

No: SLT16/OCGC/EMP-16/QAQC/GEN/2019/3242

Date: 11th April 2019

To,
PMC-2R
Oriental Consultants Global Consortium
(OCG – OCI – NK – NKI – RITES)
Dedicated Freight Corridor Corporation India Limited (DFCCIL)
3rd Floor, Pragati Maidan, Metro Station Building Complex,
New Delhi – 110 001, INDIA.

Kind Attn.: **Mr. Katsuyuki Saito**
(Project Director, The Engineer for Employer)

Sub : Contract Agreement no. 2015/HQ/EL/Ph-II/EMP-16/8/SOJITZ-L&T dated 31-03-2016 for Design, Supply, Installation, Testing and Commissioning of 2x25kV Overhead Equipment's, Traction Sub-stations, Auxillary Stations, Switching Stations, Auto Transformer Stations and SCADA System on Design-Build Lump Sum Price Basis for JNPT – Makarpura (Vadodara) Section (Approx. 422 kms) of Western Dedicated Freight Corridor (Phase-2) (Contract package EM P-16), EM P-16. - **Submission of Control Copies of Method Statement for foundation, Mast Erection and Grouting**

Ref:- 1. SLT16's Letter No. SLT16/OCGC/EMP-16/QAQC/GEN/2017/3155 dated 28/03/2019
2. Engineer's Letter No. L/OCGC/DFCC/CMT/EMP-16/1804/22810 dated 5/04/2019

Dear Sir,

Further to the letter under reference No. 2 above, we hereby submitting the eight sets of Control Copies for the complete set of documents of Method Statement for foundation, mast erection and grouting for which NONO has been received. And further to the engineer's comments vide letter in reference 2 we are removed the "Normal mix using volume batching -manual mixing at site" from check list for mast alignment and grout.

Thanking you and assuring you of our best services at all times, we remain.

Yours' Sincerely,
For **SOJITZ – L&T CONSORTIUM**



(Ratnesh K. Srivastava)
Contractor's Representative



Copy to:

- GGM/Elect/WC-2, DFCCIL
- CPM(South), DFCCIL(Mumbai)
- ACPM(South), DFCCIL(Mumbai)
- ZMT-1 ZMT-2,ZMT-3

Encl: Eight sets of Control Copies for Method Statement for foundation, mast erection and grouting

SUBMITTAL

To Oriental Consultants Global Consortium (OCG) 3 rd Floor, Pragati Maldan Metro Station Building, New Delhi – 110001	Date: 11/04/2019	
	No: SUBM/SLT16/OCGC/EMP-16/QAQC/890	

Project:	ELECTRICAL AND MECHANICAL WORKS, PACKAGE-16 (EMP-16)
Subject:	Submission of Control Copies of Method Statement for foundation, Mast Erection and Grouting
Kind Attn.:	Mr. Katsuyuki Saito (Project Director)

Please find enclosed the following drawings / documents:

S.No.	Description	Drawing / Document No.	Rev*	Qty.	Cat.	Type	Remarks
1	Control Copies for Method Statement for foundation, mast erection and grouting	DOC/EMP16/QAQC/GEN/023	02	8	A	1 PR + 1CD	

* This revision supersedes the previous revision if any, of drawings / documents. Superseded drawings / documents shall be removed from all points of issue and / or use.

S.No.	Distribution	Qty.	Cat.	Type	Remarks
1	Dr. Sanjay Nayar, GGM/Elec./DFCCIL	1	I	1 PR	

Category (Cat.):

A - For Approval
 G - Good for Construction
 P - Preliminary

B - As Built
 J - For Information
 T - For Tender Purpose

Type:

CD - Compact Disc
 RP - Reproducible
 TC - Submittal

FD - Floppy Disk
 SC - Soft Copy
 Copy ZD - Zip Disk

PR - Prints
 TR - Tracings

Yours Sincerely
 For Sojitz-L&T Consortium



Ratnesh K. Srinastava
 (Contractor's Representative)



Contractor's Certification:

This certifies that all design has been performed utilizing the skill and care to be expected of a professionally qualified, competent and licensed designer, experienced in work of similar nature and scope. This further certifies that all works relating to the preparation, review, checking and certification of design has been verified by us.

For Contractor Sojitz - L&T Consortium.



Chief Design Engineer

Name: John Hasrouni

Position / Designation: Chief Engineering Manager
/SLT

Date: 11/04/2019

Place: Faridabad, Haryana



Contractor's Representative

Name: Ramesh K. Srivastava

Position / Designation: Project
Coordinator

Date: 11/04/2019

Place: Faridabad, Haryana

Design Certificate

This Design Certificate refers to the submission explained by Part A, B and C as described below.

Part A

- Submission no. SUBM/SLT16/OCGC/EMP-16/DGN/890 Comprises the following:
- Document/ Drawings: Submission of Control Copies of Method Statement for foundation, Mast Erection and Grouting

S. No.	Description	Document No.	Rev
1.	Control Copies for Method Statement for foundation, mast erection and grouting	DOC/EMP16/QAQC/GEN/023	02

Part B

Documents for which a "Notice of No Objection" has been issued and which are of relevance to this Submission no. SUBM/SLT16/OCGC/EMP-16/DGN/890

Document:

Technical Design Package No.:

Technical Submission No.: _____

Date of Issue of "Notice of No Objection":

Part C

NONOC for the documents mentioned in Part B annexed.

Designer's Statement:

We hereby certify that:

- a) The design of the Permanent Works / Temporary Works (as applicable), as illustrated and described in the documents scheduled in 'Part A' below, complies with the Employer's Requirements and Specifications requirements and the contractor's proposal.
- b) An in-house check has been undertaken and completed to confirm the completeness, adequacy and validity of the design of the Permanent Works / Temporary Works (as applicable) as illustrated and described in the documents scheduled in 'Part A' below;
- c) All necessary and required approvals relating to the design of the Permanent Works / Temporary Works (as applicable), as illustrated and described in the documents scheduled in 'Part A' below, have been obtained and copies of such approvals are annexed in 'Part C' below;
- d) All effects of the design comprising the submission on the design of adjacent or other parts of the Works have been fully taken into account in the design of those parts.

Signed by 'Authorized Representative'



(For Designer M/s Ardanuy)

Name: Sergio Raposo Carmona

Position / Designation: Project Manager

Date: 11/04/2019



A Sojitz - L&T Consortium



डेडीकेटेड फ्रेट कोरीडोर

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OCG CONSORTIUM

WDFC Phase-2

Electrical and Mechanical Works

Contract Package-16 (EMP-16)

Method Statement for Foundation, Mast Erection and Grouting

Document No-DOC/EMP-16/QAQC/GEN/023 Rev-2

CONTROL COPY (SET-01)

Contractor:

SOJITZ - L&T CONSORTIUM

c/o Larsen & Toubro Limited
Railway SBG, Vatika Mindscapes Building
Tower 'A', 8th & 9th Floors
12/3, Delhi – Mathura Road
Near Sarai Khawaja Metro Station
Faridabad – 121003, Haryana

Client:

**DEDICATED FREIGHT
CORRIDOR CORPORATION OF
INDIA LIMITED**

5th Floor, Pragati Maidan
Metro Station Building
New Delhi – 110001

Consultant:

**ORIENTAL CONSULTANTS
GLOBAL CONSORTIUM**

3rd Floor, Pragati Maidan
Metro Station Building
New Delhi – 110001

Designer / Sub-Contractor:

Ardanuy

ARDANUY INGENIERIA S.A.

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Tel. +34.91.799.45.00 Fax: +34.91.799.45.01
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**DEDICATED FREIGHT CORRIDOR
JNPT-MAKARPURA (VADODARA SECTION)
(APPROX. 422KM) INCLUDING TESTING
AND COMMISSIONING ON DESIGN BUILD
LUMP SUM PRICE BASIS OF (PHASE-2)
OF WESTERN DEDICATED FREIGHT
CORRIDOR
(PACKAGE EMP-16)**

**METHOD STATEMENT FOR
FOUNDATION , MAST
ERECTION AND GROUTING**

CONTROLLED COPY


(Ratnesh K. Srivastava)
Contractor's Representative
(EMP-16 – Sojitz –L&T Consortium)



(Shiv Kumar)
For The Engineer for Employer
(PMC-2R)

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Letter No. L/OCGC/DFCC/CMT/EMP-16/1904/22810

Dated: 05/04/2019

M/s Sojitz-L&T Consortium
C/O Larsen & Turbo Ltd.
Transportation Infrastructure-IC,
L&T Construction, Vatika Mindscape Building,
Tower A', 8th Floor, 12/3, Delhi – Mathura Road,
Near Sarai Khawaja Metro Station, Faridabad – 121003

(Kind Attn: Mr. Ratnesh K. Srivastava, Contractor's Representative)

Sub.: EMP-16: Design, Supply, Installation, testing and commissioning of 2X25KV overhead equipment, Traction Sub-station, Auxiliary Stations, Switching Stations, Auto Transformer Stations and SCADA Systems on design-build lump sum price basis for JNPT–Makarpura (Vadodara) section (approx. 422 kms) of Western Dedicated Freight Corridor (Phase-2) – Method Statement for foundation, Mast erection and grouting.

- Ref.:** 1. Contract Agreement No.2015/HQ/EL/Ph-II/EMP-16/8/SOJITZ-L&T dated 31.03.2016 Part-2 GS.
2. Contractor's letter–SLT16/DFCCIL/EMP-16/QAQC/GEN/2018/2255 dated 12.11.2018.
3. ZMT letter No.-L/OCGC/DFCC/ZMT-2/EMP-16/1902/267 dated 04.02.2019.
4. Contractor's letter–SLT16/DFCCIL/EMP-16/QAQC/GEN/2019/2861 dated 13.02.2019.
5. Engineer's Letter- L/OCGC/DFCC/CMT/EMP-16/1902/21331 dated 25.02.2019
6. Contractor's letter–SLT16/DFCCIL/EMP-16/QAQC/GEN/2019/3032 dated 06.03.2019.
7. Engineer's Letter- L/OCGC/DFCC/CMT/EMP-16/1902/22327 dated 26.03.2019
8. Contractor's letter–SLT16/DFCCIL/EMP-16/QAQC/GEN/2019/3155 dated 28.03.2019.

Dear Sir,

Vide letter under reference (7) above, Contractor has resubmitted the document after incorporating compliance to the Engineer's comments conveyed vide ref (7) for "Method Statement for foundation, mast erection and grouting. The submitted document has been reviewed by the Engineer and remarks are as under:

"Notice of No Objection" [NONO in terms of Sub Clause no.1.10.23 of ER (Ref-Part 2: Employer Requirement of CA)] is hereby issued to the document No. DOC/EMP-16/QAQC/GEN/023 (Rev 2) under reference (8) above subject to following correction in final submission of document.

1. It is noted that Contractor has not complied Engineer's comments vide ref. (5) that wherever manual mixing is mentioned in the document, shall be removed along with the relevant text/data.

Despite Engineer's comments, 'Normal mix using volume batching - manual mixing at site' is still mentioned in 'check list for mast alignment & grout'. It needs to be removed.

Yours sincerely,



(Shiv Kumar)
Dy. Project Director
For 'The Engineer' of Employer



- CC: 1. Mr. Sanjay Nayar (GGM/EL/WC-II/DFCCIL)
2. Mr. Rajiv Tyagi/ CPM (South)
3. Mr. Shyam Singh/CPM (North)
4. Mr. G.D. Bhagwani/CPM/Vadodara
5. ZMT-1, ZMT-2, ZMT-3

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No: SLT16/OCGC/EMP-16/QAQC/GEN/2019/3155

Date: 28th March 2019

To,

PMC-2R
Oriental Consultants Global Consortium
(OCG - OCI - NK - NKI - RITES)
Dedicated Freight Corridor Corporation India Limited (DFCCIL)
3rd Floor, Pragati Maidan, Metro Station Building Complex,
New Delhi - 110 001, INDIA.

Kind Attn.: **Mr. Katsuyuki Saito**
Project Director

Dear Sir,

Sub : Contract Agreement No. 2015/HQ/EL/Ph-II/EMP-16/8/SOJITZ-L&T dated 31.03.16 for "Design, supply, installation, testing and commissioning of 2X25 kV overhead equipment, traction sub-stations, switching stations, auto transformer stations and SCADA system on design-build lump sum price basis for JNPT-Makarapura(Vadodara) section (approx 422 kms) of Western dedicated freight corridor (phase-2) (contract package EMP-16)" : **EMP16 - Submission of Method Statement for Foundation, Mast Erection and Grouting.**

Ref :

1. Contract Agreement no. 2015/HQ/EL/Ph-II/EMP-16/8/SOJITZ-L&T dated 31-03-2016 part-2 GS.
2. SLT letter No - SLT16/DFCCIL/EMP-16/QAQC/GEN/2019/2861 Dated 13.2.2019
3. PMC Letter No - L/OCFC/DFCC/CMT/EMP-16/1902/21331 Dated 25.2.2019
4. SLT Letter No - SLT16/DFCCIL/EMP-16/QAQC/GEN/2019/3032 Dated 06.3.2019
5. PMC Letter No - L/OCFC/DFCC/CMT/EMP-16/1903/22327 Dated 26.3.2019

With reference to letter in reference 5, we are resubmitting the Method Statement for Foundation, Mast Erection and Grouting incorporating the observation given by the Engineer. The details of compliance is attached as engineer's comment summary and resolution form (ECS & RS).

Sl no	Description	Document Number	Revision
1	Method Statement for Foundation, Mast Erection and Grouting	DOC/EMP-16/QAQC/GEN/023	Rev 2

In view of the above, Engineer may kindly arrange to issue NONO to the above Documents

Thanking you and assuring you of our best services all the times,

Yours faithfully,

For Sojitz-L&T Consortium




(Ratnesh K. Srivastava)
Contractor's Representative

CC:

1. DFCCIL- GGM/ Elec/WC-II
2. DFCCIL- ACPM/ Elec/ Mumbai
3. OCGC - CMT

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Encl: as above



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WDFC PHASE-2 JNPT – MAKARPURA (VADODARA) PACKAGE-16 (EMP-16)

METHOD STATEMENT FOR FOUNDATION, MAST ERECTION AND GROUTING

DOCUMENT NO. DOC/EMP-16/QAQC/GEN/023 REV-2

CONTRACTOR:
SOJITZ - L&T CONSORTIUM
c/o Larsen & Toubro Limited
Railway SBG, Vatika Mindscapes Building
Tower 'A', 8th & 9th Floors
12/3, Delhi – Mathura Road
Near Sarai Khawaja Metro Station
Faridabad – 121003, Haryana

CLIENT:
DEDICATED FREIGHT
CORRIDOR CORPORATION OF
INDIA LIMITED
5th Floor, Pragati Maidan
Metro Station Building
New Delhi – 110001

CONSULTANT:
ORIENTAL CONSULTANTS
GLOBAL CONSORTIUM
3rd Floor, Pragati Maidan
Metro Station Building Complex,
New Delhi – 110001



2	28-03-19	VM		PKS		SKG	
Rev.	Date	Name	Sign	Name	Sign	Name	Sign
			Prepared by		Reviewed by		Approved by

Revision History

Revision No.	Revision Date	Revision Details		Approved by
		Clause No.	Revision	
00	12-11-2018	-	Initial Submission	
01	6-03-2019	-	The document has been revised as per our response vide letter No.SLT16/DFCCIL/EMP16/QAQC/GEN/2019/3032 DATE: 6.03.2019 against Engineers letter no. L/OCGC/DFCCIL/CMT/EMP-16/1902/21331 DATE : 25.02.2019	
02	28 -3 -2019	-	The document has been revised as per our response vide letter No.SLT16/DFCCIL/EMP16/QAQC/GEN/2019/3155 DATE: 28.03.2019 against Engineers letter no. L/OCGC/DFCCIL/CMT/EMP-16/1903/22327 DATE : 26.03.2019	



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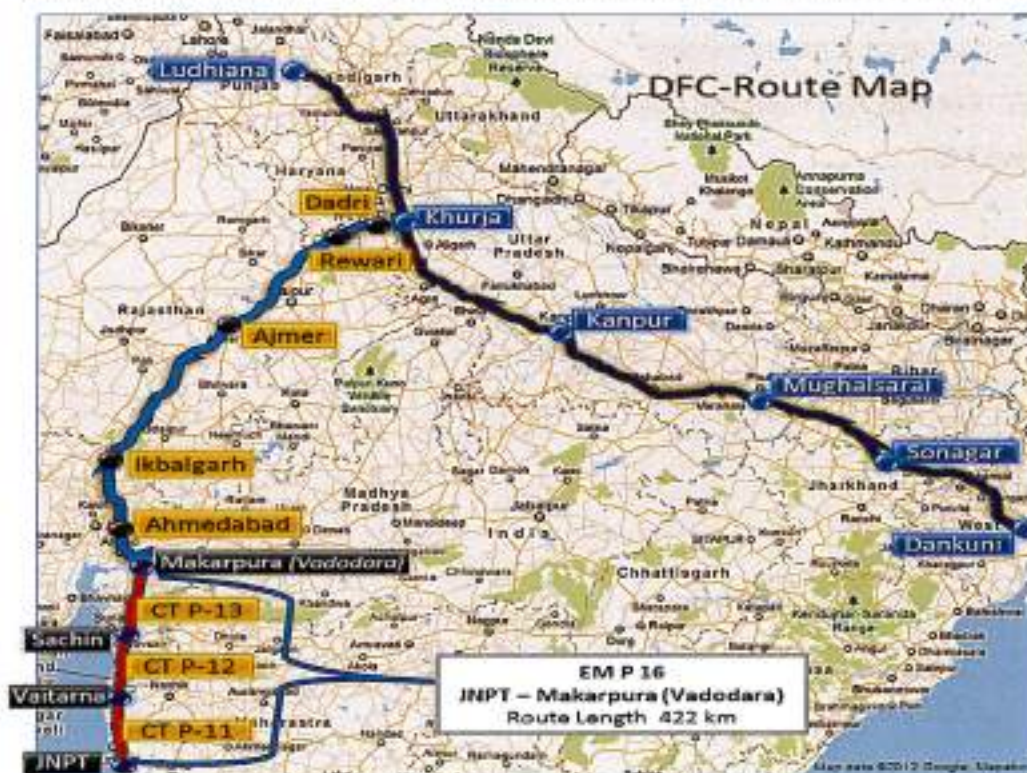
1. BRIEF DESCRIPTION OF THE PROJECT

Ministry of Railways (MOR), Government of India has planned to construct a High Axle Load dedicated Freight Corridor (DFC) covering about 3325 km on two corridors, known as the Eastern and Western Corridors.

The Western Corridor is planned from Jawaharlal Nehru Portat Nhava Sheva (JNPT), Mumbai to Tughlakabad / Dadri near Delhi. The Western Corridor of DFC Project covers a length of about 1,480 RKM (JNPT – Ahmadabad – Palanpur – Rewari – Asaoti – Dadri). Western Corridor is planned to be implemented in two phases. The first phase envisages construction of about 915 RKM between Makarpura (Vadodara) and Rewari and second phase is of about 565 RKM consisting of Vadodara-JNPT of about 422 RKM and Rewari – Dadri of about 143 RKM. This document deals with Makarpura (Vadodara) – JNPT section of 2nd phase of the Western Corridor only.

Package-16 consists of 422 Kms of double line electrified track with 2x25 kV AC, 50 Hz, and Overhead Catenary System from Vadodara to JNPT running along the existing Indian Railway Tracks. The route is to be constructed, capable of operating at a maximum train speed of 100 km/h with an initial axle load of 25T.

Formation and bridge structure are to be provided for 32.5T axle load and track structure for 25T axle load. Provisions to raise track and traction structures by 275 mm are considered.



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The proposed alignment between JNPT – Makarpura is located on east side of existing IR. The proposed alignment of DFC is passing generally parallel to the existing IR network between JNPT-Makarpura and taking detours to avoid city congestion. Almost 71% of the proposed DFC alignment passes parallel to the existing IR network and 29% of the alignment passes through detours.

The complete stretch from Makarpura (Vadodara) to JNPT (422 km) has been divided into three sections, viz. Makarpura (Vadodara) to Sachin of about 131 kms, Sachin to Vaitarana about 186 kms and Vaitarana to JNPT of about 102 kms.

Section	TKM	TSS	SWS (SP, SSPs)	Milestone
Makarpura (Vadodara) – Sachin	279	2	14	MS-1
Sachin – Vaitarana	380	3	17	MS-2
Vaitarana – JNPT	237	2	9	MS-3

2. PURPOSE/SCOPE OF WORK :

2.1. Purpose

To establish a procedure to carry out the foundation (by manual method or mechanized augering), mast erection and grouting works in a good workmanship manner and to ensure higher productivity, Quality & Safety aiming towards zero re-work/ rejection & Non-conformities.

2.2. Scope of Work

- Digging of earth & marking foundation pit by adopting conventional manual method or by mechanized auger for conventional or cylindrical foundation respectively.
- To cast the conventional or cylindrical foundation leaving a scroll hole for mast erection.
- Erect the traction mast in the scroll pit and grout the mast by maintaining suitable reverse deflection as per design.

3. REFERENCE DOCUMENT:

- Project Quality Assurance Plan – DOC/EMP-16/PLNG/OTH/001 Rev. 01
- Contract Agreement – Vol. III (Particular specification).
- Environmental Social Management Plan.
- Site Quality Assurance plan – DOC/EMP-16/QAQC/GEN/009 Rev 5
- Approved EHS Management Plan & EHS Work Procedure Plan.

4. ABBREVIATIONS:

List of frequent used abbreviations in this document are tabulated below:

S. No	Abbreviation	Expansion
1.	OHE	Overhead equipment
2.	LOP	Layout Plan
3.	CSD	Cross Sectional Details
4.	RRV	Road cum rail vehicle
5.	BFR	Bogie Flat for Rails
6.	GFC	Good for construction
7.	FBM	Foundation Bending moment
8.	CAPO	Chief accident prevention officer
9.	QA	Quality assurance
10.	QC	Quality control
11.	SAPO	Senior Accident Prevention Officer
12.	IR	Indian Railways
13.	CENO	Chief Environmental officer
14.	SENO	Senior Environmental Officer
15.	SHO	Safety Health officer



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5. ROLES AND RESPONSIBILITIES:**5.1. Project Director:**

- 5.1.1. Overall in charge of execution of project design, planning and execution of work.
- 5.1.2. Responsible for monitoring the entire process of design, construction and execution of foundation, mast erection and grouting works at site with due adherence of safety & quality.

5.2. Head Quality

- 5.2.1. Plan & monitors the overall quality of the work carried out at site. Ensure all required QA/QC infrastructure is well in place, all measuring & testing equipment are duly calibrated.
- 5.2.2. Monitors implementation of all requirements as per contract and project quality assurance plan during the execution of the work.
- 5.2.3. Directs quality personnel in accordance with the site requirement.
- 5.2.4. Analyzing the observations of site recordings and report the same to project director and mitigation of non-conformities if any as per relevant control procedures.

5.3. QC Engineer

- 5.3.1. Identify material sources and conduct materials test and ensure conformity as per relevant ITP.
- 5.3.2. Conduct routine tests on materials & workmanship as per ITP for conformance and maintain records.
- 5.3.3. Ensure that tests are performed as per ITP and values are as per acceptance limit.
- 5.3.4. Maintain the records of all the laboratory tests.
- 5.3.5. Verifying the level of the foundation and displacement from the measurements of the auto level and dial gauge arrangement respectively.

5.4. Package manager:

- 5.4.1. Will be responsible for planning and execution of day to day activities in line with contractual requirements.
- 5.4.2. Will be responsible for ensuring work being carried as per approved method statements and GFC drawings.
- 5.4.3. Will be responsible for monitoring of progress of site activities.
- 5.4.4. Will be responsible for implementing Quality control and quality assurance process and procedures in execution activities in close co-ordination with site quality team.
- 5.4.5. Will be responsible for correcting any defects and deficiencies in the erection activities in accordance with specification/norms and communicating the remedial action with quality control and quality assurance team.
- 5.4.6. Responsible for ensuring safety of man, machine by adhering to all safety norms.

5.5. Section in-charge:

- 5.5.1. Reports to the project manager and co-ordinates with the Engineer for day to day activities.
- 5.5.2. Vests the overall responsibility for construction work and site work activities at section level.
- 5.5.3. Responsible for carrying out work with approved method statement and GFC drawings.
- 5.5.4. Implementation of safety and quality procedures.
- 5.5.5. Documentation of all process related reports as per PQAP requirements, technical specifications and Engineer's instruction.
- 5.5.6. Ensure that all the workmen engaged under him are properly trained & have undergone site SHE induction before assigning any task at construction site.

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5.6. Site engineer:

- 5.6.1. Reports to the section in-charge.
- 5.6.2. Responsible for execution of foundation, mast erection and grouting of mast as described in this method statement and along with QC engineer maintain the construction record.
- 5.6.3. Carrying out work only with approved method statement and GFC drawing.
- 5.6.4. RFI submission as per the system according to the activities planned.
- 5.6.5. Co-ordinates and execute the work related to other agencies like, concrete plant, arranging all construction related material, tools & tackles, curing of foundation etc.
- 5.6.6. Understand and follow the applicable SHE requirements, ensure hazard/ aspect identification and risk/ impact assessment is done for the work.
- 5.6.7. Give pep talk on SHE requirements to the workmen under him.

5.7. SHE Director:

- 5.7.1. Formulate SHE Policy, SHE Plan, SHMoP, ESMP, ESMoP, HIV / AIDS Manual, SHE Objectives & Targets and seek top management approval.
- 5.7.2. Review and approve SHE Plan (Processes, Procedures, Work Instructions, and Programs).
- 5.7.3. Evolves PPEs Guidelines and implement it.
- 5.7.4. Provide guidelines / assistance in implementation of SHE Plan, SHMoP, ESMP, ESMoP, HIV / AIDS Manual, SHE Objectives & Targets.
- 5.7.5. Prepare & review HIRAC (Hazard Identification Risk Assessment and Control) related to various activities.
- 5.7.6. Determines, assesses and report SHE Performance Indicators including compliance with statutory requirements.
- 5.7.7. Routine and surprise SHE Audits & SHE Inspections at work sites and recommended corrective and preventive actions.
- 5.7.8. Prepare Training modules related to various work activities & conduct the awareness training programs among the employees including sub-contractor's employees.
- 5.7.9. Coordinates and interacts with the Employer / Engineer or his representatives and External Agencies on various SHE matters and implementing the same at work sites.
- 5.7.10. Plan & organize SHE events / campaigns for creating SHE awareness among the employees including sub-contractor's employees & workmen.
- 5.7.11. Capacity for building of SHE Team for safe execution of the project.
- 5.7.12. SHE Director acts as Secretary of Project SHE Committee and prepared & submit various SHE reports to the Employer/ Engineer, as per their requirement.
- 5.7.13. Responsible for giving directions and coordinating with execution team for multiple SHE obligatory requirements related various work activities to be implemented & for safe execution at work sites.

5.8. Chief Environmental Officer (CENO):

- 5.8.1. Responsible for implementation of Environmental & Social Management Plan.
- 5.8.2. Conduct Environmental management / HIV AIDS prevention program for Employees / Workers.
- 5.8.3. Prepare and implement 'Environmental Aspect & Impact' register for critical activities of the project.
- 5.8.4. Investigates incidents impacting Environmental and Social aspects of the project and recommends for corrective actions. Participate regularly in Monthly SHE committee meetings.
- 5.8.5. Organize campaigns and awareness program to promote Environmental & Social Management Plan in the project.
- 5.8.6. Day-to-day environmental management, supervision and monitoring of environmental related work activities and authority to stop work activity, if non-compliance is observed.

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- 5.8.7. Ensure Environmental legal compliance (If required Environmental consent / permission related to Batching Plan, DG set and Bore well from concerned authority / SPCB / MoEF) and its compliance as and when required.
- 5.8.8. Conduct Environmental & Social Management audit and inspection. Complying with Employer / Engineer's observations & issues related to various work sites.
- 5.8.9. Conducting training on environmental Aspects and modules as a part of training program.

5.9. Senior Environmental Officer (SEO):

- 5.9.1. Ensure effective implementation of ESMP, ESMoP at site level.
- 5.9.2. Coordinating and monitoring Environmental management at work sites.
- 5.9.3. Conducting work sites Environmental inspections at regular intervals.
- 5.9.4. Complying with Employer and Engineer's observations & issues related to his work sites.
- 5.9.5. Conducting training on environmental Aspects & Impacts and modules as a part of training program.
- 5.9.6. Assisting CENO in preparation of ESMP, ESMoP and other inspection forms.
- 5.9.7. Coordinating with Package managers, site in-charges to make sure that the Environmental Management Plan is being effectively implemented at work sites.
- 5.9.8. Keeping records of site inspections, audit reports and correspondence (related to his site).
- 5.9.9. Submission of all inspection records, monitoring reports to CENO at regular intervals.
- 5.9.10. Participate regularly in Monthly SHE committee meetings.
- 5.9.11. Implementing the corrective & preventive actions for the non-compliance, if observed at sites.
- 5.9.12. Conducting regular meetings with CENO for implementation of Environmental Management Plan and monitoring activities.
- 5.9.13. Conduct Environmental management / HIV AIDS prevention program among the employees / workmen.
- 5.9.14. Prepare and implement 'Environmental Aspect & Impact' register for critical activities of the project.
- 5.9.15. Investigates incidents impacting Environmental and Social aspects of the project and recommends for corrective actions.
- 5.9.16. Organize campaigns and awareness program to promote Environmental & Social Management Plan in the project.
- 5.9.17. Ensure Environmental legal compliance (If required Environmental consent / permission related to Batching Plan, DG set and Bore well from concerned authority / SPCB / MoEF) and its compliance as and when required.
- 5.9.18. Conduct Environmental & Social Management audit and inspection.
- 5.9.19. Keeping record of tree plantation done at work sites.

5.10. In charge plant & machinery

- 5.10.1. Responsible for healthy working conditions of machinery and equipment.
- 5.10.2. Issues fitness certificate for machinery and equipment.
- 5.10.3. Overall management of heavy equipment, plants and vehicles.
- 5.10.4. Ensure mobilization of equipment according to the mobilization plan.

6. RESOURCES, EQUIPMENT & MANPOWER REQUIREMENT:

6.1. Manpower:

- A. Site In charge – 1 No
- B. Site engineer / supervisor -1 No
- C. Quality engineer / supervisor – 1 No
- D. Safety engineer / supervisor – 1 No
- E. Skilled workers – as per site requirement
- F. Un skilled workers – as per site requirement



Above manpower requirement is indicative. This may change as per the site condition

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6.2. Material:

- A. Quantity of concrete shall be as per requirement
- B. Scroll box – as per foundation design drawing
- C. Shuttering material – as per requirement
- D. Mast – Type and quantity as per approved drawings
- E. Grouting clamp – as per requirement
- F. Wooden wedges – as per requirement
- G. Spirit level – 3 no
- H. Tools and tackles – as per requirement
- I. Anchor loop – as per requirement
- I. Quantity of concrete mentioned as "as per requirement" shall be calculated from approved GFC drawing and approved volume chart.
- II. Quantity of other required material mentioned "as per requirement" shall be calculated from approved GFC drawing.

6.3. Equipment:

Following equipment may be used at various locations as per requirement:

- i. Augering machine– 1 No
- ii. Batching plant /RM800-1 No
- iii. Transit mixer – 1 No
- iv. Crane for mast erection – 1 No
- v. Concrete vibrator – 1 No + 1 no standby
- vi. Sling wire rope – of required sizes and quantity
- vii. Total station – 1 No
- viii. Auto Level – 1 No

Above list of equipment is indicative. This may change as per the site requirement during actual execution of work or new innovative plant & machinery may be used in-order to faster progress of project execution in a better and efficient way.

7. WORK PROGRAM:

Work program for site construction of foundation, mast erection & grouting shall be as per availability of formation / Track from CTP-11, 12 & 13 contractor.

8. SELECTION OF FOUNDATION TYPE:

Selection of foundation shall be as per GFC drawing.

The type of foundation among conventional as per RDSO or cylindrical type shall be finalized by the contractor's designer for any particular location in line with the type of fronts e.g. Rail track already laid, formation with ballast or without ballast.

The following clauses detail the procedure to be followed during the casting of foundation using conventional and / or cylindrical methods:

- Conventional foundation
- Cylindrical foundation

8.1. CONVENTIONAL FOUNDATION:

Sequence of works for conventional foundation shall be as under:

- A. Study of the drawings
- B. Marking of foundation location
- C. Excavation of foundation pit
- D. Casting of foundation

The details of above stages are described hereunder:



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8.1.1. Study of the drawings:

- 8.1.1.1. Ensure that all the drawings eg. Layout plan (LOP), cross sectional details (CSD) and volume chart for the foundation are duly & clearly approved by Engineer in code NONO and "Good for construction" (GFC) by the design department over and above the Engineer's approval.
- 8.1.1.2. The approved copies of all the necessary drawings, documents etc. shall be studied by the site staff. These documents shall be read in conjunction with the referred documents therein.

8.1.2. Marking of foundation location:**8.1.2.1. For the location where track is already available :**

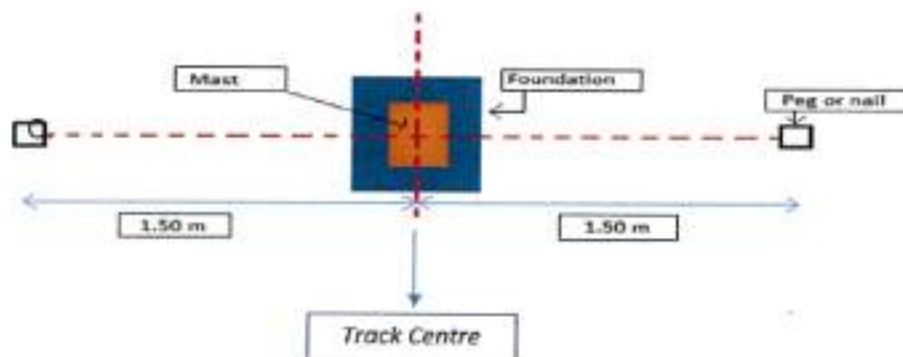
- A. Location of each foundation shall be marked in accordance with chainage as per approved LOP.
- B. For marking of foundation location of every mast, the center line of DFCC track (UP/DN/Loop line) shall be marked on the formation with peg or nail to maintain the required implantation by means of co-ordinate details provided by the CTP – 11 & 12 and 13 contractors and transfer the coordinate from CTP's Contractor TBM at respective locations.
- C. In the particular Km where foundation need to be cast, Location of the first mast foundation shall be marked by duly verifying the chainage of the location from Km marking / stone and span (distance between center of the two adjacent mast) from the last location of the previous Km as shown in the approved LOP, this will ensure the right/correct location of mast with respect to the respective chainage as shown in LOP.
- D. Continues locations in the Km shall be marked with reference to the first location marking by following same procedure as above, span shall be measured with reference to the previous location.
- E. After marking the chainage of the location, implantation shall be marked from center of the track.
- F. By sectioning shall be carried out (for 2 m distance) on the adjacent track and marking on the both tracks shall be matched to ensure the perpendicularity of the implantation marking with reference to the track.
- G. While marking at locations at curvature super elevation requires to be taken care and marking should be carried out from the highest rail.
- H. In case of anchor location, mark the setting distance from the center of the foundation on the direction as shown in the approved LOP and measure the implantation of the anchor location from the center of the track.

8.1.2.2. For the location where track is not available :

- A. Prior to any intervention on site, a surveyor team set the location of every mast. The center line of DFCC UP/DN track shall be marked on the formation with peg or nail to maintain the required implantation by means of co-ordinate details provided by the CTP – 11 & 12 and 13 contractors or as given in approved LOP drawing.
- B. The location of every mast must be indicated on the embankment with a minimum of two points at 1m or 1.5m on both sides of the theoretical mast location (refer to the figure below).



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- D. For anchor location, mark the center point of the anchor from center point of the main location using total station in an appropriate distance as mentioned in the drawings.

8.1.3. Mast foundation:

The sequential activities shall be undertaken as below:

8.1.3.1. Excavation of foundation pit :

- I. After marking the center of the foundation with reference to the implantation as shown in the approved drawing, the outer dimensions of the foundation shall be marked from the approved volume chart based on the Foundation bending moment (FBM) code provided in the approved drawing.
- II. After marking the outer dimensions, the excavation work shall commence either manually by the worker or by earth excavator or by a combination of both (i.e. workers as well as earth excavator) as per prevailing site requirement.
- III. Ensure that excavated material being removed with proper care and disposed off at appropriate place.
- IV. Excavate the foundation till desire depth as per approved drawing.
- V. After foundation pit is completely excavated, verify the dimensions of the foundation as per approved volume chart and approved drawings by using survey staff / measuring tape.
- VI. Due safety precautions & measures as defined in Appendix – 1 should be taken during pit excavation.

8.1.3.2. Concrete mixing :

- I. The grade of concrete shall be desired as per approved drawing and CA.
- II. Design proportions for concrete mix shall followed as per engineer's approval. The method for concrete mixing shall be finalized by the contractor as per site conditions and availability of the resources from following methods.

A. Nominal mix (volume batching) – using RM 800 mixer machine:

- a) Feeding of all the concrete materials (cement, Aggregates & sand) to the Mixer is manual through weighing system that has load cell devices to weigh the materials.
- b) After feeding the material (Cement ,Aggregate & sand) the weight is displayed in the panel
- c) The hopper assembly of these bins is operated through hydraulic mechanism which enables the lifting and loading of the material in to the drum.
- d) Water is discharged into the mixer drum through the discharge pump by manual as per the quantity with respect to approved mix design set when the concrete batching process is on.
- e) When the Concrete batching process is on, admixture is to be added by manual by using measuring jar as per the quantity with respect to approved mix design, if any.
- f) The mixing drum shall rotate forward in clockwise direction and in antilock wise direction for around 2.5 to 3 minutes to generate thorough mix.

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- g) The mixing shall be continued until there is a uniform distribution of the materials in the mass is uniform in color and consistency.
- h) Pour the mixed concrete into excavated foundation pit.
- i) The concrete shall be discharged into the Wheelbarrow / normal /chutes which will be carried to the works place and further through steel pans as per the site requirement.

B. Ready mix concrete as per approved design mix:

- a) The concrete shall be prepared as per approved design mix in the contractor's / supplier's batching plants.
- b) Concrete shall be transported to the foundation location by transit mixers.
- c) From the transit mixer concrete shall be poured into foundation pit through suitable manual methods.

8.1.3.3. Form work (shuttering work):

- I. Suitable formwork shall be used, wherever required (muffing).The formwork material shall be of pre-fabricated mild steel in suitable sizes.
- II. The form work provided shall be removed after completion of foundation without disturbing the foundation after 16 hours from casting of the foundation.

8.1.3.4. Concrete placement / pouring of concrete into foundation pit:

- I. Concrete prepared out of above methods either 8.1.3.2 (A) or (B), the method of concrete, casting of the foundation shall be as per following steps:
- II. Place this prepared cement concrete into the excavated pit using shovel or other suitable tools till 1.35 meter from top of the foundation as per drawing.
- III. Place the scroll box of suitable diameter & size diameter as given in the drawing into at the foundation pit duly ensuring the proper implantation and verticality for easy removal of scroll; it should also need to be ensured that scroll placed at center of the foundation.
- IV. Complete the casting of foundation till the top of the foundation as per approved drawing by the continuously pouring of concrete.
- V. Top of the foundation should be maintained at level specified from rail level as per approved drawing.
- VI. Ensure the proper ramming being carried out during the casting of foundation, wherever required needle vibrator shall also be used.
- VII. Rotate the scroll box clock-wise and anti-clock wise immediately after completion of foundation to ensure that scroll box not getting stuck with the foundation.
- VIII. The scroll shall be gently lifted within 2 hours after casting of the foundation.
- IX. Cover the hole with a suitable cover to prevent accidental fall and accumulation of debris into scroll hole.

8.1.3.5. Backfilling:

- I. Wherever foundation pits excavated more than the required dimensions, the same need to be backfilled properly after completion of casting and removal of formwork.
- II. Backfilling shall be done properly and adequately compacted. Water along with manual rammer may be used during backfilling for achieving better compaction.
- III. Excavated earth from the foundation pit shall be used for the backfilling.

8.1.4.Anchor foundation(with anchor loop):

8.1.4.1. Marking and Excavation:

- I. Anchor foundation shall be marked in line with main foundation, mark the anchor location at the setting distance from the main foundation as per the approved drawing.
- II. Implantation of the anchor loop shall be same as of the mast.
- III. Mark the outer dimensions of the anchor foundation in accordance with FBM from approved volume chart.

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- IV. After marking of the foundation, excavation shall be commenced as per clause 8.1.3.1 of this document.
- V. Ensure that excavate soil form the foundation being disposed at nearby appropriate place.

8.1.4.2. Casting of foundation:

- I. Prepare the concrete as per clause no 8.1.3.2 of this document.
- II. Pour the concrete at the excavated pit up to level where anchor loop to be placed.
- III. Place the anchor loop as shown in the approved drawing by keeping galvanized portion exposed out of the pit and hold it firmly till foundation casting completed by temporary means.
- IV. Complete the casting of foundation by continuously pouring the concrete into the foundation pit till the top of the foundation.
- V. Ensure the proper ramming being carried out during the casting of foundation, wherever required needle vibrator shall also be used.

8.1.5. Anchor foundation(with dwarf mast):

8.1.5.1. Marking and excavation :

- I. Mark the dwarf mast location from the mast location as per setting distance provided in the approved drawing.
- II. Mark the outer dimensions of the foundation as per approved volume chart with reference to the FBM code provided in the approved drawing.
- III. Excavate the foundation as per clause 8.1.3.1 of this document.

8.1.5.2. Concreting:

- I. Carryout the concreting as per 8.1.3.4 of this document except the usage of the scroll box of 400 mm diameter instead of 600 mm diameter or as shown in approved drawing used for the main foundation.
- II. Carry out the formwork and backfilling as per clause no 8.1.3.2 & 8.1.3.4 of this document.

8.1.6. Curing:

- 8.1.6.1. Curing of all above foundations shall be carried out by filling water in mast hole foundation and anchor foundation to be cured for 7 days or apply the curing compound over top of the foundation.

8.2. CYLINDRICAL FOUNDATION:

Sequence of works for cylindrical foundation shall be as under:

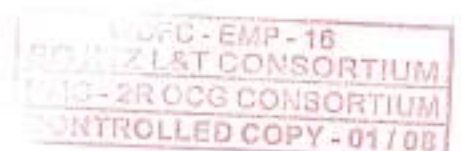
- A. Equipment for augering and concreting.
- B. Marking of foundation location as per GFC drawing.
- C. Excavation of foundation pit using auguring.
- D. Fixing of scroll.
- E. Casting of foundation.

8.2.1. Equipment for augering and concreting:

Suitable equipment shall be deployed for a particular location based on the type of front available. For different type of execution fronts different equipment shall be deployed as described below:

8.2.1.1. Equipment for augering operation:

- A. Tractor mounted auger – for formation.
- B. Rail Road Versatile (RRV) Excavator mounted guided auger – For the front where track is already laid.



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8.2.1.2. Equipment for Concreting operation:

- A. RRV Concrete Mixer.
- B. Ready Mix Concrete Batching Plant.
- C. Transit Mixer (RRV) / vehicle suitable for road / formation.
- D. Mini batching plant –RM 800.
- E. Concrete Vibrator.
- F. Wheel Barrow.

Above list of equipment is indicative. The deployment and use of different equipment shall be as per site requirement which shall be governed by the clause 8.2.1.1 & 8.2.1.2. The deployment of these equipment shall be done as & when they are procured and available for use.

8.2.2. Study of the approved GFC drawings:

- 8.2.2.1. The drawings shall be duly & clearly approved by Engineer in code NONO and "Good for construction" (GFC) by the design department over and above the Engineer's approval.
- 8.2.2.2. The approved copies of all the necessary drawings, documents etc. shall be studied by the site staff. This document shall be read in conjunction with the referred documents therein.

8.2.3. Marking the location for augering/ setting of pegs:**8.2.3.1. For the location track is already available:**

- A. Location of each foundation shall be marked in accordance with chainage as per approved LOP.
- B. For marking of foundation location of every mast, the center line of DFCC track (UP/DN/Loop line) shall be marked on the formation with peg or nail to maintain the required implantation by means of co-ordinate details provided by the CTP – 11 & 12 and 13 contractors and transfer the coordinate from CTP's Contractor TBM at respective locations.
- C. In the particular Km where foundation need to be cast, Location of the first mast foundation shall be marked by duly verifying the chainage of the location from Km marking / stone and span (distance between center of the two adjacent mast) from the last location of the previous Km as shown in the approved LOP, this will ensure the right/correct location of mast with respect to the respective chainage as shown in LOP.
- D. Continues locations in the Km shall be marked with reference to the first location marking by following same procedure as above, span shall be measured with reference to the previous location.
- E. After marking the chainage of the location, implantation shall be marked from center of the track.
- F. By sectioning shall be carried out (for 2 m distance) on the adjacent track and marking on the both tracks shall be matched to ensure the perpendicularity of the implantation marking with reference to the track.
- G. While marking at locations at curvature super elevation requires to be taken care and marking should be carried out from the highest rail.
- H. In case of anchor location, mark the setting distance from the center of the foundation on the direction as shown in the approved LOP and measure the implantation of the anchor location from the center of the track.

8.2.3.2. For the location track is not available :

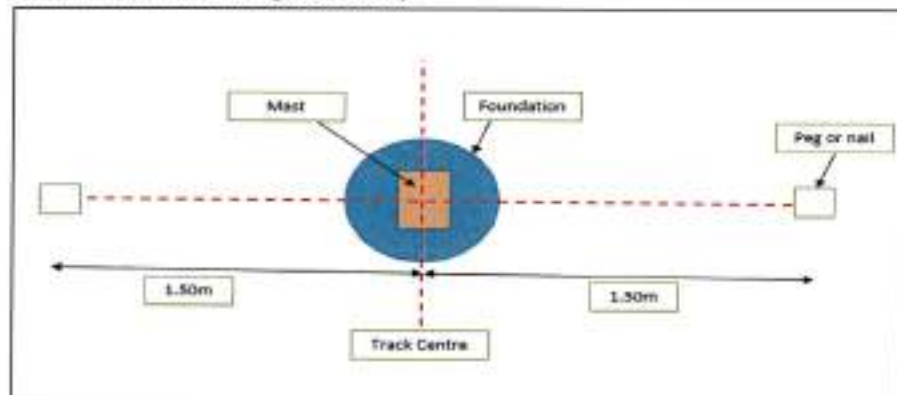
- A. Prior to any intervention on site, a surveyor team set the location of every mast. The center line of DFCC UP/DN track shall be marked on the formation with peg or nail to maintain the required implantation by means of co-ordinate details

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provided by the CTP – 11 & 12 and 13 contractors or as given in approved LOP drawing.

- B. The location of every mast must be indicated on the embankment with a minimum of two points at 1m or 1.5m on both sides of the theoretical mast location (refer to the figure below).



- C. For anchor location, mark the center point of the anchor from center point of the main location using total station in an appropriate distance as mentioned in the drawings.

8.2.4. Mechanized augering :

8.2.4.1. Maneuvering of equipment :

- 8.2.4.2. The equipment shall be maneuvered to the specific point of augering according to the specific site conditions mentioned hereunder:

A. If formation is available :

- i. Tractor mounted guided auger shall be maneuvered over the formation. In order to ensure the smoother maneuvering of the equipment temporary ramp shall be provided in the slope in certain locations.
- ii. The Tractor mounted auger shall be positioned on the formation firmly before the operation.
- iii. RRV Excavator mounted auger shall be maneuvered over the formation. Rubber pads shall be used while moving the excavators on formation to avoid damages to the formation.
- iv. If formation has higher gradient with reference to service road easy access shall be provided for tyre mounted equipment.

B. If formation is available and ballast laid over formation:

- i. Tractor mounted guided auger shall be maneuvered over the formation. If formation has steep slope provision of ramp shall be made. Rubber track pads shall be installed on the crawlers to avoid damage to formation while movement.

C. If P way is laid :

- i. RRV Excavator mounted auger shall be positioned on the rails at level crossing.

8.2.4.3. Augering procedure:

- I. The augering process shall be repeated until the required depth is achieved as per the approved drawing.
- II. The material excavated due to this operation shall be cleared off by employing worker after the auger is lifted.
- III. The excavated pit shall be checked to ensure that the dimensions of the pit are as per the approved drawings.



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- IV. In case of anchor location, auger the anchor location marked by repeating the above steps.

8.2.4.4. Clearing the excavated pit:

- I. If in case water is obtained in the pit after excavation, it shall be cleared by pumping. After clearing of the pit, it shall be ensured that no object or debris falls into it.
- II. The area surrounding the excavated pit shall be designated as a restricted area. Access shall be restricted to authorized personnel.

8.2.5. Concrete mixing, transportation and placement:

Depending upon the availability of infrastructure for concrete mixing, transportability and other site conditions including the urgency of work requirement, following different methods maybe used for concrete mixing:

- A. Weigh batching
B. Volume batching

8.2.5.1. Concrete Mixing:

I. Design mix (Weigh Batching):

- a) Concrete mix proportions shall be taken as per the nominal mix guidelines in table 9 of IS 456-2000 for grade of concrete as per approved drawing.
- b) Concrete shall be mixed by weigh batching in a mechanical mixer in self-loading concrete mixer or at concrete batching plant.
- c) Workability of the concrete shall be checked by slump cone tests as specified in IS 1199-1959.

II. Nominal Mix (Volume Batching):

- a) Volume batching shall be carried in accordance with clause 10.2.4 of IS 456-2000 and as per 9.10.2 of contract agreement as per clause no. 8.1.3.2 (A), (B) of this document.

8.2.5.2. Transportation of ready mix concrete:

- I. Concrete shall be transported by means of transit mixer and wheels barrows as described hereunder:
- A. **Front with formation only available (without ballast):** Transit mixer and self-loading mixer shall move on formation to point of concreting.
In order to feed the self – loading mixer raw materials stocking arrangements shall be provided at desired locations.
- B. **Front with formation only available (with ballast):** Transit mixer and self-loading mixer shall move on service road to reach the point of concreting. Concrete shall be collected from the concreting point to the foundation by means of wheel borrows.
- C. **Front with rail:** Rail road versatile (RRV) transit mixer and self-loading mixer shall move on rails wherever rail is laid. Alternatively it shall be moved in wheel borrow from the nearest point access road wherever rail is not laid.
- D. The above mentioned selection criteria of equipment for transporting the concrete is indicative and shall be selected on the basis of actual prevailing site conditions and availability of equipment. At the time of concreting works. Any one option may be adopted by the contractor.

8.2.5.3. Concreting of Mast Foundation:

- A. Grade of concrete used for mast foundation shall be as specified in relevant approved drawing and CA
- B. Suitable scroll shall be used for OHE foundations.
- C. Place the reinforcement steel as per approved drawing.



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- D. Pour the concrete into the augured foundation by suitable means up to the level of 1.35 m from top of the foundation or as shown in drawings.
- E. Install the scroll at the depth of 1.35 m from top of the foundation or as shown in drawing.
- F. After setting up scroll in correct position(i.e. in the centre of the foundation), complete the foundation casting by pouring the concrete till the foundation top is levelled as mentioned in the drawing.
- G. Cast concrete cube samples as required of size 15cmx15cmx15cm for the testing of concrete for compressive strength.
- H. Ensure the proper ramming being carried out during the casting of foundation wherever required needle vibrator shall also be used.
- I. Loosen the scroll immediately after completion of concrete, before concrete setting in by rotating clockwise and anti-clockwise so that the scroll doesn't get jammed inside the foundation at later stage.
- J. Lift the scroll gently after ~2 hours or as required from the foundation to avoid any crack or damage to the foundation.
- K. Cover the hole with a suitable cover to prevent accidental fall and accumulation of debris into Scroll hole.

8.2.5.4. Concreting of Anchor Foundation (with anchor loop):

- A. Repeat the step no. A of clause no. 8.2.5.3, excluding provision of scroll box.
- B. Place the anchor loop with the galvanized portion exposed above ground to 100mm and ensure that the anchor loop placed right angle to the foundation. Thereafter pour the concrete duly securing the anchor loop at its position.
- C. Pour the concrete till the height at where anchor loop needs to be placed as per drawing.

8.2.6. Concreting of Dwarf Foundation:

- A. For dwarf mast foundation, steps mentioned in the clause 8.2.5.3 shall be followed with scroll box of 400 mm diameter.

8.2.7. Curing of Concrete:

- 8.2.7.1. Curing of all above foundations shall be carried out by filling water in mast hole foundation and anchor foundation to be cured for 7 days or apply the curing compound over top of the foundation.

9. MAST ERECTION AND GROUTING:

In view of different kinds and nature of execution fronts that may be available for mast foundation, different work methodologies may be adopted for mast/ anchor foundation.

9.1. Mast erection:

9.1.1. Mast erection using crane:

- 9.1.1.1. The cover over the scroll pit shall be removed and scroll hole shall be cleaned if required.
- 9.1.1.2. Suitable crane with suitable sling and D shackle shall be provided for mast erection.
- 9.1.1.3. Sling shall be provided on one third length of the mast from top and shall be locked with D shackle.
- 9.1.1.4. Crane hook shall be lowered near the sling of the mast wherein it shall be engaged with D shackle manually.
- 9.1.1.5. Mast shall be lifted and placed in the scroll pit of the foundation.
- 9.1.1.6. The hook of the crane shall be disengaged from the D shackle and the slings shall be removed manually.
- 9.1.1.7. The mast shall be stabilized by providing necessary wooden wedges and channel / angle box type fitting.
- 9.1.1.8. Major safety precaution: When mast is erected towards Indian Railways (IR) side, it should be ensured that mast is always leaning towards opposite direction



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of IR. This will ensure that accidental fall of mast toward IR track will never happen.

9.1.1.9. Necessary precaution to be taken if IR lines are energized with 25KV.

9.1.2. Mast erection using mast grabber:

9.1.2.1. The cover over the scroll pit shall be removed and scroll hole shall be cleaned if required.

9.1.2.2. The mast shall be lifted using mast grabber and shall be maneuvered to the location of mast erection.

9.1.2.3. The mast shall be placed in the scroll pit and the mast grabber shall be maneuvered for next operation.

9.1.2.4. The mast shall be stabilized by providing necessary wooden wedges and channel / angle box type fitting.

9.1.2.5. **Major safety precaution:** When mast is erected towards Indian Railways (IR) side, it should be ensured that mast is always leaning towards opposite direction of IR. This will ensure that accidental fall of mast toward IR track will never happen.

9.1.2.6. Necessary precaution to be taken if nearby IR lines are live.

9.1.3. Mast erection using crane mounted on the BFR/RRV (For the front where track is laid)

9.1.3.1. Load the mast into the BFR as per mast erection schedule from the store.

9.1.3.2. After obtaining proper approvals and working clearance from the authorized person either in written format or in agreed mode of communication, move the BFR into the location.

9.1.3.3. Halt the BFR at location, instruct the crane operator to lift the type of mast required at the particular location and erect the same.

9.1.3.4. Tilt the mast towards country side and support, when mast erection in IR side mast shall be leaned towards track side.

9.1.3.5. Move the BFR into next location and repeat the mast erection as per mast erection schedule.

9.1.3.6. **Major safety precaution:** When mast is erected towards Indian Railways (IR) side, it should be ensured that mast is always leaning towards opposite direction of IR. This will ensure that accidental fall of mast toward IR track will never happen.

9.1.3.7. Necessary precaution to be taken if nearby IR lines are live.

9.1.4. Mast erection using tripod (for the front where formation is available)

In the event, where mechanized cranes may not be feasible to be used and at certain locations near live IR tracks, this method may be used.

9.1.4.1. Place the tripod in appropriate location by calculating pulling distance required to lift the mast.

9.1.4.2. Ensure the stability of the tripod by firmly holding the legs of the tripod into the ground.

9.1.4.3. Connect the rope into the pulley at the top of the tripod.

9.1.4.4. Tie the other end of the rope with the mast and pull the rope gradually to lift the mast.

9.1.4.5. Manually guide the lifted mast into the scroll hole of the mast foundation by means of the guide rope tied to the mast.

9.1.4.6. Place the mast in to the scroll hole and put support for the mast.

9.1.4.7. Remove the rope connected with the mast and remove the tripod.

9.2. Grouting

Grouting activity shall be carried out in two parts as below:

1. Alignment of mast
2. Concreting

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9.2.1. Alignment of mast:

- i. The mast shall be aligned by adjusting wooden wedges and channel / angle box type fitting wherein channel / angle box type fitting shall be anchored to the formation.
- ii. The mast shall be given reverse deflection as per approved drawing and it shall be verified by using plum bob or jig.

9.2.2. Concreting

- I. To grout aligned mast, the grade of concrete shall be used as specified in relevant approved drawing and CA.
- II. Continuously pour the concrete in the scroll pit and after completion of 75% of the concrete pouring remove the wooden wedges supporting the mast and using the poking rod ram the concrete thoroughly to get the inform setting of the concrete.
- III. Continue pouring the concrete till the top of the foundation.
- IV. By using poking rods, poke the concrete all around the mast regularly to get the uniform concreting.
- V. Cast concrete cube samples as required of size 15cmx15cmx15cm for the testing of concrete for compressive strength.
- VI. Muffing of mast shall be done as per approved drawing.

10. QUALITY ASSURNACE AND QULAIITY CONTROL:**10.1. Excavation of foundation pit:****A. For conventional foundation:**

- i. Dimensions of the foundation pit shall be verified before pouring of the concrete with reference drawing & approved volume chart and shall not be less than the drawing dimension.
- ii. All survey data related to center point of foundation; implantation etc. shall be verified with respect to the relevant drawings & documents.

B. For cylindrical foundation:

- i. Dimensions of the foundation pit shall be verified before pouring of the concrete with reference drawing and shall not be less than the drawing dimension.
- ii. All survey data related to center point of foundation; implantation etc. shall be verified with respect to the relevant drawings & documents.

10.2. During casting of foundation:**A. For nominal mix (RM-800):**

- i. Mixing proportional of cement, sand and aggregates shall be in verified line with approved design mix.
- ii. Cube samples and testing will be done as per IS 456:2000 for 7 days and 28 days. Records shall be maintained.
- iii. Ensure curing of foundation

B. For Ready mix concrete (RMC):

- i. Verification of batch slips
- ii. Cube samples shall be cast in accordance with IS 456:2000 and the sample will be tested for 7 days and 28 days. Records shall be maintained.
- iii. Concrete details given by batching plant shall be verified. .
- iv. Ensure curing of foundation.

10.3. During mast erection and grouting:

10.3.1. Verticality and reverse deflection of the mast shall be verified in accordance with drawing.

10.3.2. Cube samples will be casted in accordance with IS 456 and the sample will be tested for 7 days and 28 days & records of same shall be maintained.



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11. SAFETY, HEALTH & ENVIRONMENT:

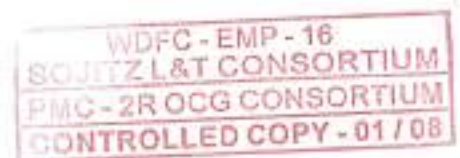
SHE Risk assessment for the entire work has been explained in appendix – 1.

12. INSPECTION AND TEST PLAN FOR CONCRETE WORK :

The Inspection and test plan shall be followed for concrete work as per approved site quality assurance plan (Doc no: DOC/EMP-16/QAQC/GEN/009 Rev -05) in Clause no 11 & check list / formats as per clause no 12.

13. ANNEXURES:

1. Inspection and test plan (ITP).
2. Checklists.
3. Equipment used for auguring.



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ANNEXURE -# 1A – Inspection and Test Plan for Conventional & Cylindrical OHE Foundation:

Ref	Main Activity	Test method	Specification and other reference documents	Acceptable criteria	Inspection by.		Frequency	Verifying documents	Remarks
					SLT-16	Eng's			
1	Requirements During excavation of pit for foundation								
1.1	verification of location of the foundation pit	As per approved drawing and method statement	Approved GFC drawing	As per approved Drawing	W	W	Prior to commencement of excavation	Approved GFC drawing	
1.2	Verification of dimensions of excavated pit	Measuring the depth and diameter of pit	Approved GFC drawing & Approved volume chart	Not to be Less than dimension mentioned in the drawing	W	W	Prior to pouring of concrete	Approved GFC drawing	
2	Requirements during casting of foundation								
2.1	Design mix	Verification of Design mix approval and batch sheet	As per method statement	Approved design mix	W	R	Prior to pouring of concrete	Approved design mix copy	
2.2	Testing of concrete cube samples		IS 516	IS 456	W	W	After 7 th & 28 days of curing from date of casting	Lab test report	

Legend : W-witness inspection point R-Documents review



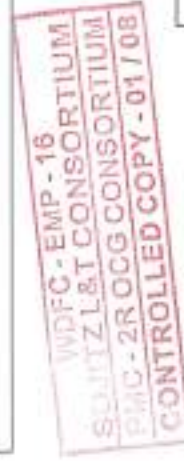
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ANNEXURE -# 1B – Inspection and Test Plan for OHE Mast Erection and Grouting

Ref	Main Activity	Test method	Specification and other reference documents	Acceptable criteria		Inspection by.		Frequency	Verifying documents	Remarks
				SLT-16	Eng's					
1	Requirements During alignment of mast									
1.1	Verification of mast type	Mast type to be verified in accordance with approved drawing	Approved GFC drawing	Should be same as in approved drawing	W	W	Prior to commencement of grouting	Visual check		
1.2	Verification of Location of Mast	As per approved LOP	Approved GFC drawing / Method statement	as per approved Drawing	W	W	Prior to commencement of grouting	Visual check		
2	Requirements before grouting of mast									
2.1	Verification of reverse deflection and alignment of the mast	Reverse deflection measurement through plumb and spirit level	Method statement	as per approved Drawing	W	W	Prior to commencement of grouting	Visual check		
2.2	Design mix	Verification of Design mix approval and batch sheet	As per method statement	Approved design mix	W	R	Prior to pouring of concrete	Approved design copy		
2.3	Testing of concrete cube samples		IS 516	IS 456	W	W	After 7 th & 28 days of curing from date of casting	Lab test report		

Legend : W-witness inspection point R-Documents review



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ANNEXTURE - 2

CHECKLIST



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Format no: WDFC/EMP-16/OHE/01			
			
			
CHECK LIST FOR OHE FOUNDATION			
PROJECT	: WDFC PHASE- 2 EMP-16 : JNPT – MAKARPURA (VADODARA)		
EMPLOYER	: DFCCIL		
ENGINEER	: PMC-2R OCG CONSORTIUM		
CONTRACTOR	: SOJITZ - L&T CONSORTIUM		
S.no	Description	Observation YES / NO / NA	Remarks (if any)
a) Location marking :			
1	Locations marked as per approved GFC drawing		
2	Anchor foundation (if applicable) marked at appropriate setting distance from mast foundation as per approved drawing (if available)		
b) Excavation of foundation			
Equipments for excavation as per site condition as follows			
1	Augering machine		
2	Manual Excavation using hand tools		
c) Verification of Foundation Dimensions :			
1	Pit dimensions are verified in accordance with Approved GFC drawing & Approved volume chart		
d) Concreting:			
1	Concrete mixing done as per (please tick for applicable method)		
A)	Normal mix using volume batching - RM 800		
B)	Ready mix concrete (RMC)		
2	Nominal mix using volume batching - RM 800		
A)	Design Proportion approval verified		
B)	Casting of concrete cubes		
3	Ready mix concrete (RMC)		
A)	Design proportion approval verified		
B)	Casting of concrete cubes		
SLT		PMC-2R (OCGC)	



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S.no		Description	Observation YES / NO / NA	Remarks (if any)
a) Mast erection:				
1		Type of Mast as per approved GFC drawing		
b) Alignment of mast :				
1		Reverse deflection verified and found as per drawing		
2		Mast Alignment verified and found as per drawing		
c) Grouting of mast :				
1		Concrete mixing done as per (please tick for applicable method)		
A)		Normal mix using volume batching - RM 800		
B)		Ready mix concrete (RMC)		
2		Nominal mix using volume batching - RM 800		
A)		Design Proportion approval verified		
B)		Casting of concrete cubes		
3		Ready mix concrete (RMC)		
A)		Design proportion approval verified		
B)		Casting of concrete cubes		
SLT			PMC-2R (OCGC)	



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ANNEXURE -# 3 – Equipment used for auguring (for work commencement):

The details, specifications and photographs of auguring machine are being included in this addendum as below:

S. No	Parameter	Value
1	Capacity of the engine	75 HP
2	Dimensions	
	Length	6.5 m (approx.)
	Width	2.5 m (approx.)
3	Over all weight	6500 kg (approx.)
4	Outriggers	Hydraulically controlled



Counter weight mounted in the tractor



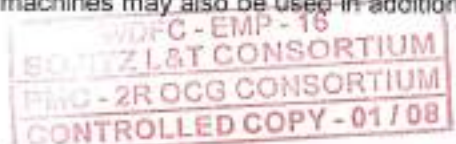
Hydraulic controlled outriggers



Wooden plank placed below the rest pad of outriggers

Note: -

This equipment is being used to commence the foundation work at site. However, in future other type of options may also be explored and different kinds of machines may also be used in addition to this machine.



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Appendix – 1

SHE Risk ASSESSMENT



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WDFC-PHASE 2-EMP16

Ref: WDFC/EMP-16/SLT/SHE/034 REV 00

SHE RISK ASSESSMENT

Name of the Project: WDFC, Phase-II, EMP-16 Project

Business Unit: RSBU / TFL

Activity considered: Excavation of Conventional & Cylindrical Foundation and Concreting

Date: 28.03.2019, Rev 00

Sl. No	Activity	Hazard / Environmental Aspect			Existing Control Measure	Probability Rating	Severity Rating	Risk/ Impact Level	Additional Control Measures (If a list is exhaustive, Give only a doc Ref no. of the Safe Work Method)	Residual Risk / Impact	Action By
		Source / Situation / Act	Possible Out come	People at risk							
1	Manual Excavation of foundation for OHE Mast.	Manual Material handling	Minor injury	Workmen and staff	Maximum lift 25kg allowed, Training, TBT, Minimize manual handling by using mechanical means wherever possible.	3	2	6 M	1. Job specific training shall be imparted to workmen. 2. Health checkup shall be carried out at regular interval.	L	Site Engineer / SHE Engineer
2		Collapsing of soil inside the pit	Lost time injury	Workmen	At regular interval, excavated earth be removed from the edge of the pit.	2	3	6M	1. No person shall be allowed to be near the excavation pit other then trained staff and workers. 2. Work shall be carried out with close supervision. 3.Excavated soil shall be placed at least 2 feet away from excavated edge	L	Site Engineer
3		Underground utilities	Fatality	Workmen	1. Layout survey shall be done prior to excavation to protect the underground utilities at work site.	2	5	M	1.Periodic inspection & monitoring shall be carried out. 2. Safety instructions shall be	L	



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					2. Permit to work (PTW) system shall be followed.					communicated through TBT. 3. Underground utilities shall be detected / marked by locator and authorized person permission shall get before executing any work.	Site Engineer / SHE Engineer
4	Work at height or an embankment of height more than 6 meters Fall of person into pit	Major injury	Workmen and staff	1. Proper edge protection to avoid fall of person. 2. Work group will be trained about hazards and control required.	2	4	8M	L	1. Job specific training should be imparted to workmen. 2. Permit to work (PTW) shall be followed.	Site Engineer / SHE Engineer	
5	Major injury	Workmen	1. Excavated pit barricaded to prevent any person to go near to it. 2. Tapes, signage boards placed near the pit for warning any person.	2	4	8M	L	1. Excavated pit shall be closed with a thick metal sheet, until the foundation casting being done. 2. Safety instructions shall be provided through TBT.	Site Engineer / SHE Engineer		
6	No safe worthiness certificate available for vehicle /equipment	Lost time injury	Operator, Nearby staff and workmen	Ensuring testing of the equipment by a competent person (TPI) and availability of valid test certificate prior to commencement of work by Augur machine.	2	3	6M	L	Safety checklist shall be followed.	P&M / Site Engineer / SHE Engineer	
7	Selection of suitable equipment for erection	Minor injury	Operator, Nearby staff and workmen	1. Selection of equipment done according to the soil stability and required excavation depth. 2. Work is not carried out until permitted by site SHE and P&M team.	2	2	4L	L	1. Work shall be carried out with close supervision. 2. Safety instructions shall be provided through TBT. 3. Equipment / Vehicle shall be inspected as per the checklist for 100% serviceability by P&M staff.	P&M / Site Engineer / SHE Engineer	

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8	Tilting / Topping of vehicle / Equipment	Major injury	Operator, Nearby staff and workmen	1. Vehicle placed on a compacted and leveled ground. 2. All out riggers shall be extended fully. 3. Work activity shall be carried out with close supervision. 4. Work carried out as per method statement & Safe work procedures.	2	4	M	1. Permit to work system (Excavation) shall be followed before starting of work. 2. Wooden blocks shall be provided below the out riggers to spread the whole load on the ground level. 3. Specific training to be imparted to operators for execution of work. 4. Housekeeping inspection shall be carried as per the checklist provided. 5. Wheels supports shall be provided of Augur Machine.	L	P&M / Site Engineer / SHE Engineer			
9	Incompetent operating & Operator's fitness	Lost time injury	Nearby staff and workmen	Ensured the selected person is competent, physically fit and engaged in work / Screening of operators	2	3	6M	All levers shall be in locked position to prevent unauthorized operation.	L	P&M / Site Engineer / SHE Engineer			
10	Operating at edge of embankment	Major injury	Operator, Nearby staff and workmen	1. The soil condition shall be checked for compaction before taking the equipment near to the edge at distance of minimum 1 meter from the edge of embankment 2. Work activity carried out with close supervision.	3	3	6M	1. Ensure barricading in safe distance for equipment operation. 2. Safety instructions shall be communicated through TBT.	L	Site Engineer / SHE Engineer			
11	Entanglement with rotary parts of augur	Major injury	Operator, Nearby staff and workmen	1. No person shall be allowed near the rotary parts of augur. 2. Ensuring augur is stopped before any persons is allowed for removing the excavated earth.	2	4	8M	1. Only operator shall give instructions to workmen. 2. Relevant training shall be provided to all workmen. 3. Safety instructions shall be	L	P&M / Site Engineer / SHE Engineer			



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12	Entanglement with rotary parts of vehicle (Radiator fan)	Major injury	Operator, Nearby staff and workmen	All small rotary parts of vehicle guarded with mesh fence or appropriate material.	2	4	8M	L	communicated through TBT. 1. Periodic inspection of equipment shall be carried through checklists. 2. Safety instructions shall be communicated through TBT.	P&M / Site Engineer / SHE Engineer
13	Working adjacent to live overhead electrical lines	Electrocution / electric shock / Fatality	Operator, Nearby staff and workmen	1. Not allowing operation shall be done within 6 meter radius of any overhead lines. 2. Electrical work permit shall be taken before starting of operation. 3. Work carried out as per method statement & Safe work procedures.	2	5	M	L	1. Adequate safety measures (e.g LOTO system) to be complied before starting of operation. 2. Specific training shall be provided to all employees. 3. Safety instructions shall be communicated through TBT. 4. Augur shall be earthed with minimum two temporary earth.	Site Engineer / SHE Engineer
14	Underground utilities	Fatality	Operator, Nearby staff and workmen	1. Layout survey done prior to excavation to protect the underground utilities at work site. 2. Not allowing to excavate by machine if utilities identified. 3. Permit to work (PTW) shall be followed.	2	5	10M	L	1. Periodic inspection & monitoring is to be carried out. 2. Safety instructions shall be communicated through TBT. 3. Underground utilities shall be detected / marked by locator and authorized person permission shall be obtained before executing any work.	Site Engineer / SHE Engineer
15	Hydraulic hose pipe burst	Major injury	Operator, Nearby staff and workmen	1. Ensuring no leakages present in hydraulic chamber, hoses, valves. 2. Periodic maintenance and inspection of hydraulic hose pipe is being carried out.	3	4	M	L	Shall not allow any person to stand below hydraulically operated machine parts.	P&M / Site Engineer / SHE Engineer



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16	Smoke control for pollution control	Intense health effect	Operator, Nearby staff and workmen	1. PUC certificate available with vehicle with validity period. 2. Specific PPE (Nose mask) provided to all workmen working surrounding the vehicle.	3	3	M	1. Ensure maintenance of engine, air filters for less smoke. 2. Safety instructions shall be communicated through TBT.	L	P&M / Site Engineer / SHE Engineer
17	Noise	Minor health effect	Operator, Nearby staff and workmen	1. Exhaust muffler is available at vehicle to control noise. 2. Specific PPE (Ear plugs) provided to continuous exposure to noise.	3	2	M	1. Periodic rest shall be provided to workers, who are continuously expose to noise. 2. Safety instructions shall be communicated through TBT.	L	P&M / Site Engineer / SHE Engineer
18	Dust	Minor health effect	Operator, Nearby staff and workmen	Provides specific PPE (Nose mask) while working in dusty areas.	3	2	M	1. Periodic inspection through checklist & monitoring shall be carried out. 2. Safety instructions shall be communicated through TBT.	L	P&M / Site Engineer / SHE Engineer
19	Heat from vehicle	Minor health effect	Operator, Nearby staff and workmen	Continuous operation avoided preventing over heating of vehicle / equipment and malfunctioning affect the staff.	3	2	6M	Ensure adequate coolant level and cooling system function before starting if work activity.	L	P&M / Site Engineer / SHE Engineer
20	Fire in equipment	Minor injury	Operator, Nearby staff and workmen	1. No flammable materials allowed to keep within 20 feet of equipment. 2. Periodic maintenance of batteries being carried out to avoid short circuit/loose terminal lugs.. 3. Fire extinguisher provided at work site.	2	2	4L	1. Relevant training shall be provided to all employees about fire prevention. 2. Work should be carried out with close supervision. 3. Periodic inspection through checklist & monitoring shall be carried out.	L	P&M / Site Engineer / SHE Engineer

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21	Flying object while operation	Minor injury	Operator, Nearby staff and workmen	1. Speed of augur restricted to 100 rpm. 2. Barricading done at surrounding working area to prevent any person go near to equipment while operation.	3	2	6M	L	1. Periodic inspection & maintenance is to be carried out. 2. Work shall be carried out with close supervision. 3. Specific training shall be provided to all employees.	Site Engineer / SHE Engineer
22	Collapsing of soil near the pit	Minor injury	Operator, Nearby staff and workmen	At regular interval excavated earth shall be removed from the edge of the pit.	2	2	L	L	1. No person shall not be allowed near the excavation pit without instruction. 2. Work shall be carried out with close supervision. 3. Excavated soil shall be placed 2 feet away from the excavated edge.	Site Engineer / SHE Engineer
23	Fall of person into pit	Major injury	Any person of Public	1. Excavated pit barricaded to prevent any person to go near to it. 2. Tapes, signage boards placed near the pit for warning any person of public..	2	4	M	L	1. Excavated pit shall be closed with a thick metal sheet/stone slab, until the foundation casting is done.. 2. Signages shall be place to warn the public..	Site Engineer / SHE Engineer
24	Alcohol influence at work site	Minor / Major injury	Any person	No person allowed shall be allowed to enter the site under the influence alcohol or abused drugs.	2	2	L		Specific awareness shall be provided to all employees about consuming alcohol.	Site Engineer / SHE Engineer
25	CONCRETIN G OF FOUNDATIO N	Minor injury	Operator, Nearby staff and workmen	Ensuring checking of the transit mixer by a competent person (TPI) and availability of valid fitness certificate / Insurance	2	2	L		Pre and post inspection of transit mixer shall be carried as per the checklists.	P&M / Site Engineer / SHE Engineer



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30	Stuck in wet concrete	Minor injury	Any person	After foundation casting the surrounding area barricaded to prevent any one to contact with wet concrete.	3	2	6M	L	all employees in Pep talk Signage / warning boards shall be provided at work site to warn any person about the condition.	Site Engineer
31	Exposure to heat	Minor health effect	Any person	1. Drinking water facility provided at work site. 2. Energy drink (Glucose / ORS mixed water) provided to all at intervals. 3. Temporary shelter (Tent) provided at work site.	3	1	L	L	1. No one shall get continuous exposure to sun for more than 02 hrs with 20 minutes rest in rest shed. 2. Specific training shall be provided to all employees.	
32	ENVIRONMENTAL ASPECT / IMPACT FOR EXCAVATION AND CONCRETING OF FOUNDATION	Localized effect	Operator, Staff & Workmen / Surrounding community (Air pollution)	Valid PUC certificate available	3	3	M	L	Ensure periodical maintenance of Engine, air filters for less smoke.	P&M and SHE Engineer
33	Noise	Minor effect	Operator, Staff & Workmen / Surrounding community (Noise pollution)	Exhaust muffler is available at vehicle to control noise	3	2	M	L	1. Periodic medical test shall be done of workers, who are expose to noisy environment. 2. workers shall work in rotation to have less exposure to noise.	P&M and SHE Engineer



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	Dust	Minor effect (short term)	Operator, Staff & Workmen / Surrounding community (Air pollution)	Water sprinkling shall be done of the site to subside the dust.	3	2	6M	L	Site Engineer and SHE Engineer	
34										
35	Fire in equipment	Minor effect	Operator, Staff & Workmen / Surrounding community (Air pollution)	<ol style="list-style-type: none"> No flammable materials allowed to keep within 20 feet of equipment. Periodic maintenance of batteries be carried out to avoid short circuit./ spark due to loose terminal lugs 	2	2	4	<ol style="list-style-type: none"> Relevant training shall be provided to all employees about fire prevention Periodic inspection through checklist & monitoring is to be carried out. Fire extinguisher provided at work site. 	P&M, Site Engineer and SHE Engineer	
36	Leakage of Hydraulic oil	Localized effect	Surrounding community (Land contamination)	Ensuring no leakages present in hydraulic chamber, hoses & valves	2	3	M	L	P&M, Site Engineer and SHE Engineer	
37	Leakage of battery acid	Minor effect	Technician / Workmen	Following safe handling method, while transporting batteries	2	2	L		Site Engineer and SHE Engineer	
38	Working near to operational IR track	Loss of Railway/ LT property /Loss of life	Operator, Staff & Workmen Railway passenger	<ol style="list-style-type: none"> Hard Barricading to be done at 3.5 meter from the centre of nearest IR track. A lime line of 150 mm width shall be marked at 06 meter from the nearest IR track 	3	5	M	L	<ol style="list-style-type: none"> Specific training shall be provided to all employees. Periodic maintenance and inspection of hydraulic system shall be done 	Site Engineer and SHE Engineer
									<ol style="list-style-type: none"> Specific training shall be provided to all employees. Periodic inspection and monitoring is to be carried out. 	Site Engineer and SHE Engineer
									<ol style="list-style-type: none"> Follow the guideline as per the clause 806 and 807 of IRPWW. When working within the 3.5 meter from the centre of IR track, obtain PTW with power 	Site Engineer and SHE Engineer

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38	Working at night/Poor visibility condition.	Infringement to SOD of IR Topping of construction equipment	Loss of Railway/S LT property /Loss of life	Operator, Staff & Workmen Railway passenge r	<p>3. When working between 3.5 meter and 06 meter away from the centre of nearest IR track, it will be ensure that no part of construction equipment infringe to IR SOD.</p> <p>4. Deployment of 02 nos flagmen with red and green flag/Light with whistle.</p> <p>5. Training to all staff for emergency procedure for stopping the incoming train in case of infringement of construction equipment to IR SOD.</p> <p>6. PPE compliance by all.</p> <p>7. Obtain the contact details of nearest SMLC gate for help in stopping movement of train in emergency.</p> <p>8. Keep a distance of more than 02 meter away from the OHE.</p> <p>1. Intimate and Obtain night working permission from the PMC.</p> <p>2. Follow the working protocol for night working / working during the poor visibility.</p> <p>3. Area light shall be done with the 100 LUX.</p> <p>4. Light arrangement shall be made to ensure that not creating glaring effect to loco-Pilots eyes of IR when working in parallel section.</p> <p>5. Vehicle movement not to exceed 10 KMPH.</p> <p>6. TBT to all staff for emergency rescue plan/</p>	2	4	8M	<p>block from the traffic controller of concerned railway through PMC and DFCCI in line with clause 807 of IRPWM.</p> <p>3. NO work shall be done after the sunset.</p>	L	Site Engineer and SHE Engineer
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39	Adverse weather condition	Ill health Minor Injury	Loss of manpower r/hrs/	Operator, Staff & Workmen	7. Compliance of PPE by all staff. 1. Arrangement of rest shed for workers to take breaks in cooler, shaded areas and rest regularly during summer season. 2. No work in sun from 1200h – 1500 h in open worksite. 3. Arrangement for cool drinking water to avoid dehydration. 4. Arrangement of glucose during summer. 5. Avoid more than 02 hours continuous working at open worksite. 6. Take rest in rest shed for 15 minutes after 02 or less hours of work. 7. Work in rotation 8. No work shall be done during the rain. 9. Provide raincoat to all workmen for protection from rain. 10. on commencement of rain stop the work and stable the construction equipment on formation minimum 06 meter away from the IR track	2	3	6M	L	1. Loose clothing during the summer season by workers/staff. 2. Provide workers to use goggles in summer. 3. Ensure for proper access and egress to worksite with contingency plan for safe stopping work and shed for workmen on start of rain.	Site Engineer and SHE Engineer
40	Adverse weather condition	Toppling /collapse of lifting machine, Like mobile crane/(Hydr a)	Grievous injury or fatality	Operator, Staff & Workmen	1. Stop the work and Lower the boom of mobile crane during the high wind. 2. Stable the lifting machines in the centre of the formation with the all locking device in place as per the OEM manual of lifting equipments during	2	4	8M	L	1. Site engineer/site safety officer to ensure that lifting machine is always more than 01 meter away the edges of formation bed top. 2. Always refer to weather	Site Engineer and SHE Engineer



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				high wind.. 3. During the monsoon period all involved for the work shall use rain coat only, no umbrella.				forecast issued by the local meteorological department for the day.		
41	Adverse weather condition	Collapse of temporary structure	Grievous injury or fatality	Operator, Staff & Workmen	1. No temporary structure shall be used other than the beach umbrella / Canopy as rest shed. 2. During high wind, all umbrella/Canopy shall be folded and secured. 3. All staff to take shelter at the bottom of formation at the toe line of alignment against the direction of wind.	2	4	8M	L 1. Stop the work in case of wind speed is more than 40 KMPH 2. Use goggles to protect the eyes from dust.	Site Engineer and SHE Engineer
42	Adverse weather condition	Thunderstorm and lightning	Grievous injury or fatality	Operator, Staff & Workmen	1. To Locate the thunderstorm from the worksite, count the seconds between a flash of lightning and the clap of thunder. Roughly for every three seconds gives you about a kilometer. 2. You should seek shelter quickly if the length of time between the lightning flash and the clap of thunder is 30 seconds or less. 3. Keep all metal and electrical objects more than 20 metres away from all personal of site. 4. Avoid water and find a low-lying open place that is a safe distance from trees, poles or metal objects. Water will transmit strikes from further away and lightning likes to strike high objects.	3	4	12 H	L 1. Suspend activities for at least 30 minutes after the last clap of thunder of 30 seconds or less. 2. If no shelter is available, crouch low, with as little of your body touching the ground as possible using safety shoes. 3. Stay away 100 feet from concrete floors or walls of bridge or structure. 4. Ensure for PPE compliance by all at the site. 5. Explain about the lightning and thunderstorm in Tool Box Talk	Site Engineer and SHE Engineer

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43.	Working near & over water (at Bridge)	Minor Injury	Lost time injury	Operator, Staff & Workmen	<p>1. Barricade the edges of bridge.</p> <p>2. Move the construction equipment at 10 KMPH.</p> <p>3. No auguring is required on bridge as space left by CST contractor for OHE mast erection.</p> <p>4. While auguring operation near the bridge, ensure for edge protection and stable the augur at minimum 01 meter away from the formation edge and also from abutment portion of bridge.</p>	2	3	6M	<p>1. Tool box talk to workmen for fall protection.</p> <p>2. Alert the workmen and staff towards the Tripping and falling hazards, if any</p>	L	Site Engineer and SHE Engineer
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Probability Descriptions (The highest category will always be used)		
VALUE	Status	Description
5	Very much likely	Happens several times per year in a construction site.
4	Most Likely	Happens several times per year in our IC.
3	Likely	Incident occurred in our IC.
2	Unlikely	Known to occur in other ICs & construction industry.
1	Most Unlikely	Never heard of in construction industry.

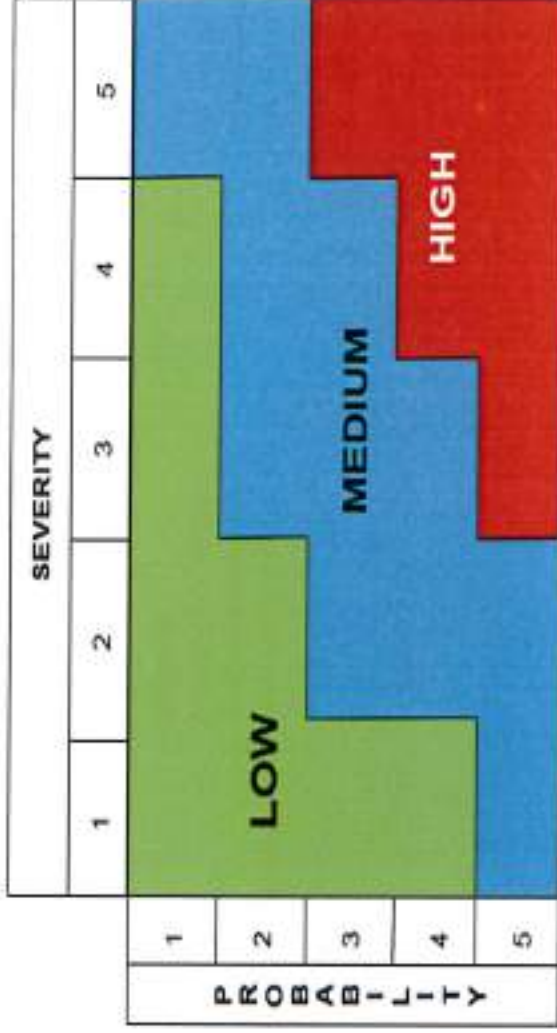
Severity Descriptions (The highest category shall always be used)			
VALUE	Result of Hazard to Personnel		Severity of the Environmental impact
	Safety	Health	
5	Single or multiple Fatality	Terminal illness	Massive effect
4	Serious Injury requiring hospitalisation	Unemployable due to illness	Major effect
3	Lost Time Injury	Intense health effect	Localized effect
2	Injury requiring Medical Treatment but not Lost Time	Minor health effect	Minor effect
1	First Aid treatment only	Slight health effect	Slight effect

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Matrix for Risk Assessment



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WDFC-PHASE 2-EMP16

Ref: WDFC/EMP-16/SLT/SHE/034 REV 00

SHE RISK ASSESSMENT

Name of the Project: WDFC, Phase-II, EMP-16 Project

Activity considered: Mast / Boom Erection & Grouting

Business Unit: RSBU / TFL

Date: 28.03.2019, Rev 00

Sl. No	Activity	Hazard / Environmental Aspect			Existing Control Measure	Probability	Severity Rating	Risk/ Impact Level	Residual Risk / Impact	Action By
		Source / Situation / Act	Possible Outcome	People at risk						
1	MAST ERECTION	No competent test certificate available for crane	Lost time injury	Any person	Ensuring testing of crane by a competent person and availability of valid test certificate	2	3	M	L	P&M / Site Engineer / SHE Engineer
2		Crane operator & signaler competency and fitness	Lost time injury	Driver, Nearby staff and workmen	1. Ensured the selected person is competent, physically fit and engaged in work. 2. Ensured that driver / operator having valid license.	2	3	M	L	P&M / Site Engineer / SHE Engineer

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3	Selection of suitable equipment for lifting activity	Minor injury	Operator, Nearby staff and workmen	1. Selection of equipment done according to the load to be lifted. 2. Work is not carried out until permitted by the site SHE and P&M.	2	2	L	1. Work shall be carried out with close supervision. 2. Safety instructions should be communicated through Tool box talk (TBT)	P&M / Site Engineer / SHE Engineer
4	No load certificate for lifting tools / tackles	Minor injury	Any person	Ensuring load testing of the lifting tools & tackles by a competent person and availability of valid test certificate.	2	2	L	Pre and Post inspection of lifting tools & tackles shall be carried through checklists.	P&M / Site Engineer / SHE Engineer
5	Tilting / toppling of crane	Major injury	Operator, Nearby staff and workmen	1. Permit to work system followed before lifting operation at work site. 2. Selecting the crane according to the load. 3. Crane placed in a leveled ground. 4. Work area is cleared of any obstructions.	2	4	M	1. Permit to work system (Excavation) shall be followed before starting of work. 2. Wooden blocks shall be provided below out riggers to spread the whole load on the ground level. 3. Specific training to be imparted to operators. 4. Housekeeping inspection shall be carried through checklists. 5. Wheel supports shall be provided.	P&M / Site Engineer / SHE Engineer



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6	Nearby live overhead electrical lines	Fatality	Operator, Nearby staff and workmen	1. Not allowing operation within 6meter of any overhead lines. 2. Electrical work permit taken before starting of operation. 3. Work carried out as per method statement and safe operating procedures. 4. Permit to work (PTW) shall be followed.	2	5	M	1. Adequate safety measures (e.g LOTO System) to be compiled before starting of operation. 2. Specific training shall be provided to all employees. 3. Safety instructions shall be communicated through TBT.	L	Site Engineer / SHE Engineer
7	Damaged slings	Minor injury	Workmen	1. Damaged slings are not used at work site. 2. Specific PPE (Hand gloves) provided workmen to prevent cut injuries.	2	2	L	Work shall be carried out with close supervision.		Site Engineer / SHE Engineer
8	Failure of lifting tools and tackles	Major injury	Staff and Workmen	1. Selection of all lifting tools and tackles done according to the load. 2. Ensured selected lifting tools and tackles having valid competent person test certificate.	2	4	M	1. Safety instructions shall be communicated through TBT. 2. Job specific training program shall be imparted to all employees. 3. Work shall be carried out with close supervision.	L	Site Engineer / SHE Engineer
9	Hit by object (Mast)	Lost time injury	Workmen	1.No person allowed near the object (mast)	2	3	M	Guy ropes shall be used to control the mast movement from a safe distance.	L	Site Engineer / SHE Engineer



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10	Hit by vehicle (Crane)	Major injury	Staff and Workmen	1. No person allowed to work or stand in the path of crane movement. 2. Work carried out with close supervision.	2	3	M	1. Barricading shall be done in crane movement area to prevent any person to in the pathway. 2. Pre and Post inspection of crane shall be carried through checklists. 3. Ensure reverse horn available at vehicle.	L	Site Engineer / SHE Engineer
11	Fall of object (Mast)	Major injury	Staff and Workmen	1. Damaged slings or wire ropes were not used for lifting. 2. No persons allowed near the load while lifting operation being carried out.	2	4	M	1. Periodic inspection and maintenance of crane shall be carried out to detect any damage in pendant / hoist rope. 2. Working area shall be barricaded to prevent any person to sit or stand nearby the crane while lifting operation.	L	Site Engineer / SHE Engineer
12	Falling of portal boom due to improper tightening of bolts	Major injury	Staff and Workmen	1. Tightness of bolts ensured twice before releasing of crane. 2. No persons allowed below the lifted object (Portal boom) while erection work is being carried out.	2	4	M	1. Permit to work at height shall be taken before starting of work. 2. Specific job training shall be provided to all employees. 3. Working area shall be barricaded to avoid unauthorized entry.	L	Site Engineer / SHE Engineer



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13					Workmen	Provided specific PPE (Safety harness) for workmen to work at height.	2	4	M	1. Permit to work at height system shall be deployed before commencement of work activity. 2. Work shall be carried out with close supervision.	L	Site Engineer / SHE Engineer
14	Hydraulic hose pipe burst	Major injury	Operator, nearby staff and workmen	1. Ensuring no leakages present in hydraulic chamber, hoses, valves. 2. Periodic maintenance and inspection of hydraulic hose pipe is being carried out.	2	4	M	L	Shall not allow any person to stand below hydraulically operated machine parts.	P&M / SHE Engineer		
15	Smoke	Intense health effect	Operator, nearby staff and workmen	1. Valid PUC certificate available. 2. Specific PPE (Nose mask) provided to all workmen working surrounding of vehicle.	3	3	M	L	1. Ensure periodic maintenance of Engine, air filters for less smoke. 2. Safety instructions shall be communicated through TBT.	P&M / SHE Engineer		
16	Noise	Minor health effect	Operator, nearby staff and workmen	1. Exhaust muffler is available at vehicle to control noise. 2. Specific PPE (Nose mask) provided for continuous exposure to noise.	3	2	M	L	1. Periodic rest shall be provided to workers, who are continuously expose to noise. 2. Safety instructions shall be communicated through TBT.	P&M / Site Engineer / SHE Engineer		
17	Alcohol influence at work site	Minor injury / health effect	Any person	No person allowed to enter site under the influence of alcohol or abused drugs.	2	2	L	Site Engineer / SHE Engineer	Specific awareness shall be provided to all employees about using alcohol / drugs at site			

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18	GROUTING	Handling of Mast	Minor injury	Workmen	Guy ropes provided for mast alignment to prevent direct contact of any person	2	2	L	1. Wooden blocks shall be provided to side by side to prevent mast to tilt at one side. 2. Work should be carried out by following method statement and safe work procedures.	Site Engineer / SHE Engineer
19		Fall of tools inside pit	Minor injury	Workmen	No person allowed to keep hand while mast alignment being carried out.	2	2	L	1. Work shall be carried out with close supervision. 2. Relevant training shall be provided to workmen	Site Engineer / SHE Engineer
20		Contact with cement concrete	Minor injury	Workmen	Provided specific PPE (PVC hand gloves / gumboot) while working in concrete	3	2	M	Relevant training shall be provided to workmen	Site Engineer / SHE Engineer
21	ENVIRONMENTAL ASPECT / IMPACT FOR EXCAVATION, MAST ERECTION	Smoke	Localized effect	Operator, Staff & Workmen / Surrounding community (Air pollution)	Valid PUC certificate available	3	3	M	Ensure periodical maintenance of Engine, air filters for less smoke.	P&M and SHE Engineer
22		Noise	Minor effect	Operator, Staff & Workmen / Surrounding community (Noise pollution)	Exhaust muffler is available at vehicle to control noise	3	2	M	Periodic test shall be provided to workers, who are continuously expose to noise.	P&M and SHE Engineer
23		Fire in Equipment	Minor effect	Operator, Staff & Workmen /	1. No flammable materials allowed to keep within 20 feet of equipment.	2	2	L	1. Relevant training shall be provided to all employees about fire	P&M, Site Engineer and

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24	Leakage of hydraulic oil	Localized effect	Surrounding community (Air pollution)	2. Periodic maintenance of batteries being carried out to avoid short circuit. 3. Fire extinguisher provided at work site.	2	3	M	<p>prevention</p> <p>2. Periodic inspection through checklist & monitoring is to be carried out.</p> <p>1. Specific training shall be provided to all employees. 2. Periodic maintenance and inspection of hydraulic system shall be done</p>	L	P&M, Site Engineer and SHE Engineer
25	Leakage of battery acid	Minor effect	Surrounding community (Land contamination)	Ensuring no leakages present in hydraulic chamber, hoses & valves	2	2	L	<p>Following safe handling method, while transporting batteries</p> <p>1. Specific training shall be provided to all employees. 2. Periodic inspection and monitoring is to be carried out.</p>		Site Engineer and SHE Engineer
26	Adverse weather condition Ill health Minor injury	Loss of manpower/hrs/	Operator, Staff & Workmen	<p>1. Arrangement of rest shed for workers to take breaks in cooler, shaded areas and rest regularly during summer season.</p> <p>2. No work in sun from 1200h – 1500 h in open worksite.</p> <p>3. Arrangement for cool drinking water to avoid dehydration.</p> <p>4. Arrangement of glucose during summer.</p> <p>5. Avoid more than 02 hours</p>	2	3	6M	<p>1. Loose clothing during the summer season by workers/staff.</p> <p>2. Provide workers to use goggles in summer.</p> <p>3. Ensure for proper access and egress to worksite with contingency plan for safe stopping work and shed for workmen on start of rain.</p>	L	Site Engineer and SHE Engineer



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27	Adverse weather condition	Toppling /collapse of lifting machine, Like mobile crane(hydray) Auguring Machine	Grievous injury or fatality	Operator, Staff & Workmen	<p>continuous working at open worksite.</p> <p>6. Take rest in rest shed for 15 minutes after 02 or less hours of work.</p> <p>7. Work in rotation</p> <p>8. No work shall be done during the rain.</p> <p>9. Provide raincoat to all workmen for protection from rain.</p> <p>10. on commencement of rain stop the work and stable the construction equipment on formation minimum 06 meter away from the IR track</p>	2	4	8M	<p>1. Site engineer/site safety officer to ensure that lifting machine is always more than 01 meter away the edges of formation bed top.</p> <p>2. Always refer to weather forecast issued by the local metrological department for the day.</p>	L	Site Engineer and SHE Engineer
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28	Adverse weather condition	Collapse of temporary structure	Grievous injury or fatality	Operator, Staff & Workmen	<p>1. No temporary structure shall be used other than the beach umbrella / Canopy as rest shed.</p> <p>2. During high wind, all umbrella/Canopy shall be folded and secured.</p> <p>3. All staff to take shelter at the bottom of formation at the toe line of alignment against the direction of wind.</p>	2	4	8M	<p>1. Stop the work in case of wind speed is more than 40 KMPH</p> <p>2. Use goggles to protect the eyes from dust.</p>	L	Site Engineer and SHE Engineer
29	Adverse weather condition	Thunderstorm and lightning	Grievous injury or fatality	Operator, Staff & Workmen	<p>1. To Locate the thunderstorm from the worksite, count the seconds between a flash of lightning and the clap of thunder. Roughly for every three seconds gives you about a kilometer.</p> <p>2. You should seek shelter quickly if the length of time between the lightning flash and the clap of thunder is 30 seconds or less.</p> <p>3. Keep all metal and electrical objects more than 20 metres away from all personal of site.</p> <p>4. Avoid water and find a low-lying open place that is a safe distance from trees, poles or metal objects. Water will transmit strikes from further away and lightning likes to strike high objects.</p>	3	4	12 H	<p>1. Suspend activities for at least 30 minutes after the last clap of thunder of 30 seconds or less.</p> <p>2. If no shelter is available, crouch low, with as little of your body touching the ground as possible using safety shoes.</p> <p>3. Stay away 100 feet from concrete floors or walls of bridge or structure.</p> <p>4. Ensure for PPE compliance by all at the site.</p> <p>5. Explain about the lightning and thunderstorm in Tool Box Talk</p>	L	Site Engineer and SHE Engineer



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30	Working near & over water (at Bridge)	Fall from height /Drowning	Fatality / Lost time injury	Operator, Staff & Workmen	<p>1. Barricade the edges of bridge.</p> <p>2. Move the construction equipment at 10 KMPH.</p> <p>3. Safety net shall be erected along the length of bridge on both side of bridge to protect fall from height and also for drowning case if the bridge is over the river</p> <p>4. Stop workers to go to pond for taking bath..</p>	2	3	6M	1. Tool box talk to workmen for fall protection. 2. Alert the workmen and staff towards the Tripping and falling hazards, if any	L	Site Engineer and SHE Engineer
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Probability Descriptions (The highest category will always be used)		
VALUE	Status	Description
5	Very much likely	Happens several times per year in a construction site.
4	Most Likely	Happens several times per year in our IC.
3	Likely	Incident occurred in our IC.
2	Unlikely	Known to occur in other ICs & construction industry.
1	Most Unlikely	Never heard of in construction industry.

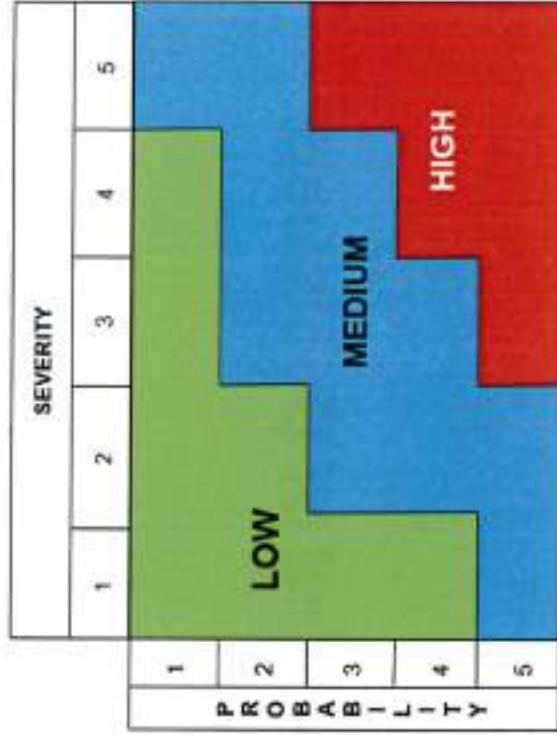
Severity Descriptions (The highest category shall always be used)			
VALUE	Result of Hazard to Personnel		Severity of the Environmental impact
	Safety	Health	
5	Single or multiple Fatality	Terminal illness	Massive effect
4	Serious Injury requiring hospitalisation	Unemployable due to illness	Major effect
3	Lost Time Injury	Intense health effect	Localized effect
2	Injury requiring Medical Treatment but not Lost Time	Minor health effect	Minor effect
1	First Aid treatment only	Slight health effect	Slight effect

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Matrix for Risk Assessment



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