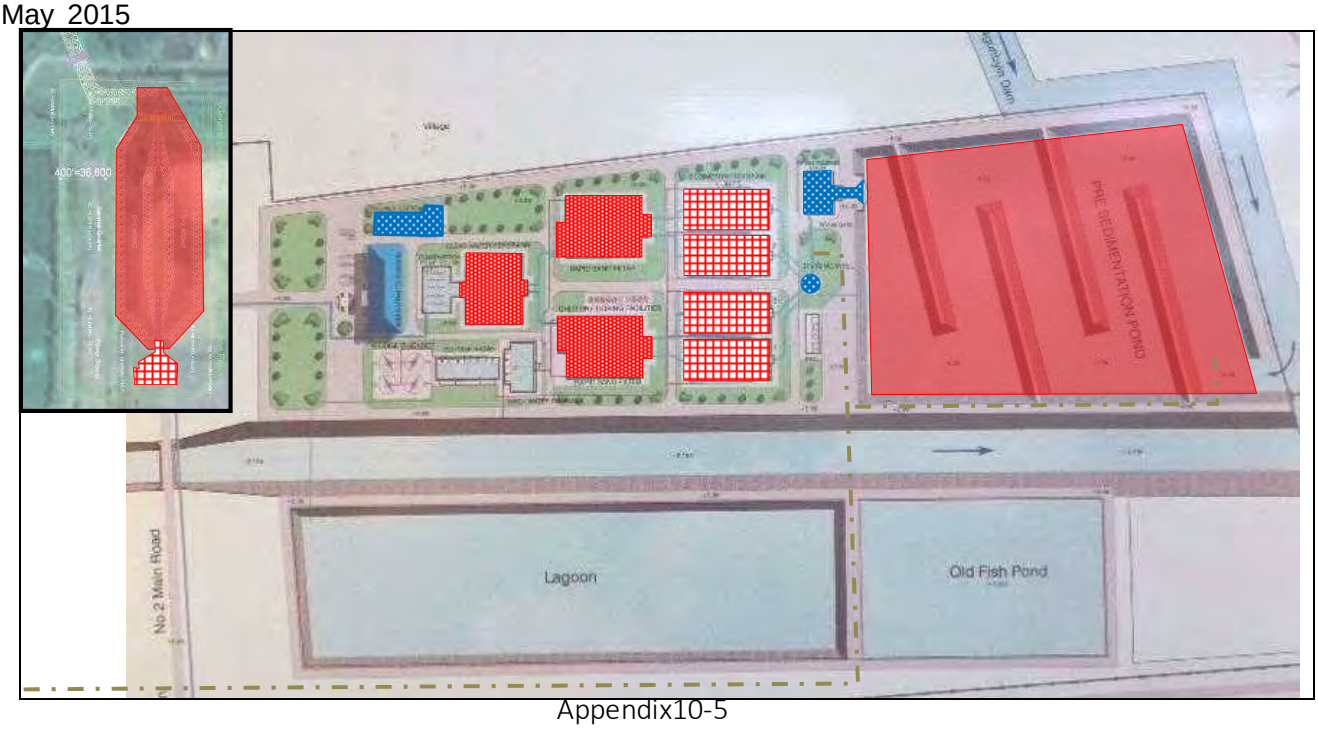
March 2015



April 2015

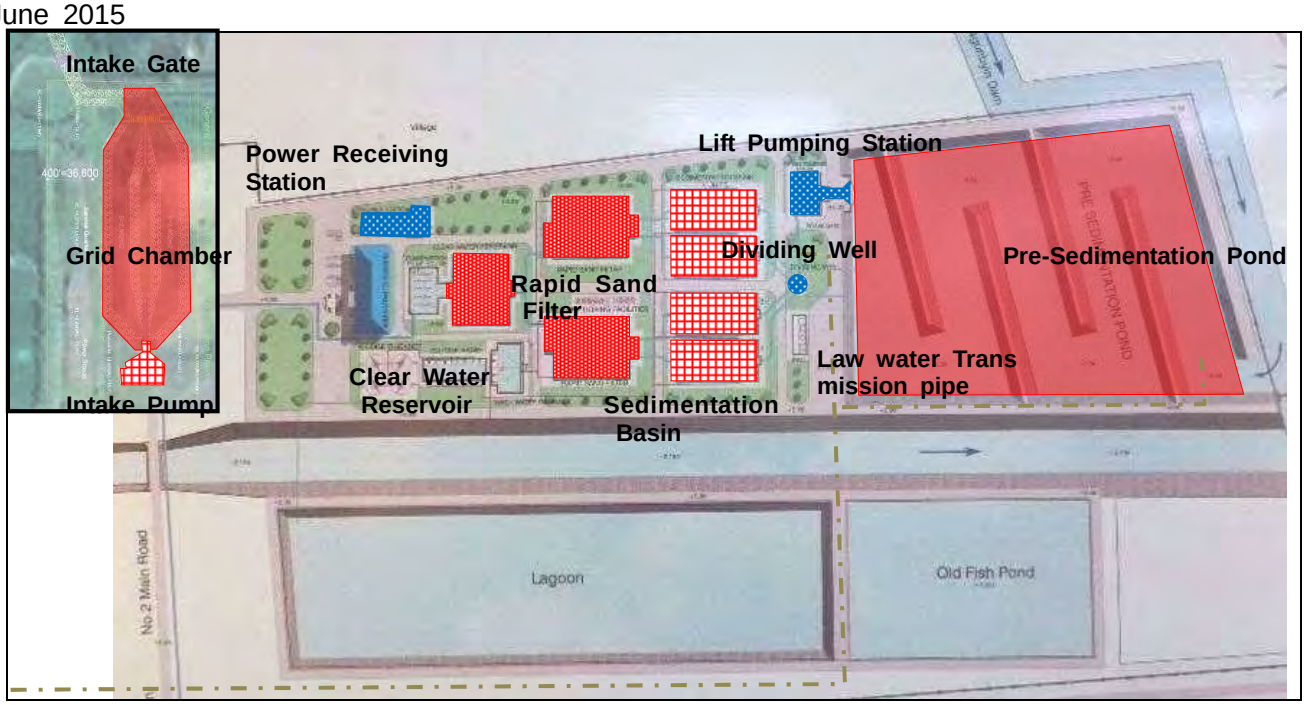


May 2015

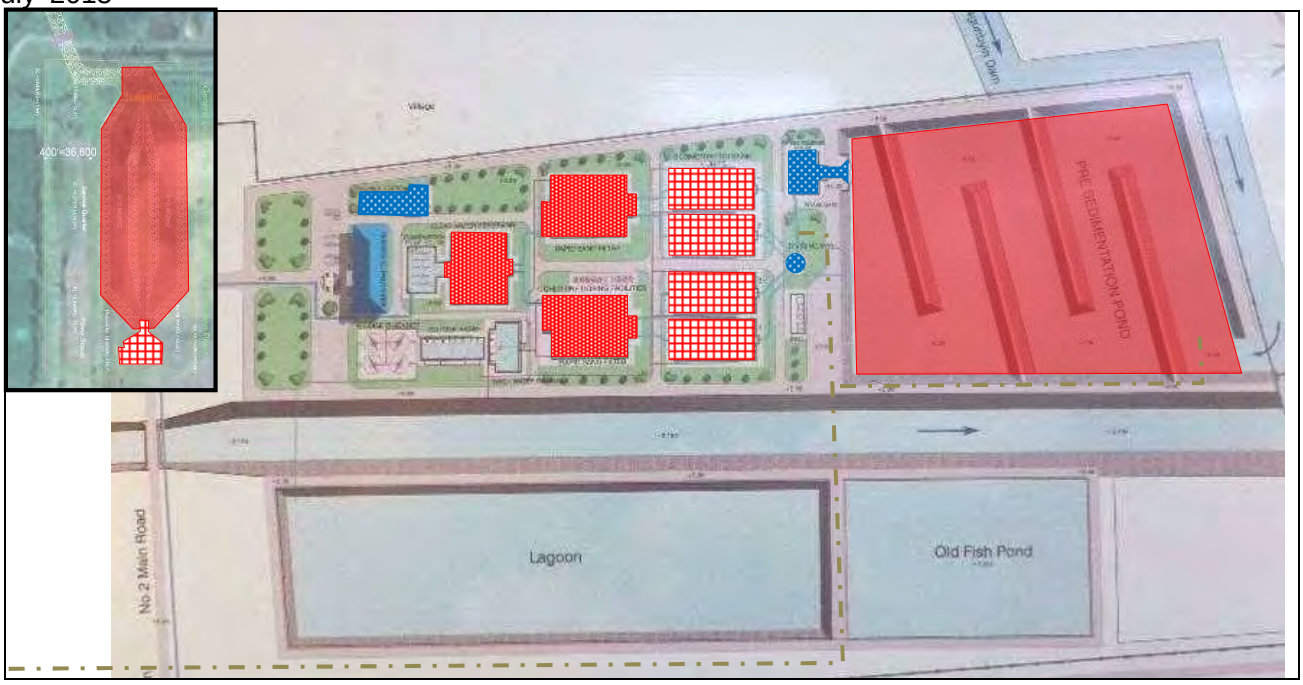


Status: ■Under Construction(Piles, Basement, Walls, Roofs) and ■Completion

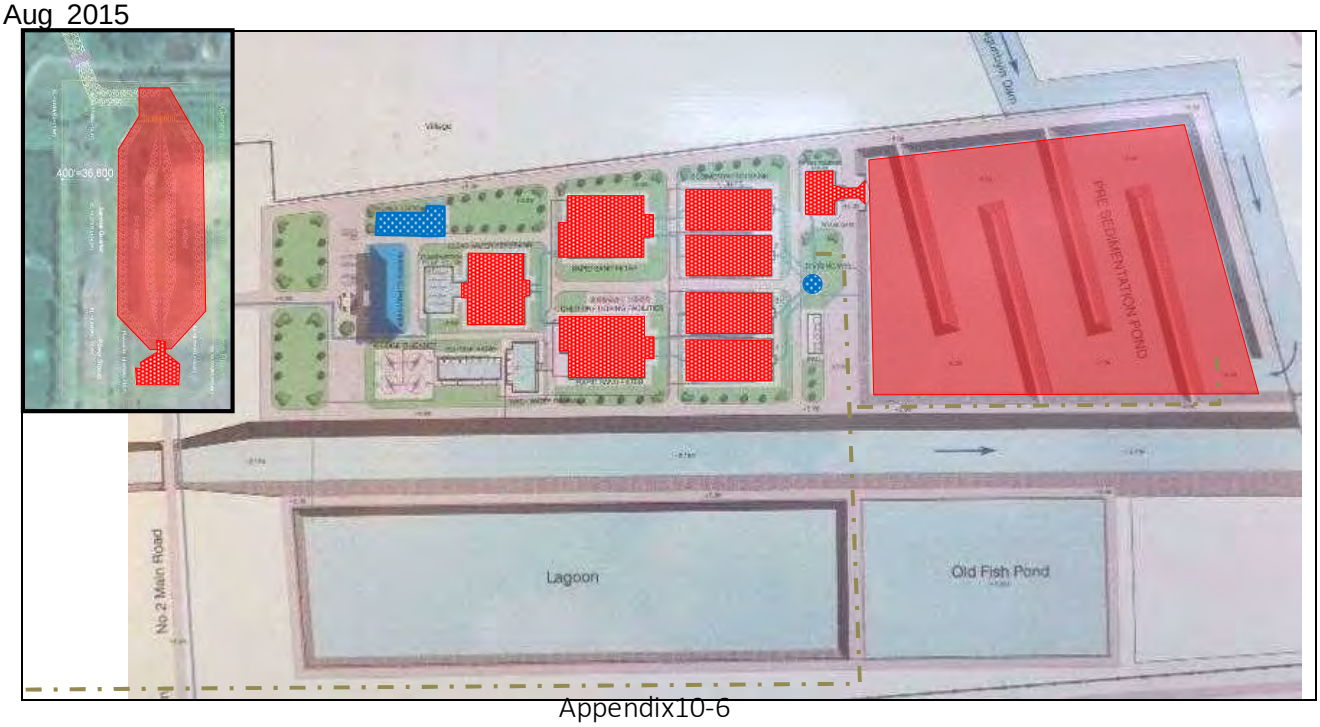
June 2015



July 2015

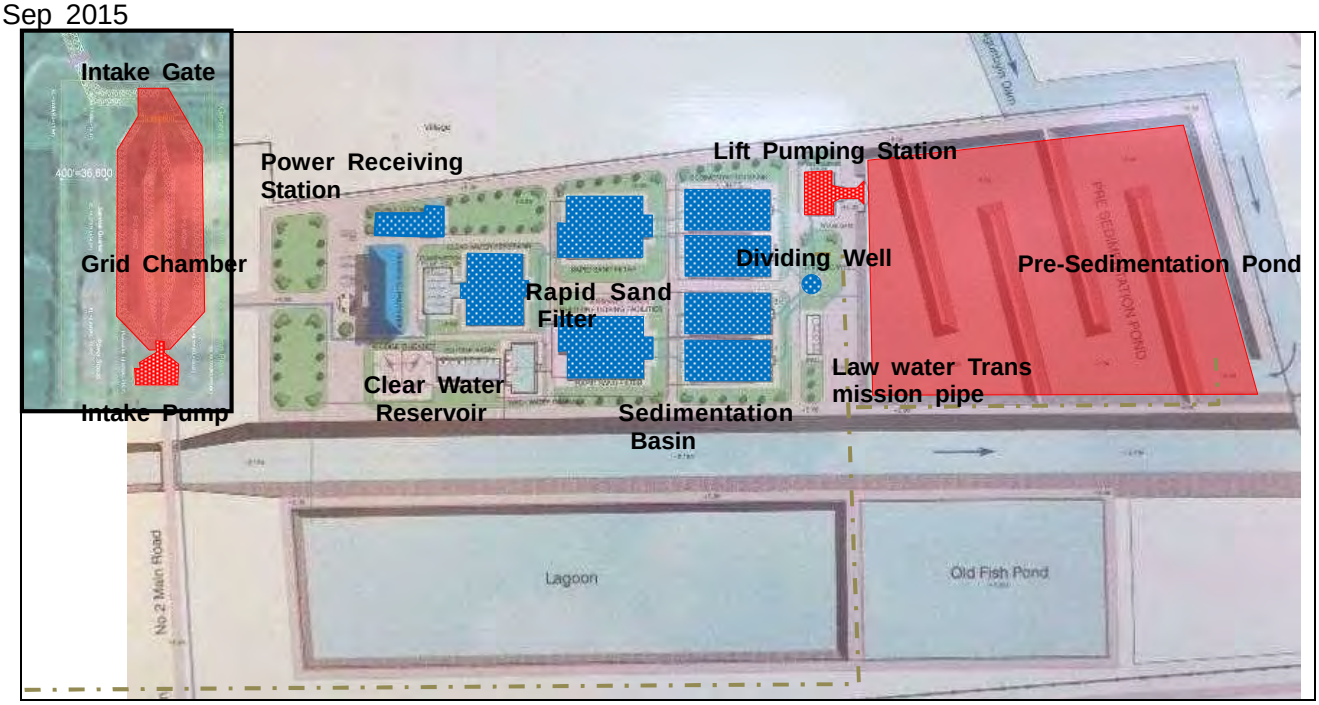


Aug 2015

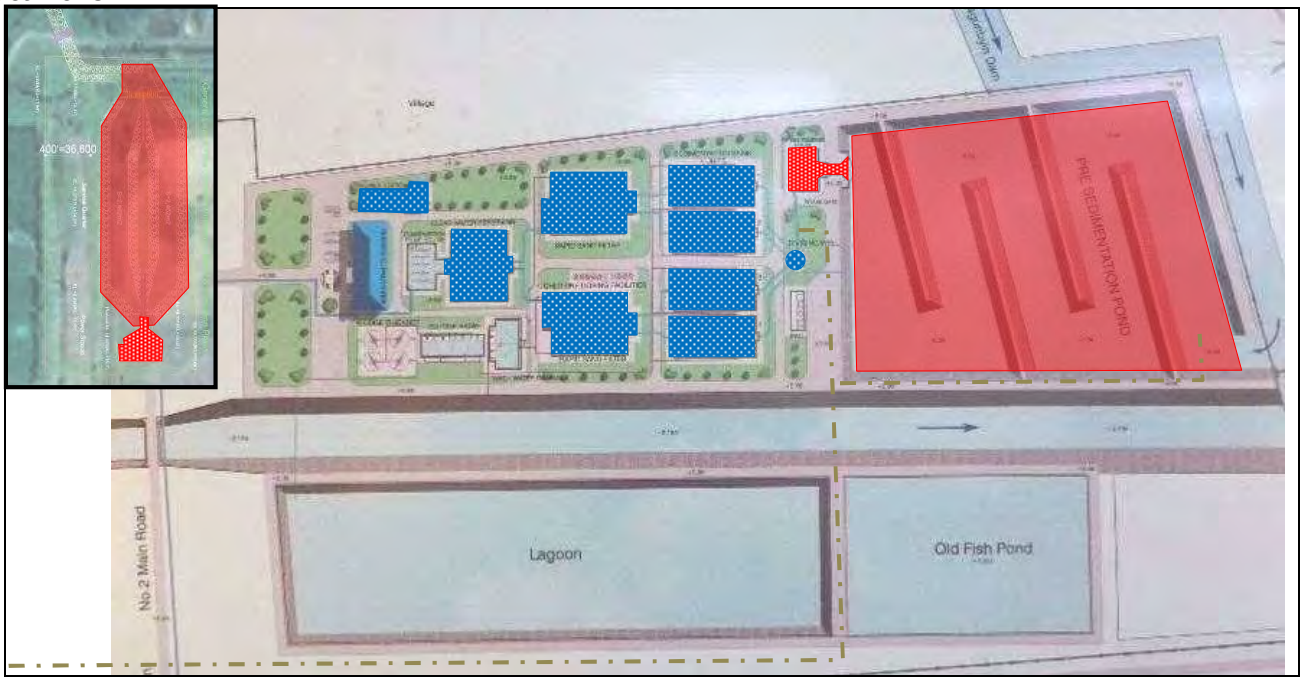


Status: ■Under Construction(Piles, Basement, Walls, Roofs) and ■Completion

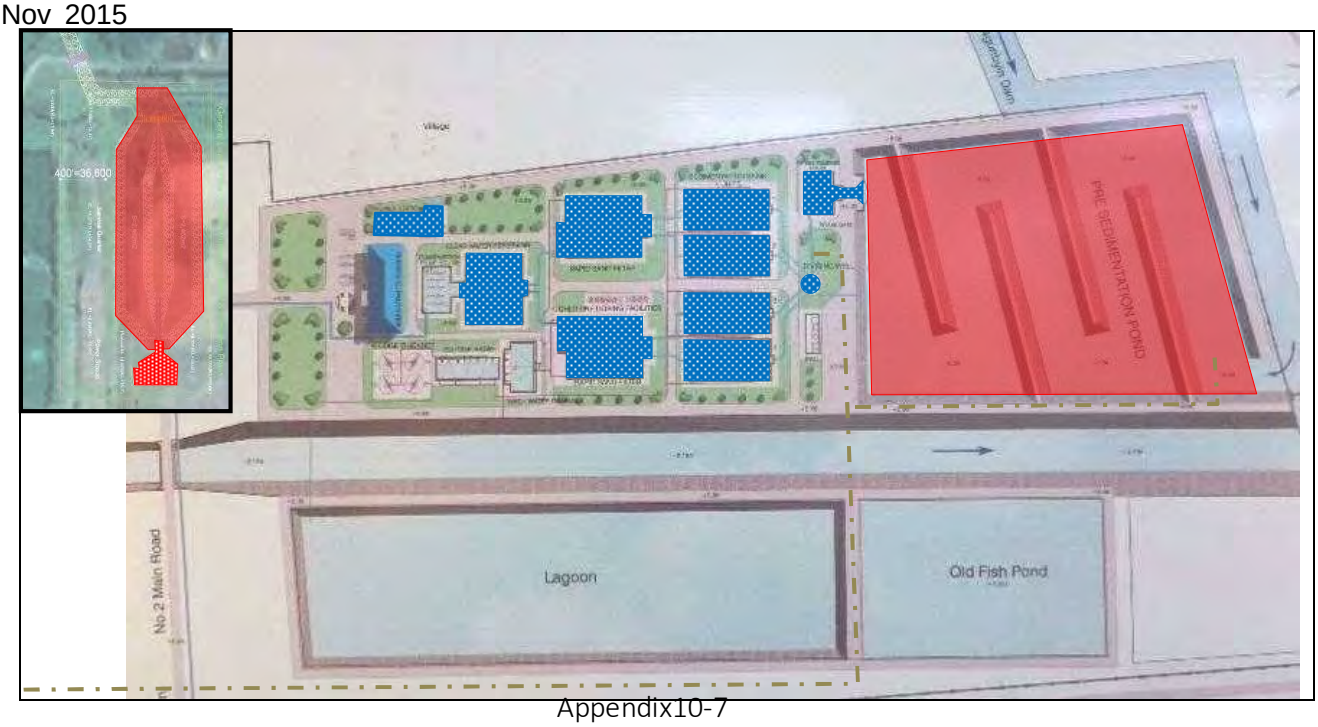
Sep 2015



Oct 2015

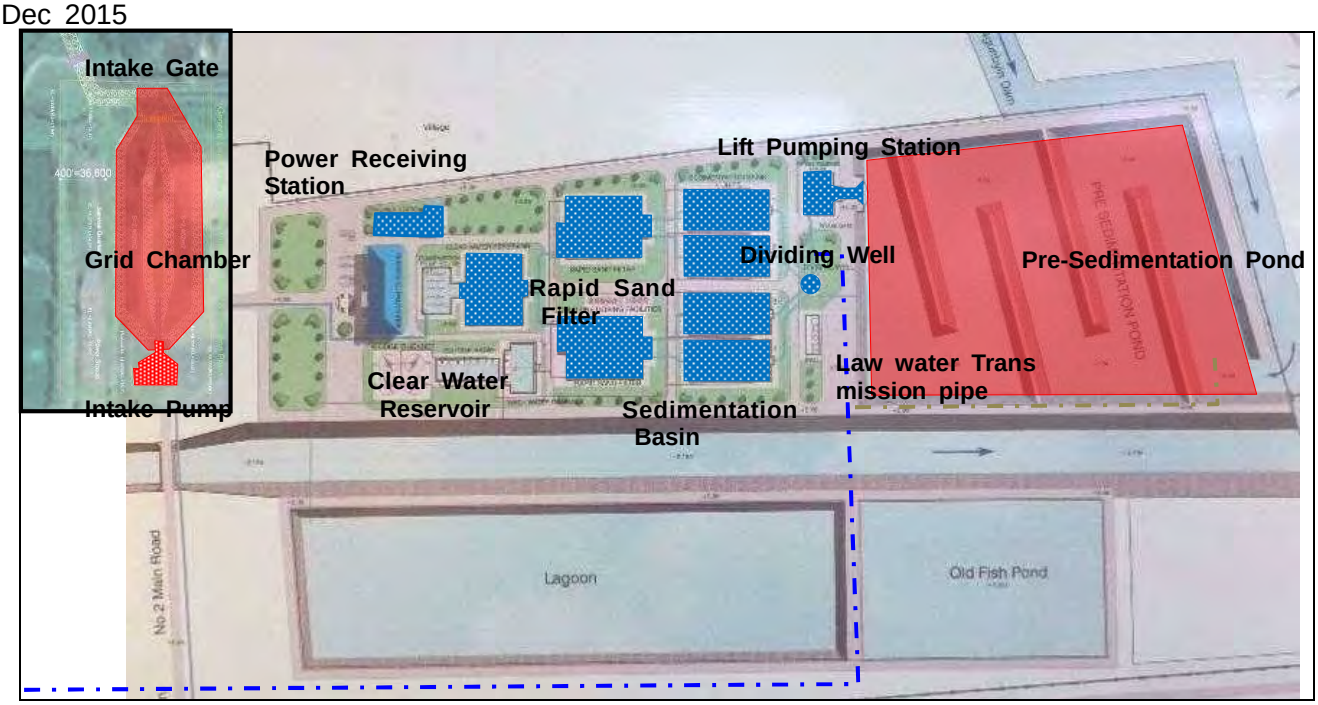


Nov 2015

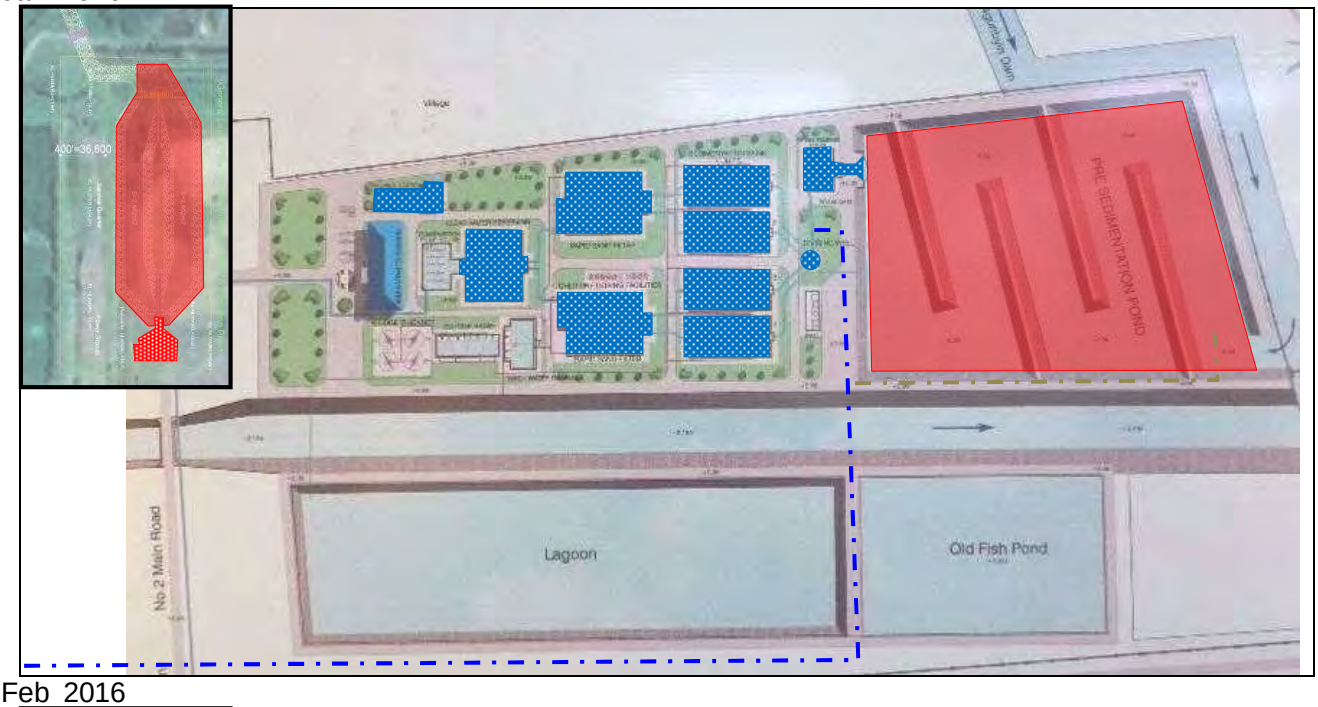


Status: ■Under Construction(Piles, Basement, Walls, Roofs) and ■Completion

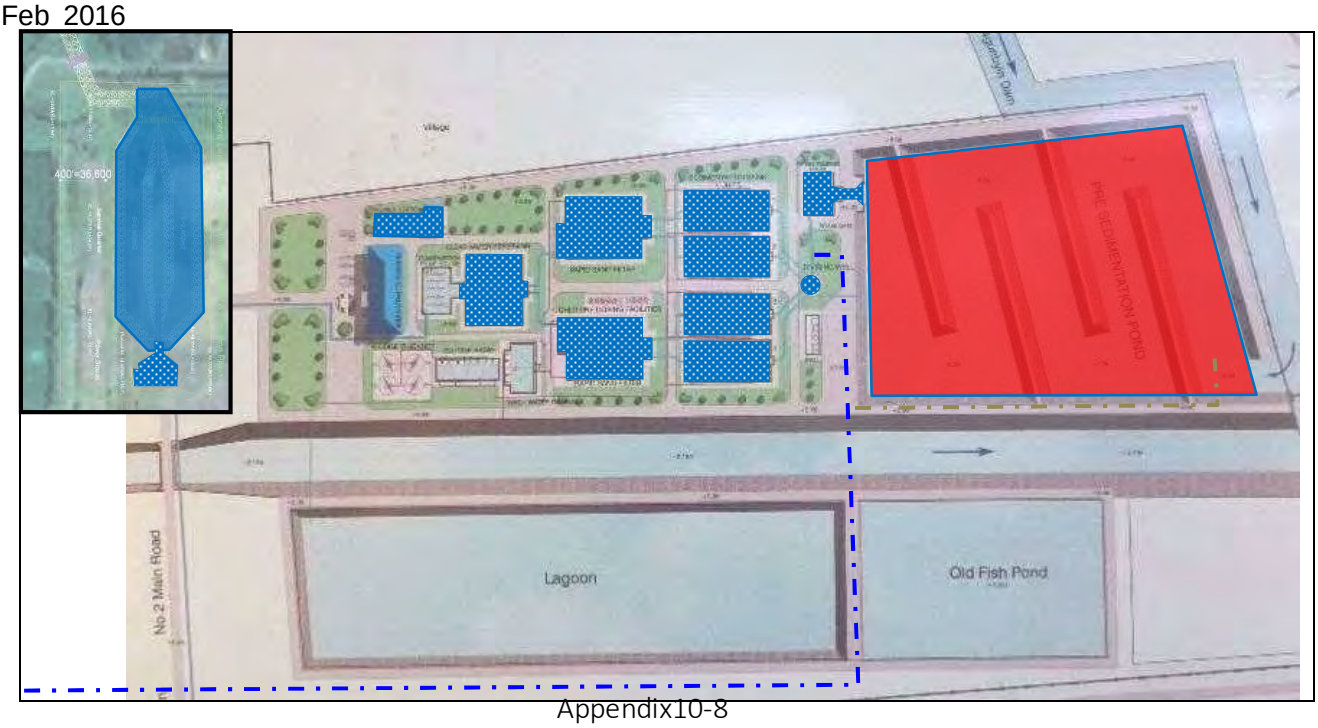
Dec 2015



Jan 2016

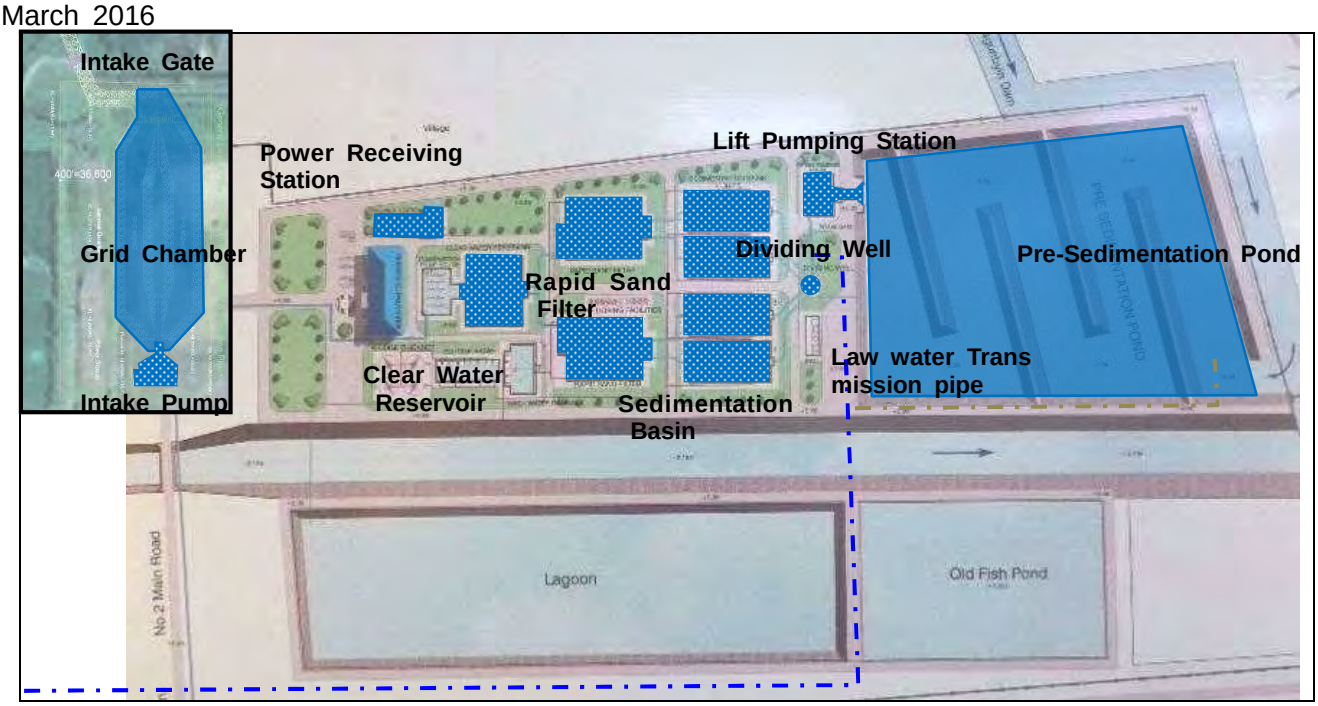


Feb 2016



Status: ■Under Construction(Piles, Basement, Walls, Roofs) and ■Completion

March 2016



Intake Facility

	
Candidate Site in Riverbank of Ngamoeik Creek, 18 Sep. 2014	Decided Site of Intake Facility, 09 Dec. 2014
	
Grit chamber, 04 Feb 2015	Grit chamber, 27 Feb 2015
	
Grit chamber, 31 March 2015	Description panel, 28 April 2015
	
Grit chamber, 28 April 2015	Grit chamber, 02 June 2015
	
Grit chamber, 02 July 2015	Intake gate, 16 July 2015

	
Grit chamber, 04 Sep. 2015	Intake gate, 04 Sep. 2015
	
Intake gate, 29 Sep. 2015	Intake gate,05 Jan. 2015
	
Grit chamber, 29 Jan. 2015	Grit chamber, 29 Feb. 2015
	
Grit chamber, 29 March 2016	Grit chamber, 09 June 2016
	
Grit chamber, 28 Sep. 2016	Grit chamber, 03 Jan. 2017

Intake Pumping Station

	
31 March 2015	28 April 2015
	
02 June 2015	02 July 2015
	
04 Sep. 2015	29 Sep. 2015
	
20 Oct. 2015	29 Jan. 2015
	
29 Feb. 2015	03 March 2016

	
29 March 2016	11 May 2016
	
09 March 2017	21 March 2017
	
31 March 2017	18 April 2017
	
26 April 2017	Incoming panel, 28 May 2017
	
01 June 2017	28 July 2017

	
Incoming panel, 07 Sep. 2017	Incoming panel/ Control panel, 29 Sep. 2017
	
17 Oct. 2017	Control panel, 27 Oct. 2017
	
Control panel, 21 Jan. 2017	Wiring work, 21 Jan. 2017
	
Wiring work, 27 Feb. 2017	Check of control program, 11 Jan. 2018
	
Check of control program, 14 Feb. 2018	Operation Training, 07 March 2018

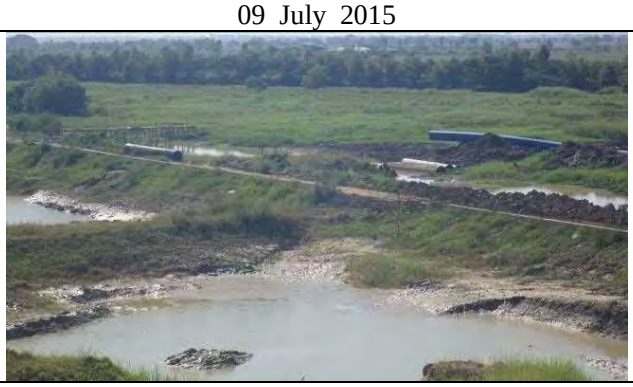
Raw Water Transmission Pipelines

	
28 April 2015	Ductile iron pipe, 28 April 2015
	
Polyethylene pipe, 02 June 2015	02 June 2015
	
09 July 2015	16 July 2015
	
04 Sep. 2015	05 Oct. 2015
	
11 Jan. 2015	01 Feb. 2015

	
1Feb.29日2015	Jan.26日2016
	
26 Jan. 2016	Railway crossing, 03 March 2016
	
Railway crossing, 05 April 2016	09 June 2016
	
Flowmeter chamber, 21 Feb. 2017	Flowmeter chamber, 09 March 2017

Pre-Sedimentation Pond

	
26 Mar 2014	07 July 2014

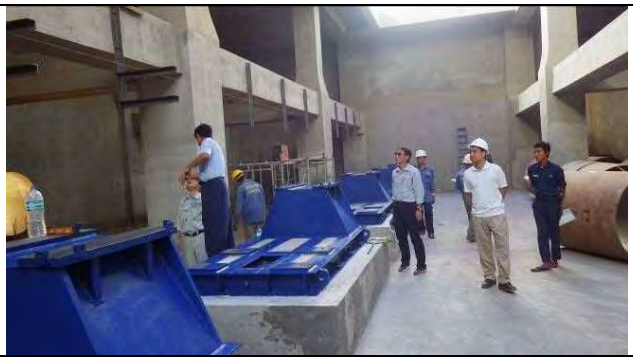
	
04 Sep 2014	26 Nov 2014
	
02 Jan 2015	30 Jan 2015
	
31 March 2015	02 June 2015
	
09 July 2015	29 Sep. 2015
	
05 Jan. 2015	01 Feb. 2015

	
29 Feb. 2015	03 March 2016
	
05 April 2016	29 April 2016
	
09 June 2016	07 July 2016
	
28 July 2016	03 Jan. 2017

Lift Pumping Station

	
26 Mar 2014	28 Apr 2014

	
22 Sep 2014	26 Nov 2014
	
09 Jan 2015	30 Jan 2015
	
04 Feb 2015	27 Feb 2015
	
31 March 2015	31 March 2015
	
28 April 2015	02 June 2015

	
09 July 2015	16 July 2015
	
04 Sep. 2015	04 Sep. 2015
	
29 Sep. 2015	05 Jan. 2015
	
01 Feb. 2015	26 Jan. 2016
	
03 March 2016	29 March 2016

	
29 April 2016	09 June 2016
	
09 June 2016	24 Aug. 2016
	
29 Jan. 2016	03 Jan. 2017

Dividing Well

	
02 March 2014	28 April 2014
	
31 Oct. 2014	26 Nov. 2014

	
09 Jan. 2015	30 Jan. 2015
	
28 April 2015	02 June 2015
	
09 July 2015	29 Sep. 2015
	
29 Feb. 2015	26 Jan. 2016
	
28 Sep. 2016	04 Jan. 2016

	
22 Jan. 2016	24 Jan. 2017

ACH Dosing House

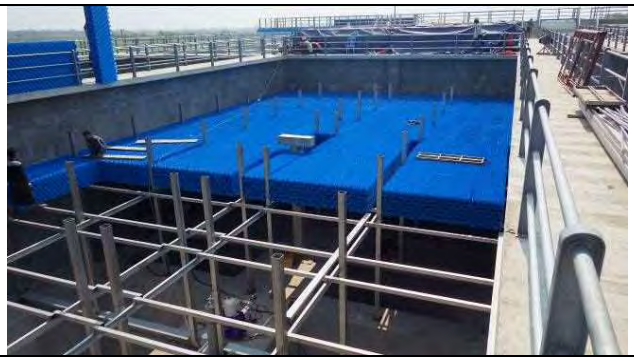
	
22 Jan. 2018	23 Feb. 2018

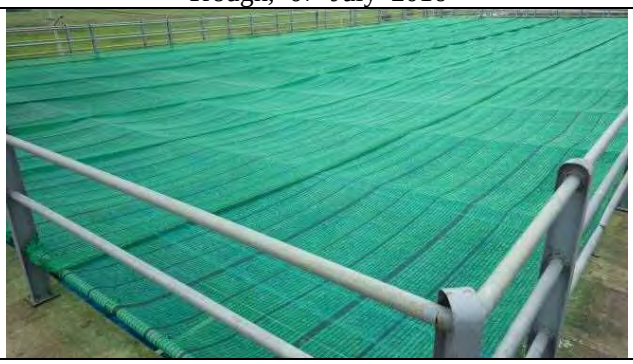
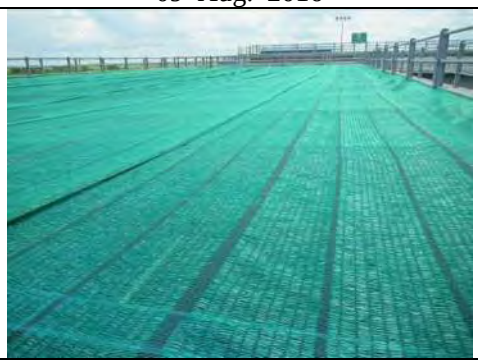
Sedimentation Basins

	
26 March 2014	22 May 2014
	
07 July 2014	10 July 2014
	
25 Sep. 2014	31 Oct. 2014

	
26 Nov. 2014	02 Jan. 2015
	
02 Jan. 2015	04 Feb. 2015
	
04 Feb. 2015	27 Feb. 2015
	
31 March 2015	31 March 2015
	
31 March 2015	28 April 2015

	
28 April 2015	28 April 2015
	
02 June 2015	02 June 2015
	
09 July 2015	16 July 2015
	
04 Sep. 2015	04 Sep. 2015
	
29 Sep. 2015	29 Sep. 2015

	
05 Jan. 2015	Tube settler, 08 Jan. 2015
	
26 Jan. 2016	01 Feb. 2015
	
29 Feb. 2015	Tube settler, 03 March 2016
	
Tube settler, 05 April 2016	Trough, 29 April 2016
	
09 June 2016	07 July 2016

	
Trough, 07 July 2016	09 Aug. 2016
	
Light shielding sheet, 31 Aug. 2016	Light shielding sheet, 28 Sep. 2016
	
04 Jan. 2016	Inlet valve, 13 Oct. 2016
	
14 March 2017	01 June 2017
	
24 Aug. 2017	Remedial work of water leakage, 20 Sep. 2017

	
Remedial work of water leakage, 12 Oct. 2017	Remedial work of water leakage, 07 Jan. 2017
	
Remedial work of water leakage, 29 Jan. 2017	Remedial work of water leakage, 05 Feb. 2017

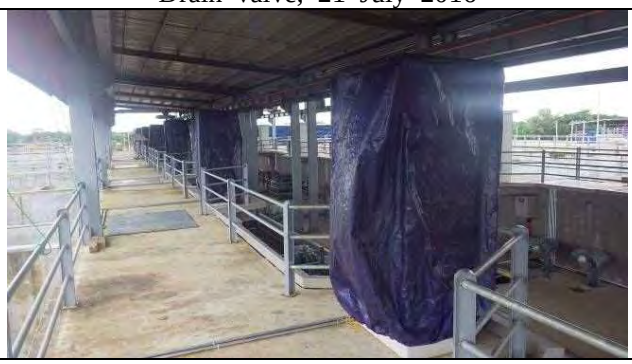
Rapid Sand Filters

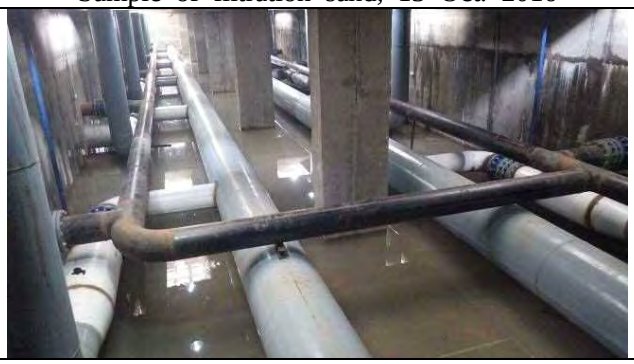
	
26 March 2014	28 April 2014
	
16 May 2014	07 July 2014
	
04 Sep. 2014	25 Sep. 2014

	
31 Oct. 2014	02 Jan. 2015
	
02 Jan. 2015	04 Feb. 2015
	
17 Feb. 2015	27 Feb. 2015
	
31 March 2015	28 April 2015
	
28 April 2015	02 June 2015

	
02 June 2015	09 July 2015
	
02 July 2015	09 July 2015
	
16 July 2015	16 July 2015
	
21 Aug. 2015	21 Aug. 2015
	
05 Oct. 2015	29 Sep. 2015

	
20 Oct. 2015	28 Jan. 2015
	
29 Feb. 2015	08 Jan. 2015
	
26 Jan. 2016	26 Jan. 2016
	
03 March 2016	03 March 2016
	
05 April 2016	05 April 2016

	
29 April 2016	29 April 2016
	
29 April 2016	02 June 2016
	
Back wash pump and blower, 07 July 2016	Drain valve, 21 July 2016
	
Pipe route, 21 July 2016	Control panel, 21 July 2016
	
Back wash pump and blower, 28 Sep. 2016	28 Sep. 2016

	
Drain valve, 28 Sep. 2016	Sample of filtration sand, 13 Oct. 2016
	
22 Jan. 2016	29 Jan. 2016
	
Change of air pipe route, 03 Jan. 2017	07 Feb. 2016
	
02 Feb. 2017	21 Feb. 2017
	
Change of air pipe route, 21 Feb. 2017	Sieving of sand, 28 Feb. 2017

Sieving of sand, 28 Feb. 2017

Sieving of sand, 14 March 2017

Sample of filtration gravel, 31 March 2017

Sieving of sand, 21 March 2017

26 April 2017

Sieving of sand, 18 May 2017

Sieving of sand, 11 July 2017

Improvement of strainer, 24 Oct. 2017

Improvement of strainer, 07 Jan. 2017

Improvement of strainer, 21 Jan. 2017

	
Improvement of strainer, 21 Jan. 2017	Sieving of sand, 12 Feb. 2017
	
05 Feb. 2017	Improvement of strainer, 02 Jan. 2017
	
02 Jan. 2017	Test of back washing, 17 Jan. 2018
	
Sieving of sand, 12 Jan. 2018	Sieving of sand, 23 Feb. 2018
	
Sieving of sand, 19 April 2018	Sieving of sand, 19 April 2018

	
19 April 2018	19 April 2018

Clear Water Reservoir

	
26 March 2014	28 April 2014
	
22 May 2014	07 July 2014
	
04 Sep. 2014	31 Oct. 2014
	
26 Nov. 2014	09 Jan. 2015

	
30 Jan. 2015	17 Feb. 2015
	
31 March 2015	28 April 2015
	
Explanation of chlorination, 28 April 2015	02 June 2015
	
16 July 2015	05 Jan. 2015
	
28 Jan. 2015	29 Feb. 2015

	
29 April 2016	02 June 2016
	
Leak test by filling water, 28 Sep. 2016	Inlet pipe, 26 April 2017

Wash Water Tank

	
03 Jan. 2017	02 Feb. 2017
	
14 March 2017	26 April 2017
	
Lagoon, 22 Jan. 2018	

Power Receiving Station

	
26 March 2014	26 March 2014
	
28 April 2014	28 April 2014
	
07 July 2014	25 July 2014
	
Incoming line of 33Kv Transmission, 15 Aug. 2014	The branch point along the Route No. 3, 15 Aug. 2014

Others

	
Benchmark in the WTP, 02 May 2014	Below Base Course of Service road, 28 Apr 2014

	
Flange Gasket, 02 May 2014	Strainer of Existing WTP, 02 May 2014
	
Service road, 02 June 2015	Removal of temporary material, 05 Oct. 2015
	
Service road, 26 May 2016	Drainage ditch, 25 Aug. 2016
	
Drainage ditch, 28 Sep.2 2016	Drainage ditch, 21 Feb. 2017
	
Drainage ditch, 21 March 2017	Drainage ditch, 26 April 2017