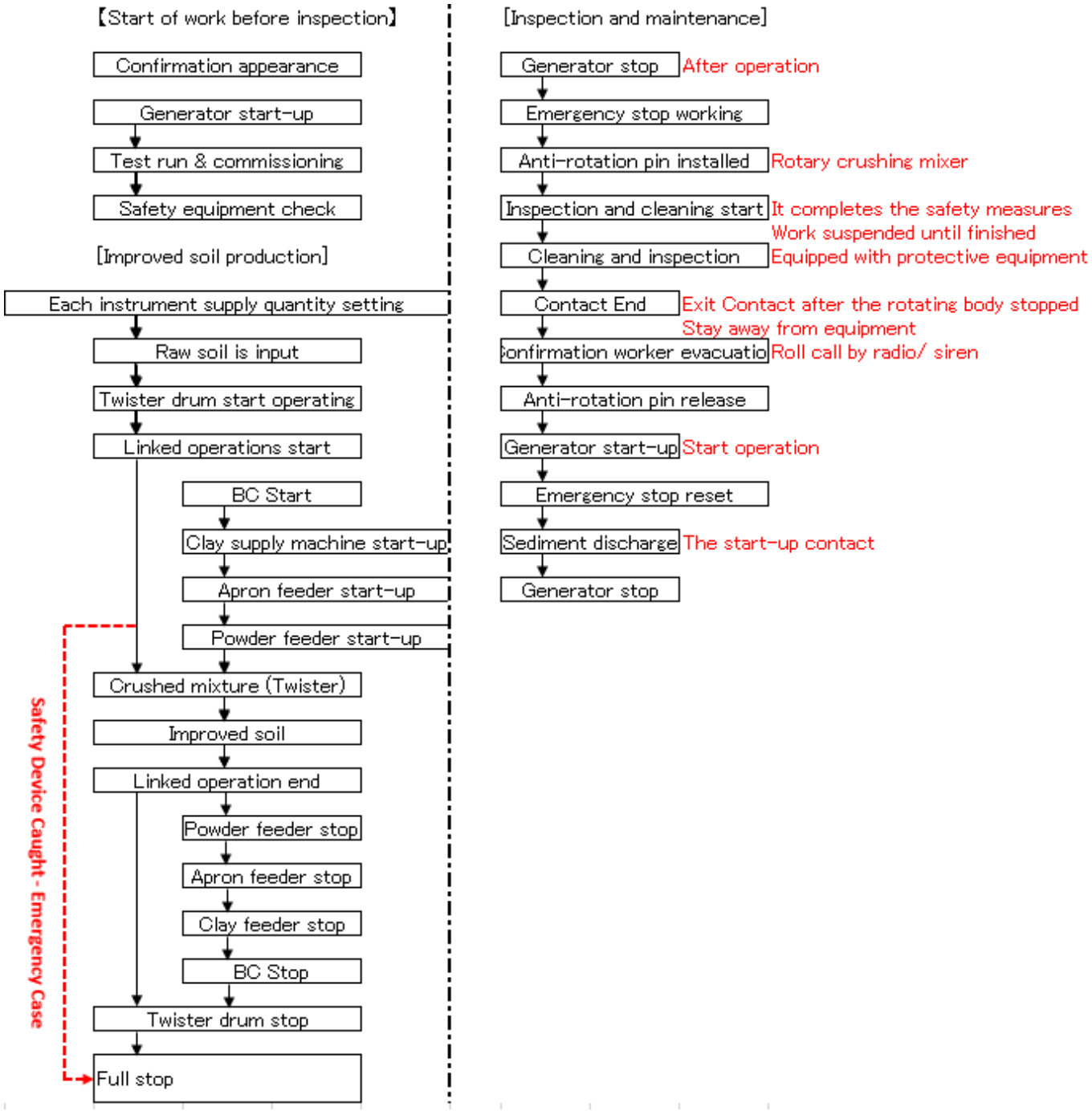
MOVE EARTH. MOVE EVERYTHING.

JDC CORPORATION
YANGON BRANCH

Twister Operation Work Flow



Work Procedures Manual (Rotary Crushing Mixing Plant Operation)

Construction Name		Project Name	Rotary Crushing Mixing Plant Operation	Work Period	2018 / / ~ 2018 / /
		Company	Kokudokaihatsu Co., Ltd.	Author	Marui	Created Date	2018 / /

Signature of Meeting Attendees		Meeting Date:	
Company Name	Full Name	Company Name	Full Name

Construction System

Prime Contractor

Primary

Secondary

Tertiary

Tertiary

Work Organization

Work Conductor	
Plant OP	
Heavy Equipment OP	

Qualified Work

Vehicle-Based Construction Machinery

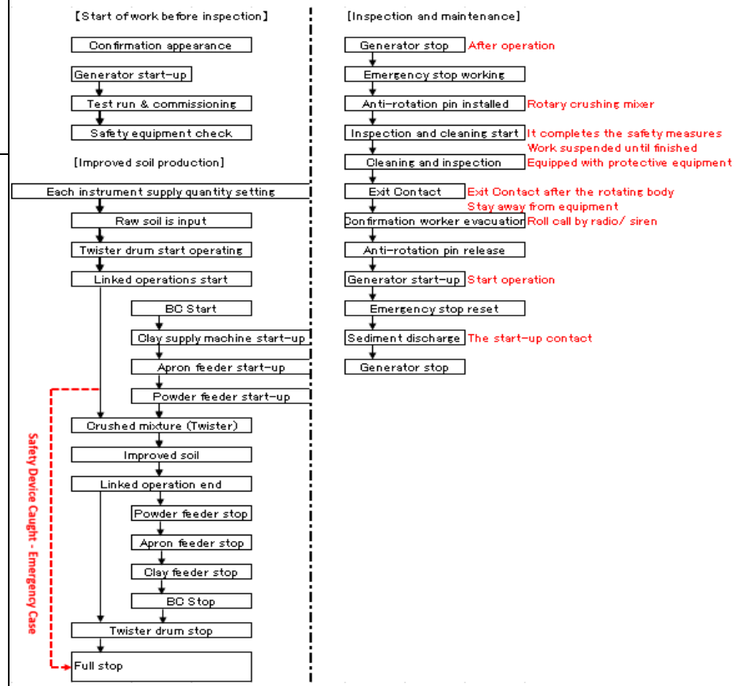
Used Machinery and Tools

Rotary crushing mixing plant, a hydraulic excavator 0.8m3,

Protective Equipment

Helmets, safety shoes, protective gloves, safety belts

Illustration of a work procedure



	Key Points of the Work Procedures	Risk [Danger and Harmful Factors]	Dangerous: Severe a	Dangerous: Frequency b	Dangerous: valuatio a × b	Precaution Action [Removal or Reduction Measures of Hazards]
Work Tasks / Activities	1. Preparation Work					
	To participate in the morning meeting.	- Other construction work, well-known of off-limits area				- To make sure their coordination matters with other construction work.
		- Health status, suitability of clothing				- Check the physical condition of clothing, correct the clothing error.
	Perform a risk prediction activities.	- Work, danger points, well-known of working procedure				- Raise the level of understanding of the work.
		- Monitored by qualified person				- Allocate right man at the right place and confirm the qualification's certificate.
	Carry out the start-up inspection.	- Inspection work to prevent finger injury	1	3	B	- Wear protective equipment when performing the inspection.
		- Heavy machinery should not be congested during inspection				- The person in charge carry out the inspection of equipment based on the inspection list.
	Perform an explicit work area.	- Vehicles no contact with heavy equipment	3	1	B	- Check the perimeter of safety to work.
	*Work area is yellow flag, heavy machinery work area is a red flag	- Hand clamped or the finger injured when using hammer	2	2	B	- Confirm the safety of the hand
	2. Start of work before inspection					
	Conduct inspection of each device.					
	1) Deformation of appearance, damage, check the wear and tear	- To fall from a high place	3	1	B	- Use safety belt when work at height
		- Inspection work to prevent finger injury	1	3	B	- Wear protective equipment when performing the inspection.
	2) The generator to start.	- Plant is running/ operating	3	1	B	- Check the breaker OFF to start.
	3) Perform a single test run of the equipment.	- Caught up in the rotating body	3	1	B	- Inform the worker on test running by siren
	(Carried out inspection in pairs and OP)					- If there is an abnormality, take action according to the inspection procedure.
	4) Confirm the operation of the safety device.	- Caught up in the rotating body	3	1	B	- Confirm the realibility of the signal
	3. Improved soil production					
	1) To adjust the supply quantity setting of each device.	- Erroneous input and affect the quality of product	1	1	C	- Confirm the input values thru few person.
	The water content ratio measurement					
	2) The raw soil material is input into the hopper.	- Debris, hit the worker, fall from height	2	1	C	- Perform the off-limits measures.
	Daikatamari (φ200 or more), foreign matter is pre-removal	- Contact with worker at the time of turning	3	1	B	- Check the perimeter of safety to work.
	Put about 8 min after injection of the hopper	- Heavy equipment to fall from the height	3	1	B	- Confirm the working condition of scaffolding.
	3) To start the linked operation.	- Caught up in the rotating body.	3	1	B	- Perform the plant operation signal.
	The operation start contact by radio or siren	- Debris, hit the worker, fall from height	2	1	C	- Make sure the work area is clearly indicated.
	Administration computer, to monitor the running state					- Confirm no entry of unauthorized person from entering into plant.
						- Monitoring camera, to check the operating status by radio/ siren.
	4) Improve soil, accumulation and loading the mixture	- In contact with worker and hit	3	1	B	- Make sure the work area is clearly indicated.
	Close working with plant heavy equipment	- Plant and heavy machinery is in contact	1	2	C	- Perform a safety check of the surroundings.

★ Evaluation criteria and evaluation point of the risk assessment

a: The magnitude of the danger b: The frequency of danger

3: Extremely serious (disaster with the death and ◦ 3: Pretty occur (also occur about once six months)

2: Critical (lost-time injuries = off 4 or more days o 2: Sometimes happen (occur about once a year)

1: Minor (Fukyu disaster = disaster of less than cl◦ 1:Rarely occur (which occurs about once in 5 years)

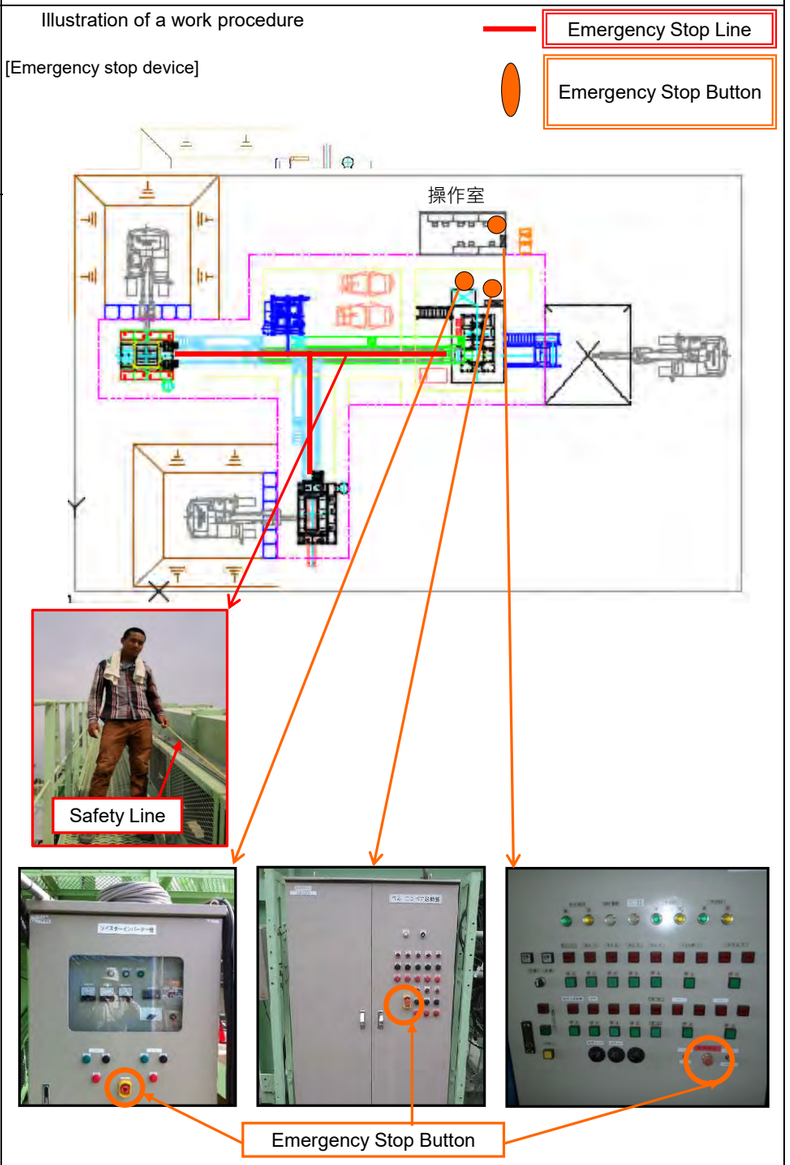
Evaluation of risk (a × b) → A: 9 ~ 6 (high risk), B: 4 ~ 3 (medium risk),
C: 2 ~ 1 (low risk)

Work Procedures Manual (Rotary Crushing Mixing Plant Operation)

Work Tasks / Activities	Key points of the work procedures	Risk [Danger and Harmful Factors]	Risk of: Severe b	Frequency a	Evaluation a × b	Precaution Action [Removal or Reduction Measures of Hazards]
	5) Carry out the operation management.	- Fall from height	1	2	C	- Do not place objects along the passage.
	Administration computer, check the operating status on the monitor	- Caught up in the rotating body	1	2	C	- Do not approach the rotating body during plant operating.
		- Material dropping from overhead	1	3	B	- During operation, it is prohibited to enter except safety passage.
	To check any abnormality in the plant					- Cleaning and maintenance is complusory when the machine stopped.
	4. Corresponding at the time of abnormal discovery					- Inspect the abnormality as complied with the inspection procedure.
	[Case where there is urgency]					
	1) Emergency safety stop line, manually pull to activate the emergency stop device	- Fall from height	1	2	C	- Perform a safety check of the surroundings.
	2) After the plant is stopped, in the radio, etc.	- Caught up in the rotating body	3	1	B	- Do not resume operation until abnormality is determined.
	To explain the situation to the OP.					
	[In the case of no urgency]					
	1) The situation described by the OP thru radio/ siren	- Caught up in the rotating body	3	1	B	- Stay away from the equipment until the instruction/ permit if given.
	Stop the plant operation untill confirm the situation.					
	2) To recover/ repair the abnornality through the inspection and maintenance procedures.	- Caught up in the rotating body	3	1	B	- Follow the inspection and maintenance procedures.
						- Work in pair, buddy system.
	3) To resume the operation.	- Caught up in the rotating body	3	1	B	- Operator always start with safety check prior operation.
	Resume the operation after confirm the safety of equioment and workers					- Notify the workers before resume operation.
	5. Abnormalities recovery work (common)					
	Confirmation of abnormal condition/ situation	- Caught up in the rotating body	3	1	B	- Stay away from the equipment until the instruction/ permit if given.
	Carry out the restoration work thru meeting	- Work, danger points, lack of procedure				- Raise the level of understanding of the work.
	Tools required for equipment preparation	- Fall from height	1	2	C	- Do not place objects along the passage.

Illustration of a work procedure

[Emergency stop device]



[Prohibited to walk through under conveyor during plant operation]

- Entering/ Walk through under conveyor is prohibited.

- Clean the bottom part of conveyor when plant is shut dow

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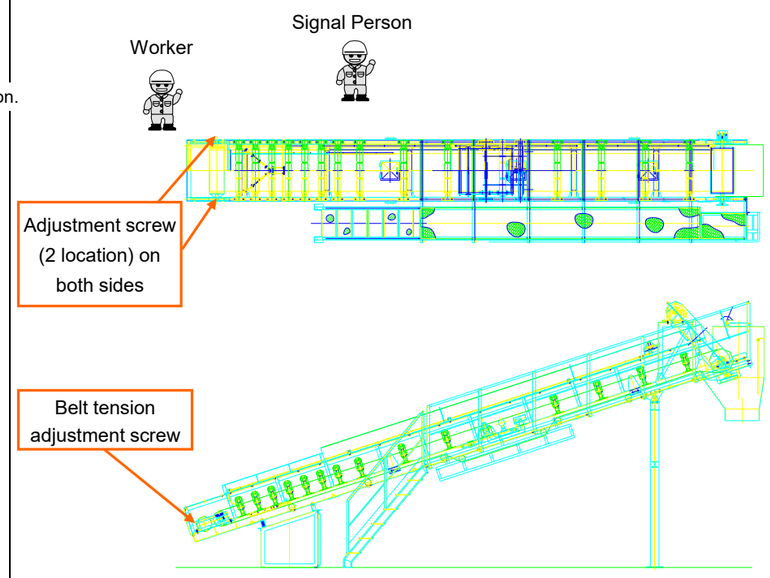
Work Procedures Manual (Rotary Crushing Mixing Plant Operation)

Work Tasks / Activities	Key Points of the Work Procedures	Risk [Danger and Harmful Factors]	Risk of: Severe (b)	Risk of: Frequency (a)	Risk of: Evaluation (a × b)	Precaution Action [Removal or Reduction Measures of Hazards]
	5. In correspondence of continously abnormality discovered After work contents common knowledge confirmation is needed. 5-1) In the case of the conveyor belt misaligned. [Operating procedures]					
	① After the plant is stopped, thru the radio/ siren, etc. To explain the situation to the OP.	- Caught up in the rotating body	3	1	B	- Stay away from the equipment until the instruction/ permit if given.
	↓ ② Determined the abnormal issue and work content. Assigned personnel to the location.					
	↓ ③ Only operate the abnormal conveyor after confirmation.	- The plant operator mistakenly run wrong equipment.	3	1	B	- Plant operation should be done carefully. - Stay away from the equipment until the instruction/ permit if given.
	↓ ④ Adjustment towards conveyor belt tension with a tool.	- Caught up in the rotating body	3	1	B	- Always adjust the misaligned conveyor during operation. - Work when the side cover is attached. - Work in pair, buddy system. - Operate the equipment by signal confirmation thru radio/ siren.
	↓ ⑤ Stop the conveyor after the adjustment is completed.					
	↓ ⑥ Resume operation after signal confirmation.					

Illustration of a work procedure

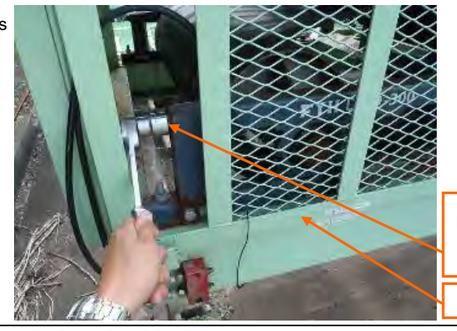
[Inspection and maintenance]

Work Order	Work	Worker: Regular	Worker: Deputy	Use tool
0	Operation stop [notify thru radio/ siren]			
1	Report on abnormal situation			
	Prepare the necessary tool equipment			
2	Qualified person check [visual]			
3	Conveyor start-up			
4	Conveyor belt tension adjustment			Ratchet
5	Conveyor stop			
6	Qualified person check [visual]			
7	Operation resume			



※ Conveyor running during alignment adjustment

Always make adjustments when the side cover is attached.



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Work Procedures Manual (Rotary Crushing Mixing Plant Operation)

Work Tasks / Activities	Key Points of the Work Procedures	Risk [Danger and Harmful Factors]	Risk of Severe b	Risk of Frequency a	Risk of Evaluation a × b	Precaution Action [Removal or Reduction Measures of Hazards]
	5. In correspondence of continously abnormality discovered After work contents common knowledge confirmation is needed. 5-2) Conveyor rubber skirt turn-up/ not in position case					
	[Operating procedures]					
	① After the plant is stopped, thru the radio/ siren, etc. To explain the situation to the OP.	- Caught up in the rotating body	3	1	B	- Stay away from the equipment until the instruction/ permit if given.
	↓					
	② Determined the abnormal issue and work content. Assigned personnel to the location.					
	↓					
	③ After confirming the stop sign, turn off the generator.	- Wrong stop procedure and break the machine.	1	1	C	- Point out and correction.
	↓					
	④ Adjust the belt tension screw to loosen the tension.	- Hand injury during tools handling.	1	2	C	- Appropriate handle of tools. - Equipped with protective equipment.
	↓					
	⑤ Turn up/ Align the rubber skirt rubber on top of the main belt.	- Hand injury during tools handling.	1	2	C	- Appropriate handle of tools. - Equipped with protective equipment.
	↓	- Fall from height	3	1	B	- Use safety belt when working at height.
	⑥ Recover/ Return the original tension state thru adjusting the belt tension screw.					
	↓					
	⑦ Turn on the generator after confirmation of visually checking.	- The plant is not working.	3	1	B	- Check the breaker OFF and start.
	↓					
	⑧ Only operate the abnormal conveyor after confirmation.	- The plant operator mistakenly run wrong equipment.	3	1	B	- Plant operation should be done carefully. - Stay away from the equipment until the instruction/ permit if given.
	↓					
	⑨ Adjustment towards conveyor belt tension with a tool.	- Caught up in the rotating body	3	1	B	- Always make adjustments when the side cover is attached. - Work in pair, buddy system. - Operate the equipment by signal confirmation thru radio/ siren.
	↓					
	⑩ Stop the converyor after the adjustment is completed.					
	↓					
	⑪ Resume operation after signal confirmation.					

Illustration of a work procedure

Conveyor rubber skirt repair

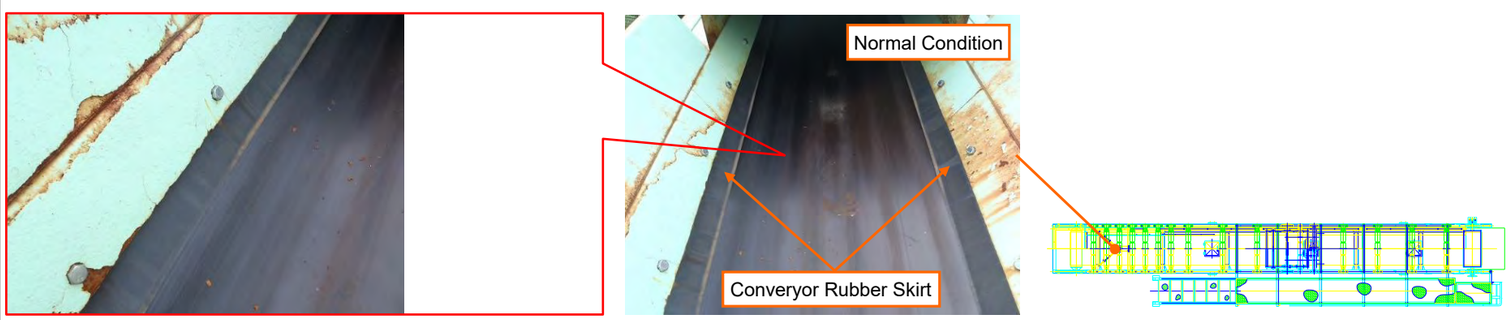
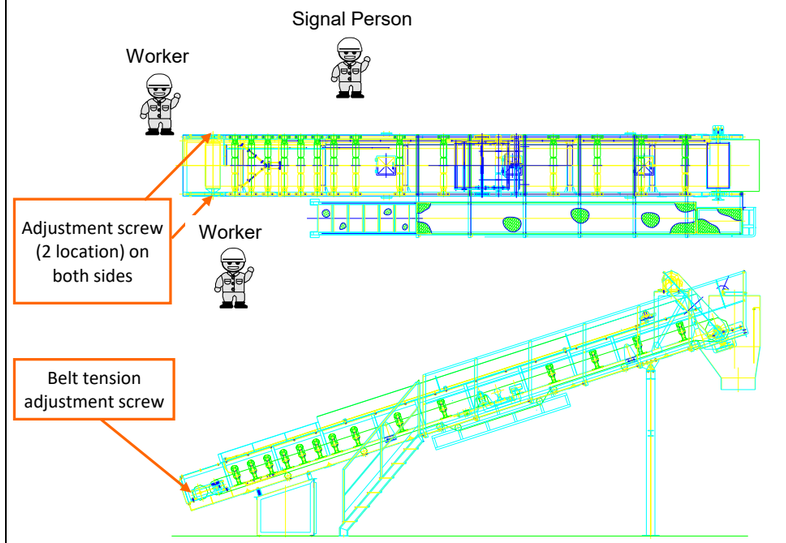


Illustration of a work procedure

[Inspection and maintenance]

Work Order	Work	Worker Regular	Worker Deputy	Use tool
0	Operation stop [notify thru radio/ siren]			
1	Report on abnormal situation			
	Prepare the necessary tool equipment			
2	Generator OFF			
3	Loosen the conveyor belt tension screw			
4	Conveyor rubber skirt repair			
5	Qualified person check [visual]			
6	Generator ON			
7	Conveyor start after signal confirmed.			
8	Conveyor alignment adjustment			
9	Operation resume after signal confirmed			



※ Conveyor running during alignment adjustment

Always make adjustments when the side cover is attached.

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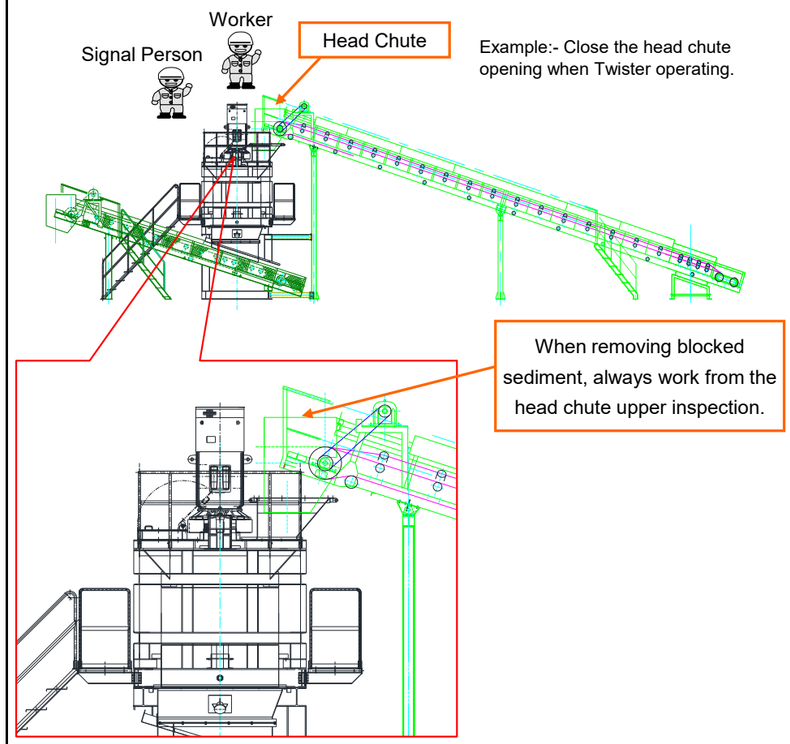
	5. In correspondence of continously abnormality discovered After work contents common knowledge confirmation is needed. 5-3) In the case of head chute sediment blockage. [Operating procedures]					
	① After the plant is stopped, thru the radio/ siren, etc. To explain the situation to the OP.	- Caught up in the rotating body	3	1	B	- Stay away from the equipment until the instruction/ permit if given.
	↓					
	② Determined the abnormal issue and work content. Assigned personnel to the location.					
	↓					
	③ From the top of head chute inspection opening, Scrape the soil with scraper and release the soil downwards.	- Hand injury during tools handling.	1	2	C	- Appropriate handle of tools. - Equipped with protective equipment.
		- Material dropping from overhead	2	2	B	- Always remove the sediment from the top part.
	↓	- Fall from height	3	1	B	- Use safety belt when working at height.
	④ If the cut-off earth and sand accumulated downward, Flush the accumulated earth and sand manually after signal confirmation.	- Caught up in the rotating body	3	1	B	- Make sure signal is confirmed by radio/ siren.
		- The plant operator mistakenly run wrong equipment.	3	1	B	- Plant operation should be done carefully. - Stay away from the equipment until the instruction/ permit if given.
	↓					
	⑤ Stop the machine after the adjustment is completed.					
	↓					
	⑥ Resume operation after signal confirmation.					

Illustration of a work procedure

[Inspection and maintenance]

Work Order	Work	Worker		Use tool
		Regular	Deputy	
0	Operation stop [notify thru radio/ siren]			
1	Report on abnormal situation			
Prepare the necessary tool equipment				
2	Removal of the blockage sediment			
3	Qualified person check [visual]			
4	Conveyor start after signal confirmed.			
5	Operation resume after signal confirmed			



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	6. Cleaning and Inspection					
	1) Turn OFF the generator.	- Wrong stop procedure and break the machine.	1	1	C	- Point out and correction.
	- To display the tag of "in check".					
	- Keep the key to look the operation room.					
	2) Activate the emergency stop button.					
	3) To set the anti-rotation pin.	- Both hand and fingers injury during pin handling.	1	1	C	- Wear protective gloves when working.
	4) The starting of cleaning and inspection work to be informed thru the radio, etc.					
	5) The cleaning and inspection is carried out.	- Entrance/ Inhale of dust or debris into eyes or mouth.	1	1	C	- Wear safety glass and put on dust mask.
	- Wear a safety belt during work at height.	- Fall from height.	3	1	B	- Ensure the wearing of safety belts.
	- Always put on/ equipped with safety equipment after you removed it.	- Hand and finger striked by chipper.	1	2	C	- Do the work at a stable posture.
	- Remove the sediment/ dirt on upper part or overhead before cleaning the lower part.	- Fall of sediment from the overhead	2	2	B	- Before operation start, makesure to check overhead equipment. If there is a stack of earth, etc., remove the stack of earth first and then drop it down. - When dropping the earth and sand down, make sure there are no people working below.
	6) The completion of cleaning and inspection work to be informed thru the radio, etc.					
	7) To reset the anti-rotation pin.					
	8) Turn ON the generator.					
	9) To reset the emergency stop button.					
	10) Manually start up the belt conveyor and discharge the sediment.	- Caught up in the rotating body	3	1	B	- Operation is always to start with safety check.
	11) To stop the belt conveyor.	- Caught up in the rotating body	3	1	B	- Keep away from the rotating body be stopped.
	12) To clean the plant.	- Muddy water enters into the eyes.	1	3	B	- Ensure the wearing of protective glasses.
	13) Turn OFF the generator.	- Wrong stop procedure and break the machine.	1	1	C	- Point out and correction.

Illustration of a work procedure

[Inspection and maintenance]

Work Order	Work	Worker: Regular	Worker: Deputy	Use tool
0	Operation Finish [Notify the workers thru radio/ siren]			
1	Operation panel emergency stop button activated			
2	All generator stopped			
3	All generator key keep in the control room			
4	Display "under inspection" tag to all generators			
5	Cleaning start [Inform the cleaning started in radio]			
PPE Equipped: helmet, safety shoes, safety gloves, safety glasses, protective mask, safety belts (work at height)				
6	Anti-rotation pin is installed			
7	Removal of the soil from Twister belt conveyor inlet			Scraper
8	Twister inspection lid is removed/ open			Ratchet
9	Removal of soil surrounding of Twister inspection lid			Scraper
10	Twister in cleaning ① (unconsolidated portion)			Scraper
11	Twister in the cleaning ② (consolidated portion)			Scraper
12	Twister inspection lid is attached/ closed			Ratchet
13	Remove/ Reset the anti-rotation pin			
14	Twister internal cleaning completion [direct communication]			
15	Cleaning completed, check visually for confirmation			
16	200V generator start "under inspection" tag removed			
17	Operation panel emergency stop button released			
18	Belt conveyor, belt feeder activated			
19	Sediment discharged			
20	Belt conveyor, belt feeder stopped			
21	200V generator stopped			
22	200V generator key keep in the control room			
23	Display "under inspection" tag to 200V generator			
24	Cleaning completion			

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2: Critical (lost-time injuries = off 4 or more days of the disaster)

1: Minor (Fukyu disaster = disaster of less than closed 4 days)

b: The frequency of danger

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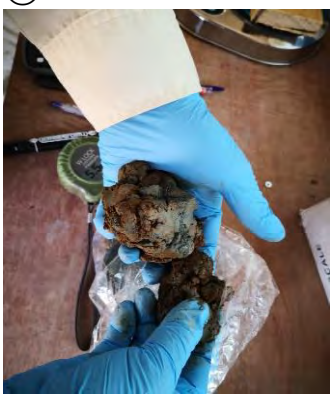
JDC CORPORATION
YANGON BRANCH

TWISTER OPERATION SEQUENCES

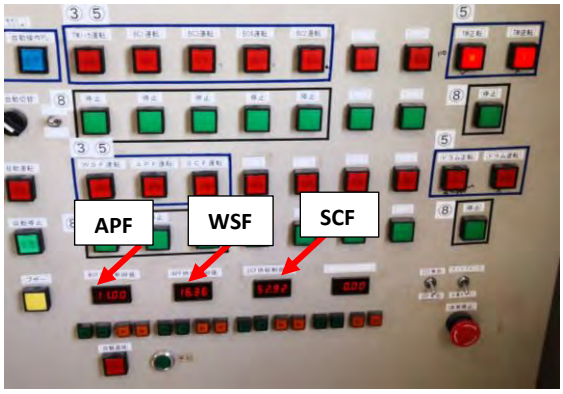
Before Operation Start:

① Moisture Content Test (For Additive Adjustment and Material Input Quantity)




② Adjust the Belt Weighing Scale (BS1 & BS2) to "0" and reset.

③ Calculate and set the required frequency of each hopper prior to the beginning of operation.

TWISTER OPERATION SEQUENCES

After Moisture Content Test / Prior To Operation:

① Worker task assignment, inspection and confirmation of heavy equipment placement.


② Additive hopper SCF should be FULL before operation start.


③Sieve the additive before added into SCF. The foreign object will damage the SCF.




TWISTER OPERATION SEQUENCES

Commissioning & Operation Time:

① Inspector to check the condition of the equipment according to check list (Twister V-belt, drum operating status, belt conveyor alignment and condition).

② Notify all workers before plant start by siren. Confirm all workers safety and plant operation start.

③ During operation, the assigned worker/ inspector will patrol and check regularly (every 10 minutes) on the operating status of equipment.

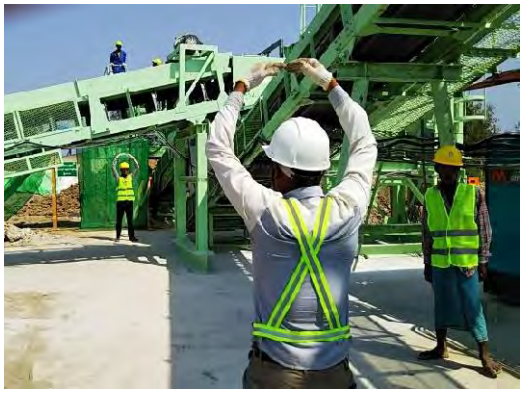
④ During operation, APF hopper and WSF hopper are continuously input with material.

⑤ During operation, the display of belt weighing scale (BS1 & BS2) are monitored and the discharge amount is adjusted if necessary.
→ Refer to the *Additive Check Sheet* for adjustment of the supply quantity of each material.

TWISTER OPERATION SEQUENCES

At the End of Operation:

① Each worker to be notified in advance with a siren.

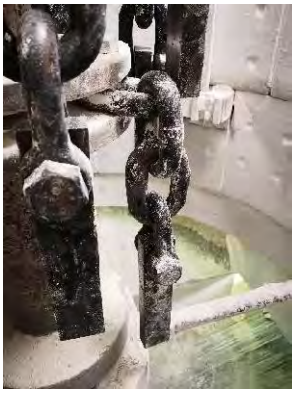


② TM operation stop and cleaning work start. The generators are shut down. The emergency stop button is set while the Twister safety pin (above the drum) is put in location securely.

③ Measure the wear and tear condition of the impact chain by measuring tape and recorded on daily basis.

④ Impact chain replacement should be determined in considering of crushing and mixing condition and cost. The mounting bolt should be replaced if it is wear off 80% or more.



*Note 1: Used chain- replace with new chain or welding build up. All chain must be equal/ constant length and weight in order to maintain the balance of the Twister Shaft.

*Note 2: The size of new chain should be taken as reference and sample during fabrication purpose

TWISTER OPERATION SEQUENCES

Long Term Shut Down:

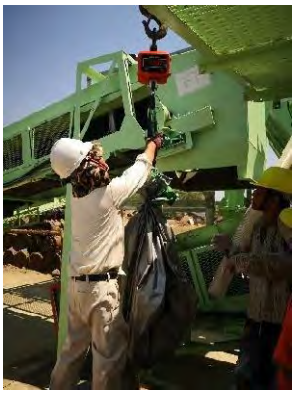
① During long term shut down, the SCF should be cleaned and free of residue, especially the remaining residue (lime/ cement). Removal of residues become difficult when time goes by.





② An idle operation is necessary once a week for 30 minutes, in case of the plant is shut down for long period.

③ Calibration of additives should be redo after plant shut down for long duration.

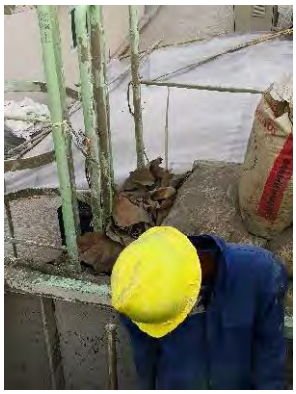



TWISTER OPERATION SEQUENCES

Preventative Measures:

① Input of foreign object (such as wood, rock and cement paper bag pieces) into the hopper can affect the quantitative performance and quality of final products.





② In such cases, please conduct a *simple confirmation check* as shown below.

##Simple Confirmation Work:-

❶ Input the additive into SF hopper from empty condition until FULL. The number of bags input at the time is counted and recorded.

For example: 130 bags cement x 50kg/ bag = 6.5 ton

❷ Start operation and measure the time taken it from FULL hopper to EMPTY condition.

For example: 120 minutes (from FULL to EMPTY)

❸ Calculation as below:

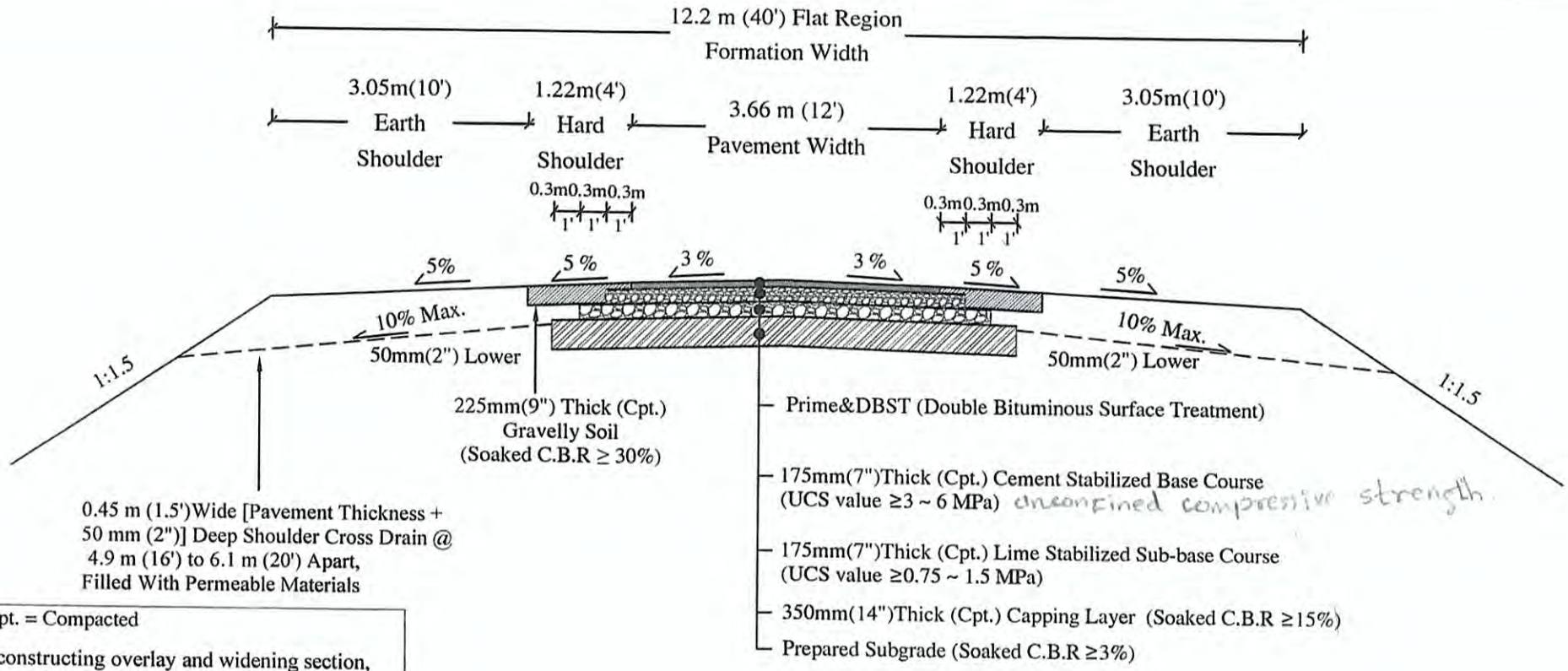
6.5 ton / 120 minutes = 3.25 ton/ hour

❹ Check the difference between the inspected quantity (3.25 ton/ hour) and previous calibrated quantity.

❺ If the difference is large, remove the foreign object inside the hopper and clean it.

❻ If the previous calibrated value and measured value deviate from each other, please perform calibration again.

添付6：設計仕様／現場品質管理試験結果



Note: Cpt. = Compacted

- Before constructing overlay and widening section, embankment and subgrade layers have to be compacted according to the following specifications to get their specified compaction.
Design Subgrade CBR≥3%(Soaked)
Subgrade Thickness =12" (Cpt.)(DOC ≥95%)
Embankment (DOC ≥90%)
- Hard shoulder mix design (4 days soaked CBR≥30%) has to be performed at laboratory before construction.

Fig. (2) Typical Cross Section of Bogalay - KyeinChaung - KaDonKaNi Road

Ministry of Construction Department of Highways Research & Development Section	Deputy Director	Assistant Director	Staff Officer	Drawing No.
				Fig. (2)

TWISTER METHOD COLLABORATION PROGRAM

ROAD CONSTRUCTION (23.5KM-24KM) TRIAL SECTION TEST REPORT

TRIAL TEST RESULT - by MOC SITE QC

Course	Design Mix	No. of Roller Passes	Test Point	Moisture Content, w (%)	Dry Density of Soil, Pd (g/cm^3)	(1st Test) Degree of Compaction, DOC (%)	(Re-Test) Degree of Compaction, DOC (%)	Soaked CBR (%)/ UCS (MPa)	Remarks
CAPPING LAYER Plasticity Index - 10 ≤ PI ≤ 20 CBR ≥ 15% (7 days moist & 4 days curing) RRL's Degree Of Ccompaction requirement: 95 %	**A1** **(Chosen for Road Construction)** **Soil 60% - Sand 40% - Lime 6.9%** OMC (w) = 14.40 % MDD ($P d_{max}$) = 1.92 g/cm^3	4	1	14.80	1.37	71.30	82.50	-	①First field density test was failed due to usage of unsuitable work equipment (sheepfoot roller compactor). ②All trial capping layers to be loosened and recompacted by smooth roller compactor. ③Re-Test on 2 April 2019.
			2	13.80	1.70	89.20	83.70	-	
			3	14.20	1.36	71.10	83.10	-	
		6	1	14.80	1.69	88.40	91.30	-	
			2	11.60	1.49	77.70	93.50	-	
			3	13.40	1.38	71.80	91.80	-	
		8	1	14.00	1.47	77.00	95.30	-	
			2	14.80	1.31	68.40	96.60	-	
			3	14.20	1.35	70.60	95.80	-	
	A2 **Soil 50% - Sand 50% - Lime 4.6%** OMC (w) = 13.30 % MDD ($P d_{max}$) = 1.96 g/cm^3	4	1	14.40	1.40	71.60	80.30	-	①First field density test was failed due to usage of unsuitable work equipment (sheepfoot roller compactor). ②All trial capping layers to be loosened and recompacted by smooth roller compactor. ③Re-Test on 2 April 2019.
			2	13.80	1.43	72.00	83.70	-	
			3	14.10	1.40	71.80	83.90		
		6	1	13.50	1.28	65.30	89.50	-	
			2	14.70	1.52	77.50	88.90	-	
			3	12.50	1.41	71.90	88.10	-	
		8	1	14.00	1.28	65.30	91.30	-	
			2	14.80	1.35	68.80	94.70	-	
			3	13.70	1.42	72.30	91.50	-	
	A3 **Soil 40% - Sand 60% - Lime 4.6%** OMC (w) = 13.10 % MDD ($P d_{max}$) = 1.98 g/cm^3	4	1	14.00	1.43	72.00	81.10	-	①First field density test was failed due to usage of unsuitable work equipment (sheepfoot roller compactor). ②All trial capping layers to be loosened and recompacted by smooth roller compactor. ③Re-Test on 2 April 2019.
			2	14.30	1.28	64.90	83.10	-	
			3	13.80	1.39	70.40	83.60	-	
		6	1	13.40	1.46	74.10	87.50	-	
			2	14.20	1.47	74.50	87.90	-	
			3	14.60	1.35	68.20	90.30	-	
		8	1	14.80	1.41	71.50	89.50	-	
			2	14.20	1.41	71.50	91.30	-	
			3	14.40	1.37	69.20	91.70	-	
SUB-BASE Plasticity Index - 10 ≤ PI ≤ 20 CBR ≥ 30% (7 days moist & 4 days curing) UCS Requirement: ≥0.75 - 1.5 Mpa (7 days moist & 1 days soaked curing) RRL's DOC requirement: 98 %	**B1** **(Chosen for Road Construction)** **Soil 15% - Sand 15% - River Shingle 70% - Lime 6.9%** OMC (w) = 6.70 % MDD ($P d_{max}$) = 2.15 g/cm^3	4	1	7.30	1.88	87.90	-	-	
			2	6.90	1.83	85.30	-	-	
			3	6.50	1.94	90.40	-	-	
		6	1	5.90	2.03	94.50	-	-	
			2	6.90	2.04	95.00	-	-	
			3	7.20	2.02	93.80	-	-	
		8	1	7.10	2.11	98.50	-	-	
			2	7.50	2.12	98.90	-	-	
			3	6.50	2.09	97.50	-	-	
BASE UCS Requirement: ≥ 3 - 6 MPa (7 days moist & 1 days soaked curing) RRL's Degree Of Compaction requirement: 98 %	**C1** **(Chosen for Road Construction)** **C/R (1"x2") 25% - C/R (3/4") 20% - C/R (1/2") 15% - C/R (3/8") 10% - Dust 30% - Cement 4.6%** OMC (w) = 4.80 % MDD ($P d_{max}$) = 2.31 g/cm^3	4	1	6.50	1.85	79.90	-	-	
			2	6.30	1.82	78.70	-	-	
			3	5.70	1.81	78.30	-	-	
		6	1	5.60	2.03	78.77	-	-	
			2	6.10	2.07	89.50	-	-	
			3	5.70	2.10	90.70	-	-	
		8	1	6.50	2.27	98.10	-	-	
			2	6.30	2.28	98.50	-	-	
			3	5.70	2.41	104.30	-	-	
	C2 **C/R (1"x2") 25% - C/R (3/4") 20% - C/R (1/2") 15% - C/R (3/8") 10% - Dust 30% - Cement 5.75%** OMC (w) = 5.00 % MDD ($P d_{max}$) = 2.30 g/cm^3	4	1	6.10	1.86	80.90	-	-	
			2	5.50	1.83	79.60	-	-	
			3	5.70	1.81	78.80	-	-	
		6	1	5.50	2.17	94.50	-	-	
			2	5.40	2.14	93.20	-	-	
			3	5.80	2.18	94.70	-	-	
		8	1	5.50	2.51	109.30	-	-	
			2	5.40	2.47	107.50	-	-	
			3	5.50	2.50	108.90	-	-	
	C3 **C/R (1"x2") 25% - C/R (3/4") 20% - C/R (1/2") 15% - C/R (3/8") 10% - Dust 30% - Cement 6.9%** OMC (w) = 5.50 % MDD ($P d_{max}$) = 2.29 g/cm^3	4	1	5.90	1.86	81.10	-	-	
			2	5.70	1.95	85.00	-	-	
			3	5.70	2.01	87.90	-	-	
		6	1	5.80	2.16	94.50	-	-	
			2	5.80	2.09	91.30	-	-	
			3	5.60	2.15	93.90	-	-	
		8	1	5.70	2.38	103.90	-	-	
			2	5.80	2.38	103.90	-	-	
			3	5.80	2.35	102.80	-	-	

TWISTER METHOD COLLABORATION PROGRAM

ROAD CONSTRUCTION (23.5KM-24KM) TEST REPORT

TEST RESULT - by MOC SITE QC

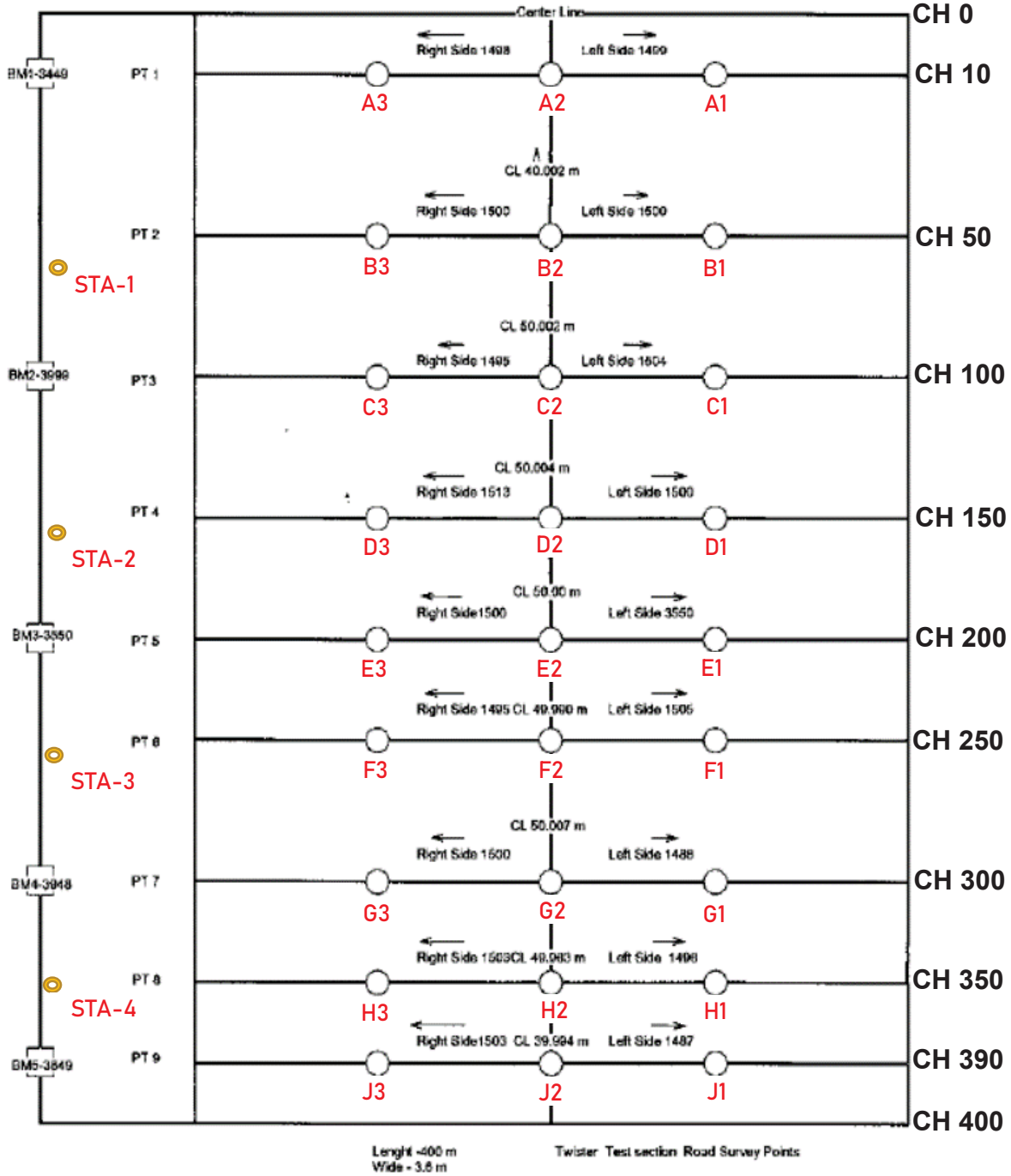
Course	Point	Moisture Content, w (%)	Dry Density of Soil, *P* d (g/cm^3)	Degree of Compaction, DOC (%)	Soaked CBR (%)/ UCS (MPa)	Date of Field Density Test / Remarks
CAPPING LAYER **Soil 60% - Sand 40% - Lime 6.9%** OMC (w) = 14.40 % MDD ($P\,d_{max}$) = 1.92 g/cm^3 CBR ≥ 15% (7 days moist & 4 days curing) RRL's Degree Of Compaction requirement: 95 %	1	-	-	-	-	Covered by sub-base. No sampling taken.
	2	-	-	-	-	Covered by sub-base. No sampling taken.
	3	13	1.84	96	-	Density Test @ 1/5/2019
	4	13.4	1.82	95	-	Density Test @ 1/5/2019
	5	14.2	1.86	97	-	Density Test @ 1/5/2019
	6	14.1	1.84	96	-	Density Test @ 1/5/2019
	7	12.7	1.86	97	-	Density Test @ 1/5/2019
	8	13.6	1.08	94	-	Density Test @ 1/5/2019
	9	14.8	1.87	97.6	-	Density Test @ 1/5/2019
	10	14.1	1.83	95.4	-	Density Test @ 1/5/2019
	11	14	1.86	97	-	Density Test @ 1/5/2019
	12	-	-	-	-	No sampling taken.
	JDC MOISTURE CONTENT TEST					
	S/N	**Date**	**Time**	**Moisture Content, w (%)**		
	1	23-Apr-19	1030	17.3		
	2	24-Apr-19	1100	18.9		
	3	25-Apr-19	0800	17.6		
	4	26-Apr-19	0820	18.0		
	5	27-Apr-19	0900	19.9		
	6	29-Apr-19	0930	15.3		
SUB-BASE **Soil 15% - Sand 15% - River Shingle 70% - Lime 6.9%** OMC (w) = 6.70 % MDD ($P\,d_{max}$) = 2.15 g/cm^3 CBR ≥ 30% (7 days moist & 4 days curing) UCS: ≥ 0.75 - 1.5 Mpa (7 days moist & 1 day soaked curing) RRL's Degree Of Compaction requirement: 98 %	1	6.2	2.15	100	**0.85 MPa**	Density Test @ 3/5/2019
	2	6.9	2.17	101		Density Test @ 3/5/2019
	3	7	2.12	99		Density Test @ 3/5/2019
	4	5.9	2.15	100		Density Test @ 3/5/2019
	5	6.1	2.1	98	-	Density Test @ 3/5/2019
	6	6.5	2.1	98		Density Test @ 3/5/2019
	7	5.8	2.12	99		Density Test @ 7/5/2019
	8	6.5	2.15	100		Density Test @ 7/5/2019
	9	6.8	2.1	98	-	Density Test @ 7/5/2019
	10	5.8	2.12	99		Density Test @ 7/5/2019
	11	6	2.1	98		Density Test @ 7/5/2019
	12	6.2	2.12	99		Density Test @ 7/5/2019
	JDC MOISTURE CONTENT TEST					
	S/N	**Date**	**Time**	**Moisture Content, w (%)**		
	1	30-Apr-19	1600	6.1		
	2	1-May-19	1045	6.0		
	3	2-May-19	1430	7.3		
	4	3-May-19	1430	8.4		
	5	6-May-19	0945	10.2		
BASE **C/R (1"x2") 25% - C/R (3/4") 20% - C/R (1/2") 15% - C/R (3/8") 10% - Dust 30% - Cement 4.6%** OMC (w) = 4.80 % MDD ($P\,d_{max}$) = 2.31 g/cm^3 UCS Requirement: ≥ 3 - 6 MPa (7 days moist & 1 days soaked curing) RRL's Degree Of Compaction requirement: 98 %	1	5	2.3	101	**0.91 MPa** (Dust Mix)	Density Test @ 12/5/2019
	2	4.2	2.28	99		Density Test @ 12/5/2019
	3	5.6	2.4	104		Density Test @ 12/5/2019
	4	4.5	2.4	106	**0.78 MPa (Sand Mix)** Mould: 10 May (PM) Tested: 19 May (AM)	Density Test @ 12/5/2019
	5	5.1	2.31	100		Density Test @ 12/5/2019
	6	5.4	2.37	103		Density Test @ 12/5/2019
	7	4.3	2.28	99	**1.7 MPa (Sand Mix)** Moulded: 10 May (PM) Tested: 19 May (AM)	Density Test @ 12/5/2019
	8	4.9	2.33	101		Density Test @ 12/5/2019
	9	5	2.4	104		Density Test @ 12/5/2019
	10	4.9	2.33	101	**1.97 MPa (Sand Mix)** Moulded: 10 May (PM) Tested: 19 May (AM)	Density Test @ 12/5/2019
	11	4.8	2.28	99		Density Test @ 12/5/2019
	12	4.5	2.37	103		Density Test @ 12/5/2019

JDC CORPORATION
YANGON BRANCH

添付7：定期道路変状劃定（モニタリング）

LEVELLING FOR BOGALAY'S CONSTRUCTION ROAD BY TWISTER METHOD

Construction Road Location:



JDC CORPORATION
YANGON BRANCH

POST MONITORING FOR ROAD 23.5KM - 24 KM, BOGALE

Overall Cumulative Points Level

POINT	RL (m)	REMARKS
BM1	10.000	Datum RL+10.000 m/ STA-1
A1	9.938	
A2	10.026	
A3	10.013	
B1	10.047	
B2	10.080	
B3	10.064	
C1	10.022	
C2	10.059	
C3	9.998	
BM2	9.938	Station changed to STA-2
D1	9.969	
D2	10.031	
D3	10.000	
E1	10.108	
E2	10.160	
E3	10.128	
BM3	10.168	Station changed to STA-3
F1	10.252	
F2	10.277	
F3	10.220	
G1	10.184	
G2	10.234	
G3	10.216	
BM4	10.281	Station changed to STA-4
H1	10.180	
H2	10.213	
H3	10.184	
J1	10.270	
J2	10.339	
J3	10.306	
BM5	10.217	

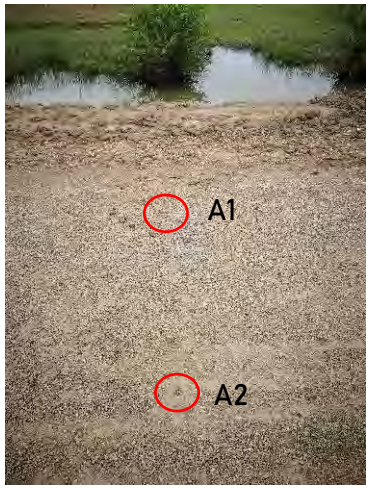
Chainage (CH)	Point Interval	Distance (mm)
CH 10	A1 --> A2	1,499
	A2 --> A3	1,498
	A2 --> B2	40,002
CH 50	B1 --> B2	1,500
	B2 --> B3	1,500
	B2 --> C3	50,002
CH 100	C1 --> C2	1,504
	C2 --> C3	1,495
	C2 --> D2	50,004
CH 150	D1 --> D2	1,500
	D2 --> D3	1,513
	D2 --> E2	50,000
CH 200	E1 --> E2	1,500
	E2 --> E3	1,500
	E2 --> F2	49,990
CH 250	F1 --> F2	1,505
	F2 --> F3	1,495
	F2 --> G2	50,007
CH 300	G1 --> G2	1,488
	G2 --> G3	1,600
	G2 --> H2	49,993
CH 350	H1 --> H2	1,496
	H2 --> H3	1,503
	H2 --> J2	39,994
CH 390	J1 --> J2	1,487
	J2 --> J3	1,503
	-	-

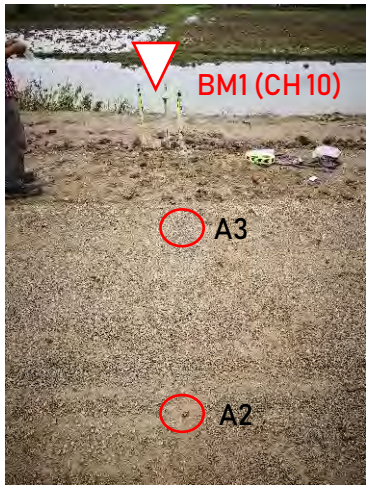
JDC CORPORATION
YANGON BRANCH

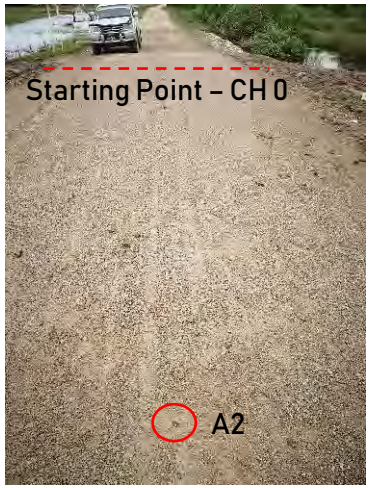
Post Quality Control Monitoring Works (Level Survey for 400m Road)

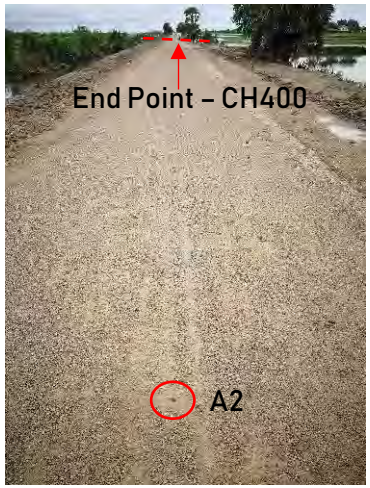
Date: 29 May 2019

Point A – CH 10

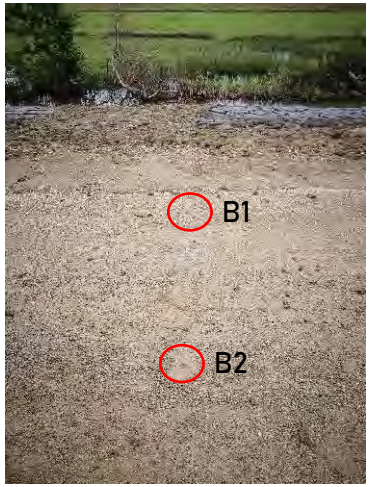


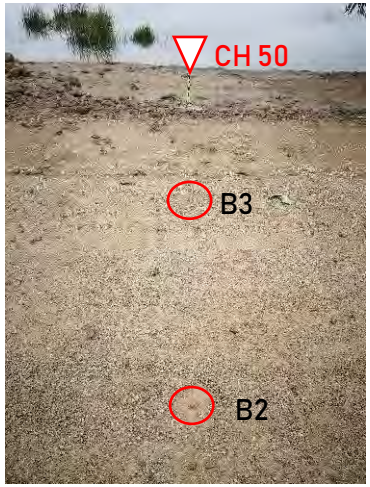


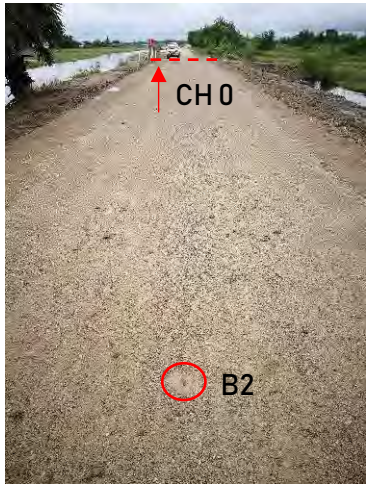


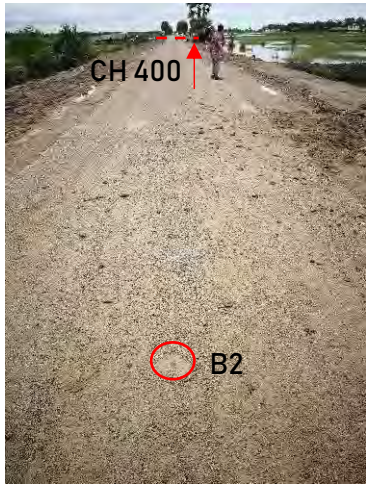


Point B – CH 50





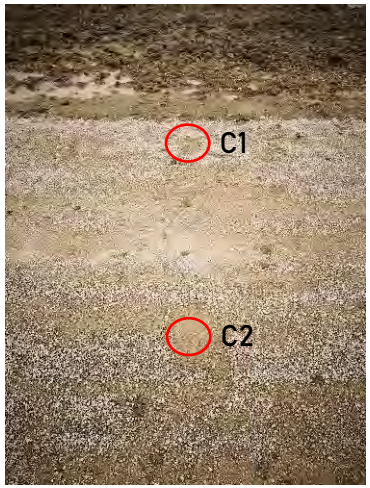


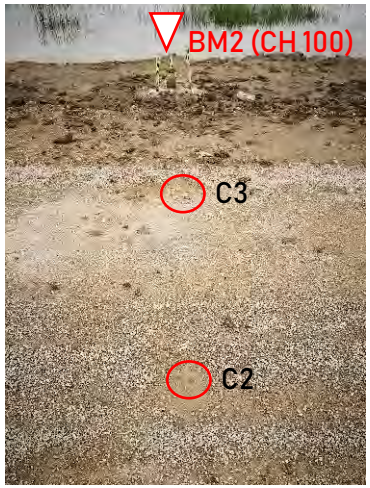


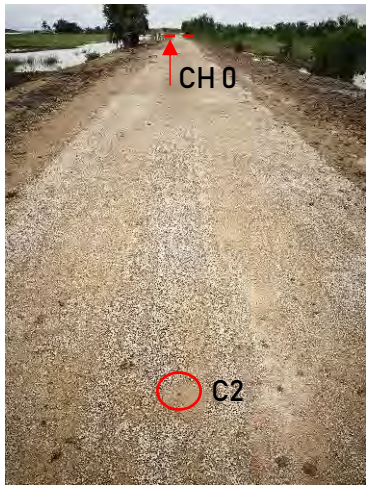
Post Quality Control Monitoring Works (Level Survey for 400m Road)

Date: 29 May 2019

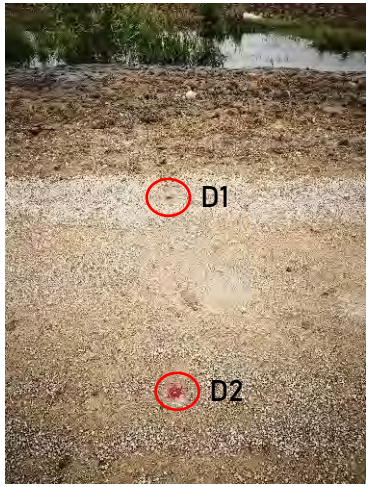
Point C – CH 100

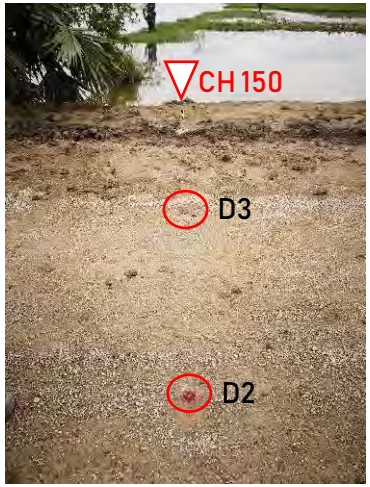






Point D – CH 150

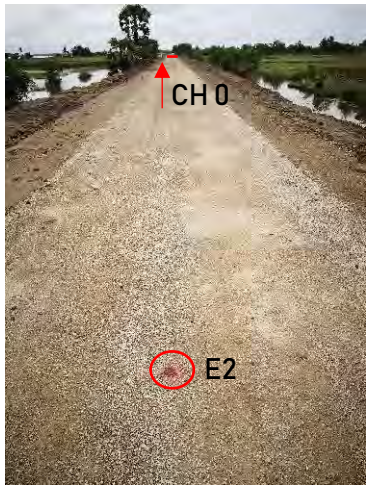


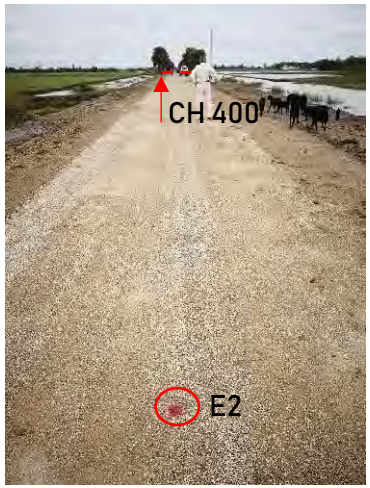


Post Quality Control Monitoring Works (Level Survey for 400m Road)

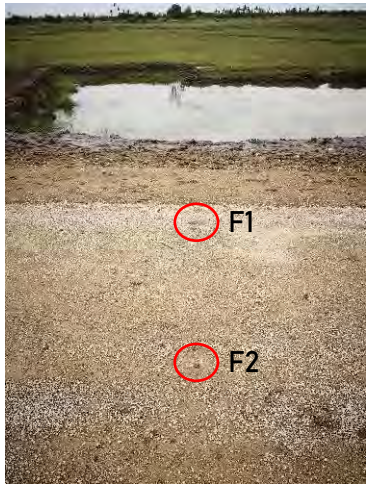
Date: 29 May 2019

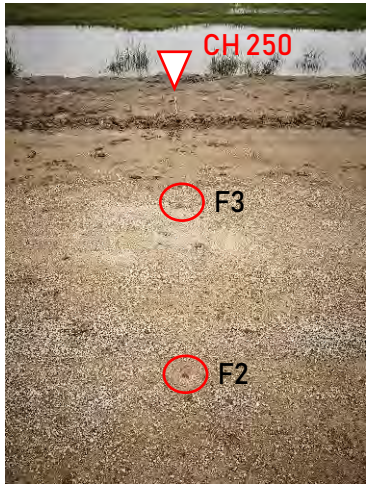
Point E – CH 200

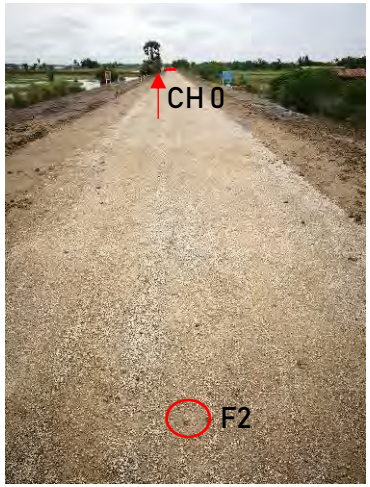




Point F – CH 250



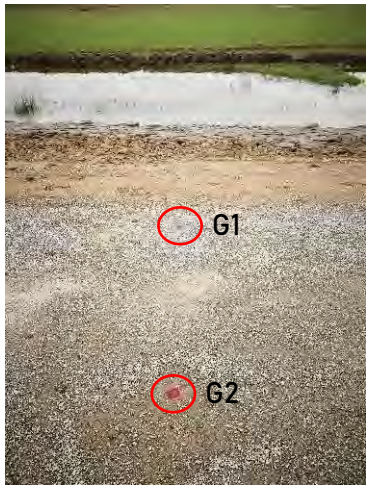


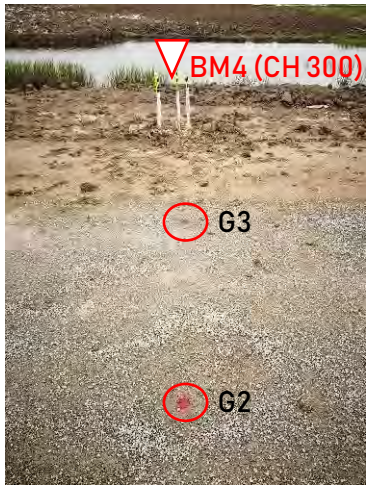


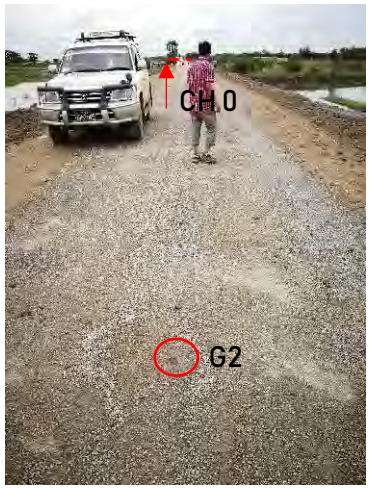
Post Quality Control Monitoring Works (Level Survey for 400m Road)

Date: 29 May 2019

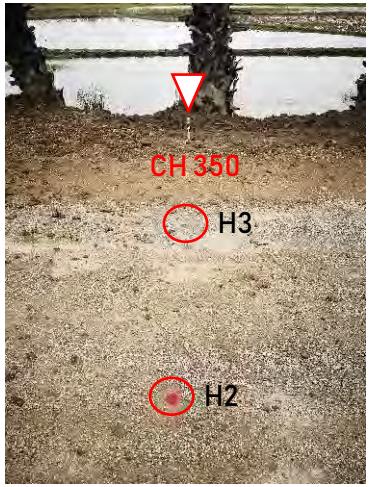
Point G – CH 300

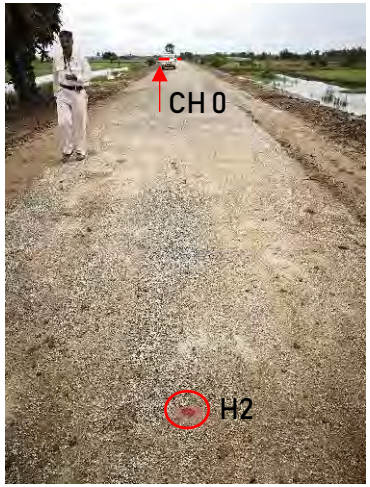


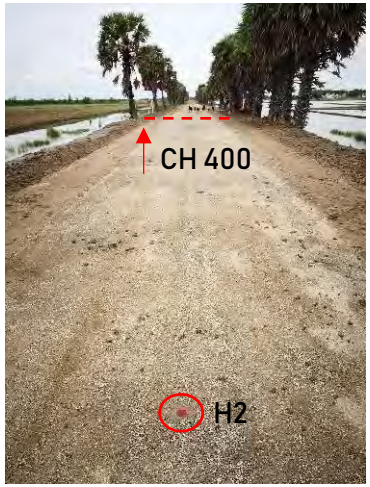




Point H – CH 350



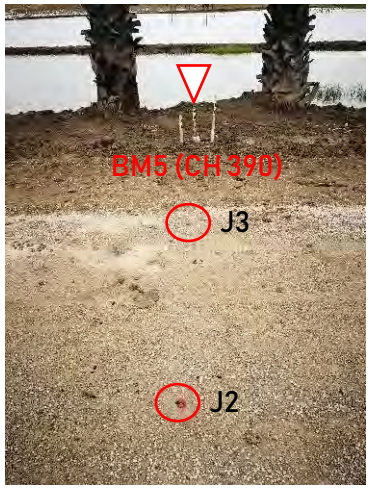


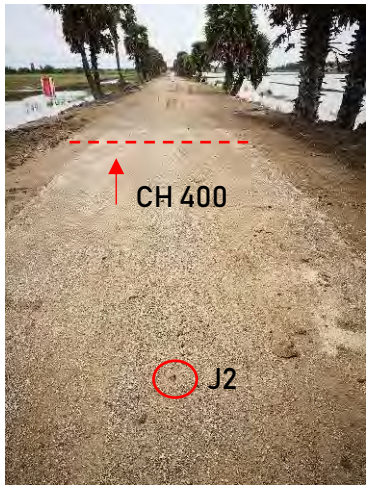


Post Quality Control Monitoring Works (Level Survey for 400m Road)

Date: 29 May 2019

Point J – CH 390





Others:

添付8：現場見学会(Part 1)

Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

JDC CORPORATION
YANGON BRANCH

Demonstration Date: 7th March 2019

COMPANY	ATTENDEES	POSITION	DEPARTMENT
MOC	1. U Khin Zaw	Chief Engineer, CE	Mechanical Section
	2. U Htoon Htoon Naing	Deputy Director, DD	Road Unit 14
	3. U Kyaw Zaw	Executive Engineer, EE	Mechanical Section, Pyapon District
	4. U Thein Zaw Oo	Assistant Engineer, AE	Road Unit 14
	5. U Win Naing	Assistant Engineer, AE	Mechanical Section, Pyapon District
	6. U Zaw Zaw Hlaing	Special Sub Assistant Engineer, SSAE	Mechanical Section

Activities of the Day:

I. Briefing on Twister methodology
II. Discussion on Twister progress and schedule
III. Visit to Twister foundation
IV. Display the Twister promotional video

Photos of the Day:






添付9：現場見学会(Part 2)

JDC CORPORATION
YANGON BRANCH

Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

Demonstration Section [26 April – 11 May 2019]

Demonstration Section Workflow:

① Briefing on Project Outline

i. Project Objective & Milestone
ii. Mix Design Specification
iii. Quality Control and Testing Result

② Demonstration on Twister Operation

i. Briefing on Twister Plant main parts
ii. Introduction on Twister operation mechanism & control system
iii. Visit to 400m construction road site

③ Demonstration Video with Q&A

i. Display Twister promotional video
ii. Discussion on future development
iii. Q&A session

Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

JDC CORPORATION
YANGON BRANCH

Demonstration Date: 26th April 2019

COMPANY	ATTENDEES	POSITION	DEPARTMENT
MOC	1. U Taung Tun	Director of Engineer, DE	Mechanical Section
	2. U Sein Hlaing	Master of Engineer, ME	Mechanical Section
	3. U Kyaw Kyaw Min Kyi	Assistant Engineer, AE	Mechanical Section
	4. U Thein Zaw Oo	Assistant Engineer, AE	Special Road Construction Unit 14
	5. U Kyaw Soe	Sub Assistant Engineer, SAE	Mechanical Section

Photos of the Day:








Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

JDC CORPORATION
YANGON BRANCH

Demonstration Date: 29th April 2019

COMPANY	ATTENDEES	POSITION
Yachiyo Engineering Co., Ltd	1. Mr. Tetsuo Yatsu	Senior Manager
	2. Ms. Su Pan Pan Ko	Project Coordinator
TOA Road Myanmar Co., Ltd	1. Mr. Murakami Kenji	Managing Director
	2. Ms. Khin Zar Zar Khaing	International Administrator & Secretary

Photos of the Day:








Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

JDC CORPORATION
YANGON BRANCH

Demonstration Date: 30th April 2019

COMPANY	ATTENDEES	POSITION
Telico Joint Stock Company	Mr. Dao Trieu Kim Cuong	Chairman
Dat Phuong Joint Stock Company	Mr. Pham Quang Binh	General Director

Photos of the Day:








Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

JDC CORPORATION
YANGON BRANCH

Demonstration Date: 2nd May 2019

COMPANY	ATTENDEES	POSITION
Fukken Co., Ltd	1. Mr. Akasaki Toshiya	Director
	2. Mr. Aung Aung Soe	Engineering Secretariat
Haven Co., Ltd	1. Mr. Aaron, Aung Khant Kyaw	Managing Director

Photos of the Day:








Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

JDC CORPORATION
YANGON BRANCH

Demonstration Date: 3rd May 2019

COMPANY	ATTENDEES	POSITION
JICA	1. Ms. Suzuki Keiko	Project Formulation Advisor
	2. Mr. Sunada	
Pacific Consultants Co., Ltd (Oriental)	1. Mr. Yoneyama Hideki	Road Engineer / Consultant
Eight-Japan Engineering Consultants Inc.	1. Mr. Miyamoto Hirokazu	Chief Representative
SMEC Myanmar Co., Ltd	1. Mr. Yan Naing Myo + 3 staff	Director

Photos of the Day:








Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

JDC CORPORATION
YANGON BRANCH

Demonstration Date: 7th May 2019

COMPANY	ATTENDEES	POSITION
RRL	1. Daw Htar Zin Thin Zaw	Chief Engineer, CE
	2. U Soe Thiha	QC Assistant Engineer, AE

Photos of the Day:

Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

JDC CORPORATION
YANGON BRANCH

Demonstration Date: 11th May 2019

COMPANY	ATTENDEES	POSITION	
MOC	6. U Aung Myint Oo	Deputy Director General, DDG	DOH – Planning
	7. U Khin Zaw	Chief Engineer, CE	DOH
	8. U Myint Oo	Chief Engineer, CE	DOH - Ayeyarwaddy Region
	9. U Htoon Htoon Naing	Deputy Director, DD	DOH – Road Unit 14
	10. U Kyaw Zaw	Executive Engineer, EE	DOH – Pyapon District
	11. U Thein Zaw Oo	Assistant Engineer, AE	DOH – Road Unit 14
	12. U Win Naing	Assistant Engineer, AE	DOH – Pyapon District
	13. U Ohm Maung	Assistant Engineer, AE	DOH – Pyapon District
RRL	14. U Soe Thiha	QC Assistant Engineer, AE	Road Research Laboratory

Photos of the Day:








Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

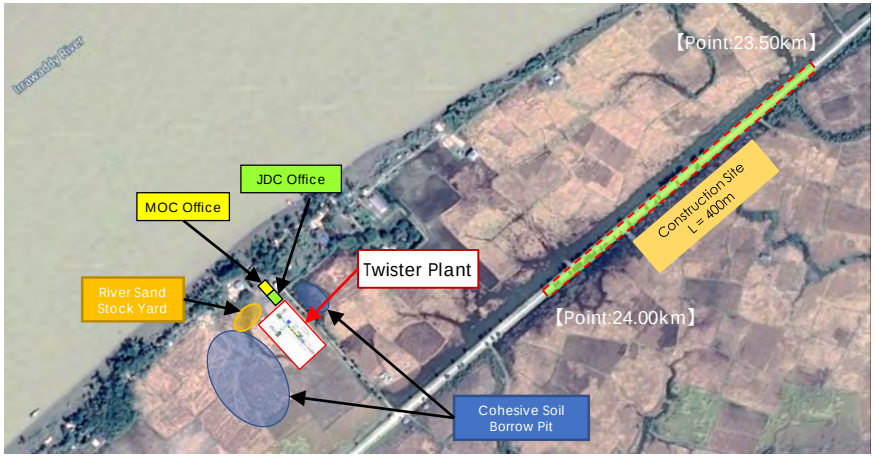
添付10：プロジェクト概要

1. OVERVIEW

- Owner : JICA (Consignment Contract)
- Contract Period : 30th November 2018 - 31st August 2020
- Program Purpose : Demonstration to Myanmar government and local / foreign companies on the most effective soil improvement technology "Twister Method".
- Demonstration Details

① Demonstration Content : Utilization of "Twister Method" effectively to produce the improved local soil as the material for subgrade, sub-base and base course in road construction.

② Construction Location : 400m length around 24km point of Road S_{16}-49 (Bogalay – KyeinChaung – KaDonKaNi), approximately 200km away to Southwest from Yangon.

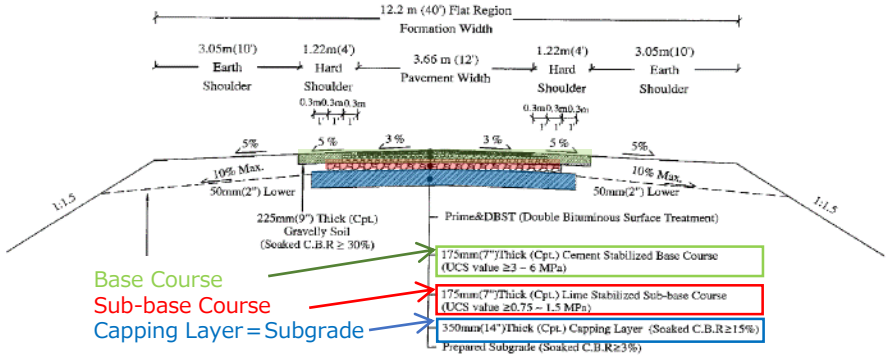


③ Material Quantity：❶ Subgrade= 400m (length)×5.46m (width)×350mm (thk.)= 765m³

❷ Sub-Base= 400m (length)×4.86m (width)×175mm (thk.)= 340m³

❸ Base = 400m (length)×4.26m (width)×175mm (thk.)= 298m³

Total Improved Soil Quantity = 765m³ + 340m³ + 298m³ =1,403m³

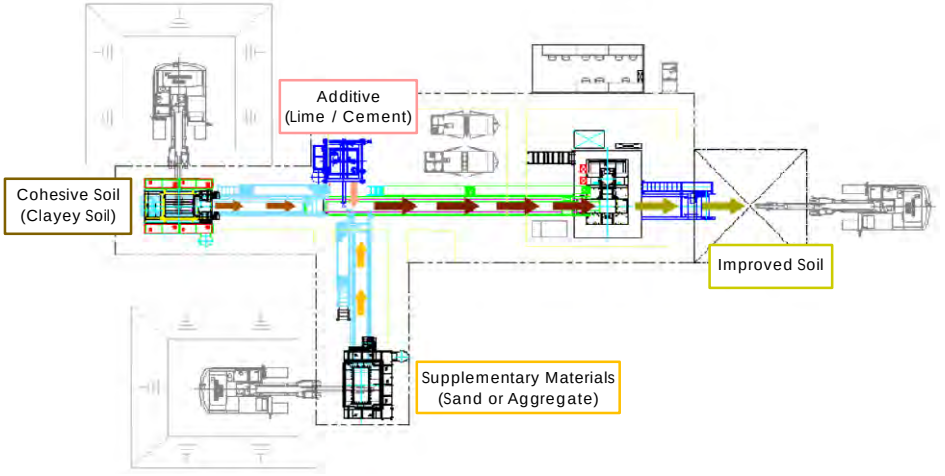


④ Material Mixture Proportion

Material / Course	Cohesive Soil	River Sand	River Shingle	Lime
Subgrade (Capping Layer)	60 %	40 %	-	6.9 %
Sub-Base	15 %	15 %	70 %	6.9 %

Material / Course	C/R (1"x2")	C/R (3/4")	C/R (1/2")	C/R (3/8")	Dust	Cement
Base	25 %	20 %	15 %	10 %	30 %	4.6 %

⑤ Plant Layout



Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

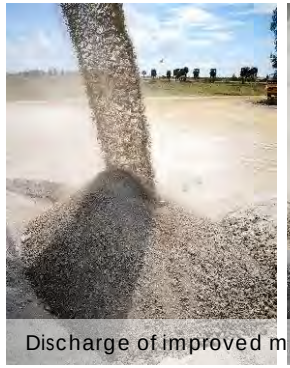
2. PROJECT MILESTONE

- 16th Oct. 2015 : Submission of project plan to JICA for technology dissemination project
- 25th Dec. 2015 : Approval of JICA project
- 08th Jun. 2018 : Accomplishment of Memorandum of Understanding btw. JICA–MOC-JDC
- 30th Nov. 2018 : Accomplishment of Consignment Contract with JICA
- 22nd Dec. 2018 : Accomplishment of Land Lease Contract btw. MOC - Site Landlord
- 29th Dec. 2018 : Commencement of site preparation work by MOC
- 01st Feb. 2019 : Dispatching of Twister equipment from Yokohama Port, Japan
- 07th Mar. - 09th Mar. 2019 : Arrival of Twister equipment at Bogalay project site
- 11th Mar. - 28th Mar. 2019 : Assembly of Twister equipment, Test & Commission, Operation Guidance
- 29th Mar. - 06th Apr. 2019 : Trial Test section implementation
- 22nd Apr. - 18th May 2019 : Construction of 400m pavement by using improved soil
- 29th Apr. - 11th May 2019 : Demonstration occasion for MOC/ Japan – Local – Foreign Corporations
- 06th Jun. - 07th Jun. 2019 : "Twister Method" presentation occasion to MOC
- Present : Regular monitoring and evaluation work on constructed pavement

3. Plant/ Site Condition

① Overview of Twister Plant Assembly Completion

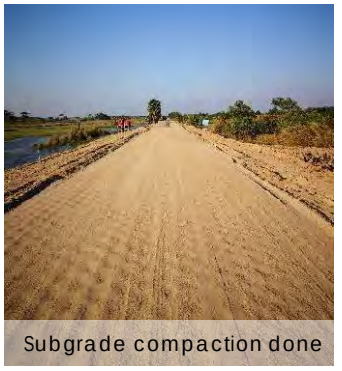
Improved material under production



Discharge of improved material

② Production of Improved Material

Subgrade was spread and levelled



Subgrade compaction done

③ Subgrade/ Capping layer construction work

Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)


Sub-base was spread evenly, levelled and compacted


Sub-Base course compaction done

④ Sub-Base course construction work


Base was levelled and compacted


Base course compaction done

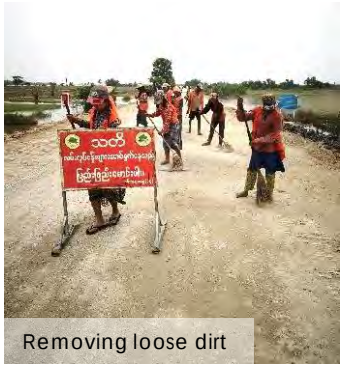
⑤ Base course construction work


Moisture content test prior operation


Sand Replacement test after compaction done

⑥ Quality Control

Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)


Removing loose dirt


1st layer bitumen sprayed


1st layer chipping spread


1st layer (prime coat) done

⑦ Surface Treatment（1st layer bitumen and chipping spread, compaction）

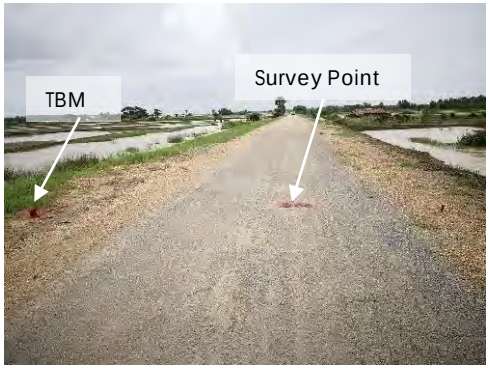

2nd layer bitumen sprayed


2nd layer chipping spread


2nd layer (finishing coat) done

⑧ Surface Treatment（2nd layer bitumen and chipping spread, compaction）


Survey points setup




TBM


Leveling guide and tutoring

⑨ Regular monitoring and evaluation on pavement work

Collaboration Program with JICA-MOC for Disseminating Construction Soil Improving Method (Twister Method)

Presentation and technology disseminating session

Twister plant operation demo

Q&A session

Pavement quality inspection

⑩ Presentation workshop for MOC higher person-in-charge and staffs

PROJECT SCHEDULE

	Work Items		Year 2018					Year 2019							
		Month	9	10	11	12	1	2	3	4	5	6	7	8
			Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	Preparation for Road Design/Specification													
	1. Discussion for Laboratory Test with DOH/RRL													
	2. Laboratory Test by JDC – Meeting and Decision with DOH/RRL for Material for Test													
	2. Laboratory Test by JDC – Sampling Material for Test from DPH/Site													
	2. Laboratory Test by JDC – Laboratory Test by JDC													
	2. Laboratory Test by JDC – Initial Test Results from Laboratory Test by JDC													
	3. Determination of type/king/volume of Laboratory Test to be conducted by RRL													
	4. Laboratory Test to be conducted by RRL													
	5. Determination of Design Mix for Trial Test													
	5. Trial Test Construction on Access Road/ near Plant Yard													
	6. Finalization of Construction Plan													
2	Site Preparation Work by DOH – Environment Study / Compensation Negotiation for Paddy Field													
	Site Preparation Work by DOH – Tender Process for Preparation Work / Deterrmination of Contractor													
	Site Preparation Work by DOH – Embankment/Foundation Plan including Access Road from JDC to DOH													
	Site Preparation Work by DOH – Construction of Plant Yard and Acess Road													
	Site Preparation Work by DOH – Confirmation of Commencement of Consrtuction Work for Plant Yard on Site													
3	Procurement of TWISTER – Maintenance / Preparation of TWISTER Plant in Japan													
	Procurement of TWISTER – Confirmation of Transportation On land Route													
	Procurement of TWISTER – Confirmation of Bogale Jetty													
	Procurement of TWISTER – Confirmation of Transportation Plan from Yangon to Site Through Bogale													
	Procurement of TWISTER – Confirmation of Equipment/Material Installation of TWISTER Plant													
	Procurement of TWISTER – Export Application in Japan													
	Procurement of TWISTER – Shipping from Japanese Port after Confirmation of Completion of Plant Yard on Site													
	Procurement of TWISTER – Import License Application at Myanmar													
	Procurement of TWISTER – TWISTER Arrival at Yangon Port													
	Procurement of TWISTER – Custom Clearance by JDC/ Hand Over to DOH at Yangon Port													
	Procurement of TWISTER – Shipping from Yangon Port to Site													
	Procurement of TWISTER – Installation by DOH /Commissioning by JDC and DOH													
4	Road Construction Work – Road Construction on Existing Road No.(5) for Two Furlong (400m)													
5	Workshop – Pilot Project Presentation and Twister Demonstration session													

LEGEND :

ORIGINAL SCHEDULE

REVISED SCHEDULE

Technology for recycling all construction generated soil

Twister Method

(Rotary crushing & mixing Method)

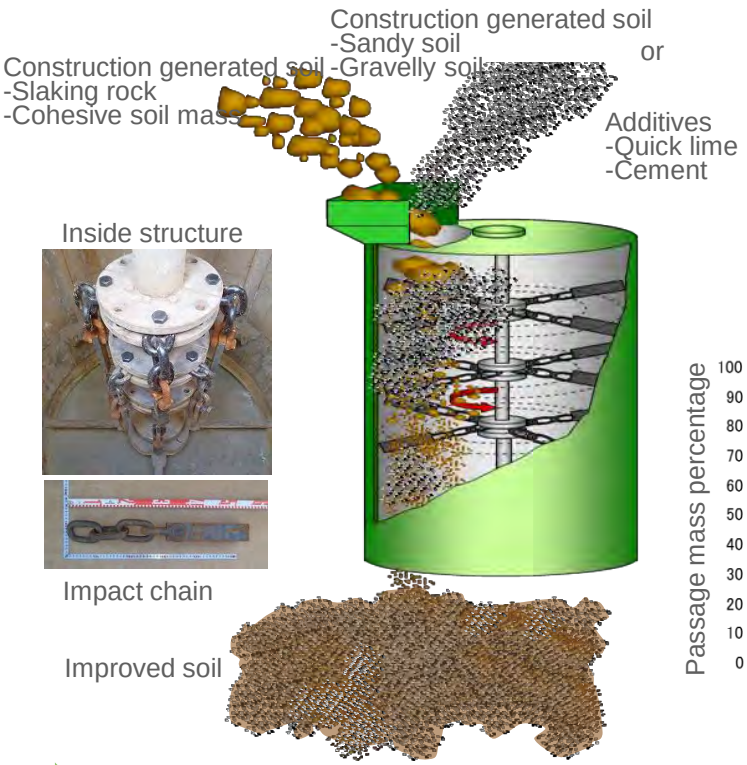
NETIS (New Technology Information System) registration number : **KT-090048-VE**
recognized by Japanese Ministry of Land, Infrastructure, Transportation and Tourism

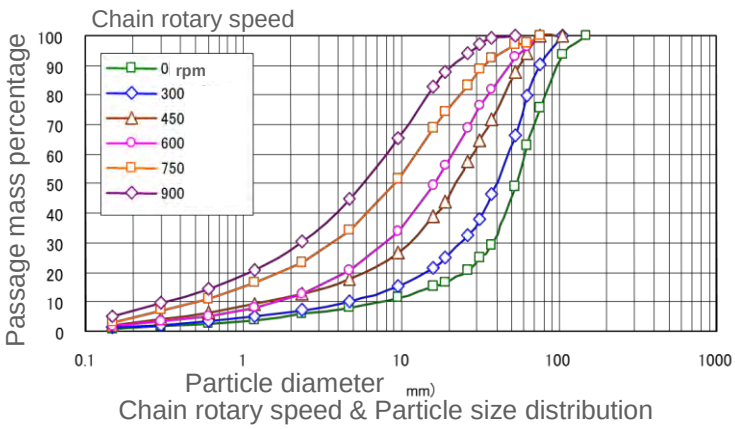
JDC CORPORATION

Ⅰ. Overview of Twister Method

1. Simultaneously crushing & mixing by itself
2. Applicable to high moisture content cohesive soil - soft rock
   (particle size < 250mm)
3. Consecutive and massive production
   (Maximum 145m³/hr, by TM2250. Depends on soil characteristics & conditions)
4. Simple device makes maintenance easy

Able to crush & mix wide range of materials by impact force of high speed rotary chains.

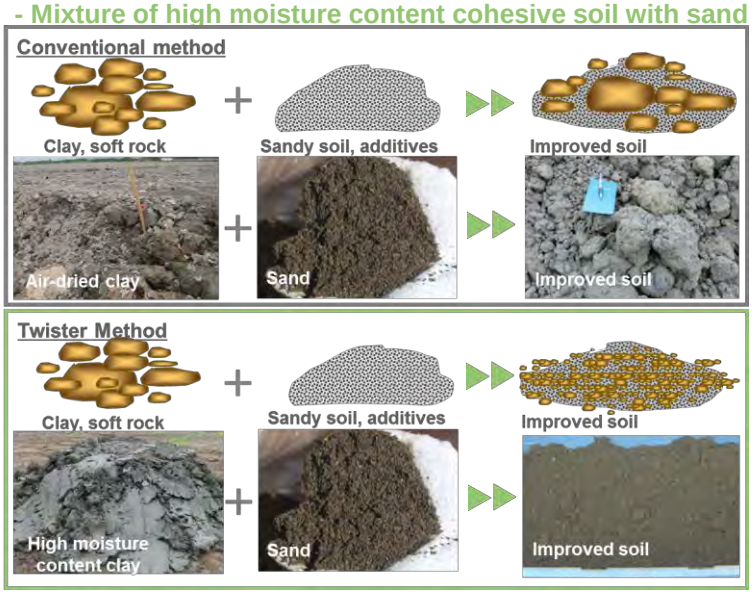




Chain rotary speed & Particle size distribution

Let mixture of high moisture content cohesive soil with sandy soil, and gravel crushing to be of the high quality.

- Mixture of high moisture content cohesive soil with sand



- Adjusted soft rock particle size

Ⅱ. Technology for recycling construction generated soil by Twister method recognized by Japanese government.

Cohesive soil and soft rock which are treated as the disposal material can be improved and reused.

Case-1 Quality improvement by mixing high moisture content cohesive soil with sandy soil

Quality of improved soil :

1) Fine fraction content 15%<Fc<50%, 2) Cone Index >400kN/m^2, 3) Degree of compaction >90%

Mixing ▶▶▶

Case-2 Particle size improvement by mixing & crushing pre-crushed soft rock with volcanic ash soil

Quality of improved soil :

1) Fine fraction content 27%<Fc<55%, 2) Cone Index >1200kN/m^2

Crushing & Mixing ▶▶▶

Improve recycle rate by sieving soil with plant and rubble.

Quality of improved soil :

1) Fine fraction content 15%<Fc<50%, 2) Cone Index >1200kN/m^2, 3) Removal of Reed rhizome & Trash

Crushing & Mixing ▶▶▶

Quicklime Mixing

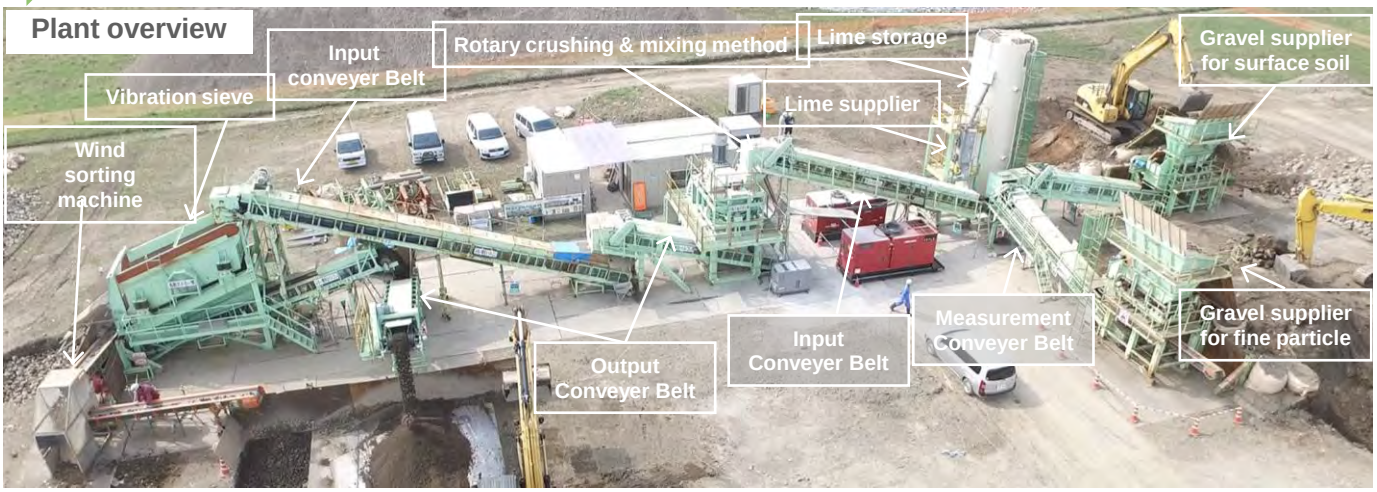
Ⅲ. Actual projects (Detailed project reference is available.)

For more than 204 sites in Japan, over 5.8 mil. m^3 of improved soil have been produced.

- Road / Airport runway - 25 projects
- River embankment - 60 projects

Ⅳ. Product list

We offer the best solution in accordance with site condition.



		TM-2250	TM-1500	TMSP-1500	TM-1000	HANZO
Product name						
Diameter of cylindrical main unit		φ2,250mm	φ1,500mm	φ1,500mm	φ1,000mm	φ1,000mm
Capacity	Mixing	500～800m³/day*	280～400m³/day*	260～300m³/day*	135～190m³/day*	80～110m³/day*
	Crushing & mixing	300～530m³/day*	180～260m³/day*	130～200m³/day*	60～130m³/day*	50～90m³/day*
Max. particle diameter		φ250mm	φ200mm	φ200mm	φ150mm	φ150mm
Capability for High moisture content cohesive soil		Yes	Yes	Yes	Yes	No
Type		Large site	Medium site	Small-Medium site	Small site	Small size
		Plant	Plant	Self-propelled	Plant	Vehicle mount
		3 soil + additives	3 soil + additives	2 soil + additive	3 soil + additives	1 soil + additive

*Operation time per day = 5.5 hours

Business contact

JDC corporation (Representative of Twister Method Assosiation)
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【Singapore branch】100 Beach Road #34-04 Shaw Tower 189702 Singapore Tel:+65-6220-5555
【Myanmar office】232 Orchid condo #114, Ahlone Road, Ahlone Township, Yangon Myanmar
Tel. +95-9-976-255-985
【KOKUDO JDC (Thailand) Co., Ltd.】
62 Thaniya Plaza BTS Wing Unit 1009, Silom Road, Suriyawong, Bangrak, Bangkok 10500 Thailand
Tel. +66-2-234-7167