DETAILED WORKS PROGRAM
AND
SITE SPECIFIC ENVIRONMENTAL & SOCIAL MANAGEMENT & MONITORING PLAN
FOR
INSTALLATION, OPERATION, AND DISMANTLING OF TOWER CRANE AT MAIN DAM AREA

FOR

NAM NGIEP 1 HYDROPOWER PROJECT

Document No. : NNP1-MS-MD-014-A1

OBAYASHI Corporation

Submitted By:

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REVISION STATUS

Rev. No.	Description	Issue Date	Remarks
A1	1st Submission for Owner's review	21-Dec-2015	

PART 1
DETAILED WORKS PROGRAM
(DWP)

1. GENERAL

This detailed works program focuses on installation, operation, and dismantling of tower crane for construction works of main dam body. ***The working drawing with detailed arrangement for reinforcement concrete of these tower cranes will be submitted separately.***

Four (04) tower cranes will be installed at main dam area. Particularly, they consist of one at elevation 195.00m, one at 197.90m, one at 221.57m, and one at 251.40m.

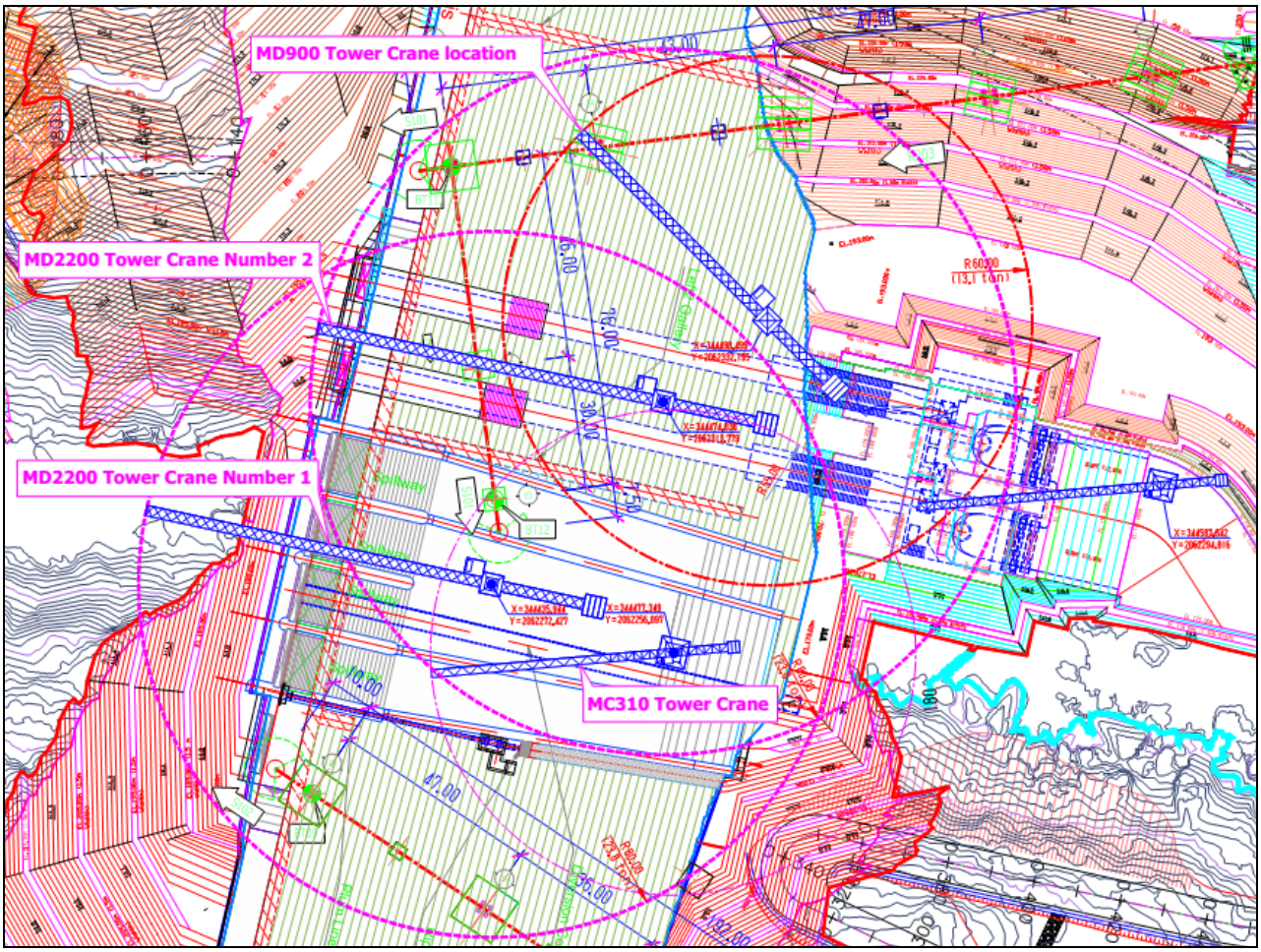


Fig.1 – Layout of arrangement

1.1. Design concept

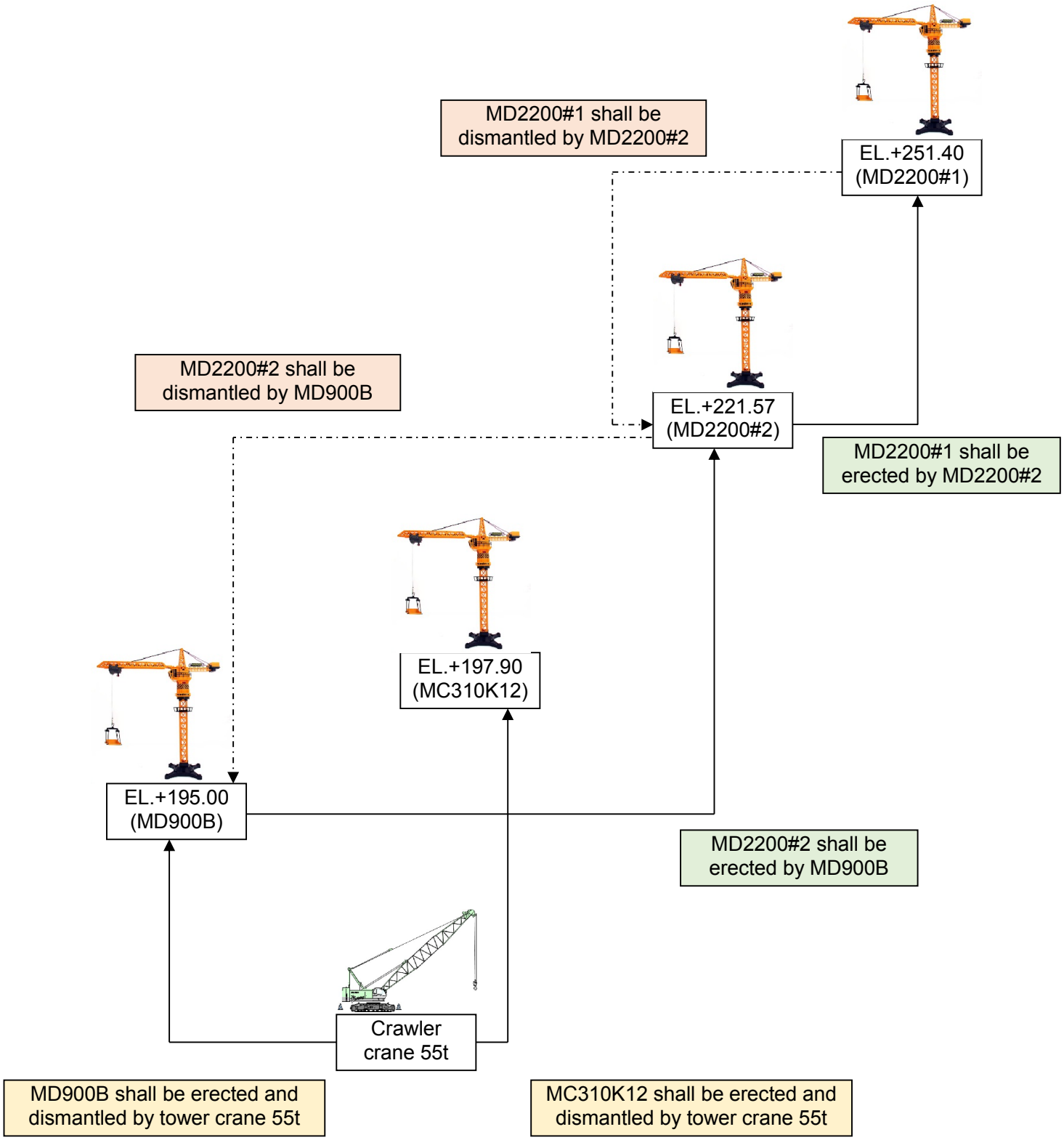


Fig.2 – Flow chart for erection and dismantlement of 04 tower cranes

1.2. Major Quantities

Table 1 – Major Quantities

No.	Description	Capacity	Quantity	Unit	Remark
1	MD900B	50 ton	01	set	At EL.+195.00
2	MD2200	32 ton	02	set	1 at EL.+221.57, 1 at EL.+251.40
3	MC310K12	12 ton	01	set	At EL.+197.90

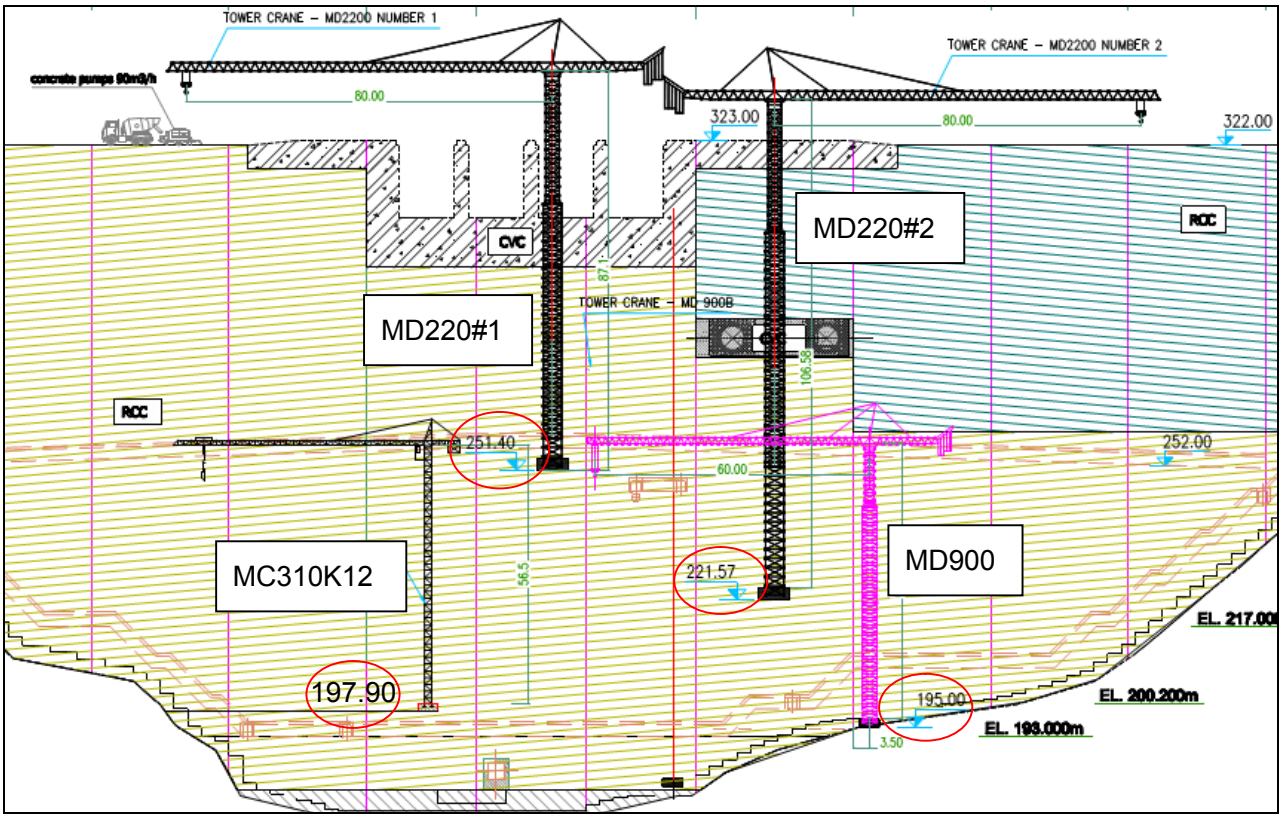


Fig.3 – Longitudinal section of tower crane arrangement

2. REFERENCE

Referenced Specifications:

- Earthwork: TS 2.8
- Ordinary Concrete (CVC) and re-bar: TS 6.

3. MATERIAL

Table 2 – Estimated material to be used

No.	Description	Quantity	Unit	Remark
1	Re-bar D25, grade SD345	38	ton	Estimated only
2	Ready-mixed concrete, class 21Mpa	392	m^3	

4. EQUIPMENT AND MANPOWER

4.1. Equipment and Tool

Table 3 – Major Equipment List

No.	Equipment / Tool	Capacity	Nos	Purpose
1	Crawler crane	55 ton	1	Lifting, casting concrete
2	Crawler backhoe	1.6 m^3	1	Excavation, loading material
3	Stationary Concrete Pump	90 m^3/h	1	Provide concrete
4	Total Station	Nikon	1	Surveying
5	Trailer	12m	1	Transportation of material
6	Dump truck	22 ton	1	Transportation of material
7	Welding machine	10kVA	3	Welding steel
8	Generator	400kVA	1	Provide power when need
9	Needle vibrator	1.5 kW	12	Compaction
10	Chipping machine	02 kW	04	Chipping rock surface
11	Air compressor	1,404 m^3/h	1	Provide air pressure

4.2. Nominated Subcontractor and Manpower distribution

Nominated Subcontractor: **SONG DA 5 JOINT STOCK COMPANY.**
In general, the subcontractor will be nominated, concerning not only price/rate but also following items, fully described below.

1) Technical competence
2) Financially stable
3) Administrative competence
4) Past project experience and reference
5) Ability to meet schedule
6) Quality and skill of work
7) Capacity(equipment, staff, worker) and organization
8) Ability to meet safety and environment requirements

And then, the evaluation for subcontractor will be done and recorded.
Manpower distribution for this work is planned as below.

Table 4 – Manpower Distribution

No.	Manpower	Planned Number	Duty
1	Engineer	1	Site management
2	Safety staff	1	Safety supervision
3	Foreman	4	Work management
4	Equipment operator	3	Backhoe, chipping machine , etc.
5	Dump truck driver	2	Transportation of material
6	Skill worker	20	Formwork, concreting
7	Common worker	15	Common work
8	Mechanic	4	Maintenance of equipment
9	Welder	3	Welding
10	Surveyor	3	Survey work
11	Electrician	2	Maintenance of electric line
Total		**58**	

4.3. Temporary Facilities

Table 5 – Major Temporary Facilities

No.	Facilities	Location	Purpose
1	Contractor's Camp	STA.4+900 (P1)	OC management board
2	Worker's Camp No.2	STA.6+120 (P1)	Sub-contractor management board
3	CVC plant	Left bank	Provide CVC
4	Disposal No.2	Left bank	Dispose unsuitable material
5	Disposal No.6	Right bank	Dispose unsuitable material

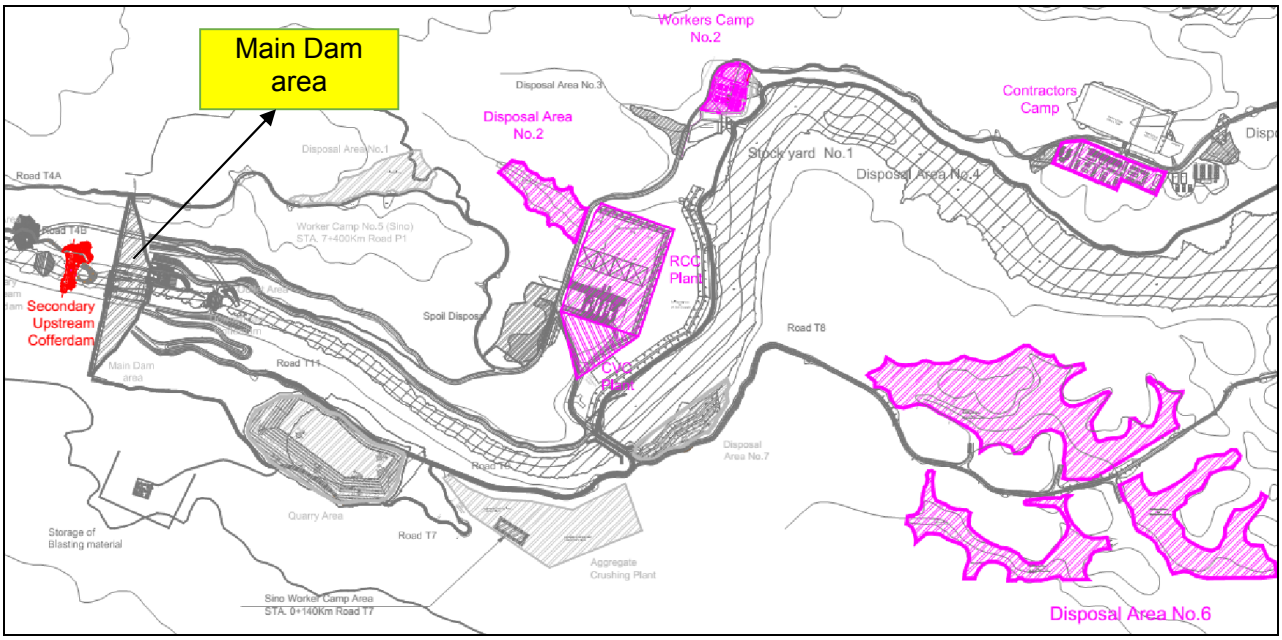


Fig. 4 – Major Temporary Facilities Map

5. CONSTRUCTION PROCEDURE

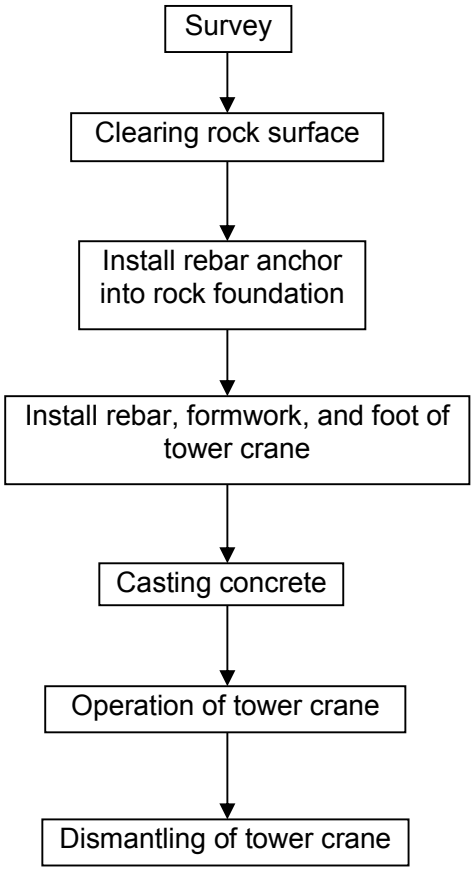


Fig.5 – Flowchart of construction procedure

5.1. Survey Work

The Main Dam axis coordinates to be established based from local coordinates.

NNG1-2	N 2062622.962	E 344440.726	EL351.111
MDL-1	N 2062498.474	E 344655.722	EL324.215
MDL-5	N 2061979.291	E 344363.534	EL353.177
MDL-6A	N 2062005.745	E 344202.327	EL375.011

The elevations and coordinates of tower crane will be determined based on them as well. The details will be shown in the working drawing that will be submitted separately.

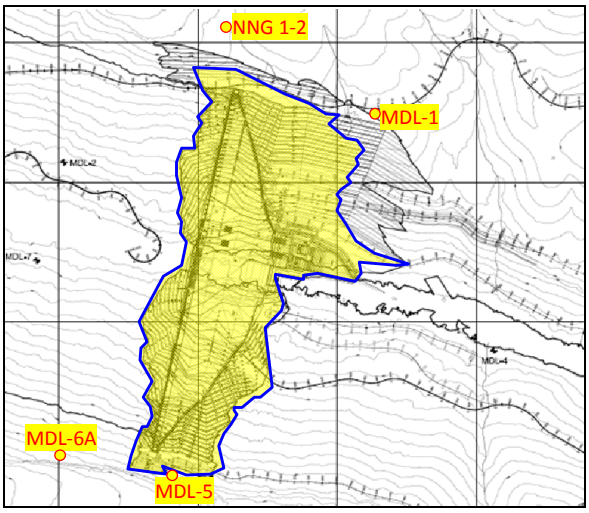


Fig.6 – Location of the Bench Mark for Main Dam Excavation Works

Initially, temporary benchmarks for elevations and coordinates are established around the work area. These benchmarks will be pegged, confirmed, and approved by the Owner.

Survey instruments shall be calibrated in accordance with the section 5.3.3 testing equipment and facilities of the latest Quality Assurance Program (Document No. NNP1-PRG-DrQAP-A3) enclosed with Contractor letter NNP1-PCL-00086, dated 16th January 2014.

5.2. Clearing of rock surface, and installtion of re-bar anchor into rock foundation

- Before concrete works, the rock surface should be clean. Clearing shall consist of the removal and disposal of everything above foundation surfaces that includes broken stone, trees, stumps, logs, bush, undergrowth, grass, crops and loose vegetable objects.

- The foundation which tower crane will be installed on should be the rock. The excavation or dig may be required to reach the rock surface in case there is soil layer above.

- A hole will be drilled with diameter of 42mm into rock foundation for anchor. This anchor will be re-bar with diameter of 28mm and embedded approx. 4m in rock, 1.5m in concrete. These details will be shown in the working drawing that will be submitted separately.

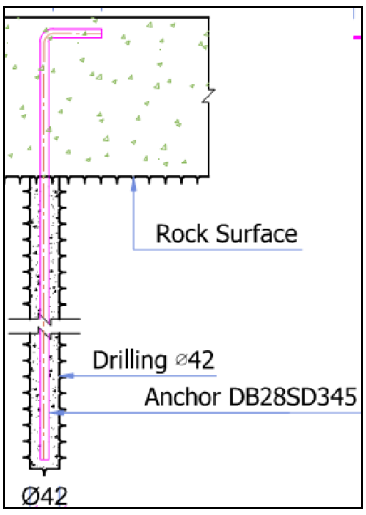


Fig.7 – Typical cross section of re-bar anchor into rock foundation

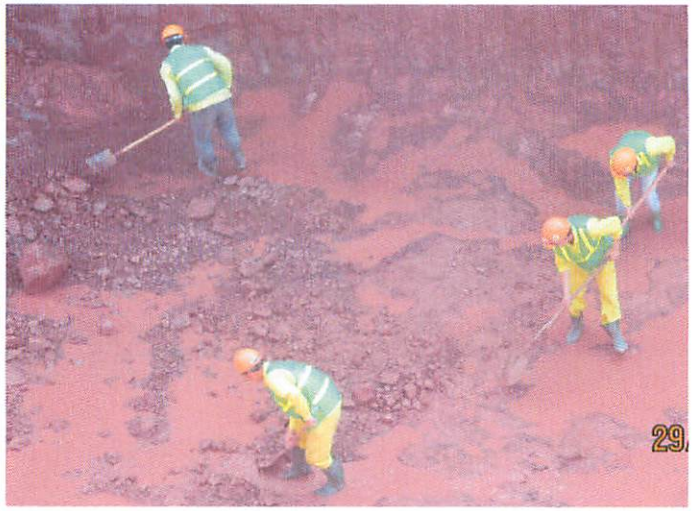


Fig.8 – Typical clearing of rock surface by manpower and scoop

5.3. Installation of Re-bar, Formwork, and Foot of Tower crane

5.3.1. Re-bar

- The reinforcement will be deformed bar in grade SD 345, as specified in the working drawing that will be submitted separately.
- The mill certificate must be accompanied for each the delivery.
- All reinforcement will be stock-piled according to kind and will be kept elevated from the ground with proper covering to insure that the rebar will be free from getting wet to avoid surface corrosion.
- Rebar workshops and rebar storage yard will be established nearby the construction area. Rebar will be fabricated as approved working drawing at rebar workshops with the use of bending and cutting machines. After completion of fabrication for each piece, it will be carefully kept in the dry and stable condition at stockyard, which is more 20cm higher than ground surface and no water flooded areas and covered by plastic sheet to protect rain weather.
- Layout of rebar skeleton will be marked clearly at the surface of the lean concrete. Rebar should be set up to reach exact position considering the appropriate concrete covering.
- Mortar block spacers will be used for spacer of bottom and side in order to keep the appropriate concrete covering. The support bar will be installed on mortar block spacer. The purpose of this support bar is for fixing bottom reinforcement in tidy and ensuring the thickness of concrete covering will be as per specification. Rebar DB12 or DB16 will be used as the support bar.

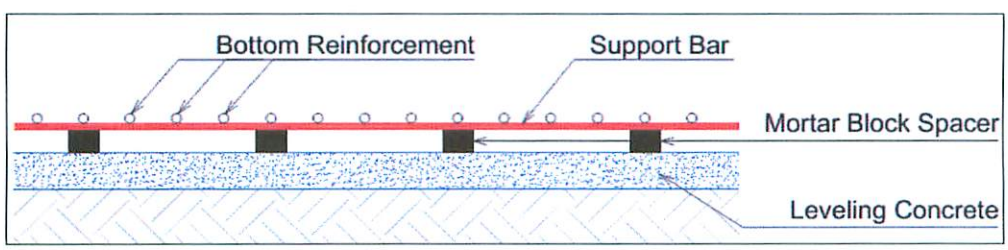


Fig.9 - Concrete Covering and Fixing Bottom Reinforcement Arrangement

- After installation of the bottom rebar, top rebar; side rebar and starter rebar/main rebar will then be placed on its exact location. Position of starter rebar/main rebar will be paid enough attention. Hoop rebar will be tied with diagonal temporary bars opposite to each other to make a case which will against a temporary support system to keep it in stable position.

5.2.2. *Formwork*

- Steel forms will be used for concrete casting. Forms will be cleaned and form release agent will be applied prior to installation. Excessive application of release agent which may contaminate the concrete will not be allowed. Materials which adhere to or discolor the concrete surface will not be used. Formworks will be installed using the line markings on the lean concrete. Forms will be set at exact position and held true to the dimension of the structure prior to and during placement of concrete. It will have adequate supports, stable and constructed in accordance with the working drawings. Access openings may be provided for cleaning out extraneous materials immediately before concrete placement.
- Metal ties or anchorages within the form will be constructed in order to install and remove the formwork without causing damage. Forms will not be removed until the concrete has attained sufficient strength to prevent damage to the concrete surface preferably after 24 hours. Prior to re-use, forms will be checked for damaged and if so must be repaired.

Fig.10 – Typical photo of formwork setting

- The formworks will be fabricated at the workshop. Their details will be specified in the working drawing that will be submitted separately. At some irregular positions such as corner, rubber form shall be used to fill-in the gap between two panel forms. All forms shall be cleaned free from dust, grease or other matter and shall be applied form-oil before installation.

5.2.3. *Foot of tower crane*

- The steel that is to be used for foot should be in grade SS400. It is required high accuracy for the position survey. This step will affect the assembly of tower crane later accordingly.
- The foot will be embedded approx. 1m in the concrete. Its details will be shown in the working drawing that will be submitted separately.

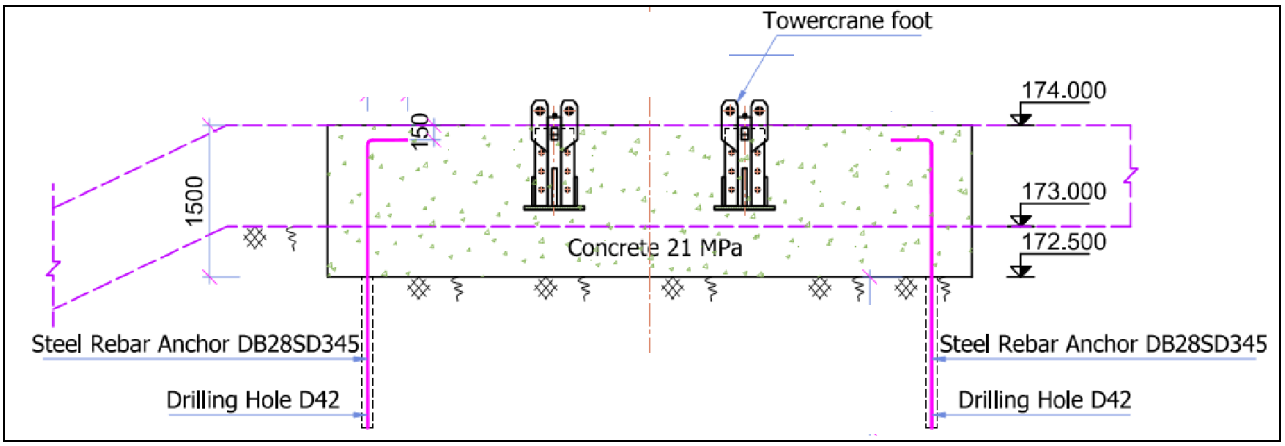


Fig.11 – Typical arrangement of foot for tower crane

5.4. Concrete Work

- They will be casted in CVC that will be provided by mixer truck from CVC plant. The transportation time from batching plant to placement point should be within 90 minutes.
- Before concrete works, the surface should be cleaned. Clearing will consist of the removal and disposal of everything above foundation surface. That includes broken stone, trees, stumps, logs, bush, undergrowth, grass, crops and loose vegetable matter.
- Ready – mixed CVC will be supplied by 90m^3/h stationary concrete pump, or 160m^3/h mobile concrete pump truck, or hopper & crawler crane. The mix proportion will be provided and approved by the Owner as mentioned in Specification. The mix proportion below is reference only. The official design will be approved by the Owner according to the actual test result of trial mix at the plant. The preferable mix will be proposed and submitted separately considering facilities, placing method, and feasible workability.

Table 6 – Mix proportion of CVC C21Mpa ***(reference only)***

Mix Code	D_{max} (mm)	Strength at 28 days (Mpa)	Slump (cm)	W (kg/m^3)	C (kg/m^3)	W/C (%)	S/A	Air content (%)	Aggregate (kg/m^3)				Adm. (l/m^3)	
									Sand	Agg. 5-10	Agg. 10-20	Agg. 20-40	Sika 257	Sika AER
C21	40	21	8±2.5	155	271	57.0	41.5	4.5	770	285	273	547	1.81 (0.75%C)	0.04 (0.015%C)

- Dimensions, alignment and elevation of top concrete shall be checked and must be within the allowable tolerance described in working drawing.
- Concrete surface will be finished by trowel or plate compactor after placement. The curing measure will be applied for preservation of moisture after 24 hours and maintained minimum 7 days after placement.
- The casting should be carried out in the dry weather and in cool weather such as early morning time or end of afternoon time or night time in order to avoid the shrinkage cause the cracks in structure. In the raining case, placed concrete will be cover by canvas, water will flow from higher to lower position and not join into concrete.

- The re-bar will be covered by concrete with enough thickness as specified in the working drawing. Particularly, it is 100mm for the wall and bottom slab; and 70mm for the slab.

5.5. Operation and Dismantling

- The tower crane will be installed, operated, and dismantled according to the construction schedule of main dam body and main powerhouse. Their planned sequence is shown in Appendix 9.4.
- They will be operated in 2 shifts to support construction activities of main dam and powerhouse. The lifting will be strictly complied with the diagram loading that was issued by the manufacturer and will be shown in the working drawing.
- The 55 ton crawler crane will be used for erection of the first and for dismantling of the last tower crane.

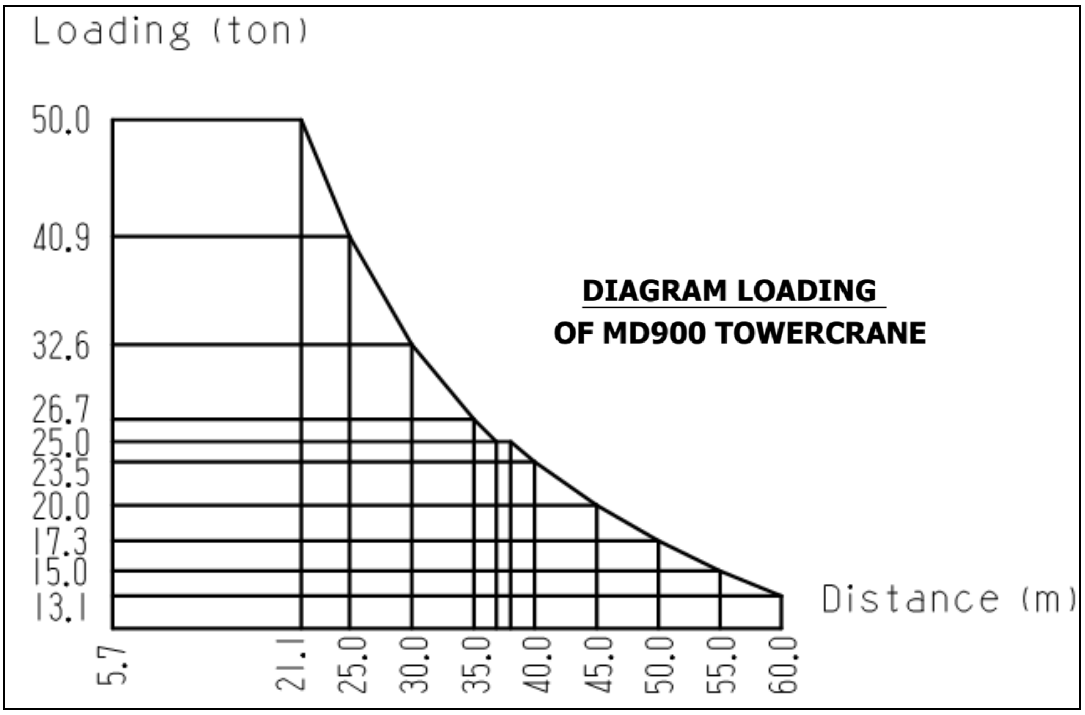


Fig.12 – Typical diagram loading of tower crane MD900B

6. SAFETY CONTROL

Safety control for site works shall follow the latest Safety and Security Program (Document No. NNP1-PRG-SSP-A3) enclosed with Contractor's letter NNP1- PCL- 00044, dated 10th December 2013.

Before commencement of work, safety training shall be carried out to relevant staffs and workers. The emergency action plan is attached in Appendix 9.3.

6.1. Safety indoctrination

- Tool box meeting (TBM) shall be conducted by Safety Officer at the commencement of each shift, on a daily basis to remind the individual work crew on health and safety issues related to the work in progress throughout the construction period.
- Work and safety instruction shall be issued by Chief Engineer/ Construction Manager to subcontractors' representative or workers during daily meeting, then it will be signed by the person receiving the instruction.

6.2. Health control for occupational health program

- Safety officer shall check and ensure that appropriate Personal Protective Equipment (PPE) are provided to the workers and that training is given to use and maintain their PPE effectively and appropriately for the jobs on the site.
- In-house Rules and Regulations shall be posted at prominent locations, e.g. bulletin boards, at project sites. All new workers, subcontractors and staff shall be briefed on the rules and regulations and it shall be abide by them.

6.3. Accident countermeasures

Countermeasures for prevention of occurrence of accident, especially during the installation, operation, and dismantling of tower crane; the following shall be concerned.

6.3.1. Accident by heavy equipment

- All machinery and equipment that are commonly deployed at the project site, shall be checked before the commencement of each work.
- Clear warning sign board will be arranged at risky location such as slope, unstable foundation.
- All workers and staffs are prohibited from approaching the working radius of heavy equipment.
- In case the worker needs to approach the equipment, they shall request the operator to stop operation and confirm the stopping.
- Stopper shall be set when equipment is parked on site.

6.3.2. Safety measure for rainy season

- Equipment should always park at the parking area after the work
- Engineer or safety officer should always check water level at inlet and outlet of diversion tunnel when raining.
- Clear warning sign shall be arranged around the boundary between river and land and to inform all worker "Mind Your Step" and "Slippery Rock Surface".
- When thunderstorm will come, all worker shall evacuate.
- The discontinuance criteria for the climate condition is as follows,
  - (i) over 30mm per day of expected rainfall amount.
  - (ii) over 10mm per hour of rainfall amount
  - (iii) the gap of wildfire and thunder is short

  Re-starting of work will be after checking of site condition.

- In case of heavy rain, engineer or safety officer shall monitor the river water level at inlet and outlet of diversion tunnel carefully when it reaches at the alert level, all equipment and workers shall be evacuated to a higher ground level or shall be parked at Camp Yard.

6.3.3. Safety Hauling

- Adequate barricades and suitable warning signs are put up at conspicuous area where person are most likely to fall to open side of the slope and around heavy equipment.
- No unauthorized person shall be allowed to enter the working area.
- The limit of dump truck speed is less than 30km/h in site
- Dumping material and other superimposed load are place apart from the edge to avoid collapse.

6.3.4. Safety measures to prevent from slope sliding

- Visual check of slope condition before commencement of construction work.
- Training of a sign of land sliding for labor.
- No vehicle, equipment, and machinery park at the edge of embankment or on unstable ground.

6.4. Safety control plan against flood and evacuation procedure

6.4.1. General

Monitoring for safety control plan against flood shall be based on the following measures described below.

- Weather and tide forecast from the Local Bureau of meteorology
- Analysis of water level based on survey monitoring data.
- Visual monitoring of water level gage by engineer or safety officer in the inlet and outlet of diversion tunnel daily.
- Actual river discharge and rainfall intensity.

6.4.2. Procedure

- The procedure shall be complied with Management System for the Flood in Rainy Season (Document No. NNP1-OTH-MSF-A4) enclosed with Contractor's letter NNP1-PCL-01484, dated 2nd September 2015.
- Main dam area shall use monitoring point at inlet of River Diversion Tunnel. Please refer to clause *4.1 Monitoring Point at Inlet for Diversion Tunnel* of Document No. NNP1-OTH-MSF-A4 for details.

7. QUALITY ASSURANCE

Quality Assurance shall be followed to the Quality Assurance Program (Document No. NNP1-PRG-DrQAP-A3) enclosed with Contractor's letter NNP1-PCL-00086, dated 16th January 2014.

Quality control works will be conducted by the Contractor whereby effective implementation and inspection of this work shall be made to ensure that the quality is maintained. The inspection and test on site shall be informed of the Owner before the implementation.

Material testing during construction will be performed by on-site laboratory as specified in specifications. And the proposed Inspection and Test Plans (ITP) are as shown in the Appendix 9.5. The raw materials consist of fine aggregate, coarse aggregate, cement, and admixture for CVC will be controlled and confirmed by CVC Plant in accordance with Appendix 9.7 – Inspection Test Plan (ITP) that was submitted through our letter No.NNP1-PCL-00388 of 20-Aug-2014.

PART 2
SITE SPECIFIC ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (SS-ESMMP)

8. ENVIRONMENTAL & SOCIAL MANAGEMENT & MONITORING PLAN

8.1. Introduction

This Site Specific Plan has been prepared to highlight environmental and social conditions prior to the beginning of each construction activity and will be used as a tool to ensure the particular activity follows the correct management and mitigation procedures. Sub-Plans will be used to detail mitigation methods for each of the activities associated with the construction or embankment works.

This plan details the installation, operation, and dismantling of tower crane at main dam area. Four (04) tower cranes will be installed, 1 at EL.+195.00m, 1 at EL.+197.90m, 1 at EL.+221.57m, and 1 at EL.+251.40m. They consist of 3 kinds; MC310K12 in capacity of 12 ton, MD900B of 50 ton, and MD2200 of 64 ton.

Table 8.1 below shows the referential linkages of documents regarding environmental matters in the NNP1 Project. The Owners (NNP1) documents use references and information from the Concession Agreement. This SS ESMMP (Contractor) uses references and information from Owners EIA/ESMMP and Owners ESMMP-CP.

Table 8.1 – List of Main Documents and Approving Authority

Item	Hierarchy of Documents	Approving Authority
1	Concession Agreement	GOL
2	NNP1 EIA/EMMP	GOL
3	ESMMP-CP	GOL
4	Contractors EMP	NNP1
5	SS ESMMP	NNP1

The Contractor documents are; Contractors EMP (Item 4) and SS ESMMP (Item5) which have used applicable information extracted from the Owners documents which are Concession Agreement (Item 1), NNP1 EIA/ESMMP (Item 2) and ESMMP-CP (Item 3).

All obligations of the contractor are stated in the Civil Works Contract (CWC) which includes Schedule 9 (*Concession Agreement Pass Through Obligations*) and is the only governing document for the Contractor.

8.2. Environmental and Social Pre-Construction Description

8.2.1. Land use in the area

Four (04) tower cranes will be installed at the main dam area. It located within the construction area which has already been compensated for the villager.

This construction area was prepared while main dam excavation was deploying. Their foundation will be constructed and be anchor on the rocky surface.

8.2.2. Proximity to villages, cultural sites

The closest village to the installation area is Ban Hatsaykham, over 3km downstream of the site. There will be no impacts to cultural sites.

Table 8.2 below is a pre-construction checklist to identify any major environmental impacts that may occur during construction works. After completion of the checklist the Sub-Plans can be selected accordingly.

Table 8.2 – Environmental Assessment Checklist – For Pre Construction

Site Location	Main dam and main powerhouse area		
GPS Coordination	Refer to 5.1, Part 1 of this DWP		
Photo	See attached photos below		
Date	Nov 23, 2015		
Estimated Area	0.16 ha		
Prepared By	Santi Sayakoummane		
Checked By	Mr Keiji Sasaki		
Site Description	Four (04) tower cranes will be installed at 04 locations, at 04 elevations to support the construction activities of main dam body and main powerhouse. Their foundation will be casted in CVC.		
Project Setting	**Yes**	**No**	**Description**
Will the site require UXO clearance?		√	UXO clearance in the construction area has already been completed prior to main dam excavation deployed.
Is there surface water located in close proximity to the site?		√	The river flow was diverted through diversion tunnel. Therefore, the installation area will be kept dry enough for construction.
Is there a village or community located in close proximity to the site?		√	Closest Village is Ban Hatsaykham, approx. 3km downstream.
Is the site located in a vegetated area?		√	It was cleared and excavated while main dam excavation was deploying.
Is the site located in agricultural land?		√	Located within construction area of main dam body and main powerhouse
Are there any PCR in the area?		√	No confirmed PCR on site
Is there an existing access road to the site?	√		Road T1, T2 at Left Bank (EL.+230 & 250) Road T10, T11 at Right Bank (EL.+200 & 230)
Can the site be viewed from public viewpoints?		√	Area is closed off to the public
Is the site located within an existing Construction Area?	√		Main dam body and main powerhouse
Will the site development require the construction of a sub-camp, office and storage? (if yes, provide a list)		√	Worker Camp No.2 will be used for the Sub-Contractors worker camp.
Other Comments:			

Environmental Impacts	Likelihood (Yes/No)	Mitigation measure to be Implemented
Will the site development result in increased dust generation at near-by villages?	No	No Villages within vicinity of site
Will the site development result in increased noise generation at near-by villages?	No	No Villages within vicinity of site
Will the site development result in surface water turbidity?	No	River water was diverted through diversion tunnel. The waste water treatment plant will be provided to treat the turbidity prior to discharge to the watercourse.
Will site development result in changes to drainage patterns?	Yes	Nam Ngiep River will be flow through the Diversion Tunnel.
Will the site result in erosion?	No	It will be kept dry enough for construction. Furthermore, its foundation is bedrock and the slope is protected by shotcrete.
Will vegetation clearing be required?	No	The clearance and excavation were deployed while main dam excavation is conducting.
Will the site be setting up hazardous components? (storage, workshop)	No	All fuels and oils will be stored at workshops at camps.
Will the site generate waste?	Yes	Rubbish, garbage will be collected and transported to the approved disposal. All hazardous materials such used oils and containers will be transported back to workshop.

Picture 1 – Expected location at main powerhouse from upstream view

Table 8.3 identifies the relevant list of Sub Plans required for the installation, operation, and dismantling of tower crane at main dam area. The Sub Plans were selected after a review of the following:

- Detailed Works Program (DWP)
- Pre-Construction assessment (as per attached Environmental Checklist)
- NNP1 EIA and ESMMPs

Table 8.3 Sub Plans for Main Powerhouse works

Sub-Plan	Item	Environmental	Social
SP01	Erosion and Sediment Control	X	
SP02	Water Availability and Pollution Control	X	
SP03	Emission and Dust Control	X	
SP04	Noise and Vibration	X	
SP05	Waste Management	X	
SP06	Hazardous Material Management	X	
SP07	Vegetation Clearing	-	
SP08	Landscaping and Re-vegetation	-	-
SP09	Biodiversity Management	-	-
SP10	Spoil Disposal	-	
SP11	Quarry and Construction Layout	-	-
SP12	Unexploded Ordinance (UXO) Survey and Disposal		X
SP13	Construction of Work Camps	-	-
SP14	Traffic and Access		X
SP15	Training Awareness		X
SP16	Project Personal Health Program		X
SP17	Emergency Preparedness		X
SP18	Cultural Resource		X

Detailed descriptions are found in the relevant sections relating to Environmental or Social Management and Monitoring Plans. See Contractors EMMP-CP Appendix 2.1 “Sub-Plan for Civil Works”

A detailed Environmental Management Activity Table for the installation, operation, and dismantling of tower crane can be referred to in Appendix 9.7 of this report.

8.3. Sub-Plan Detail for the Tower Crane Works – Environment

SP01 Erosion and Sediment Control

- Almost excavation works were done while main dam excavation was deploying.
- All of slope was protected by shotcrete with wire mesh.
- Only minor chipping work will be required.
- The construction area will be kept in the dry condition.

SP02 Water Availability and Pollution Control

- The water river from Nam Ngiep will be utilized for the construction.
- The turbidity water will be treated at Waste Water Treatment Plant what will be provided at downstream of main dam body before discharge to the river. The details of this plant including calculation for sediment pond will be submitted separately.
- No concrete will be disposed on site, any leftover concrete must be transported to the batching plant or disposal areas No. 2 and No. 6.
- Washing of mixer trucks must also be carried out at designated wash bays.
- No concrete waste is to be left behind or disposed into any water course.

SP03 Emission and Dust Control

- All workers must wear the appropriate PPE when on site.
- Water spraying will be conducted daily on existing access roads.
- The dust is minor due to there is no earth work. The main activities are re-bar and concrete work.

SP04 Noise and Vibration

- The distance from the construction areas to the nearest village, Ban Hatsaykam, more than 3km downstream from the site. There is no influence of noise and vibration.
- All workers must wear the appropriate PPE at all times, including hard hat, ear plugs when working with loud cutting equipment and vibratory roller, correct gloves for working with welding machines and safety harnesses when working at the heights.

SP05 Waste Management

- General waste or recycled waste from workers must be collected and later transported back to worker camps or main construction site for correct disposal.
- Construction waste, such a steel reinforcements, steel plate, H – beam will be stockpiled on site and then transferred to main construction site.
- The waste bin and toilet will be provided at workshop nearby the construction area. All workers will be instructed to use properly.
- **Dumping any type waste into watercourses is highly prohibited**

SP06 Hazardous Material Management

- All fuels for heavy machinery are stored at worker camp sites in specially designed areas, with mobile fuel trucks used for refueling of machinery.
- Any used containers will be stored appropriately on site in a designated area and removed straight away when empty.
- Hazardous materials such as oils, paints and gas tanks will be kept securely to prevent spilling, e.g., gas tanks will be kept in a storage cage above any potential flood level.
- Any hazardous containers will be labeled accordingly and kept in appropriate storage facilities, with all Material Safety Data Sheets (MSDS) when required.

- Storage should have adequate roofing and concrete flooring to reduce the risk of any spillage.
- Any *hazardous waste* materials will be maintained within these storage facilities and disposed of by approved companies.
- Spill response kits will be provided where any such hazardous materials are stored.
- Correct PPE must be used at all times.
- **Discharge of any hazardous materials into watercourses is highly prohibited.**

8.4. Sub-Plan Detail for the Tower Crane Works – Social

SP12 Unexploded Ordinance (UXO) Survey and Disposal

- UXO clearance has been carried out at main dam excavation including powerhouse area by NNP1 before the beginning of any construction activities.
- If any UXO's or suspicious objects are found, work must stop immediately and NNP1 notified.

SP14 Traffic and Access

- Traffic speed regulation devices as signage will be installed at sensitive locations in the vicinity and approaching construction site.
- Barriers will be installed around high risk areas, such as along access roads around main construction sites.
- The construction area will only be for Project workers and staff. No unauthorized entry will be permitted.
- The installation of a security gate along road P1 (STA. 3+945km) will require an ID card for both persons and vehicles to be shown to security staff. Anyone without an ID card will not be allowed access into the construction site.
- All construction vehicles will be restricted to 30km/h within the construction site.
- Regularly monitoring of traffic conditions will be conducted as part of the weekly Environmental, Health and Safety inspection, with main focus being driving speeds around the Project site.

SP15 Training and Awareness

- All new employees will be required to complete Induction Training from OC/NNP1 prior to commencing any work on site.
- In this training, the Contractor will highlight site regulation/rule, and safety & environmental issue.
- A register of induction training will be maintained and can be provided to NNP1 on request.
- Monthly safety meetings and joint inspections will be conducted with all top management and safety staff, and will cover all relevant health and safety issues on site.
- Weekly meetings are also conducted to bring further awareness to environmental health and safety issues.
- Weekly and monthly environmental monitoring will also be carried out, items include visual monitoring of air quality, soil erosion, effluent discharge and waste disposal.
- Daily toolbox meetings are also conducted to raise worker awareness regarding daily work schedules, safety issues and environmental issues.
- *Toolbox meetings are also conducted to raise worker awareness regarding safety and environmental issues such as attention in work with heavy truck, careful in narrow hauling road, work on the height as well as in the depth, regularly check and maintenance machinery, not disturb natural resource like watercourse; flora; fauna, etc. For these works training will emphasize prohibition of hunting and fishing within or around the construction area.*

SP16 Project Personnel Health Program

- Referring to Section 6 in Part 1 of the DWP, a tool box meeting will also be carried out weekly and before commencement of any new works.
- Health Awareness Training will be carried out for all personnel in the monthly mass meeting.

- The register for each item above can be provided to NNP1 on request.
- First aid kits will be prepared on site accordingly, these include; Individually wrapped sterile adhesive dressing, Crepe bandage (5.0 cm), Crepe bandage (7.5 cm), Absorbent Gauze (packet of 10 pcs), Adhesive plaster roll (1.25 cm width), Triangular bandages, Scissors, Safety Pins, Disposable gloves (pairs) One-way valve transparent mask or 2-way mouthpiece, Sterile water or saline in 100 ml disposable container (only where tap water is not available).
- First aid kits will be located at the temporary office or within excavators and subcontractor vehicles.
- Section 6 ***Safety Control*** of the DWP, highlights main issues during construction.

SP17 Emergency Preparedness

- Referring to the emergency action plan in Appendix 9.3, the emergency response procedures, emergency contact numbers and communication and reporting procedures will be clearly displayed and each staff shall always carry it.
- First aid kits will be prepared at each site accordingly.
- Hazardous materials will be stored in the permitted area or the area instructed by the authorities.
- The safety control plan against flood and evacuation procedure is as follows. Please refer to Management System for the Flood in Rainy Season (Document No. NNP1-OTH-MSF-A4) enclosed with Contractor's letter NNP1-PCL-01484, dated 2nd September 2015 for details.

    1) Monitoring for safety control plan against flood shall be based on the following measures described below:
        - Weather forecast from the Local Bureau of meteorology
        - Analysis of water discharge based on survey monitoring data.
        - Visual monitoring of water level gauge by watchman along main dam site.
    2) When there is a forecast of heavy rain, watchman shall monitor elevation of water level carefully.
    3) Warning shall be given when the water level rises rapidly (increase of 1.5m per hour)
    4) Watchman shall follow the reporting procedure of the Emergency Action Plan in Appendix 9.3. Evacuation procedure for safety control plan is described as follows:
        (i) After confirmation alert, the safety officer shall provide signal voice (whistle and/or siren) as commencement for immediate evacuation of all construction, equipment and tools, and workers to higher ground.
        (ii) After the removal of equipment and tools, attendance of workers shall be checked and confirmed after the evacuation.
        (iii) The Safety officer will do a final check of whole area to ensure the evacuation process is completed.
- *In the case of oil spillage/ leakage accidents, the emergency response kits such as absorbent sheets or similar will be provided.*
- *In case of the hazardous accident including oil spillage/ leakage, ESD will be notified of the situation immediately, as per agreed procedures. NNP1 will the coordinate a response with the contractor.*
- In case of accidental happening, the Contractor will prepare the Accident Report to NNP1PC within 24 hours, including the immediate remedial action and preventive action for future re-occurrence. Site rehabilitation plans are also required in the event of serious contamination/ accident.

SP18 Cultural Resource

According to the EIA document, a preliminary survey of the Project Area was conducted by the Lao PDR Department of Museums and Archaeology (DMA) in October of 2007. In September 2013 local villagers informed NNP1 of Buddha images located in caves near the NNP1 Temporary Bridge site (adjacent to T7 area). On the 30th November 2013 the images were successfully relocated to the local Temple at Ban Hat Gniun. The relocation was complemented by traditional Buddhist ceremonies, which involved Lao department and authorities including; Head of Hat Gniun Village, Representative from NNP1, Representative from Bolikhamxay Province, Representative from Bolikhan District and RMU.

If the Contractor is to find any new physical or cultural resources during construction, the Contractor shall stop the works and inform the Owner immediately and follow the Chance Find Procedures outlined below.

8.5. Chance Find Procedures

Objectives of Chance Find Procedures are to; (a) minimize impacts to resources from all NNP1 related activities and (b) to ensure that any artifacts uncovered are appropriately recorded, documented and reported to the appropriate line agencies.

If any fossil or cultural item of significance is found the Contractor will promptly give notice to the Owner. This follows the guidelines stated in the Civil Works Contract “CWC” Clause 4.25 regarding Fossil and Artifacts.

Chance find procedures as described in Contractors EMMP-CP Sub-plan Appendix 2.1 Sub-Plan for Civil Works, “21:Cultural Resources” The following steps will be implemented in the event that previously unidentified artifacts are identified:

i. The Contractor shall immediately cease operations in areas where artifacts/archaeological finds are unearthed and immediately inform NNP1 Site Manager.

ii. The Owner will consult the Head of Village and Culture and Tourism Administration Office to obtain advice regarding the next steps.

iii. The Contractor to recommence work only after the Culture and Tourism Office has provided official notification accordingly.

9. APPENDIX

9.1. Plan Drawing and Catalogue

9.2. Organization Chart

9.3. Emergency Plan

9.4. Construction Schedule

9.5. Inspection and Test Plan (ITP)

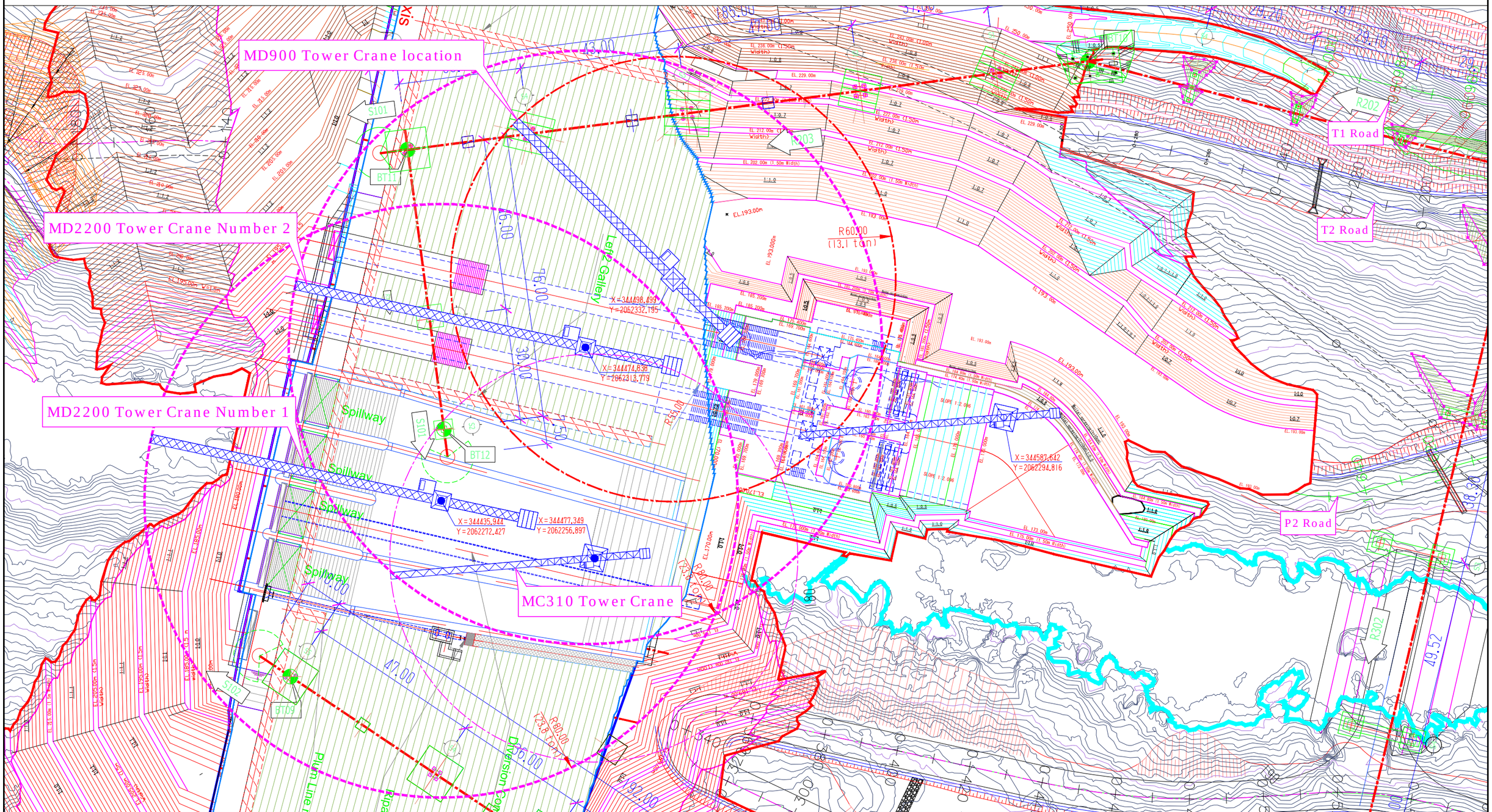
9.6. Risk Register

9.7. Environmental Management Active Table

Appendix 9.1

Plan Drawing and Catalogue

LAYOUT OF TOWER CRANE LOCATION



NOTE:

- This drawing is made based on the actual survey data.
- Dimensions are in mm, elevations are in m.

OBAYASHI

OWNER:	NAM NGIEP 1 POWER COMPANY	REVISION No.	DESCRIPTION	DATE	TITLE	NAME	DATE	NAM NGIEP 1 HYDRO POWER PROJECT	
					DESIGNED				
					DRAWN			TITLE: LAYOUT OF TOWER CRANE LOCATION	
CONTRACTOR:	OBAYASHI CORPORATION				CHECKED				
					ISSUED			SCALE:	DRAWING NO. / REV

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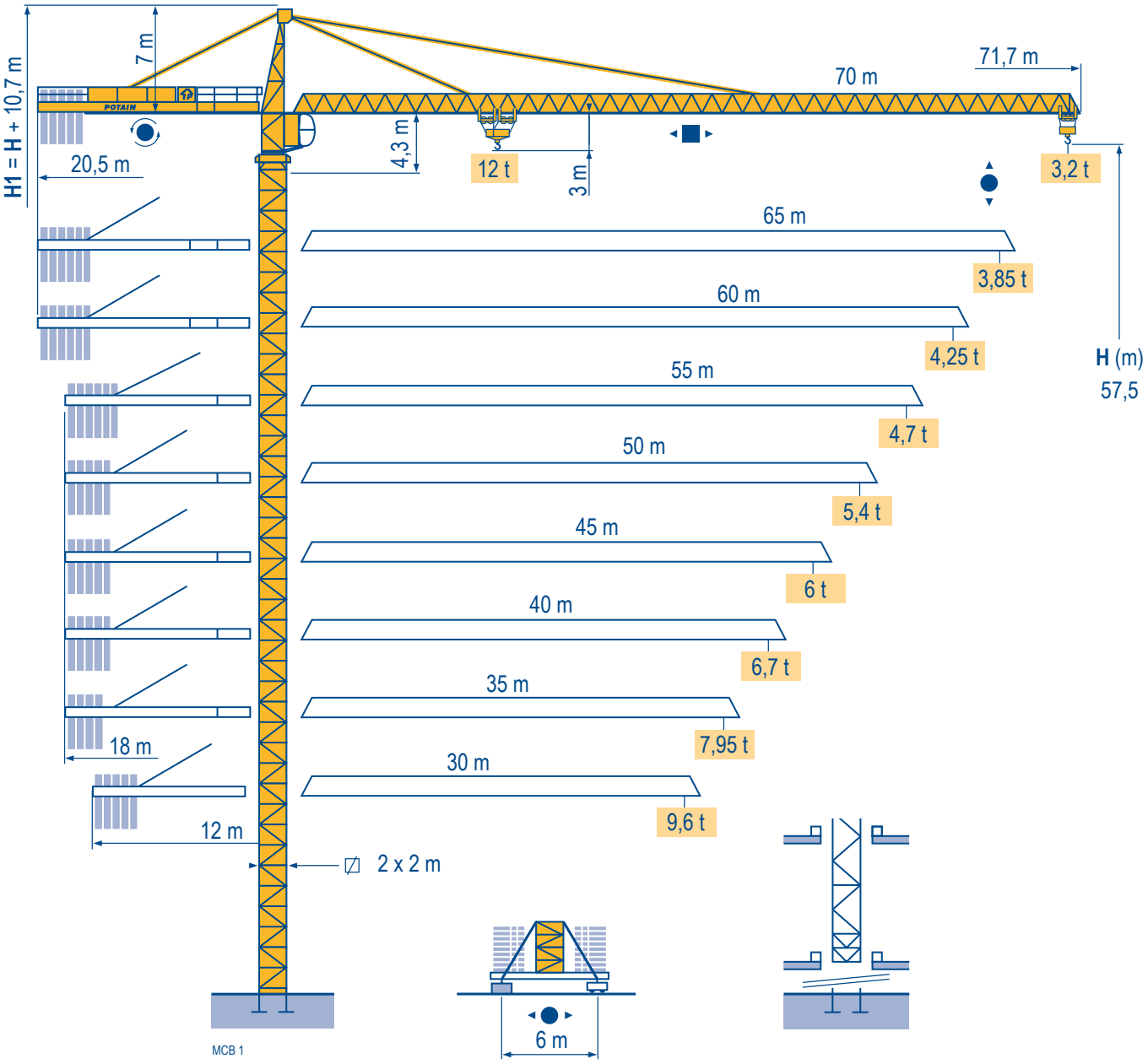

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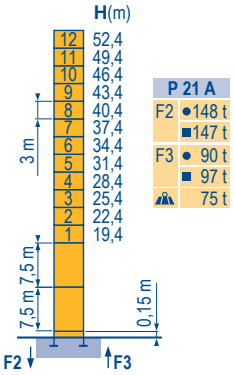
TÜV ISO 9001 FEM 1.001-A3

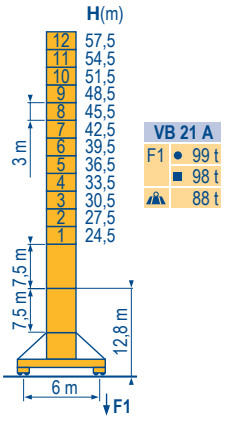
Masts / Reactions

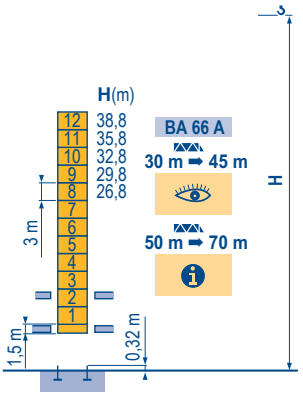
MCB 1

2 m

30 m ➡ 70 m

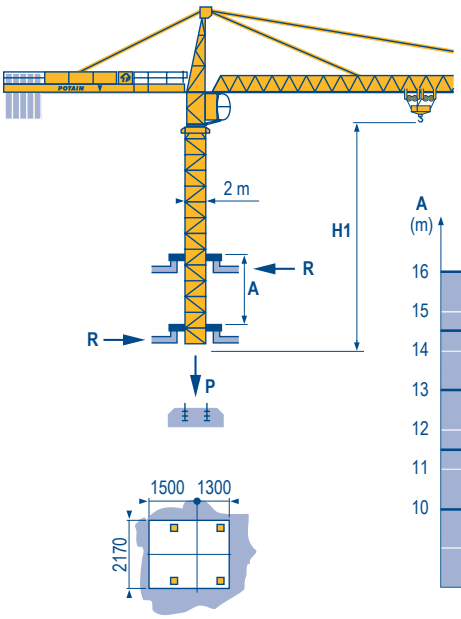






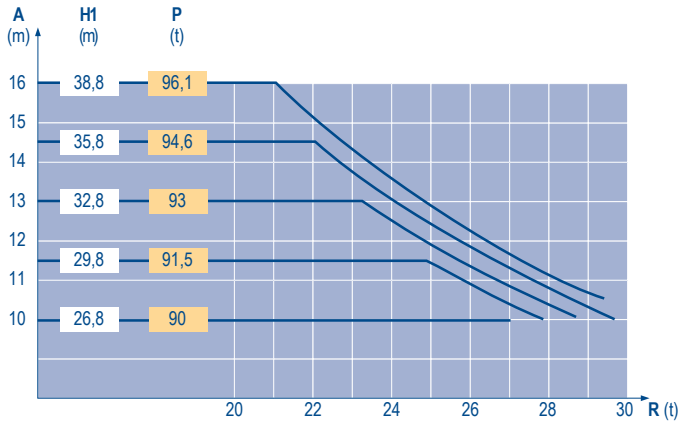
Climbing crane

MCB 1



BA 66 A

30 m ➡ 45 m



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POTAIN

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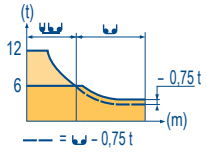
- ● Reactions in service
- ■ Reactions out of service
- Without load, ballast (or transport axles), with maximum jib and maximum height.
- Consult us
- See climbing crane

Load diagrams

MCB 1

70 m	3,1 ►	21,4	22	25	27	30	32	35	37	37,4	41,9	45	47	50	52	55	57	60	62	65	67	70	m
		12	11,6	10	9,1	8	7,3	6,5	6,1	6	6	5,5	5,2	4,9	4,6	4,3	4,2	3,9	3,7	3,5	3,4	3,2	t
65 m	3,1 ►	22,8	25	27	30	32	35	37	39	40,4	44,7	47	50	52	55	57	60	62	65	m			
		12	10,8	9,8	8,7	8	7,2	6,7	6,3	6	6	5,7	5,3	5	4,7	4,5	4,2	4,1	3,85	t			
60 m	3,1 ►	22,8	25	27	30	32	35	37	39	40,4	44,7	47	50	52	55	57	60	m					
		12	10,8	9,8	8,7	8	7,2	6,7	6,3	6	6	5,7	5,3	5	4,7	4,5	4,25	t					
55 m	3,1 ►	22,8	25	27	30	32	35	37	39	40,4	44,7	47	50	52	55	m							
		12	10,8	9,8	8,7	8	7,2	6,7	6,3	6	6	5,7	5,3	5	4,7	t							
50 m	3,1 ►	23,3	25	27	30	32	35	37	40	41,2	45,7	47	50	m									
		12	11,1	10,1	8,9	8,2	7,4	6,9	6,2	6	6	5,8	5,4	t									
45 m	3,1 ►	23,8	25	27	30	32	35	37	40	42	45	m											
		12	11,3	10,3	9,1	8,4	7,6	7,1	6,4	6	6	t											
40 m	3,1 ►	24,7	25	27	30	32	35	37	40	m													
		12	11,8	10,8	9,5	8,8	7,9	7,4	6,7	t													
35 m	3,1 ►	24,8	25	27	30	32	35	m															
		12	11,9	10,8	9,6	8,9	7,95	t															
30 m	3,1 ►	24,9	25	27	30	m																	
		12	11,9	10,9	9,6	t																	



Counter-jib ballast

MCB 1

	4 600 - 4 200 - 2 300 kg		4 200 - 700 kg	
		(kg)		(kg)
70 m	20,5 m	24 500	20,5 m	24 500
65 m	20,5 m	23 700	20,5 m	23 800
60 m	20,5 m	21 800	20,5 m	21 700
55 m	18 m	24 900	18 m	24 500
50 m	18 m	22 600	18 m	22 400
45 m	18 m	19 500	18 m	18 900
40 m	18 m	17 200	18 m	16 800
35 m	18 m	14 900	18 m	14 000
30 m	12 m	20 700	12 m	20 300

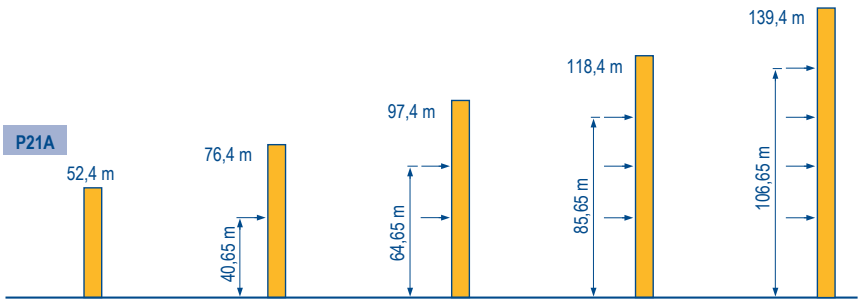
Base ballast

MCB 1

2 m	VB 21 A	H (m)	57,5	54,5	51,5	48,5	45,5	42,5	39,5	36,5	33,5	30,5	27,5	24,5	21,5
		(t)	84	72	72	72	72	72	72	60	60	60	60	60	60

Anchorages

MCB 1



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A	Distance between collars
H1	Crane height
P	Crane weight (in service)
R	Horizontal reaction

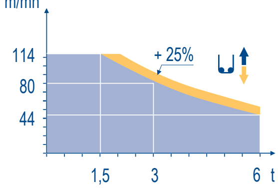
Mechanisms

MCB 3

			Single-fall hoisting (↑)				Double-fall hoisting (↑)				hp	kW	Drum
Hoisting	70 RCS 30	m/min	0 → 40		0 → 80		0 → 20		0 → 40		70	51	523 m
		t	6		3		12		6				
	75 LVF 30 Optima	m/min	0 → 44 → 56 → 80 → 114				0 → 22 → 28 → 40 → 57				75	55	570 m
		t	6	4,5	3	1,5	12	9	6	3			
Trolleying	6 D3 V4	m/min	15 - 50 (12 t) 100 (6 t)								7,4	5,4	
Slewing	RVF 162 Optima	rpm	0 → 0,7								2 x 7,5	2 x 5,5	
Travelling VB 20A VB 21A	RT 544 A1 2V R ≥ 13 m	m/min	13,5 - 27								4 x 7	4 x 5,2	

CEI 38 IEC 38	kVA
400 V (+6% -10%) 50 Hz	70 RCS : 100 kVA 75 LVF : 100 kVA

75 LVF 30 Optima



GB

- Hoisting
- Trolleying
- Slewing
- Travelling

This commercial document is not legally binding.
For any technical information, please refer to the corresponding instructions.

Manitowoc Crane CARE

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Réalisation Sedoc

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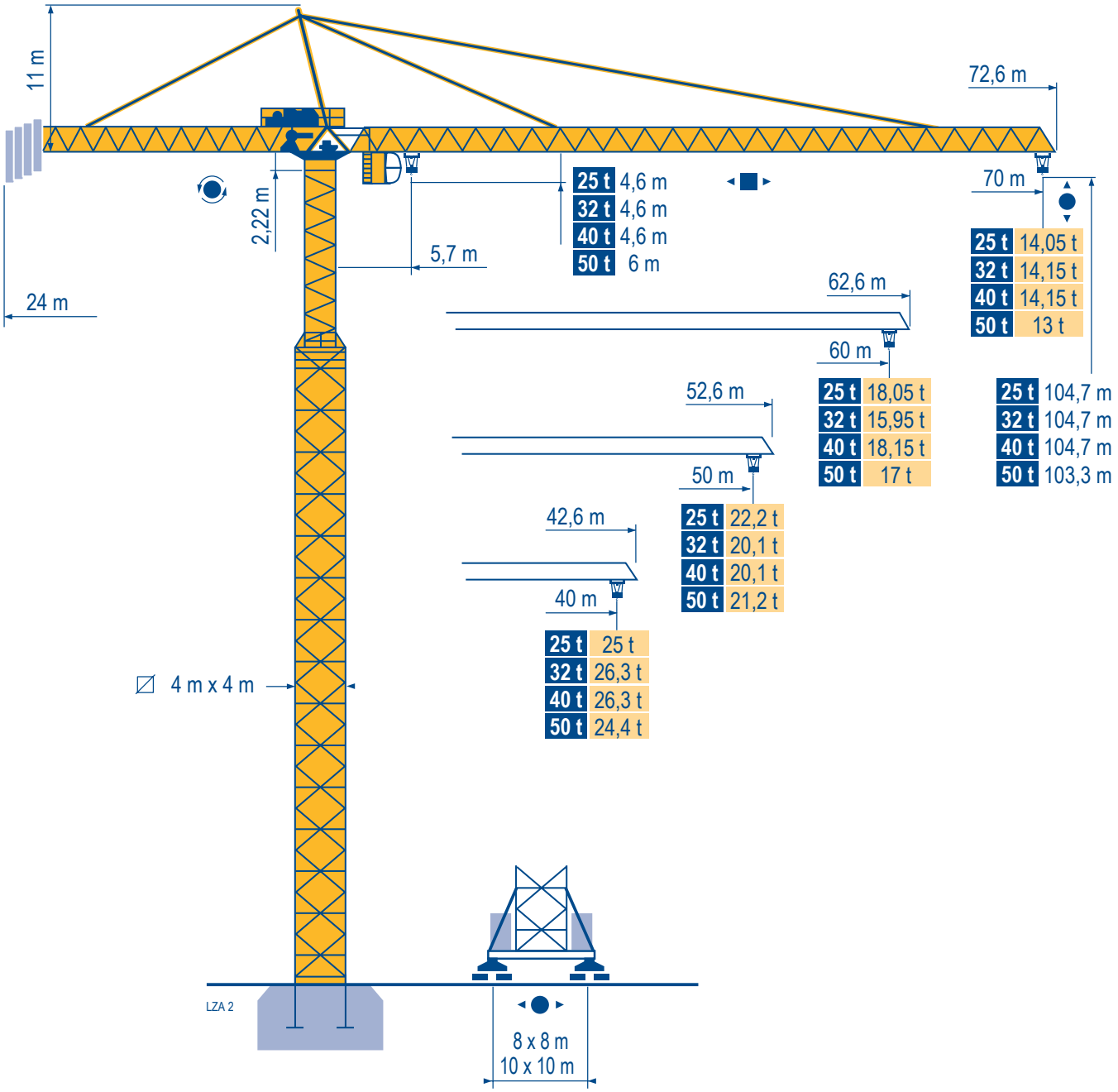
MD 900 B



CE FEM 1.001-A3

Manitowoc Crane Group

Mat / Réactions ☑ **4 m x 4 m**

Maste / Eckdrücke

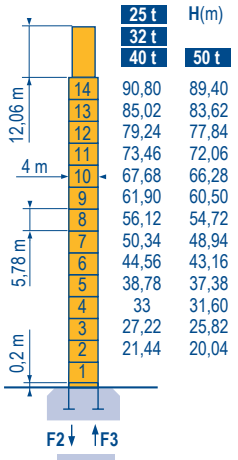
Masts / Reactions

Mástil / Reacciones

Torre / Reazioni

Tramo / Reacções

LZA 2



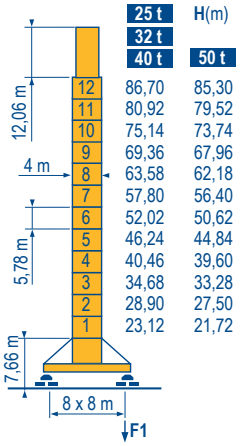
	25 t	32 t	40 t	50 t	H(m)
14					90,80
13					85,02
12					79,24
11					73,46
10					67,68
9					61,90
8					56,12
7					50,34
6					44,56
5					38,78
4					33
3					27,22
2					21,44
1					

	50 t	H(m)
14	89,40	
13	83,62	
12	77,84	
11	72,06	
10	66,28	
9	60,50	
8	54,72	
7	48,94	
6	43,16	
5	37,38	
4	31,60	
3	25,82	
2	20,04	
1		

PA 951

F2	25 t	● 247 t	■ 260 t
	32 t	● 251 t	■ 261 t
	40 t	● 251 t	■ 261 t
	50 t	● 287 t	■ 259 t
F3	25 t	● 118 t	■ 139 t
	32 t	● 130 t	■ 139 t
	40 t	● 130 t	■ 139 t
	50 t	● 136 t	■ 131 t

196 t



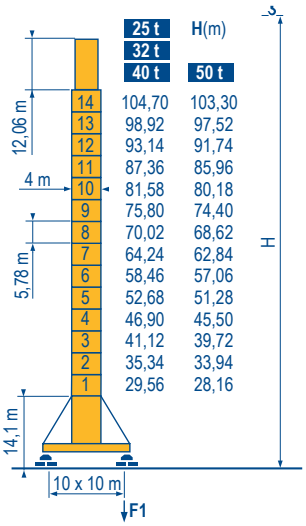
	25 t	32 t	40 t	50 t	H(m)
12					86,70
11					80,92
10					75,14
9					69,36
8					63,58
7					57,80
6					52,02
5					46,24
4					40,46
3					34,68
2					28,90
1					23,12

	50 t	H(m)
12	85,30	
11	79,52	
10	73,74	
9	67,96	
8	62,18	
7	56,40	
6	50,62	
5	44,84	
4	39,60	
3	33,28	
2	27,50	
1	21,72	

HA 950

F1	25 t	● 195 t	■ 186 t
	32 t	● 191 t	■ 187 t
	40 t	● 191 t	■ 187 t
	50 t	● 221 t	■ 187 t

218 t



	25 t	32 t	40 t	50 t	H(m)
14					104,70
13					98,92
12					93,14
11					87,36
10					81,58
9					75,80
8					70,02
7					64,24
6					58,46
5					52,68
4					46,90
3					41,12
2					35,34
1					29,56

	50 t	H(m)
14	103,30	
13	97,52	
12	91,74	
11	85,96	
10	80,18	
9	74,40	
8	68,62	
7	62,84	
6	57,06	
5	51,28	
4	45,50	
3	39,72	
2	33,94	
1	28,16	

JA 951

F1	25 t	● 197 t	■ 245 t
	32 t	● 195 t	■ 245 t
	40 t	● 195 t	■ 245 t
	50 t	● 218 t	■ 242 t

258 t

Autres implantations

Aufstellmöglichkeiten

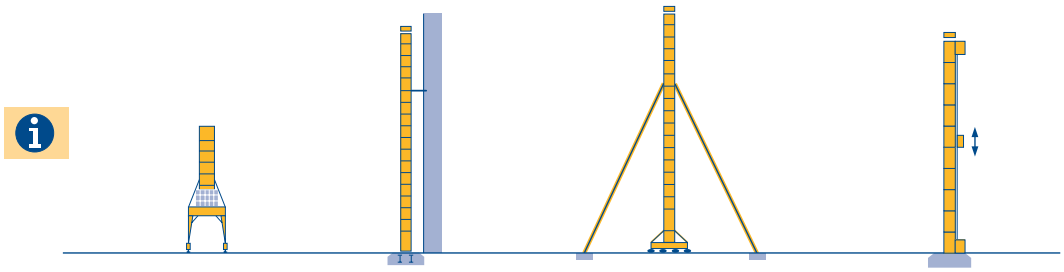
Mounting possibilities

Otras implantaciones

Altre postazioni

Outras implantações

LZA 1



MD 900 B

POTAIN

	F	D	GB	E	I	P
●	Réactions en service	Reaktionskräfte in Betrieb	Reactions in service	Reacciones en servicio	Reazioni in servizio	Reacções em serviço
■	Réactions hors service	Reaktionskräfte außer Betrieb	Reactions out of service	Reacciones fuera de servicio	Reazioni fuori servizio	Reacções fora de serviço
	A vide sans lest (ni train de transport) avec flèche et hauteur maximum.	Ohne Last, Ballast (und Transportachse), mit Maximalausleger und Maximalhöhe.	Without load, ballast (or transport axles), with maximum jib and maximum height.	Sin carga, sin lastre, (ni tren de transporte), flecha y altura máxima.	A vuoto, senza zavorra (ne assali di trasporto) con braccio massimo e altezza massima.	Sem carga (nem trem de transporte)- sem lastro com lança e altura máximas.
	Nous consulter	Auf Anfrage	Consult us	Consultarnos	Consultateci	Consultar-nos

Courbes de charges
Lastkurven
Load diagrams
Curvas de cargas
Curve di carico
Curva de cargas

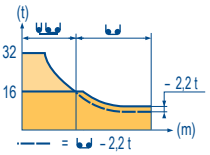
LZA 2

25 t

70 m	5,7 ►					42,4	45	50	55	60	65	**70**	m
						25	23,4	20,8	18,6	16,9	15,3	**14,05**	t
40/50/60 m	5,7 ►						45	**50**	55	**60**	m		
							25	**22,2**	20	**18,05**	t		

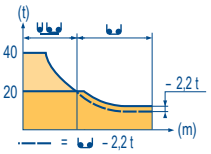
32 t

70 m	5,7 ►				31,9	35	40	45	50	55	56,4	63,1	65	**70**	m
					32	28,7	24,6	21,3	18,7	16,5	16	16	15,4	**14,15**	t
40/50/60 m	5,7 ►			33,8	35	**40**	45	**50**	55	**60**	m			
				32	30,8	**26,3**	22,9	**20,1**	17,8	**15,95**	t			



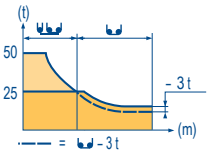
40 t

70 m	5,7 ►	26,2	30	35	40	45	47,4	52	55	60	65	**70**	m
		40	34,3	28,7	24,6	21,3	20	20	18,7	17	15,4	**14,15**	t
40/50/60 m	5,7 ►	27,8	30	35	**40**	45	**50**	50,2	55,1	**60**	m		
		40	36,7	30,8	**26,3**	22,9	**20,1**	20	20	**18,15**	t		



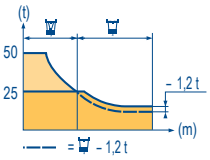
50 t

70 m	5,7 ►	20,8	25	30	35	37,2	41	45	50	55	60	65	**70**	m
		50	40,2	32,4	26,8	25	25	22,4	19,8	17,6	15,8	14,3	**13**	t
40/50/60 m	5,7 ►	21,9	25	30	35	39,2	**40**	43,3	45	**50**	55	**60**	m	
		50	43	34,7	28,8	25	**24,4**	25	23,9	**21,2**	18,9	**17**	t	



50 t

70 m	5,7 ►	19,9	25	30	34,6	35,9	40	45	50	55	60	65	**70**	m
		50	38	30,2	25	25	21,7	18,4	15,8	13,7	11,9	10,4	**9,1**	t
40/50/60 m	5,7 ►	21,1	25	30	35	36,8	38,1	**40**	45	**50**	55	**60**	m	
		50	40,9	32,6	26,7	25	25	**23,5**	20	**17,3**	15	**13,1**	t	



Mécanismes
Antriebe
Mechanisms
Mecanismos
Meccanismi
Mecanismos

LZA 3

										ch - PS hp	kW	
	25 t	150 LCC 63	m/min	40 → 48 → 60 → 80 → 96					20 → 24 → 30 → 40 → 48			150	110	520 m
			t	12,5	9,4	6,25	3,1	1,6	25	18,8	12,5	6,2	3,2			
	32 t	250 LCC 80	m/min	46 → 68 → 86 → 108 → 122					23 → 34 → 43 → 54 → 61			250	180	620 m
			t	16	12	8	4	2	32	24	16	8	4			
	40 t	250 LCC 100	m/min	40 → 52 → 66 → 84 → 96					20 → 26 → 33 → 42 → 48			250	180	488 m
			t	20	15	10	5	2,5	40	30	20	10	5			
	50 t	250 LCC 125 M5	m/min	31 → 46 → 58 → 74 → 84					15,5 → 23 → 29 → 37 → 42			250	180	410 m
			t	25	18,75	12,5	6,25	3,1	50	37,5	25	12,5	6,2			
	50 t	250 LCC 125	m/min	30 → 44 → 56 → 72 → 80					15 → 22 → 28 → 36 → 40			250	180	690 m
			t	25	18,75	12,5	6,25	3,1	50	37,5	25	12,5	6,2			
	25 t	15 DVF 16	m/min	0 → 47 (25 t) - 0 → 63 (12,5 t) - 0 → 76 (6,25 t) - 0 → 100 (3,1 t)								15	11	
	32 t		m/min	0 → 33 (32 t) - 0 → 50 (16 t) - 0 → 67 (8 t) - 0 → 100 (2,5 t)										
	40 t		m/min	0 → 33 (40 t) - 0 → 50 (20 t) - 0 → 67 (10 t) - 0 → 100 (2,5 t)										
	50 t	25 DVF 25	m/min	0 → 33 (50 t) - 0 → 66 (25 t) - 0 → 80 (12,5 t)								25	18	
		RVF 192 Optima	tr/min U/min rpm	0 → 0,6								2 x 15	2 x 11	
			m/min	8,5 - 17								8 x 5	8 x 3,7	

CEI 38	IEC 38	kVA
400 V (+6% -10%) 50 Hz		150 LCC : 185 kVA 250 LCC / 15 DVF : 320 kVA 250 LCC / 25 DVF : 330 kVA

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F	D	GB	E	I	P
Levage	Heben	Hoisting	Elevación	Sollevamento	Elevação
Distribution	Katzfahren	Trolleying	Distribución	Ditribuzione	Distribuição
Orientation	Schwenken	Slewing	Orientación	Rotazione	Rotação
Translation	Kranfahren	Travelling	Traslación	Traslazione	Translação

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Réf. 2003 48 LZA 3

Réalisation Sedoc

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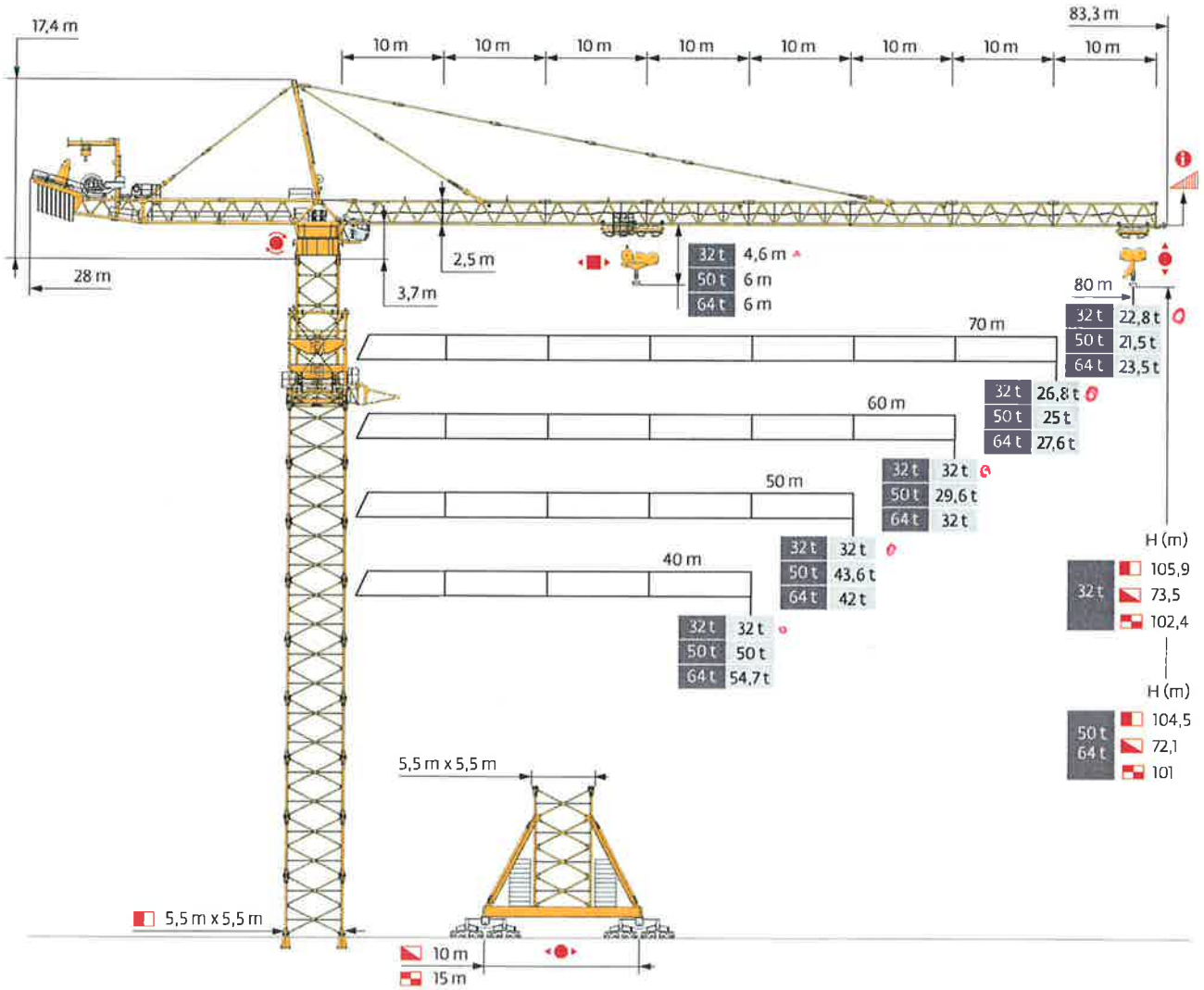
Potain MD 2200



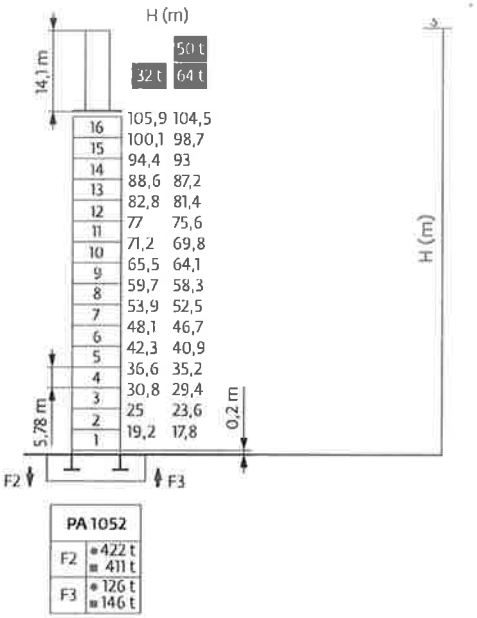
Power Control

Top Tracing II

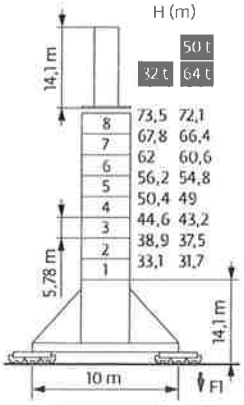
CE FEM 1.001-A3

Mât - Réactions / Mast - Reaktionskräfte / Mast - Reactions / Mástil - Reacciones / Torre - Reazioni
Tramo - Reacções / Реакция опор мачты

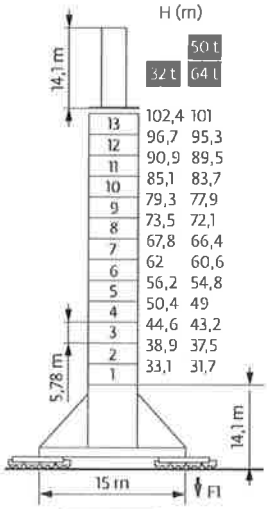
☑ 5,5 m
40 m → 80 m



PA 1052	
F2	• 422 t ▪ 411 t
F3	• 126 t ▪ 146 t

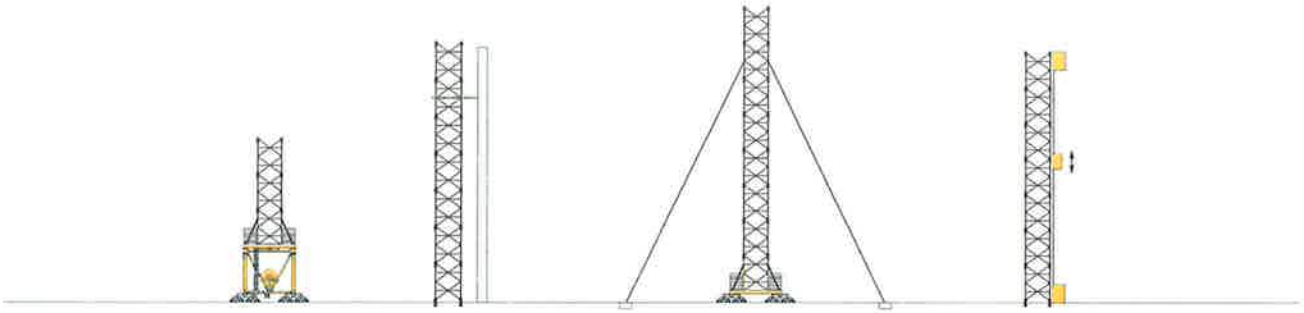


JC 1050	
F1	• 318 t ▪ 257 t



KA 1051	
F1	• 314 t ▪ 287 t

Autres implantations / Aufstellmöglichkeiten / Mounting possibilities / Otras implantaciones / Altre postazioni Outras implantações / Возможности установки



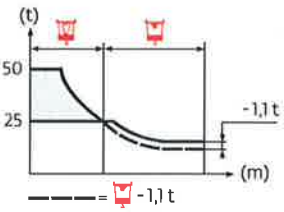
Courbes de charges / Lastkurven / Load curves / Curvas de cargas / Curve di carico Curvas de carga / Кривые нагрузок

32 t

40 m/50 m/60 m/70 m/80 m	6,5	▶						**60**	65	**70**	75	**80**	m
								32	**29,2**	**26,8**	**24,7**	**22,8**	t

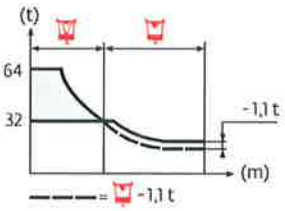
50 t

60 m/70 m/80 m	6,5	▶	38,7	40	45	50	55	**60**	65	68,6	**70**	75	**80**	m
			50	**48,1**	**41,9**	**37**	**33**	**29,6**	**26,8**	**25**	25	23,3	21,5	t
40 m/50 m	6,5	▶		44,4	45	**50**	m							
				50	**49,3**	**43,6**	t							



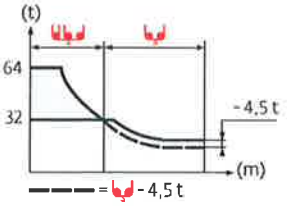
64 t

60 m/70 m/80 m	6,5	▶	30,3	35	40	45	50	54,2	55,7	**60**	65	**70**	75	**80**	m
			64	**54,3**	**46,4**	**40,3**	**35,4**	**32**	32	29,2	26,4	24	21,8	20	t
40 m/50 m	6,5	▶	34,9	35	**40**	45	**50**	m							
			64	**63,7**	**54,7**	**47,6**	**42**	t							



64 t

70 m/80 m	6,5	▶	31,1	35	40	45	50	55	55,1	61,7	65	**70**	75	**80**	m
			64	**55,9**	**47,7**	**41,3**	**36,2**	**32**	32	32	30,1	27,6	25,4	23,5	t
40 m/50 m/60 m	6,5	▶	31,2	35	**40**	45	**50**	55	**60**	m					
			64	**55,9**	**47,7**	**41,3**	**36,2**	**32**	32	t					



Mécanismes / Triebwerke / Mechanisms / Mecanismos / Meccanismi
Mecanismos / Механизмы

400 V - 50 Hz 480 V - 60 Hz														ch - PS hp	kW	
	400 V - 50 Hz	270 LVF 80 Optima	32 t	m/min	61	79	113	130	162	31	40	57	65	81	270	200	532 m
				t	16	12	8	6,7	2,8	32	24	16	13,4	5,6			
	480 V - 60 Hz	320 LVF 80 Optima		m/min	74	95	135	154	162	37	48	68	77	81	320	240	
				t	16	12	8	6,8	4,2	32	24	16	13,6	8,4			
	400 V - 50 Hz 480 V - 60 Hz	250 LCC 125	50 t	m/min	30	44	56	72	80	15	22	28	36	40	250	180	690 m
				t	25	18,8	12,5	6,2	3,1	50	37,5	25	12,5	6,25			
		250 LCC 160	64 t	m/min	24	34	44	56	62	12	17	22	28	31	250	180	440 m
				t	32	24	16	8	4	64	48	32	16	8			
		500 LCC 160		m/min	60		82		120	30		41		60	500	370	610 m
				t	32		21		5,4	64		42		10,8			
		15 DVF 16	32 t	m/min	0 → 33 (32 t) 0 → 50 (16 t) 0 → 67 (8 t) 0 → 100 (2 t)										15	11	
		25 DVF 25	50 t	m/min	0 → 33 (50 t) 0 → 66 (25 t) 0 → 80 (12,5 t)										25	18	
		25 DVF 33	64 t	m/min	0 → 25 (64 t) 0 → 50 (32 t)										25	18	
		RVF 194 Optima+		tr/min U/min rpm	0 → 0,6										4 x 15	4 x 11	
					ⓘ												

IEC 60204-32	kVA
400 V (+10% -10%) 50 Hz	270 LVF : 263 → 155 kVA 250 LCC : 283 kVA 500 LCC : ⓘ
480 V (+6% -10%) 60 Hz	320 LVF : 303 → 175 kVA 250 LCC : 329 kVA 500 LCC : ⓘ

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Per qualsiasi domanda specifica, vi preghiamo di contattarci. / Queiram por favor contactar-nos para qualquer esclarecimento técnico adicional.
В случае нестандартных вопросов, пожалуйста, консультируйтесь с нами.

	FR	DE	EN	ES	IT	PT	RU
	Appel de flèche	Auslegerüberhöhung	Jib elevation	Elevación de la flecha	Inclinazione braccio	Desvio da lança	Подъем стрелы
□	Équipements standards	Standardausrüstungen	Standard equipment	Equipamiento de serie	Equipaggiamento standard	Equipamento de série	Стандартное оборудование
□	Équipements optionnels	Sonderausrüstungen	Options	Equipamiento opcional	Equipaggiamento in opzione	Equipamento opcional	Дополнительное оборудование (опция)
●	Réactions en service	Reaktionskrafte in Betrieb	Reactions in service	Reacciones en servicio	Reazioni in servizio	Reacções em serviço	Реакция при работе
■	Réactions hors service	Reaktionskrafte außer Betrieb	Reactions out of service	Reacciones fuera de servicio	Reazioni fuori servizio	Reacções fora de serviço	Реакция в покое
	Levage	Heben	Hoisting	Elevación	Sollevamento	Elevação	Подъем
	Distribution	Katzfahren	Trolleying	Distribución	Ditribuzione	Distribuição	Перемещение по стреле
	Orientation	Schwenken	Slewing	Orientación	Rotazione	Rotação	Поворот
	Translation	Kranfahren	Travelling	Traslación	Traslazione	Translação	Перемещение крана
kVA	Puissance requise	Erforderliche Leistung	Required power	Potencia Necesaria	Potenza richiesta	Potência Necessária	Потребляемая мощность
	Fonction Power Control vitesses levage «montée» adaptées à la puissance disponible	Funktion Power Control An die verfügbare Leistung angepasste Hubgeschwindigkeiten „Heben"	Power Control function: „Hoisting" speeds adapted to the available power	Función Power control (control de la potencia): velocidades de elevación "arriba" adaptada a la energía disponible	Funzione Power Control : velocità del sollevamento « salita » adattate alla potenza elettrica disponibile	Função Power control (controlo de potência): velocidades de elevação "subir" adaptada a energia disponível	Функция Power control изменение скорости подъема в зависимости от мощности источника питания
ⓘ	Nous consulter	Auf Anfrage	Consult us	Consultarnos	Consultateci	Consultar-nos	Проконсультируйтесь у нас

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Appendix 9.2

Organizational Chart

ORGANIZATION CHART

- Project Manager: Kazuhiko Chabayashi
- Environmental Advisory Consultant: Sustainable Society Agriculture Forestry and Environment Consult Company Limited

ADMINISTRATION SECTION

- Admin. Manager: Makoto Harada
  - Account/Finance
    - Accountant: Somboun Chanthavong
    - Account Assistant: Khamfong Chanthabouly; Deunphen Vayaphan
    - Office Maid: Luk Phonharsa; Bounta Xayyavong
  - General Affair
    - Administrator: Soudsakhone Phomarinh
    - Admin Clerk: Nirut Tiyanont; Tran Thi Bich Lien
    - Admin Assistant: Yeng Leenhiavue; Ningthida Vilamongkhoun; Nguyen Ly Kim Ngan; Kolar Sisayanta; Noy Simmaly
    - Driver: Souksamone Souliyamath; Davone Sisuvong; Thongxay Xayyasan; Bounom Thammavong; Vinut Vongphouthone; Soudsada Khounphanya; Manothai Phaxaysisounon; Phomma Phongoudon; Khamdy Khamsy; Daovine Vongkeomany; Bounmy Xayyarath; Lamnhay Bounsong; Phoutthasin Sitsathone; Souliya Phetvongseng; Paseuth Luensai
  - Purchase/Logistics
    - Purchaser
  - Clinic
    - Doctor
    - Nurse: Jetana Kongrattananon
    - First Aider: Keita Tamura; Yeng Leenhiavue; Thinkonenapha Sybounhueang; Phonepaseuth Oudom; Truong Nguyen Di Khuong; Nguyen Ahn Quoc; Ho Cong Minh; Bui Xuan Thai; Michael M. Adducul; Dante Bello Anastacio; Ha Vinh Phuc
  - Chief Admistrator: Shion Ishiguro
    - JP Staff House
      - Cook: Veow Boulikhan
      - Cook Assistant: Bounpheng Xayyasan
      - Maid: Tan Phonthavong
      - Maintenance
    - Lao & Foreign Staff House
      - Cook; Cook Assistant; Maintenance
      - Maid: Vilayphone Sisavath; Kavang

ENGINEERING SECTION

- Engineering Manager: Takayuki Kimura
  - Deputy Eng. Manager
    - Shop Drawing
      - Civil Engineer: Vo Quoc Hung
      - CAD Operator: Ho Van Quoc; Le Minh Truc; Moneta Khounphachan; Nguyen Van Tuan; Trinh Thi Thanh Ha; Nguyen Quoc Anh
    - Quantity Survey
      - Chief QS Engineer
      - QS Engineer: Tran Anh Kiet; Nguyen Viet Thu; Jane A. Mercado
      - Assistant QS Engineer
    - Document Control
      - Doc. Controller: Nguyen Thi Hoang Minh; Nguyen Cam Nhung
    - Quality Control (Laboratory)
      - Chief QC Engineer: Luong Ngoc Loc
      - QC Engineer: Tran Anh Tuan
      - QC Assistant: Huynh Ngoc Quyen
      - QC Test Helper
    - Contract
      - Chief Contract Engineer: Luong Pham Duy
      - Contract assistanat
      - Public Relation

SAFETY & ENVIRONMENTAL

- Construction Manager: Tomohiro Taguchi
  - Chief Engineer: Vanhxay Sengsavang
    - Safety & Envi. Officer: Lester Baticula Palarca; Jerry B. Ponferrada; Souaxiong Briatu; Keethao Boualee
    - Environmental Specialist: Santi Sayakoummane

CONSTRUCTION SECTION

- Construction Manager: Tomohiro Taguchi
  - Deputy Construction Manager: Atsushi Esaki
    - Road Works, Dyle, Waste Disposal
      - Chief Engineer: Vo Anh Pha
        - (Road Works)
          - Civil Engineer: Khaiphone Sengmany
        - (Dyke)
          - Civil Engineer: Phanmaha Ekalath; Phonepaseuth Oudom; Khamvong Phongsouvanh
          - Office Engineer: Ananhxay Insiziengmai
        - (Waste Disposal)
          - Civil Engineer: Trinh Ngoc Viet
    - Other Contractor's Camp
      - Civil Engineer: Ray John C Senato; Che A Cam; Thinkonenapha Sybounhueang
    - Owner's Base Camp
      - (Site Works)
        - Civil Engineer: Tinnawit Sriputthirat
      - (Documents)
        - Civil Engineer: Sakda Pongsuk; Wasin Inoum
    - Survey
      - Chief Engineer
      - Surveyer: To Hoang Anh; Assistant Surveyer: Nguyen Phuoc Anh; Survey Helper (worker supply)
      - Surveyer: Bui Xuan Dung; Assistant Surveyer: Phonemexay Lornengfa; Survey Helper (worker supply)
      - Surveyer: Nguyen Van Tung; Assistant Surveyer; Survey Helper (worker supply)
- Construction Manager: Takeo Tsuchihashi
  - Deputy Construction Manager: Hideki Fukami
    - Re-reguration Dam / Dyke
      - Chief Engineer: Keita Tamura
        - (Structure)
          - Chief Engineer: Nguyen Binh Phuong
          - Civil Engineer: Michael M. Adducul; Nguyen Hong Minh; Nguyen Tri Tuc
          - Supervisor: Dao Van Nam; Vo Minh Quang; Nguyen Thanh Huy; Nguyen Van Thuc; Vu Duc Thien; Bui Danh Loc
        - (Excavation / Diversion)
          - Chief Engineer: Alexander T. Audian
          - Civil Engineer: Ha Vinh Phuc; Nguyen Huu Luyen
          - Supervisor: Ho Phi Hoang; Dao Van Dong; Nguyen Van Ngoc
          - Office Engineer: Nguyen Ngoc Quang Huy
          - Office Assistant: Khonesavanh Keophaserth
- Construction Manager: Akio Igarashi
  - Deputy Construction Manager: Toshihiko Tange
    - Diversion Tunnel
      - (Tunnel)
        - Chief Engineer: Le Duc Chuyen
        - Civil Engineer
        - Supervisor: Nguyen Quang Chuc
      - (Structure)
        - Chief Engineer
        - Civil Engineer: Truong Nguyen Di Khuong
        - Supervisor
- Construction Manager: Keiji Sasaki
  - Deputy Construction Manager: Hiroyuki Iyota
    - Main Dam Construction
      - (Quarry / Aggregate Plant)
        - Chief Engineer: Nguyen Ahn Quoc
        - Civil Engineer: Ngo Thanh Danh
        - Supervisor: Nguyen Gia Hieu; Nguyen Doan Minh Quan; Do Van Khanh
      - (Excavation & Dam Body)
        - Chief Engineer: Hisashi Nagasima
        - Chief Engineer: Vu Minh Duc
          - Civil Engineer: Ha Bac Son; Pham Hai Duong
          - Supervisor: Wittaya Phuangin; Nguyen Tan Luc
        - Chief Engineer: Sergio M. Adducul Jr.
          - Civil Engineer: Ho Cong Minh; Dante Bello Anastacio; Nguyen Minh Thien; Bui Xuan Thai
          - Supervisor: Hua Tan Tai; Dinh Dinh Thieu; Nguyen Thanh Tien
      - (RCC/CVC Plant)
        - Chief Engineer: Nguyen Ngoc Liem
        - Civil Engineer: Hoang Hai Duong; Hoang Dinh Noi; Nong Minh Duc
        - Supervisor: Huynh Ngoc Quyen; Dang Hong Thanh; Tran Thanh Phong; Nguyen Quoc Nam; Ngo Van Cuong
      - (Grouting)
        - Chief Engineer: Jedsada Sanggred
        - Civil Engineer
        - Supervisor: Nguyen Dinh Kinh; Doua Yangchiahue
      - (Cofferdam / Powerhouse)
        - Chief Engineer: Eduardo Dadia Millano
        - Civil Engineer: Tran Anh Tuan; Christoper Nicdao Viray; Huynh Cong Dan
        - Supervisor: Nguyen Huu Tri; Dinh Minh Hai; Nguyen Ngoc Tuyen; Tran Van Quang; Trinh Van Doan
- Construction Manager: Seiji Nagasaka
  - Deputy Construction Manager: Keisuke Machida
- M & E Manager: Ryuichi Miyanohara
  - M & E
    - M&E Chief Engineer
      - Mechanical Engineer: Tran Quang Hop; Assistant
      - Erectrical Engineer: Shopheap Noun; Bounlone Phomphakdy; Assistant: Anousone Haonechanh

As of 27th November 2015

OBAYASHI

NAM NGIEP 1 HYDROPOWER PROJECT
SONG DA 5 JOINT STOCK COMPANY
ORGANIZATION CHART

PROJECT MANAGER — Tran Huu Hung

- **Head of Administration Dept** — Le Thanh Son
  - Administration Staff: Vu Van Thuc; Pham Thi My Hanh; Nguyen Thu Phương
  - Interpreter: Nguyen Ngoc Thuc; Nguyen Huy Thai
  - HR Manager: Vanly Suppaso
- **Head of Technical Dept** — Le Anh Duc
  - 3D Designer: Nguyen Dai Nghia
  - Technical Staff: Pham Duy Kien; Nguyen The Dat; Le Dang Thang; Dinh Quang Toan
- **Head of Economist Dept** — Nguyen Duc Huy
  - Economist: Nguyen Văn Ngọc
- **Head of Accounting&Finance** — Pham Quang Tuan
  - Accountant: Ngo Thi Thu Sang
  - Accountant: Nguyen Anh Duc; Nông Thị Hiệp
- **Head of M&E Dept** — Mai Gia Thanh
  - M&E Staff: Pham Tien Dat
  - M&E Staff: Vu Thien Hoang; Bui Ngoc Quynh

RE-REGULATION DAM PACKAGE CONSTRUCTION MANAGER — Doan Xuan Duc

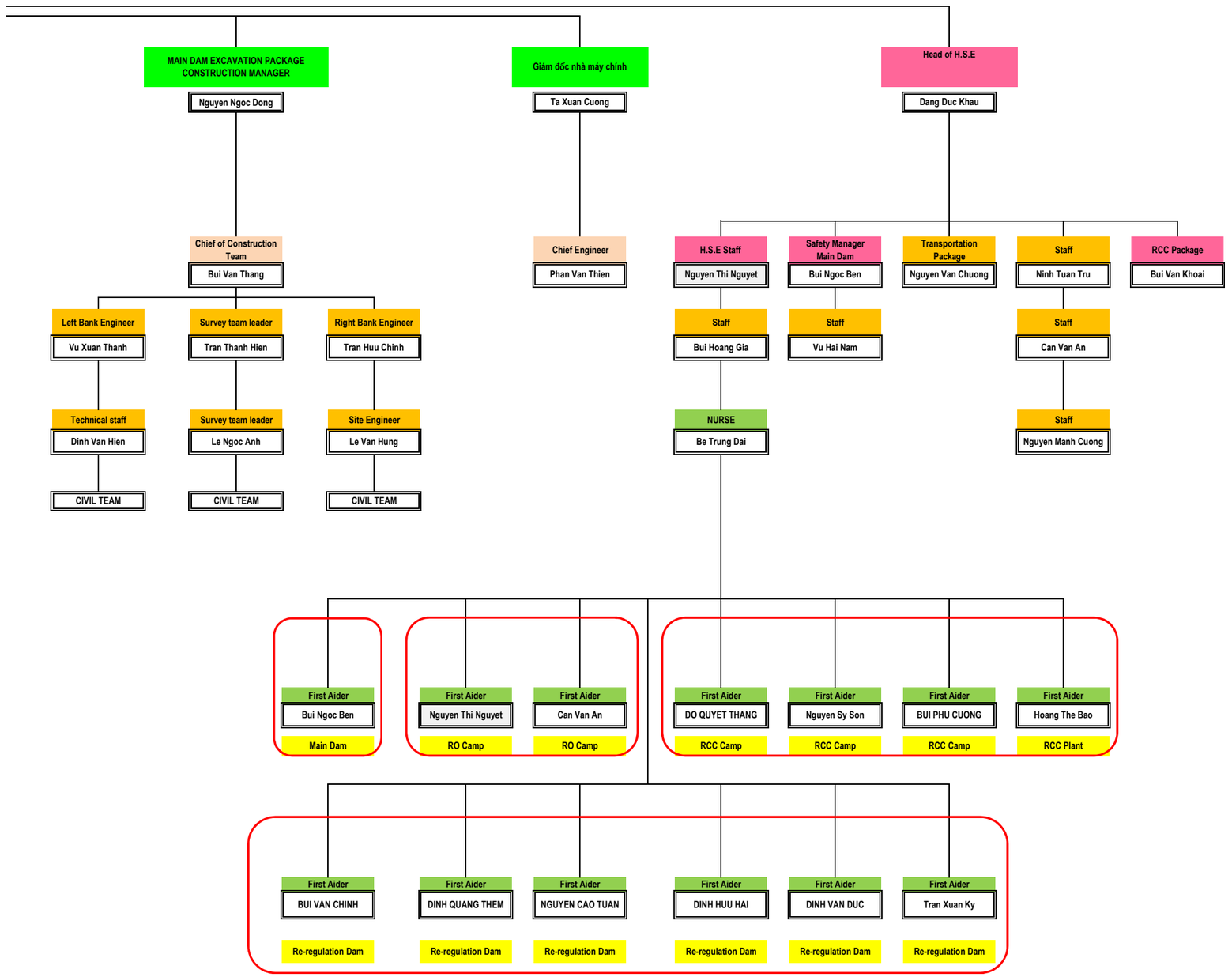
- **Chief Engineer** — Nguyen Van Nghiem
  - Rebar Fabrication Team leader: Nguyen Xuan That
    - Site Engineer: Bui Xuan Thanh; Nguyen Duy Liem
      - REBAR TEAM
  - Surveyor: Tran Manh Hong
    - Surveyor: Hoang Van Hung
  - Chief of Construction Team: Le Kim Anh; Nguyen Doan Thuong
    - Site Engineer: Nguyen Van Long; Cao Van Thanh; Nguyen Tuan Anh; Tran Xuan Ky; Duong Ngoc Tuan

RCC PLANT & RCC PLACING PACKAGE CONSTRUCTION MANAGER — Vuong Thanh Tung

- **RCC PACKAGE DEPUTY MANAGER** — Pham Quoc Ung
  - Surveyor: Tran Văn Long
    - Surveyor: Nguyen Ngoc Hai
  - Team leader - Belt conveyor installation: Dao Tien Tuan
    - Vice Team leader: Pham Van Tuong
      - Site Engineer: Tran Ngoc Liem; Tran Van Tuyen
  - Chief of CVC-Crushing Plant: Tran Van Thang
    - Site Engineer: Bui Van Ha
  - Technical Staff: Dang Van Tu
- **RCC PACKAGE DEPUTY MANAGER** — Phạm Viết Khiết
  - Chief of Construction Team: Tran Van Gian
    - Site Engineer: Nguyen Van Hung
      - Site Engineer
  - Chief of Cooling System: Đoàn Xuân Thủy
    - Vice Chief: Nguyễn Văn Thuận
      - Site Engineer: Nguyễn Quốc Khánh
  - Chief of Electricity Team: Đặng Trần Hải
    - Vice Chief: Nguyen Cong Do
      - Site Engineer: Trần Văn An
  - Chief of Mechanical Team: Phạm Văn Công
    - Site Engineer: Le Ngoc Anh
  - Basic Construction: Nguyen Hong Ha

- **RCC Placement Manager** — Dinh Van Dai
  - **RCC Placement Deputy Manager** — Tran Van Son
    - Interpreter: Duong T. Thu Huong
    - Chief of Construction: Le Dinh Quang
      - Shift Leader: Hoang Quang Trung
        - Site Engineer: Le Van Cuong; Tran Van Tuan; Bui Xuan Toan
      - Shift Leader: Than Trong Phuong
        - Site Engineer: Dinh Van Giang; Nguyen Ngoc Truong; Duong Minh Tuoi; Dinh Van Luong
      - Shift Leader: Pham Quang Anh
        - Site Engineer: Tran Ngoc Giap; Nguyen Cong Son; Pham Duy Kiem; Do Van Hung
    - Engineer: Nguyen Trong Trung
      - QA/QC Engineer: Le Kim Trong
        - QA/QC Engineer: Le Dinh Tuan
- **Chief of Lab** — Doan Hong Ky
  - Vice of Lab: Nguyen Van Khue
    - Cheif of Lab test: Le Van Nam
    - Cheif of Field test No.1: Truong Van Thang
  - Vice of Lab: Dao Van Liem
    - Cheif of Field test No.2: Nguyen Quoc Hung
    - Cheif of Field test team No.3: Nguyen Trong Oanh

19-Dec-2015

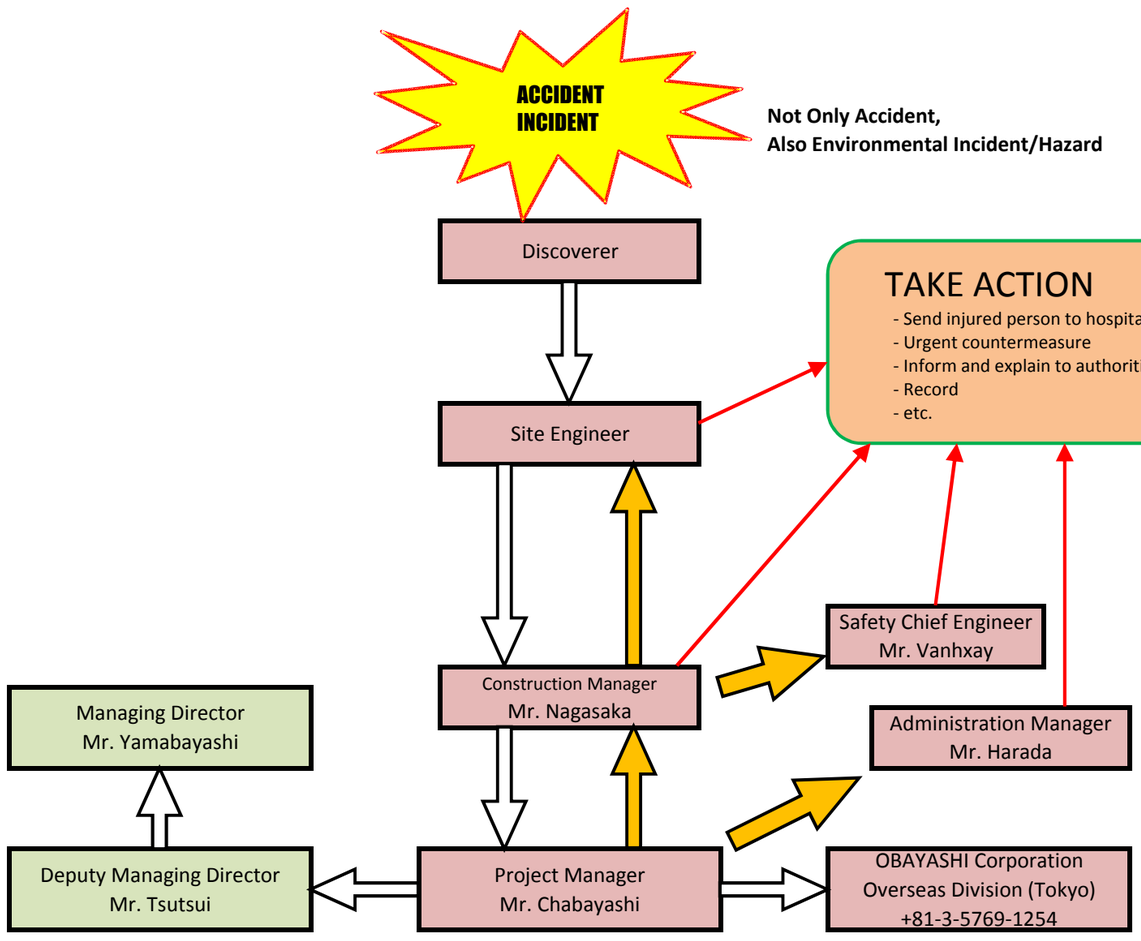

MAIN DAM EXCAVATION PACKAGE CONSTRUCTION MANAGER
Nguyen Ngoc Dong
Giám đốc nhà máy chính
Ta Xuan Cuong
Head of H.S.E
Dang Duc Khau
Chief of Construction Team
Bui Van Thang
Chief Engineer
Phan Van Thien
H.S.E Staff
Nguyen Thi Nguyet
Safety Manager Main Dam
Bui Ngoc Ben
Transportation Package
Nguyen Van Chuong
Staff
Ninh Tuan Tru
RCC Package
Bui Van Khoai
Left Bank Engineer
Vu Xuan Thanh
Survey team leader
Tran Thanh Hien
Right Bank Engineer
Tran Huu Chinh
Staff
Bui Hoang Gia
Staff
Vu Hai Nam
Staff
Can Van An
Technical staff
Dinh Van Hien
Survey team leader
Le Ngoc Anh
Site Engineer
Le Van Hung
NURSE
Be Trung Dai
Staff
Nguyen Manh Cuong
CIVIL TEAM
CIVIL TEAM
CIVIL TEAM
First Aider
Bui Ngoc Ben
Main Dam
First Aider
Nguyen Thi Nguyet
RO Camp
First Aider
Can Van An
RO Camp
First Aider
DO QUYET THANG
RCC Camp
First Aider
Nguyen Sy Son
RCC Camp
First Aider
BUI PHU CUONG
RCC Camp
First Aider
Hoang The Bao
RCC Plant
First Aider
BUI VAN CHINH
Re-regulation Dam
First Aider
DINH QUANG THEM
Re-regulation Dam
First Aider
NGUYEN CAO TUAN
Re-regulation Dam
First Aider
DINH HUU HAI
Re-regulation Dam
First Aider
DINH VAN DUC
Re-regulation Dam
First Aider
Tran Xuan Ky
Re-regulation Dam

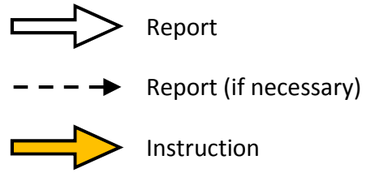
Appendix 9.3

Emergency Plan

Emergency Plan for Nam Ngiep 1 Hydropower Project

OBAYASHI Corporation





Nam Ngiep 1 Power Company Pakxan Office 054-280-168	
VTE Office	021-265-185
Mr. Yamabayashi	020-59-565-888
Mr. Tsutsui	020-55-566-959

Obayashi Corporation Pakxan Office 054-790-686	
Mr. Chabayashi	020-59-888-201
Mr. Harada	020-59-888-208
Mr. Nagasaka	020-59-888-205
Mr. Sasaki	020-59-888-218
Mr. Tsuchihashi	020-59-888-206
Mr. Kimura	020-59-888-204
Mr. Ishiguro	020-59-888-217
Mr. Dodo	020-22-422-582
Emergency Assistance Japan	+81-3-3811-8153

Hospital / Immigration / Embassy / Others	
Hospital (Lao) Bolikhamxay Provincial Hospital	054-212-154 (8:00 - 16:00) **Emergency 24Hrs.** Tel : 054-212-099
Ambulance Bolikhamxay Provincial Hospital	054-212-149 (8:00 - 16:00) **Emergency 24Hrs.** Tel : 020-5508-4966
Hospital (Thai) Bueng Kan Hospital	+66-42-491-161～3 (ext. 295) (24hrs) **Emergency** :Ms.Sunan Nokthong (Chief Nurse) Mobile: +66-86-857-8279
Hospital (Thai) Bangkok Hospital Udon Thani	+66-42-343-111 **Emergency** : Mr.Prayoon Thavon(John) (International Marketing Executive) Mobile: +66-85-010-6338
Immigration (Lao)	Mr.Sykhamxay Mobile: 020-2343-4666
Immigration (Thai)	Pol.Lt.Col. Wallop Khunmuan Mobile: +66-81-616-1100
Boat	Mr.Mone Mobile : 020-2233-9943
Helicopter	Lao Skyway Tel : 021-512-027
Embassy of Japan **Urgent Case**	020-5551-4891
Embassy of Japan **Medical Attaché**	Dr. Rie Ogiwara Mobile : 020-5559-9502

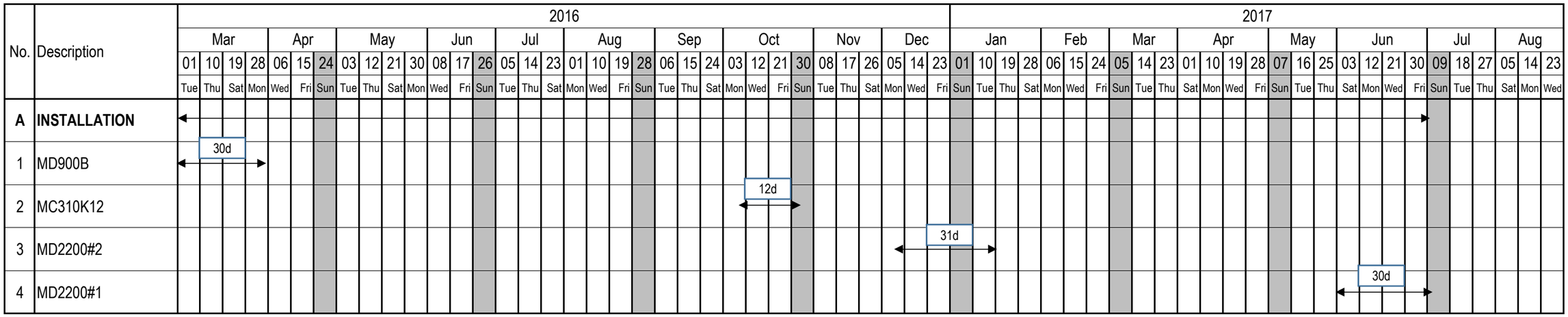
Head of Villagers of Relevant Villages		
Name of Village	Name of Head	Contact No.
Nonsomboun	Mr. Touy Inthavong	020-5614-9468
Thaheua	Mr. Boonhieng	020-5549-1810
Hat Gniun	Mr. Phouvieng	020-5977-4434
Hatsaykham	Mr. Phonsysong	030-5738-860

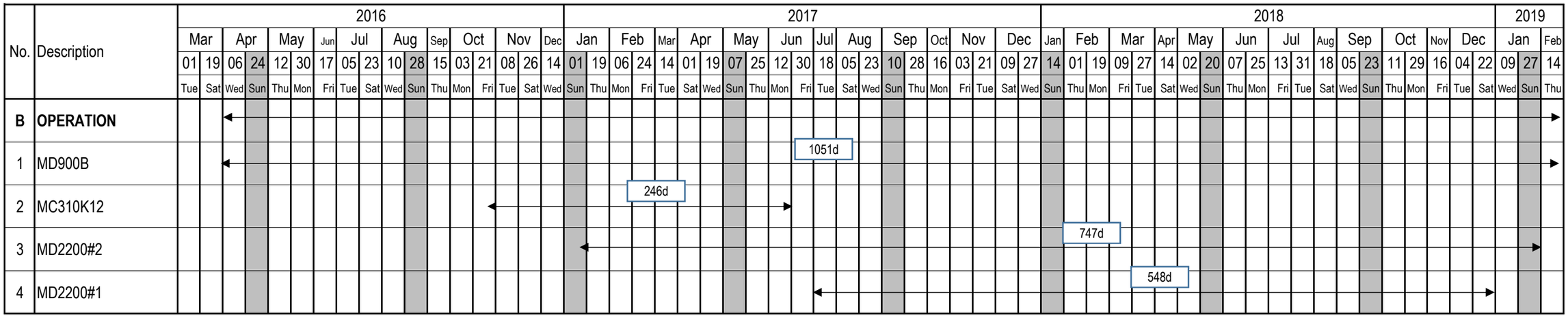
Rev. A4 As of 23th September 2014

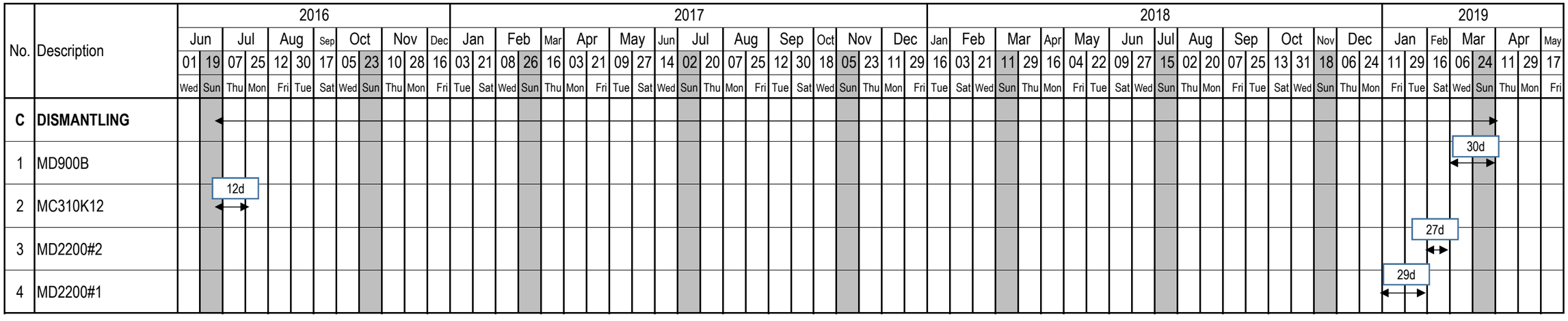
Appendix 9.4

Construction Schedule

SCHEDULE FOR INSTALLATION, OPERATION, AND DISMANTLING OF TOWER CRANE AT MAIN DAM







Appendix 9.5

Inspection and Test Plan (ITP)

9.5 INSPECTION AND TEST PLAN (ITP)

Item	Testing / Inspection Items	Description (Properties to be tested)	Specification	Inspection and Test Method	Acceptable Criteria	Inspection by			Testing Location	Frequency	Verifying Document
						S/C	OC	Own			
1	CVC										
	During concreting	Slump	TS 6.6 & 6.18	ASTM C143	Mix design	I	I	N/A	Site	1/115m^3 or 1/ each class/ each delivery day	Checklist
		Temperature, (^{o}C)	TS 6.6 & 6.18	ASTM C1064	≤ 32^{o}C (ASTM C94)	I	I	N/A	Site		Checklist
	After concreting	Compressive Strength (Normal Curing) at 7, 28, and 91 days (if use fly ash)	TS 6.6 & 6.18	ASTM C39 (AASHTO T22)	Specified strength in Mix design	I	I	N/A	Lab		Test Report
2	Re-bar	Quality Test: _Tensile Strength _Yield Point _Elongation	TS 6.15.1	Visual inspection	ASTM A615/ JIS G3112, grade SD345	I	I	N/A	Site	Each delivery	Mill Certificate

Legend:

S/C:	Subcontractor &
OC:	The Contractor
Own:	The Owner
H:	Hold Point
I:	Inspection
W:	Witness by Owner
R:	Document Review

Accredited Laboratories:	
Name	Address
1. TBA	
2. TBA	
3. TBA	

Appendix 9.6

Risk Register

TOWER CRANE AT MAIN DAM – REGISTER OF ASPECTS AND HAZARDS

Prepared by Name/Signature: _____ Date: _____

Approval by Name/Signature: _____ Date: _____

Activity	Sub Activity	Hazards	Risks/Impacts	Risk Rating	Control Measure	Risk Rating After Control Measure	Acceptance Criteria
Occupational Health and Safety							
Machinery Mobilization and Operation	Equipment and material transport	Potential of traffic accident with third party	Injury to third party	Low	Training to sub-contractors and supplier prior to first delivery	Low	Acceptable
	Hauling	Potential of collision with equipment	Injury/ Fatality	Low	Conduct toolbox meetings and periodical training	Low	Acceptable
	Erection and dismantling of machinery	Potential of falling from heights	Injury/ Fatality	Medium	Training for wearing of safety harness when at heights prior to work	Low	Acceptable
	Installing and wiring electricity	Potential of electrical faults	Injury/ Fatality from electrocution	High	Only use trained technicians	Medium	Acceptable
	Hand and power tools	Potential of electrical faults	Injury/ loss of limb/ fatality from miss-use of tool	High	Adequate training and use experienced workers	Medium	Acceptable
Common Works	Lack of awareness for safe health	Unsafe action, inadequate health control	Injury/ disease	Low	Carry out induction training and toolbox meetings	Low	Acceptable
	Using hand/power tools	Potential of electrical faults	Injury/ loss of limb/ fatality from miss-use of tool	High	Adequate training and use experienced workers	Medium	Acceptable
	Loading and unloading of equipment off/on trailer	Falling from trailer	Injury/ fatality	Medium	Conduct training and toolbox meetings	Low	Acceptable

Activity	Sub Activity	Hazards	Risks/Impacts	Risk Rating	Control Measure	Risk Rating After Control Measure	Acceptance Criteria
Common Works	Installing and dismantling of equipment and/or facilities	Getting caught in equipment	Injury/ fatality	Medium	Conduct toolbox meeting and periodical training	Low	Acceptable
	Operating, maintenance, falling from equipment	Contact with or falling from equipment	Injury/ loss of limbs/ fatality	High	Conduct training and toolbox	Medium	Acceptable
	Working at heights	Falling from scaffolding or equipment	Injury/ Fatality	High	Conduct training and toolbox meetings. Provide safety belts and guard rails around working area	Medium	Acceptable
	Working in confined spaces	Lack of oxygen, inhalation of toxic gas	Injury/ fatality	High	Provide adequate ventilation, such as blower or ducts.	Medium	Acceptable
Concrete Works	Transportation of mixer truck	Potential of collision with other vehicle, stuck and sink of vehicle	Injury/ fatality	Medium	Conduct training, toolbox meetings and assign watchmen, check condition of access road daily	Low	Acceptable
	Pump concrete	Potential of collision with trucks and or other equipment	Injury/ fatality	Medium	Conduct training, toolbox meetings and assign watchmen	Low	Acceptable
	Casting of concrete by crane bucket	Stumbling over rebar, contact with bucket, compaction by vibrator	Sprain, fracture, injury, electrification	Medium	Conducting training prior to work commencement and toolbox meeting, assign watchman	Medium	Acceptable
Re-bar work	Erection and dismantling of scaffold/support system	Falling from heights, Collapse of scaffold/support	Fatality, injury	High	Training on safety belt prior to work commencement and toolbox meeting	medium	Acceptable

Activity	Sub Activity	Hazards	Risks/Impacts	Risk Rating	Control Measure	Risk Rating After Control Measure	Acceptance Criteria
Re-bar work	Lifting, setting, mishandling of materials, tools	Hitting, clashing, with falling materials/tools	Fatality, injury	High	Training on safety handling of materials prior to commencement of work and toolbox meeting, assign watchman	medium	Acceptable
	Reinforcing bar Fabrication	Cutting, pinching by rebar cutter, bender	Injury, amputation	Medium	Training on safety operation of machine prior to commencement of work and toolbox meeting	Medium	Acceptable
	Re-bar welding	Electric leakage	Electrification	High	Toolbox meeting: wear proper PPE, working area should be well-ventilated, proper earth grounding	Medium	Acceptable
	Preparation of formwork	Mishandling electric saw, planer	Amputation, injury, bruise	Medium	Toolbox meeting; wear proper PPE, should have enough working area	Medium	Acceptable
	Assembly of formwork, supporting system	hitting fingers with hammer, falling of form, supporting member	Bruise, fatality, injury	Medium	Training on safety handling of materials prior to commencement of work and toolbox meeting, assign watchman	Medium	Acceptable
Environmental							
Machinery Mobilization and Operation	Machine and material transportation	Dust caused by transportation vehicles	Air pollution	Medium	Conduct frequent water spraying of roads, especially along village locations.	Medium	Acceptable

Activity	Sub Activity	Hazards	Risks/Impacts	Risk Rating	Control Measure	Risk Rating After Control Measure	Acceptance Criteria
	Installing and dismantling of temporary structure	Consumption of fuel and electricity	Air pollution from equipment	Low	Maintain vehicle condition	Low	Acceptable
Common Works	Daily transportation	Consumption of fuel	Air pollution	Low	Regular maintenance of vehicles	Low	Acceptable
	Lack of awareness for health and safety	Environmental Awareness	Workers disposing of chemicals and other waste into waterways and local vegetation	Medium	Provide correct training to all workers before starting work	Medium	Acceptable
	Loading and unloading of equipment off/on trailer	Consumption of fuel	Air pollution	Low	Regular maintenance of vehicles	Low	Acceptable
	Installing and dismantling of temporary structure	Consumption of fuel, gas or electricity	Disposing of waste materials into the environment	Low	Training on how to treat waste materials after site closure	Low	Acceptable
	Operating, maintaining and repairing of equipment	Consumption of fuel or electricity	Air pollution, oil leaks, cleaning of vehicles	Low	Regular maintenance of vehicles. Clean and wash vehicles in correct location e.g., wash bays.	Low	Acceptable
Concreting	CVC placement	Disposal of remaining concrete/ washing water	Potential pollution of soil/ river	High	Dispose at specified area. Daily monitoring of work site condition	Medium	Acceptable
Structure Works	Spreading, compaction of concrete	Consumption of fuel, Disposal of surplus concrete	Noise/vibration/air pollution, Soil contamination	Medium	To train truck operators for disposal method and engine cut during waiting time	Medium	Acceptable
	Casting concrete, handling of heavy materials,	Consumption of fuel, Disposal of surplus concrete	Noise/vibration/air pollution, Soil contamination	Medium	To train truck and heavy equipment operators for disposal	Medium	Acceptable

Activity	Sub Activity	Hazards	Risks/Impacts	Risk Rating	Control Measure	Risk Rating After Control Measure	Acceptance Criteria
	operation of machineries				method and engine cut during waiting time		
Other	Natural Disasters	Flooding, Storms, Heavy Winds	Increased chance of injury or fatality, damage to vehicles, buildings and machinery	High	Emergency Procedures to be followed in the case of any natural disaster	Medium	Acceptable

Appendix 9.7

Environmental Management Activity Table

9.7 Environmental Management Activity Table for Tower Crane Works

Sub-plan Item		Monitoring Method	Monitoring Frequency	On-Site Implementation
SP01	Erosion and Sediment Control	Visual	Weekly or Heavy rain	• Almost excavation works were done while main dam excavation was deploying. • All of slope was protected by shotcrete with wire mesh. • Only minor chipping work will be required. • The construction area will be kept in the dry condition.
SP02	Water Availability and Pollution Control	Visual	Routine	• The water river from Nam Ngiep will be utilized for the construction. • The turbidity water will be treated at Waste Water Treatment Plant what will be provided at downstream of main dam body before discharge to the river. The details of this plant including calculation for sediment pond will be submitted separately. • No concrete will be disposed on site, any leftover concrete must be transported to the batching plant or disposal areas No. 2 and No. 6. • Washing of mixer trucks must also be carried out at designated wash bays. • No concrete waste is to be left behind or disposed into any water course.
SP03	Emission and Dust Control	Visual	Daily	• All workers must wear the appropriate PPE when on site. • Water spraying will be conducted daily on existing access roads. • The dust is minor due to there is no earth work. The main activities are re-bar and concrete work.
SP04	Noise and Vibration	Visual	Each time	• The distance from the construction areas to the nearest village, Ban Hatsaykam, more than 3km downstream from the site. There is no influence of noise and vibration. • All workers must wear the appropriate PPE at all times, including hard hat, ear plugs when working with loud cutting equipment and vibratory roller, correct gloves for working with welding machines and safety harnesses when working at the heights.
SP05	Waste Management	Visual	Each time	• General waste or recycled waste from workers must be collected and later transported back to worker camps or main construction site for correct disposal. • Construction waste, such a steel reinforcements, steel plate, H – beam will be stockpiled on site and then transferred to main construction site. • The waste bin and toilet will be provided at workshop nearby the construction area. All workers will be instructed to use properly. • Dumping any type waste into watercourses is highly prohibited
SP06	Hazardous Material Management	Visual	Weekly	• All fuels for heavy machinery are stored at worker camp sites in specially designed areas, with mobile fuel trucks used for refueling of machinery. • Any used containers will be stored appropriately on site in a designated area and removed straight away when empty. • Hazardous materials such as oils, paints and gas tanks will be kept securely to prevent spilling, e.g., gas tanks will be kept in a storage cage above any potential flood level.

Sub-plan Item		Monitoring Method	Monitoring Frequency	On-Site Implementation
				• Any hazardous containers will be labeled accordingly and kept in appropriate storage facilities, with all Material Safety Data Sheets (MSDS) when required. • Storage should have adequate roofing and concrete flooring to reduce the risk of any spillage. • Any hazardous waste materials will be maintained within these storage facilities and disposed of by approved companies. • Spill response kits will be provided where any such hazardous materials are stored. • Correct PPE must be used at all times. • Discharge of any hazardous materials into watercourses is highly prohibited
SP12	Unexploded Ordinance (UXO) Survey and Disposal	Visual	Each Time	• UXO clearance has been carried out at main dam excavation including powerhouse area by NNP1 before the beginning of any construction activities. • If any UXO's or suspicious objects are found, work must stop immediately and NNP1 notified.
SP14	Traffic and Access	Visual	Routine	• Traffic speed regulation devices as signage will be installed at sensitive locations in the vicinity and approaching construction site. • Barriers will be installed around high risk areas, such as along access roads around main construction sites. • The construction area will only be for Project workers and staff. No unauthorized entry will be permitted. • The installation of a security gate along road P1 (STA. 3+945km) will require an ID card for both persons and vehicles to be shown to security staff. Anyone without an ID card will not be allowed access into the construction site. • All construction vehicles will be restricted to 30km/h within the construction site. • Regularly monitoring of traffic conditions will be conducted as part of the weekly Environmental, Health and Safety inspection, with main focus being driving speeds around the Project site.
SP15	Training and Awareness	Visual / Verbal	Routine	• All new employees will be required to complete Induction Training from OC/NNP1 prior to commencing any work on site. • In this training, the Contractor will highlight site regulation/rule, and safety & environmental issue. • A register of induction training will be maintained and can be provided to NNP1 on request. • Monthly safety meetings and joint inspections will be conducted with all top management and safety staff, and will cover all relevant health and safety issues on site. • Weekly meetings are also conducted to bring further awareness to environmental health and safety issues. • Weekly and monthly environmental monitoring will also be carried out, items include visual monitoring of air quality, soil erosion, effluent discharge and waste disposal. • Daily toolbox meetings are also conducted to raise worker awareness regarding daily work schedules, safety issues and environmental issues. • Toolbox meetings are also conducted to raise worker awareness regarding safety and

Sub-plan Item		Monitoring Method	Monitoring Frequency	On-Site Implementation
				environmental issues such as attention in work with heavy truck, careful in narrow hauling road, work on the height as well as in the depth, regularly check and maintenance machinery, not disturb natural resource like watercourse; flora; fauna, etc. For these works training will emphasize prohibition of hunting and fishing within or around the construction area.
SP16	Project Personnel Health Program	Visual / Verbal	Routine	• Regarding the content of Section 6 in Part 1 of the DWP in this document a tool box meeting will also be carried out weekly and before commencement of any new works. • Health Awareness Training will be carried out for all personnel in the monthly mass meeting. • The register for each item above can be provided to NNP1 upon request • First aid kits will be prepared on site and in sub-contractor vehicles.
SP17	Emergency Preparedness	Visual	Weekly	• Referring to the emergency action plan in Appendix 9.3, the emergency response procedures, emergency contact numbers and communication and reporting procedures will be clearly displayed and each staff always carry it. • First aid kits will be prepared at each site accordingly. • Hazardous materials will be stored in the permitted area or the area instructed by the authorities. • In the case of oil spillage/ leakage accidents, the emergency response kits such as absorbent sheets or similar will be provided. • In case of the hazardous accident, ESD will be notified of the situation immediately, as per agreed procedures. NNP1 will the coordinate a response with the contractor. • In case of accidental happening, the Contractor will prepare the Accident Report to NNP1PC within 24 hours, including the immediate remedial action and preventive action for future re-occurrence. Site rehabilitation plans are also required in the event of serious contamination/ accident.
SP18	Cultural Resource	Visual	Each time	• If the Contractor is to find any new physical or cultural resources during Cofferdam construction, the Contractor shall stop the works and inform the Owner immediately and follow the Chance Find Procedures.