



L&T – IHI CONSORTIUM

CONTRACT AGREEMENT

between

MUMBAI METROPOLITAN REGION DEVELOPMENT AUTHORITY

and

L&T-IHI CONSORTIUM

**(M/s LARSEN & TOUBRO LIMITED & M/s IHI INFRASTRUCTURE
SYSTEMS CO. Ltd.)**

MUMBAI TRANS HARBOUR LINK PROJECT (MTHL)

PACKAGE-1

“Procurement of Mumbai Trans Harbour Link Project (Package-1), Construction of a 10.380 km Long Bridge Section (CH 0+000 – CH 10+380) across the Mumbai Bay including Sewri Interchange”

(JICA LOAN: Mumbai Trans-Harbour Link Project (I) ID-P255)

MADE ON 26TH DECEMBER 2017

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Package-1 L&T- IHI Consortium

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Section VIII. Particular Conditions

Notes on Particular Conditions

The Particular Conditions (PC) complement the General Conditions (GC) to specify data and contractual requirements linked to the special circumstances of the country, the Employer, the Engineer, the sector, the overall project and the Works. Whenever there is a conflict, the provisions herein shall prevail over those in the GC.

Part A, Contract Data of the PC, includes data to complement the GC in a manner similar to the way in which the Bid Data Sheet complements the Instructions to Bidders.

Part B, the Specific Provisions of the PC specifies country- or project-specific provisions.

Clause numbers in the PC correspond to those in the GC.



Particular Conditions (PC)

Part A - Contract Data

Items	Sub-Clause	Data
Employer's name and address	1.1.2.2 & 1.3	Name: Mumbai Metropolitan Region Development Authority (MMRDA). Address: 2 nd Floor, New Office Building, Plot No. R-05, R-06 & R-12, 'E' Block, Bandra-Kurla Complex, Bandra (E), Mumbai Maharashtra, INDIA 40005 Phone : 91 22 2659 1239 Fax : 91 22 2659 4179 Email : chiefengineer1@mailmmrda.maharashtra.gov.in
Engineer's name and address	1.1.2.4 & 1.3	Name: To be named later. Address: To be informed later.
Bank's name	1.1.2.11	Japan International Cooperation Agency (JICA).
Borrower's name	1.1.2.12	Government of India
Time for Completion	1.1.3.3	One thousand six hundred and forty three (1,643) days including rainy seasons.
Defects Notification Period	1.1.3.7	Seven hundred and thirty (730) days.
Sections	1.1.5.6	Not applicable.
Profit	1.2	Ten percent (10 %) of Cost.
Electronic transmission systems	1.3	The electronic transmission shall be in the form of Email or facsimile or E-Tender portal.
Governing Law	1.4	Laws of India and laws of Maharashtra State.
Ruling language	1.4	English.
Language for communications	1.4	English.
Time for access to, and possession of all parts of, the Site	2.1	Twenty eight (28) days after the Commencement Date, except a certain portion of the Site, which will be made available at a later date as stipulated in Table 1.1 Interface Requirements, Section VI in the Employer's Requirements..
Engineer's Duties and Authority	3.1(B)(ii)	Variations resulting in an increase of the Accepted Contract Amount in excess of one percent (1%) shall require approval of the Employer.
Performance Security	4.2	The Performance Security will be in the form of a "Bank guarantee" in the amount(s) of Five percent (5%) percent of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount. As the Performance Security of this contract is in accordance with the ICC Publication No.758, the 6 th



		paragraph, "The Employer shall return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate" is deleted.
Progress Reports	4.21	Ten (10) copies.
General Design Obligations	5.1	Period for notifying errors, faults and defects in the Employer's Requirements: twenty eight (28) days
Normal working hours	6.5	No work at night time shall be allowed in the Coastal Regulation Zone as stipulated in the CRZ clearance issued by the Ministry of Environment, Forest & Climate Change, Govt. of India.
Commencement of Works	8.1(c)	Effective access to and possession of the Site will be given to the Contractor after the Commencement Date as stipulated in Sub-Clause 2.1 hereof.
Delay damages for the Works	8.7	One tenth percent (0.1%) of the Contract Price per day for delay beyond the Time for Completion of the Works. Refer to Part B of PC for delays beyond the interim milestone dates. The delay damages are payable in the currencies and proportions in which the Accepted Contract Amount is stated.
Maximum amount of delay damages	8.7	Ten percent (10%) of the Contract Price for delay beyond the Time for Completion of the Works. Ten percent (10%) of the Contract Price also for delays beyond the interim milestone dates (for delay from each milestone and for a combination of delays from respective milestones). The maximum for combination of the delay beyond interim milestones and the delay beyond the Time for Completion shall also be 10% of the Contract Price. Refer to PC Sub-Clause 8.7 in Part B.
Provisional Sums	13.5.(b)(ii)	Not Applicable, as there is no nominated Subcontractor involved in the Contract.
Total advance payment	14.2	Amount: Ten percent (10%) of the Accepted Contract Amount, payable in the currencies and proportions in which the Accepted Contract Amount is stated. Number of installments: Two (2) equal (5%+5%) installments. The second installment shall be made upon Contractor's submission of utilization certificate issued by Chartered Accountant stating that ninety percent (90%) of the 1 st installment has been consumed.
Repayment amortization rate of advance payment	14.2(b)	Not to exceed twenty percent (20%).
Percentage of Retention	14.3(c)	Five percent (5%).
Limit of Retention Money	14.3(c)	Five percent (5%) of the Accepted Contract Amount.
Plant and	14.5(b)(i)	This Sub-Clause is not applicable; no payment on



Materials	Plant and Materials for payment when shipped	shipment of Plant and Materials shall be made.
	14.5(c)(i): Plant and Materials for payment when delivered to the Site	This Sub-Clause is applicable; payment for Materials on the Site shall be made for the items and within the limit of amounts stipulated in the respective Price Schedules.
Minimum Amount of Interim Payment Certificates	14.6	No minimum amount set forth. Maximum two IPCs per month shall be payable.
Periods for submission of insurance: a. evidence of insurance. b. relevant policies	18.1	a. Fourteen (14) days b. Twenty eight (28) days
Maximum amount of deductibles for insurance of the Employer's risks	18.2(d)	Not applicable.
Minimum amount of third party insurance	18.3	INR Six thousand Six hundred million (6600 million).
Date by which the DB shall be appointed	20.2	28 days after the Commencement date.
The DB shall be comprised of	20.2	Three (3) members.
List of potential DB sole members	20.2	Not applicable.
Appointment (if not agreed) to be made by	20.3	The President of FIDIC or a person to be appointed by the President of FIDIC

Table: Summary of Sections

Section Name/Description (Sub-Clause 1.1.5.6)	Time for Completion (Sub-Clause 1.1.3.3)	Damages for Delay (Sub-Clause 8.7)
Not applicable	Not applicable	Not applicable



Particular Conditions (PC)

Part B - Specific Provisions

**Sub-Clause 1.6
Contract Agreement**

Add the following at the end:

“The Contractor shall pay the costs and expenses, including the stamp duty, for the registration of the executed Contract in accordance with the applicable Laws. The same will be reimbursed by the Employer.”

**Sub-Clause 1.9
Errors in the
Employer’s
Requirements**

First paragraph shall be replaced with the following:

“If the Contractor suffers delay and/or incurs Cost as a result of an error in the Employer's Requirements, and an experienced contractor exercising due care would not have discovered the error when scrutinizing the Employer's Requirements under Sub-Clause 5.1 [General Design Obligations], the Contractor shall give notice to the Engineer no later than 28 days after the Contractor becomes or should have become aware of the error and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:”

**Sub-Clause 1.15
Inspection and Audit by
Employer**

Add the following new provisions as Sub-Clause 1.15:

“The Contractor shall permit JICA, the Employer and/or persons appointed by JICA or the Employer to inspect the Site and/or the Contractor's accounts and records relating to the performance of the Contractor and to have such accounts or records audited by auditors appointed by JICA or the Employer if required by JICA or the Employer.

The auditors shall include, but not be limited to, the Comptroller and the Auditor General of India, the Accountant General of Maharashtra State, and the Technical (Quality Assurance) Auditors as may be appointed by the Employer.”

**Sub-Clause 4.1
Contractor’s General
Obligations**

Add the following new paragraph at the end of Sub-Clause 4.1:

“The Contractor shall comply with instructions given by the Engineer in accordance with the Contract.

If the Contractor considers it necessary for proper execution of the Works, he shall give reasonable notices to the Engineer on any instructions given, to enable the Engineer to issue necessary additional instructions to avoid undue delay in progress of the Works. No act or omission by the Engineer or his assistants in the performance of any of the Engineer's duties or the exercise of any of the Engineer's powers under the Contract shall, in any way, operate to relieve the Contractor of any of the duties, responsibilities, obligations or liabilities imposed on the Contractor by any of the provisions of the Contract.”

**Sub-Clause 4.21
Progress Report**

Add the following provisions at the end of the Sub-Clause:

“The Contractor shall video-record, at monthly intervals, monthly progress of the Works. The locations shall be agreed with the Engineer in the first month and maintained until completion of the Works, unless otherwise agreed with the Engineer.



The Contractor shall also video-record aerial view of the progress of the Works using radio-controlled pilotless aircrafts (drones), if so instructed and a prior permission is granted by the Engineer. This aerial view video-recording service will be paid for under the Provisional Sums. The flight paths shall be agreed with the Engineer in the first month and maintained until completion of the Works, unless otherwise agreed with the Engineer. Other details shall be agreed with the Engineer before submission of the first monthly progress report. The Contractor shall submit, as an integral part of the monthly progress reports, the video data recorded on an agreed recording medium.

**Sub-Clause 6.4
Labour Laws**

Add the following at the end:

“The employees of the Contractor or his Subcontractors shall in no case be treated as the employees of the Employer at any point of time.

Major labour laws (including amendments if any) applicable to establishment engaged in building and other construction work are as follows:

- (i) Workmen Compensation Act 1923,
- (ii) Payment of Gratuity Act 1972,
- (iii) Employees PF and Miscellaneous Provision act 1952,
- (iv) Maternity Benefit Act 1951,
- (v) Contract Labour (Regulation and Abolition) Act 1970,
- (vi) Minimum Wages Act 1948,
- (vii) Payment of Wages Act 1936,
- (viii) Equal remuneration Act 1979,
- (ix) Payment of Bonus Act 1965,
- (x) Industrial Disputes Act 1947,
- (xi) Industrial Employment (standing orders) Act 1946,
- (xii) Trade Unions Act 1928,
- (xiii) Child Labour (Prohibition and Regulation) Act 1986,
- (xiv) Inter-State Migrant Workmen’s (Regulation of Employment and Conditions of Service) Act 1979,
- (xv) The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act 1996, and
- (xvi) The Factories Act 1948.”

**Sub-clause 6.15
Measures against Insect
and Pest Nuisance**

Add the following at the end:

“The Contractor shall provide his staff and labour with suitable prophylactics for the prevention of malaria and take steps to prevent the formation of stagnant pools of water. He shall comply with all the regulations of the local health authorities in these respects and shall in particular arrange to spray thoroughly with approved insecticide all buildings erected on the Site. Such treatment shall be carried out on a regular basis throughout the Contract period or as and when instructed by the Engineer. The Contractor shall warn his staff and labour of the dangers of bilharzia and wild animals.”

**Sub-Clause 8.7
Delay Damages**

Insert the following statement as the 2nd paragraph of this Sub-Clause:

“If the Contractor fails to comply with the following interim progress milestones, the Contractor shall pay delay damages to the



Employer for the defaults:

Milestone No.	Milestone Requirements	Milestone Completion Date (after the Commencement Date)	Delay Damages (% of the Accepted Contract Amount/Day)
1	Completion of the Works amounting to 10% of the Accepted Contract Amount.	365 days	0.01
2	Completion of the Works amounting to 35% of the Accepted Contract Amount.	730 days	0.03
3	Completion of the Works amounting to 60% of the Accepted Contract Amount.	1,095 days	0.05
4	Completion of the Works amounting to 90% of the Accepted Contract Amount.	1,460 days	0.05

If the subsequent milestone (e. g. No. 3) is accomplished in a successful manner, the delay damages paid by the Contractor for the foregoing milestones (e. g. Nos. 1 and 2) shall be returned to the Contractor without bearing any interest.

Delay damage for the respective milestone shall commence on the Milestone Completion Date specified for the respective milestones and terminate either on the Milestone Completion Date specified for the next milestone or on the date the maximum limit is reached.

”

**Sub-Clause 13.8
Adjustment for
Changes in Cost**

Substitute this Sub-Clause with the following:

“In this Sub-Clause, "table of adjustment data" means the completed table of Changes in adjustment data included in the Schedules. If there is no such table of adjustment data, this Sub-Clause shall not apply.

If this Sub-Clause applies, the amounts payable to the Contractor shall be adjusted for rises or falls in the cost of labour, Goods and other inputs to the Works, by the addition or deduction of the amounts determined by the formulae prescribed in this Sub-Clause. To the extent that full compensation for any rise or fall in Costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.

The adjustment to be applied to the amount otherwise payable to the Contractor, as valued in accordance with the appropriate Schedule and certified in Payment Certificates, shall be determined from formulae for each of the currencies in which the Contract Price is



payable. No adjustment is to be applied to work valued on the basis of Cost or current prices. The formulae shall be of the following general type:

$$P_n = a + b(L_n/L_o) + c(S_n/S_o) + d(C_n/C_o) + e(B_n/B_o) + f(F_n/F_o) + g(O_n/O_o) + h(M_n/M_o)$$

where:

"P_n" is the adjustment factor for each item of work or services to be applied to the estimated value of the work or services carried out in the month "n" which shall be applied to each currency.

b = Cost coefficient of labour to the total cost

c = Cost coefficient of steel to the total cost

d = Cost coefficient of cement to the total cost

e = Cost coefficient of bitumen to the total cost

f = Cost coefficient of fuel and lubricant to the total cost

g = Cost coefficient of other materials to the total cost

h = Cost coefficient of construction machinery to the total cost

These cost coefficient (or "weighting" shown in the agreed Price Adjustment Data) for the respective items of the work or services shall be as shown in the agreed Price Adjustment Data. Work/service items not listed in the agreed Price Adjustment Data shall not be subject to price adjustment for change in costs under this Sub-Clause 13.8

"L_n", "S_n", "C_n", "B_n", "F_n", "O_n" and "M_n" are the current cost indices or reference prices for month of "n", determined pursuant to the agreed Price Adjustment Data; and

"L₀", "S₀", "C₀", "B₀", "F₀", "O₀" and "M₀" are the base cost indices or reference prices corresponding to the above cost elements on the Base Date.

The cost indices or reference prices stated in the table of adjustment data shall be used. If their source is in doubt, it shall be determined by the Engineer. For this purpose, reference shall be made to the values of the indices at stated dates (quoted in the fourth and fifth columns respectively of the table) for the purposes of clarification of the source; although these dates (and thus these values) may not correspond to the base cost indices.

In cases where the "currency of index" is not the relevant currency of payment, each index shall be converted into the relevant currency of payment at the selling rate, established by the central bank of the Country, of this relevant currency on the above date for which the index is required to be applicable.

Until such time as each current cost index is available, the Engineer shall determine a provisional index for the issue of Interim Payment Certificates. When a current cost index is available, the adjustment shall be recalculated accordingly.

If the Contractor fails to complete the Works within the Time for Completion, adjustment of prices thereafter shall be made using either (i) each index or price applicable on the date 49 days prior to



the expiry of the Time for Completion of the Works, or (ii) the current index or price: whichever is more favorable to the Employer. The weightings (coefficients) for each of the factors of cost stated in the table(s) of adjustment data shall only be adjusted if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variations.

Notes :

- 1) No price adjustment shall be made to the advance payment amount;
- 2) The price adjustment clause shall not be applicable to any extra item of work/service not included in the agreed Price Adjustment Data, and for which the rates are fixed separately under the Contract;
- 3) Where the final price indices/reference prices are not available while making payment towards Interim Payments, payments towards price adjustment shall be made based on the provisional cost indices/reference prices or cost indices/reference prices of the previous month, to be adjusted in subsequent payments as and when the final cost indices/reference prices become available.
- 4) After verifying the Interim Payment Invoice, the Engineer shall certify the price adjustment amount and advise the same to the Employer. Should any extra amount be due to the Contractor, the Employer shall pay the same within 28 days of certification by the Engineer. Any amount due from the Contractor on account of negative adjustment shall be recovered from his pending or other bills at the earliest.
- 5) Where the delay to the Works fall under Sub-Clause 8.6 [*Rate of Progress*], price adjustment shall be made as follows:
 - (a) In case the cost indices/reference prices increase above the indices/reference prices applicable to a payment made on the last date of the original Time for Completion or the delayed period under Sub-Clause 8.6 [*Rate of Progress*], the price adjustment for the period of delay shall be limited to the amount payable as per the cost indices/reference prices applicable to a payment made on the last date of the original Time for Completion or the delayed period as the case may be.
 - (b) "If the Contractor fails to complete the Works within the Time for Completion, adjustment of prices thereafter shall be made using either (i) each index or price applicable on the date 49 days prior to the expiry of the Time for Completion of the Works, or (ii) the current index or price: whichever is more favourable to the Employer.

**Sub-Clause 14.2
Advance Payment**

Replace the expression "This guarantee shall be issued by a reputable bank or financial institution selected by the Contractor" in the 3rd paragraph with the following:

"This guarantee shall be issued by a Scheduled Commercial Bank in India"



**Clause 18
Insurance**

Add the following new Sub-Clause 18.5 regarding the designer's professional indemnity insurance:

"18.5 Insurance for Design Liability

The Contractor shall effect and maintain professional indemnity insurance, which shall cover the risk of professional negligence in the design of the Works. This insurance shall be for a limit of not less than three percent (3%) of the Accepted Contract Amount. The terms and conditions shall be approved by the Employer in advance. The Contractor shall use his best endeavours to maintain the professional indemnity insurance in full force and effect until the end of three (3) years after expiry of the Defects Notification Period including any extension made in accordance with Sub-Clause 11.3. The Engineer will not issue the Final Payment Certificate until the Contractor has submitted evidence that coverage of the insurance has been provided for the aforesaid period."

**Sub-Clause 20.4
Obtaining Dispute
Board's Decision**

Add the following at the end:

"The Contractor shall accept any of the Dispute Board members on the Site and provide them with all necessary assistance on the Site as and when so requested by the Engineer and/or the Employer."



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General Conditions

1 General Provisions

1.1 Definitions

In the Conditions of Contract ("these Conditions"), which include Particular Conditions and these General Conditions, the following words and expressions shall have the meanings stated. Words indicating persons or parties include corporations and other legal entities, except where the context requires otherwise.

1.1.1 The Contract

- 1.1.1.1 "Contract" means the Contract Agreement, the Letter of Acceptance, the Letter of Tender, these Conditions, the Employer's Requirements, the Schedules, the Contractor's Proposal, and the further documents (if any) which are listed in the Contract Agreement or in the Letter of Acceptance.
- 1.1.1.2 "Contract Agreement" means the contract agreement (if any) referred to in Sub-Clause 1.6 [Contract Agreement].
- 1.1.1.3 "Letter of Acceptance" means the letter of formal acceptance, signed by the Employer, of the Letter of Tender, including any annexed memoranda comprising agreements between and signed by both Parties. If there is no such letter of acceptance, the expression "Letter of Acceptance" means the Contract Agreement and the date of issuing or receiving the Letter of Acceptance means the date of signing the Contract Agreement.
- 1.1.1.4 "Letter of Tender" means the document entitled letter of tender or letter of bid, which was completed by the Contractor and includes the signed offer to the Employer for the Works.
- 1.1.1.5 "Employer's Requirements" means the document entitled employer's requirements, as included in the Contract, and any additions and modifications to such document in accordance with the Contract. Such document specifies the purpose, scope, and/or design and/or other technical criteria, for the Works.
- 1.1.1.6 "Schedules" means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Tender, as included in the Contract. Such document may include data, lists and schedules of payments and/or prices.
- 1.1.1.7 "Contractor's Proposal" means the document entitled proposal, which the Contractor submitted with the Letter of Tender, as included in the Contract. Such document may include the Contractor's preliminary design.
- 1.1.1.8 "Tender" means the Letter of Tender and all other documents which the Contractor submitted with the Letter of Tender, as included in the Contract.
- 1.1.1.9 "Contract Data" means the pages completed by the Employer entitled contract data which constitute Part A of the Particular Conditions



- 1.1.1.10 "Schedule of Guarantees" and "Schedule of Payments" mean the documents so named (if any) which are comprised in the Schedules.

1.1.2 Parties and Persons

- 1.1.2.1 "Party" means the Employer or the Contractor, as the context requires.
- 1.1.2.2 "Employer" means the person named as employer in the Contract Data and the legal successors in title to this person.
- 1.1.2.3 "Contractor" means the person(s) named as contractor in the Letter of Tender accepted by the Employer and the legal successors in title to this person(s).
- 1.1.2.4 "Engineer" means the person appointed by the Employer to act as the Engineer for the purposes of the Contract and named in the Contract Data, or other person appointed from time to time by the Employer and notified to the Contractor under Sub-Clause 3.4 [Replacement of the Engineer].
- 1.1.2.5 "Contractor's Representative" means the person named by the Contractor in the Contract or appointed from time to time by the Contractor under Sub-Clause 4.3 [Contractor's Representative], who acts on behalf of the Contractor.
- 1.1.2.6 "Employer's Personnel" means the Engineer, the assistants referred to in Sub-Clause 3.2 [Delegation by the Engineer] and all other staff, labour and other employees of the Engineer and of the Employer; and any other personnel notified to the Contractor, by the Employer or the Engineer, as Employer's Personnel.
- 1.1.2.7 "Contractor's Personnel" means the Contractor's Representative and all personnel whom the Contractor utilises on Site, who may include the staff, labour and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works.
- 1.1.2.8 "Subcontractor" means any person named in the Contract as a subcontractor, or any person appointed as a subcontractor, for a part of the Works; and the legal successors in title to each of these persons.
- 1.1.2.9 "DB" means the person or three persons appointed under Sub-Clause 20.2 [Appointment of the Dispute Board] or Sub-Clause 20.3 [Failure to Agree on the Composition of the Dispute Board].
- 1.1.2.11 "Bank" means the financing institution (if any) named in the Contract Data.
- 1.1.2.12 "Borrower" means the person (if any) named as the borrower in the Contract Data.

1.1.3 Dates, Tests, Periods

- 1.1.3.1 "Base Date" means the date 28 days prior to the latest date for submission and Completion of the Tender.



- 1.1.3.2 "Commencement Date" means the date notified under Sub-Clause 8.1 [Commencement of Works].
- 1.1.3.3 "Time for Completion" means the time for completing the Works or a Section (as the case may be) under Sub-Clause 8.2 [Time for Completion], as stated in the Contract Data (with any extension under Sub-Clause 8.4 [Extension of Time for Completion]), calculated from the Commencement Date.
- 1.1.3.4 "Tests on Completion" means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out under Clause 9 [Tests on Completion] before the Works or a Section (as the case may be) are taken over by the Employer.
- 1.1.3.5 "Taking-Over Certificate" means a certificate issued under Clause 10 [Employer's Taking Over].
- 1.1.3.6 "Tests after Completion" means the tests (if any) which are specified in the Contract and which are carried out under Clause 12 [Tests after Completion] after the Works or a Section (as the case may be) are taken over by the Employer.
- 1.1.3.7 "Defects Notification Period" means the period for notifying defects in the Works or a Section (as the case may be) under Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects], as stated in the Contract Data (with any extension under Sub-Clause 11.3 [Extension of Defects Notification Period]), calculated from the date on which the Works or Section is completed as certified under Sub-Clause 10.1 [Taking Over of the Works and Sections].
- 1.1.3.8 "Performance Certificate" means the certificate issued under Sub-Clause 11.9 [Performance Certificate].
- 1.1.3.9 "day" means a calendar day and "year" means 365 days.

1.1.4 Money and Payments

- 1.1.4.1 "Accepted Contract Amount" means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.
- 1.1.4.2 "Contract Price" means the price defined in Sub-Clause 14.1 [The Contract Price], and includes adjustments in accordance with the Contract.
- 1.1.4.3 "Cost" means all expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, but does not include profit.
- 1.1.4.4 "Final Payment Certificate" means the payment certificate issued under Sub-Clause 14.13 [Issue of Final Payment Certificate].
- 1.1.4.5 "Final Statement" means the statement defined in Sub-Clause 14.11 [Application for Final Payment Certificate].



- 1.1.4.6 "Foreign Currency" means a currency in which part (or all) of the Contract Price is payable, but not the Local Currency.
- 1.1.4.7 "Interim Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment], other than the Final Payment Certificate.
- 1.1.4.8 "Local Currency" means the currency of the Country.
- 1.1.4.9 "Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment].
- 1.1.4.10 "Provisional Sum" means a sum (if any) which is specified in the Contract as a provisional sum, for the execution of any part of the Works or for the supply of Plant, Materials or services under Sub-Clause 13.5 [Provisional Sums].
- 1.1.4.11 "Retention Money" means the accumulated retention moneys which the Employer retains under Sub-Clause 14.3 [Application for Interim Payment Certificates] and pays under Sub-Clause 14.9 [Payment of Retention Money].
- 1.1.4.12 "Statement" means a statement submitted by the Contractor as part of an application, under Clause 14 [Contract Price and Payment], for a payment certificate.
- 1.1.5 Works and Goods
- 1.1.5.1 "Contractor's Equipment" means all apparatus, machinery, vehicles and other things required for the execution and completion of the Works and the remedying of any defects. However, Contractor's Equipment excludes Temporary Works, Employer's Equipment (if any), Plant, Materials and any other things intended to form or forming part of the Permanent Works.
- 1.1.5.2 "Goods" means Contractor's Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.
- 1.1.5.3 "Materials" means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the Contract.
- 1.1.5.4 "Permanent Works" means the permanent works to be executed by the Contractor under the Contract.
- 1.1.5.5 "Plant" means the apparatus, machinery and vehicles intended to form or forming part of the Permanent Works, including vehicles purchased for the Employer and relating to the construction or operation of the Works.
- 1.1.5.6 "Section" means a part of the Works specified in the Contract Data as a Section (if any).
- 1.1.5.7 "Temporary Works" means all temporary works of every kind (other than Contractor's Equipment) required on Site for the execution and completion of the Permanent Works and the remedying of any defects.



1.1.5.8 "Works" mean the Permanent Works and the Temporary Works, or either of them as appropriate.

1.1.6 Other Definitions

1.1.6.1 "Contractor's Documents" means the calculations, computer programs and other software, drawings, manuals, models and other documents of a technical nature (if any) supplied by the Contractor under the Contract; as described in Sub-Clause 5.2 [Contractor's Documents].

1.1.6.2 "Country" means the country in which the Site (or most of it) is located, where the Permanent Works are to be executed.

1.1.6.3 "Employer's Equipment" means the apparatus, machinery and vehicles (if any) made available by the Employer for the use of the Contractor in the execution of the Works, as stated in the Employer's Requirements; but does not include Plant which has not been taken over by the Employer.

1.1.6.4 "Force Majeure" is defined in Clause 19 [Force Majeure].

1.1.6.5 "Laws" means all national (or state) legislation, statutes, ordinances and other laws, and regulations and by-laws of any legally constituted public authority.

1.1.6.6 "Performance Security" means the security (or securities, if any) under Sub-Clause 4.2 [Performance Security].

1.1.6.7 "Site" means the places where the Permanent Works are to be executed, including storage and working areas, and to which Plant and Materials are to be delivered, and any other places as may be specified in the Contract as forming part of the Site.

1.1.6.8 "Unforeseeable" means not reasonably foreseeable by an experienced contractor by the Base Date.

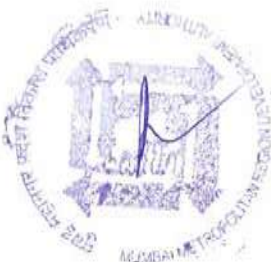
1.1.6.9 "Variation" means any change to the Employer's Requirements or the Works, which is instructed or approved as a variation under Clause 13 [Variations and Adjustments].

1.1.6.10 "Notice of Dissatisfaction" means the notice given by either Party to the other under Sub-Clause 20.4 [Obtaining Dispute Board's Decision] indicating its dissatisfaction and intention to commence arbitration.

1.2 Interpretation

In the Contract, except where the context requires otherwise:

- (a) words indicating one gender include all genders;
- (b) words indicating the singular also include the plural and words indicating the plural also include the singular;



- (c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
- (d) "written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.
- (e) the word "tender" is synonymous with "bid", and "tender" with "bidder" and the words "tender documents" with "bidding documents".

The marginal words and other headings shall not be taken into consideration in the interpretation of these Conditions.

In these conditions, provisions including the expressions "Cost plus profit" require this profit to be one-twentieth (5%) of this Cost unless otherwise indicated in the Contract Data.

1.3 Communications

Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices and requests, these communications shall be:

- (a) in writing and delivered by hand (against receipt), sent by mail or courier, or transmitted using any of the agreed systems of electronic transmission as stated in the Contract Data; and
- (b) delivered, sent or transmitted to the address for the recipient's communications as stated in the Contract Data. However:
 - (i) if the recipient gives notice of another address, communications shall thereafter be delivered accordingly; and
 - (ii) if the recipient has not stated otherwise when requesting an approval or consent, it may be sent to the address from which the request was issued.

Approvals, certificates, consents and determinations shall not be unreasonably withheld or delayed. When a certificate is issued to a Party, the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Engineer, a copy shall be sent to the Engineer or the other Party, as the case may be.

1.4 Law and Language

The Contract shall be governed by the law of the country (or other jurisdiction) stated in the Contract Data.

The ruling language for communications shall be that stated in the Contract Data.

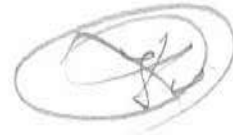
The language for communications shall be that stated in the Contract Data. If no language is stated there, the language for communications shall be the ruling language of the Contract

1.5 Priority of Documents

The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:



- (a) the Contract Agreement (if any),
- (b) the Letter of Acceptance,
- (c) the Letter of Tender,
- (d) the Particular Conditions, - Part A (Contract Data),
- (e) the Particular Conditions – Part B (Specific Provisions),
- (f) these General Conditions,
- (g) the Employer's Requirements,
- (h) the Schedules, and
- (i) the Contractor's Proposal and any other documents forming part of the Contract.



If an ambiguity or discrepancy is found in the documents, the Engineer shall issue any necessary clarification or instruction.

1.6 Contract Agreement

The Parties shall enter into a Contract Agreement within 28 days after the Contractor receives the Letter of Acceptance, unless the Particular Conditions establish otherwise. The Contract Agreement shall be based upon the form annexed to the Particular Conditions. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.

1.7 Assignment

Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party:

- (a) may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party, and
- (b) may, as security in favour of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.

1.8 Care and Supply of Documents

Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents.

The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Employer's Requirements, the Contractor's Documents, and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of access to all these documents at all reasonable times.



If a Party becomes aware of an error or defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.

1.9 Errors in the Employer's Requirements

If the Contractor suffers delay and/or incurs Cost as a result of an error in the Employer's Requirements, and an experienced contractor exercising due care would not have discovered the error when scrutinising the Employer's Requirements under Sub-Clause 5.1 [General Design Obligations], the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost plus profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent the error could not reasonably have been so discovered, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.

1.10 Employer's Use of Contractor's Documents

As between the Parties, the Contractor shall retain the copyright and other intellectual property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor.

The Contractor shall be deemed (by signing the Contract) to give to the Employer a non-terminable transferable non-exclusive royalty-free licence to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This licence shall:

- (a) apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works,
- (b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the Contractor's Documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works, and
- (c) in the case of Contractor's Documents which are in the form of computer programs and other software, permit their use on any computer on the Site and other places as envisaged by the Contract, including replacements of any computers supplied by the Contractor.

The Contractor's Documents and other design documents made by (or on behalf of) the Contractor shall not, without the Contractor's consent, be used, copied or communicated to a third party by (or on behalf of) the Employer for purposes other than those permitted under this Sub-Clause.

1.11 Contractor's Use of Employer's Documents

As between the Parties, the Employer shall retain the copyright and other intellectual property rights in the Employer's Requirements and other documents made by (or on behalf of) the Employer. The Contractor may, at his cost, copy, use, and obtain communication of these documents for the purposes of the Contract. They shall not, without the Employer's consent, be copied, used or communicated to a third party by the Contractor, except as necessary for the purposes of the Contract.



1.12 Confidential Details

The Contractor's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify compliance with the Contract and allow its proper implementation.

Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects.

1.13 Compliance with Laws

The Contractor shall, in performing the Contract, comply with applicable Laws. Unless otherwise stated in the Particular Conditions:

- (a) the Employer shall have obtained (or shall obtain) the planning, zoning or similar permission for the Permanent Works, and any other permissions described in the Employer's Requirements as having been (or being) obtained by the Employer; and the Employer shall indemnify and hold the Contractor harmless against and from the consequences of any failure to do so; and
- (b) the Contractor shall give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the Laws in relation to the design, execution and completion of the Works and the remedying of any defects; and the Contractor shall indemnify and hold the Employer harmless against and from the consequences of any failure to do so, unless the Contractor is impeded to accomplish these actions and shows evidence of its diligence.

However, the Contractor shall submit, in good time, the details of Goods to the Employer, who shall then promptly obtain all import permits or licences required for these Goods.

The Employer shall also obtain or grant all consents including permits-to-work, rights-of-way and approvals required for the Works.

1.14 Joint Several Liability

If the Contractor constitutes (under applicable Laws) a joint venture, consortium or other unincorporated grouping of two or more persons:

- (a) these persons shall be deemed to be jointly and severally liable to the Employer for the performance of the Contract;
- (b) these persons shall notify the Employer of their leader who shall have authority to bind the Contractor and each of these persons; and
- (c) the Contractor shall not alter its composition or legal status without the prior consent of the Employer.



2 The Employer

2.1 Right of Access to the Site

The Employer shall give the Contractor right of access to, and possession of, all parts of the Site within the time (or times) stated in the Contract Data. The right and possession may not be exclusive to the Contractor. If, under the Contract, the Employer is required to give (to the Contractor) possession of any foundation, structure, plant or means of access, the Employer shall do so in the time and manner stated in the Employer's Requirements. However, the Employer may withhold any such right or possession until the Performance Security has been received.

If no such time is stated in the Contract Data, the Employer shall give the Contractor right of access to, and possession of, the Site within such times as may be required to enable the Contractor to proceed in accordance with the programme submitted under Sub-Clause 8.3 [Programme].

If the Contractor suffers delay and/or incurs Cost as a result of a failure by the Employer to give any such right or possession within such time, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost plus profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

However, if and to the extent that the Employer's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be entitled to such extension of time, Cost or profit.

2.2 Permits, Licences or Approvals

The Employer shall provide, at the request of the Contractor, such reasonable assistance as to allow the Contractor to obtain properly:

- (a) copies of the Laws of the Country which are relevant to the Contract but are not readily available, and
- (b) any permits, licences or approvals required by the Laws of the Country:
 - (i) which the Contractor is required to obtain under Sub-Clause 1.13 [Compliance with Laws],
 - (ii) for the delivery of Goods, including clearance through customs, and
 - (iii) for the export of Contractor's Equipment when it is removed from the Site.

2.3 Employer's Personnel



The Employer shall be responsible for ensuring that the Employer's Personnel and the Employer's other contractors on the Site:

- (a) co-operate with the Contractor's efforts under Sub-Clause 4.6 [Co-operation], and (b) take actions similar to those which the Contractor is required to take under sub-paragraphs (a),
- (b) and (c) of Sub-Clause 4.8 [Safety Procedures] and under Sub-Clause 4.18 [Protection of the Environment].

2.4 Employer's Financial Arrangements

The Employer shall submit, before the Commencement Date and thereafter within 28 days after receiving any request from the Contractor, reasonable evidence that financial arrangements have been made and are being maintained which will enable the Employer to pay the Contract Price punctually (as estimated at that time) in accordance with Clause 14 [Contract Price and Payment]. Before the Employer makes any material change to his financial arrangements, the Employer shall give notice to the Contractor with detailed particulars.

In addition, if the Bank has notified to the Borrower that the Bank has suspended disbursements under its loan, which finances in whole or in part the execution of the Works, the Employer shall give notice of such suspension to the Contractor with detailed particulars, including the date of such notification, with a copy to the Engineer, within 7 days of the Borrower having received the suspension notification from the Bank. If alternative funds will be available in appropriate currencies to the Employer to continue making payments to the Contractor beyond a date 60 days after the date of Bank notification of the suspension, the Employer shall provide reasonable evidence in his notice of the extent to which such funds will be available.

2.5 Employer's Claims

If the Employer considers himself to be entitled to any payment under any Clause of these Conditions or otherwise in connection with the Contract, and/or to any extension of the Defects Notification Period, the Employer or the Engineer shall give notice and particulars to the Contractor. However, notice is not required for payments due under Sub-Clause 4.19 [Electricity, Water and Gas], under Sub-Clause 4.20 [Employer's Equipment and Free-Issue Material], or for other services requested by the Contractor.

The notice shall be given as soon as practicable and no longer than 28 days after the Employer became aware, or should have become aware, of the event or circumstances giving rise to the claim. A notice relating to any extension of the Defects Notification Period shall be given before the expiry of such period.

The particulars shall specify the Clause or other basis of the claim, and shall include substantiation of the amount and/or extension to which the Employer considers himself to be entitled in connection with the Contract. The Engineer shall then proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the amount (if any) which the Employer is entitled to be paid by the Contractor and/or (ii) the extension (if any) of the Defects Notification Period in accordance with Sub-Clause 11.3 [Extension of Defects Notification Period].

This amount may be included as a deduction in the Contract Price and Payment Certificates. The Employer shall only be entitled to set off against or make any deduction from an amount certified in a Payment Certificate, or to otherwise claim against the Contractor, in accordance with this Sub-Clause.

3 The Engineer



3.1 Engineer's Duties and Authority

The Employer shall appoint the Engineer who shall carry out the duties assigned to him in the Contract. The Engineer's staff shall include suitably qualified engineers and other professionals who are competent to carry out these duties.

The Engineer shall have no authority to amend the Contract.

The Engineer may exercise the authority attributable to the Engineer as specified in or necessarily to be implied from the Contract. If the Engineer is required to obtain the approval of the Employer before exercising a specified authority, the requirements shall be as stated in the Particular Conditions. The Employer shall promptly inform the Contractor of any change to the authority attributed to the Engineer.

However, whenever the Engineer exercises a specified authority for which the Employer's approval is required, then (for the purposes of the Contract) the Employer shall be deemed to have given approval.

Except as otherwise stated in these Conditions:

- (a) whenever carrying out duties or exercising authority, specified in or implied by the Contract, the Engineer shall be deemed to act for the Employer;
- (b) the Engineer has no authority to relieve either Party of any duties, obligations or responsibilities under the Contract; and
- (c) any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by the Engineer (including absence of disapproval) shall not relieve the Contractor from any responsibility he has under the Contract, including responsibility for errors, omissions, discrepancies and non-compliances.
- (d) any act by the Engineer in response to a Contractor's request except as otherwise expressly specified shall be notified in writing to the Contractor within 28 days of receipt.

The following provision shall apply:

The Engineer shall obtain the specific approval of the Employer before taking action under the following Sub-Clause of these Conditions:



- (A) Sub-Clause 4.12: agreeing or determining an extension of time and/or additional cost.
- (B) Sub-Clause 13.1: instructing a Variation, except;
- (i) in an emergency situation as determined by the Engineer, or
 - (ii) if such a Variation would increase the Accepted Contract Amount by less than the percentage specified in the Contract Data.
- (C) Sub-Clause 13.3: approving a proposal for Variation submitted by the Contractor in accordance with Sub-Clause 13.1 or 13.2.
- (D) Sub-Clause 13.4: specifying the amount payable in each of the applicable currencies.

Notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of the Works or of adjoining property, he may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply, despite the absence of approval of the Employer, with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 13 [Variations and Adjustments] and shall notify the Contractor accordingly, with a copy to the Employer.

3.2 Delegation by the Engineer

The Engineer may from time to time assign duties and delegate authority to assistants, and may also revoke such assignment or delegation. These assistants may include a resident engineer, and/or independent inspectors appointed to inspect and/or test items of Plant and/or Materials. The assignment, delegation or revocation shall be in writing and shall not take effect until copies have been received by both Parties. However, unless otherwise agreed by both Parties, the Engineer shall not delegate the authority to determine any matter in accordance with Sub-Clause 3.5 [Determinations].

Assistants shall be suitably qualified persons, who are competent to carry out these duties and exercise this authority, and who are fluent in the language for communications defined in Sub-Clause 1.4 [Law and Language].

Each assistant, to whom duties have been assigned or authority has been delegated, shall only be authorised to issue instructions to the Contractor to the extent defined by the delegation. Any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by an assistant, in accordance with the delegation, shall have the same effect as though the act had been an act of the Engineer. However:

- (a) any failure to disapprove any work, Plant or Materials shall not constitute approval, and shall therefore not prejudice the right of the Engineer to reject the work, Plant or Materials;
- (b) if the Contractor questions any determination or instruction of an assistant, the Contractor may refer the matter to the Engineer, who shall promptly confirm, reverse or vary the determination or instruction.



3.3 Instructions of the Engineer

The Engineer may issue to the Contractor (at any time) instructions which may be necessary for the execution of the Works and the remedying of any defects, all in accordance with the Contract. The Contractor shall only take instructions from the Engineer, or from an assistant to whom the appropriate authority has been delegated under this Clause. If an instruction constitutes a Variation, Clause 13 [Variations and Adjustments] shall apply.

The Contractor shall comply with the instructions given by the Engineer or delegated assistant, on any matter related to the Contract. These instructions shall be given in writing.

3.4 Replacement of the Engineer

If the Employer intends to replace the Engineer, the Employer shall, not less than 21 days before the intended date of replacement, give notice to the Contractor of the name, address and relevant experience of the intended replacement Engineer. If the Contractor considers the intended replacement Engineer to be unsuitable, he has the right to raise objection against him by notice to the Employer, with supporting particulars, and the Employer shall give full and fair consideration to this objection.

3.5 Determinations

Whenever these Conditions provide that the Engineer shall proceed in accordance with this Sub-Clause 3.5 to agree or determine any matter, the Engineer shall consult with each Party in an endeavour to reach agreement. If agreement is not achieved, the Engineer shall make a fair determination in accordance with the Contract, taking due regard of all relevant circumstances.

The Engineer shall give notice to both Parties of each agreement or determination, with supporting particulars, within 28 days from the receipt of the corresponding claim or request except when otherwise specified. Each Party shall give effect to each agreement or determination unless and until revised under Clause 20 [Claims, Disputes and Arbitration].

3.6 Management Meetings

The Engineer or the Contractor's Representative may require the other to attend a management meeting in order to review the arrangements for future work. The Engineer shall record the business of management meetings and supply copies of the record to those attending the meeting and to the Employer. In the record, responsibilities for any actions to be taken shall be in accordance with the Contract.

4 The Contractor

4.1 Contractor's General Obligations

The Contractor shall design, execute and complete the Works in accordance with the Contract, and shall remedy any defects in the Works. When completed, the Works shall be fit for the purposes for which the Works are intended as defined in the Contract.



The Contractor shall provide the Plant and Contractor's Documents specified in the Contract, and all Contractor's Personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for this design, execution, completion and remedying of defects.

All equipment, material, and services to be incorporated in or required for the Works shall have their origin in any eligible source country as defined by the Loan Agreement between the Bank and the Borrower..

The Works shall include any work which is necessary to satisfy the Employer's Requirements, Contractor's Proposal and Schedules, or is implied by the Contract, and all works which (although not mentioned in the Contract) are necessary for stability or for the completion, or safe and proper operation, of the Works.

The Contractor shall be responsible for the adequacy, stability and safety of all Site operations, of all methods of construction and of all the Works.

The Contractor shall, whenever required by the Engineer, submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this having previously been notified to the Engineer

4.2 Performance Security

The Contractor shall obtain (at his cost) a Performance Security for proper performance, in the amount stated in the Contract Data and denominated in the currency(ies) of the Contract or in a freely convertible currency acceptable to the Employer. If an amount is not stated in the Contract Data, this Sub-Clause shall not apply.

The Contractor shall deliver the Performance Security to the Employer within 28 days after receiving the Letter of Acceptance, and shall send a copy to the Engineer. The Performance Security shall be issued by an reputable bank or financial institution selected by the Contractor, and shall be in the form annexed to the Particular Conditions, as stipulated by the Employer, or in another form approved by the Employer.

The Contractor shall ensure that the Performance Security is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects. If the terms of the Performance Security specify its expiry date, and the Contractor has not become entitled to receive the Performance Certificate by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the Performance Security until the Works have been completed and any defects have been remedied.

The Employer shall not make a claim under the Performance Security, except for amounts to which the Employer is entitled under the Contract.

The Employer shall indemnify and hold the Contractor harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent to which the Employer was not entitled to make the claim.

The Employer shall return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate.

Without limitation to the provisions of the rest of this Sub-Clause, whenever the Engineer determines an addition or a reduction to the Contract Price as a result of a change in cost and/or legislation, or as a result of a Variation amounting to more than 25 percent of the portion of the Contract Price payable in a specific currency, the Contractor shall at the Engineer's request promptly increase, or may decrease, as the case may be, the value of the Performance Security in that currency by an equal percentage.



4.3 Contractor's Representative

The Contractor shall appoint the Contractor's Representative and shall give him all authority necessary to act on the Contractor's behalf under the Contract.

Unless the Contractor's Representative is named in the Contract, the Contractor shall, prior to the Commencement Date, submit to the Engineer for consent the name and particulars of the person the Contractor proposes to appoint as Contractor's Representative. If consent is withheld or subsequently revoked in terms of Sub-Clause 6.9 [Contractor's Personnel], or if the appointed person fails to act as Contractor's Representative, the Contractor shall similarly submit the name and particulars of another suitable person for such appointment.

The Contractor shall not, without the prior consent of the Engineer, revoke the appointment of the Contractor's Representative or appoint a replacement.

The whole time of the Contractor's Representative shall be given to directing the Contractor's performance of the Contract. If the Contractor's Representative is to be temporarily absent from the Site during the execution of the Works, a suitable replacement person shall be appointed, subject to the Engineer's prior consent, and the Engineer shall be notified accordingly.

The Contractor's Representative shall, on behalf of the Contractor, receive instructions under Sub-Clause 3.3 [Instructions of the Engineer].

The Contractor's Representative may delegate any powers, functions and authority to any competent person, and may at any time revoke the delegation. Any delegation or revocation shall not take effect until the Engineer has received prior notice signed by the Contractor's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked.

The Contractor's Representative shall be fluent in the language for communications defined in Sub-Clause 1.4 [Law and Language]. If the Contractor's Representative's delegates are not fluent in the said language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer.

4.4 Subcontractors

The Contractor shall not subcontract the whole of the Works.

The Contractor shall be responsible for the acts or defaults of any Subcontractor, his agents or employees, as if they were the acts or defaults of the Contractor. Unless otherwise stated in the Particular Conditions:

- (a) the Contractor shall not be required to obtain consent to suppliers solely of Materials, or to a subcontract for which the Subcontractor is named in the Contract;
- (b) the prior consent of the Engineer shall be obtained to other proposed Subcontractors; and
- (c) the Contractor shall give the Engineer not less than 28 days' notice of the intended date of the commencement of each Subcontractor's work, and of the commencement of such work on the Site.

The Contractor shall ensure that the requirements imposed on the Contractor by Sub-Clause 1.12 [Confidential Details] apply equally to each Subcontractor.



Where practicable, the Contractor shall give fair and reasonable opportunity for contractors from the Country to be appointed as Subcontractors.

4.5 Nominated Subcontractors

In this Sub-Clause, "nominated Subcontractor" means a Subcontractor whom the Engineer, under Clause 13 [Variations and Adjustments], instructs the Contractor to employ as a Subcontractor. The Contractor shall not be under any obligation to employ a nominated Subcontractor against whom the Contractor raises reasonable objection by notice to the Engineer as soon as practicable, with supporting particulars.

4.6 Co-operation

The Contractor shall, as specified in the Contract or as instructed by the Engineer, allow appropriate opportunities for carrying out work to:

- (a) the Employer's Personnel,
- (b) any other contractors employed by the Employer, and
- (c) the personnel of any legally constituted public authorities,

who may be employed in the execution on or near the Site of any work not included in the Contract.

Any such instruction shall constitute a Variation if and to the extent that it causes the Contractor suffer delays and/or to incur Unforeseeable Cost. Services for these personnel and other contractors may include the use of Contractor's Equipment, Temporary Works or access arrangements which are the responsibility of the Contractor.

The Contractor shall be responsible for his construction activities on the Site, and shall co-ordinate his own activities with those of other contractors to the extent (if any) specified in the Employer's Requirements.

If, under the Contract, the Employer is required to give to the Contractor possession of any foundation, structure, plant or means of access in accordance with Contractor's Documents, the Contractor shall submit such documents to the Engineer in the time and manner stated in the Employer's Requirements.

4.7 Setting Out

The Contractor shall set out the Works in relation to original points, lines and levels of reference specified in the Contract or notified by the Engineer. The Contractor shall be responsible for the correct positioning of all parts of the Works, and shall rectify any error in the positions, levels, dimensions or alignment of the Works.

The Employer shall be responsible for any errors in these specified or notified items of reference, but the Contractor shall use reasonable efforts to verify their accuracy before they are used.

If the Contractor suffers delay and/or incurs Cost from executing work which was necessitated by an error in these items of reference, and an experienced contractor could not reasonably have discovered such error and avoided this delay and/or Cost, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:



- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost plus profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent the error could not reasonably have been discovered, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.

4.8 Safety Procedures

The Contractor shall:

- (a) comply with all applicable safety regulations,
- (b) take care for the safety of all persons entitled to be on the Site,
- (c) use reasonable efforts to keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons,
- (d) provide fencing, lighting, guarding and watching of the Works until completion and taking over under Clause 10 [Employer's Taking Over], and
- (e) provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land.

4.9 Quality Assurance

The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the Contract. The system shall be in accordance with the details stated in the Contract. The Engineer shall be entitled to audit any aspect of the system.

Details of all procedures and compliance documents shall be submitted to the Engineer for information before each design and execution stage is commenced. When any document of a technical nature is issued to the Engineer, evidence of the prior approval by the Contractor himself shall be apparent on the document itself.

Compliance with the quality assurance system shall not relieve the Contractor of any of his duties, obligations or responsibilities under the Contract.

4.10 Site Data

The Employer shall have made available to the Contractor for his information, prior to the Base Date, all relevant data in the Employer's possession on sub-surface and hydrological conditions at the Site, including environmental aspects. The Employer shall similarly make available to the Contractor all such data which come into the

Employer's possession after the Base Date. The Contractor shall be responsible for interpreting all such data.



To the extent which was practicable (taking account of cost and time), the Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Tender or Works. To the same extent, the Contractor shall be deemed to have inspected and examined the Site, its surroundings, the above data and other available information, and to have been satisfied before submitting the Tender as to all relevant matters, including (without limitation):

- (a) the form and nature of the Site, including sub-surface conditions,
- (b) the hydrological and climatic conditions,
- (c) the extent and nature of the work and Goods necessary for the execution and completion of the Works and the remedying of any defects,
- (d) the Laws, procedures and labour practices of the Country, and
- (e) the Contractor's requirements for access, accommodation, facilities, personnel, power, transport, water and other services.

4.11 Sufficiency of the Accepted Contract Amount

The Contractor shall be deemed to:

- (a) have satisfied himself as to the correctness and sufficiency of the Accepted Contract Amount, and
- (b) have based the Accepted Contract Amount on the data, interpretations, necessary information, inspections, examinations and satisfaction as to all relevant matters referred to in Sub-Clause 4.10 [Site Data] and any further data relevant to the Contractor's design.

Unless otherwise stated in the Contract, the Accepted Contract Amount covers all the Contractor's obligations under the Contract (including those under Provisional Sums, if any) and all things necessary for the proper design, execution and completion of the Works and the remedying of any defects.

4.12 Unforeseeable Physical Conditions

In this Sub-Clause, "physical conditions" means natural physical conditions and man-made and other physical obstructions and pollutants, which the Contractor encounters at the Site when executing the Works, including sub-surface and hydrological conditions but excluding climatic conditions.

If the Contractor encounters adverse physical conditions which he considers to have been Unforeseeable, the Contractor shall give notice to the Engineer as soon as practicable.

This notice shall describe the physical conditions, so that they can be inspected by the Engineer, and shall set out the reasons why the Contractor considers them to be Unforeseeable. The Contractor shall continue executing the Works, using such proper and reasonable measures as are appropriate for the physical conditions, and shall comply with any instructions which the Engineer may give. If an instruction constitutes a Variation, Clause 13 [Variations and Adjustments] shall apply.

If and to the extent that the Contractor encounters physical conditions which are Unforeseeable, gives such a notice, and suffers delay and/or incurs Cost due to these conditions, the Contractor shall be entitled subject to notice under Sub-Clause 20.1 [Contractor's Claims] to:



- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost, which shall be included in the Contract Price

Upon receiving such notice and inspecting and/or investigating these physical conditions, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent these physical conditions were Unforeseeable, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.

However, before additional Cost is finally agreed or determined under sub-paragraph (ii), the Engineer may also review whether other physical conditions in similar parts of the Works (if any) were more favourable than could reasonably have been foreseen when the Contractor submitted the Tender. If and to the extent that these more favourable conditions were encountered, the Engineer may proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the reductions in Cost which were due to these conditions, which may be included (as deductions) in the Contract Price and Payment Certificates. However, the net effect of all adjustments under sub-paragraph (b) and all these reductions, for all the physical conditions encountered in similar parts of the Works, shall not result in a net reduction in the Contract Price.

The Engineer may take account of any evidence of the physical conditions foreseen by the Contractor when submitting the Tender, which may be made available by the Contractor, but shall not be bound by any such evidence.

4.13 Rights of Way and Facilities

Unless otherwise specified in the Contract the Employer shall provide effective access to and possession of the Site including special and/or temporary rights-of-way which are necessary for the Works. The Contractor shall obtain, at his risk and cost, any additional rights of way or facilities outside the Site which he may require for the purposes of the Works.

4.14 Avoidance of Interference

The Contractor shall not interfere unnecessarily or improperly with:

- (a) the convenience of the public, or
- (b) the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Employer or of others.

The Contractor shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

4.15 Access Route

The Contractor shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site at Base Date. The Contractor shall use reasonable efforts to prevent any road or bridge from being damaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriate vehicles and routes.



Except as otherwise stated in these Conditions:

- (a) the Contractor shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes;
- (b) the Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions;
- (c) the Employer shall not be responsible for any claims which may arise from the use or otherwise of any access route,
- (d) the Employer does not guarantee the suitability or availability of particular access routes, and
- (e) Costs due to non-suitability or non-availability, for the use required by the Contractor, of access routes shall be borne by the Contractor.

4.16 Transport of Goods

Unless otherwise stated in the Particular Conditions

- (a) the Contractor shall give the Engineer not less than 21 days' notice of the date on which any Plant or a major item of other Goods will be delivered to the Site;
- (b) the Contractor shall be responsible for packing, loading, transporting, receiving, unloading, storing and protecting all Goods and other things required for the Works; and
- (c) the Contractor shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.
- (d) the Contractor shall request the Engineer's permission to deliver any item or Goods to the Site. No Goods shall be delivered without this permission, which shall not relieve the Contractor from any obligation.

4.17 Contractor's Equipment

The Contractor shall be responsible for all Contractor's Equipment. When brought on to the Site, Contractor's Equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the Site any major items of Contractor's Equipment without the consent of the Engineer. However, consent shall not be required for vehicles transporting Goods or Contractor's Personnel off Site.

4.18 Protection of the Environment

The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.



The Contractor shall ensure that emissions, surface discharges and effluent from the Contractor's activities shall not exceed the values indicated in the Employer's Requirements or prescribed by applicable Laws.

4.19 Electricity, Water and Gas

The Contractor shall, except as stated below, be responsible for the provision of all power, water and other services he may require for his construction activities and to the extent defined in the Employer's Requirements, for the tests.

The Contractor shall be entitled to use for the purposes of the Works such supplies of electricity, water, gas and other services as may be available on the Site and of which details and prices are given in the Employer's Requirements. The Contractor shall, at his risk and cost, provide any apparatus necessary for his use of these services and for measuring the quantities consumed.

The quantities consumed and the amounts due (at these prices) for such services shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [Employer's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Employer.

4.20 Employer's Equipment and Free-Issue Material

The Employer shall make the Employer's Equipment (if any) available for the use of the Contractor in the execution of the Works in accordance with the details, arrangements and prices stated in the Employer's Requirements. Unless otherwise stated in the Employer's Requirements:

- (a) the Employer shall be responsible for the Employer's Equipment, except that
- (b) the Contractor shall be responsible for each item of Employer's Equipment whilst any of the Contractor's Personnel is operating it, driving it, directing it or in possession or control of it.

The appropriate quantities and the amounts due (at such stated prices) for the use of Employer's Equipment shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [Employer's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Employer.

The Employer shall supply, free of charge, the "free-issue materials" (if any) in accordance with the details stated in the Employer's Requirements. The Employer shall, at his risk and cost, provide these materials at the time and place specified in the Contract. The Contractor shall then visually inspect them, and shall promptly give notice to the Engineer of any shortage, defect or default in these materials. Unless otherwise agreed by both Parties, the Employer shall immediately rectify the notified shortage, defect or default.

After this visual inspection, the free-issue materials shall come under the care, custody and control of the Contractor. The Contractor's obligations of inspection, care, custody and control shall not relieve the Employer of liability for any shortage, defect or default not apparent from a visual inspection.

4.21 Progress Reports

Unless otherwise stated in the Particular Conditions, monthly progress reports shall be prepared by the Contractor and submitted to the Engineer in six copies. The first report shall cover the period up to the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 7 days after the last day of the period to which it relates.



Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

Each report shall include:

- (a) charts and detailed descriptions of progress, including each stage of design, Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection, testing, commissioning and trial operation;
- (b) photographs showing the status of manufacture and of progress on the Site;
- (c) for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:
 - (i) commencement of manufacture,
 - (ii) Contractor's inspections,
 - (iii) tests, and
 - (iv) shipment and arrival at the Site;
- (d) the details described in Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment];
- (e) copies of quality assurance documents, test results and certificates of Materials;
- (f) list of Variations, notices given under Sub-Clause 2.5 [Employer's Claims] and notices given under Sub-Clause 20.1 [Contractor's Claims];
- (g) safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations; and
- (h) comparisons of actual and planned progress, with details of any events or circumstances which may jeopardise the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

4.22 Security of the Site

Unless otherwise stated in the Particular Conditions:

- (a) the Contractor shall be responsible for keeping unauthorised persons off the Site, and
- (b) authorised persons shall be limited to the Contractor's Personnel and the Employer's Personnel; and to any other personnel notified to the Contractor, by the Employer or the Engineer, as authorised personnel of the Employer's other contractors on the Site.



4.23 Contractor's Operations on Site

The Contractor shall confine his operations to the Site, and to any additional areas which may be obtained by the Contractor and agreed by the Engineer as additional working areas. The Contractor shall take all necessary precautions to keep Contractor's Equipment and Contractor's Personnel within the Site and these additional areas, and to keep them off adjacent land.

During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction, and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish and Temporary Works which are no longer required.

Upon the issue of a Taking-Over Certificate, the Contractor shall clear away and remove, from that part of the Site and Works to which the Taking-Over Certificate refers, all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor shall leave that part of the Site and the Works in a clean and safe condition. However, the Contractor may retain on Site, during the Defects Notification Period, such Goods as are required for the Contractor to fulfil obligations under the Contract.

4.24 Fossils

All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Employer. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs Cost from complying with the instructions, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost, which shall be included in the Contract Price.

After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

5 Design

5.1 General Design Obligations

The Contractor shall carry out, and be responsible for, the design of the Works. Design shall be prepared by qualified designers who are engineers or other professionals who comply with the criteria (if any) stated in the Employer's Requirements. Unless otherwise stated in the Contract, the Contractor shall submit to the Engineer for consent the name and particulars of each proposed designer and design Subcontractor.



The Contractor warrants that he, his designers and design Subcontractors have the experience and capability necessary for the design. The Contractor undertakes that the designers shall be available to attend discussions with the Engineer at all reasonable times, until the expiry date of the relevant Defects Notification Period.

Upon receiving notice under Sub-Clause 8.1 [Commencement of Works], the Contractor shall scrutinise the Employer's Requirements (including design criteria and calculations, if any) and the items of reference mentioned in Sub-Clause 4.7 [Setting Out]. Within the period stated in the Contract Data, calculated from the Commencement Date, the Contractor shall give notice to the Engineer of any error, fault or other defect found in the Employer's Requirements or these items of reference.

After receiving this notice, the Engineer shall determine whether Clause 13 [Variations and Adjustments] shall be applied, and shall give notice to the Contractor accordingly. If and to the extent that (taking account of cost and time) an experienced contractor exercising due care would have discovered the error, fault or other defect when examining the Site and the Employer's Requirements before submitting the Tender, the Time for Completion shall not be extended and the Contract Price shall not be adjusted.

5.2 Contractor's Documents

The Contractor's Documents shall comprise the technical documents specified in the Employer's Requirements, documents required to satisfy all regulatory approvals, and the documents described in Sub-Clause 5.6 [As-Built Documents] and Sub-Clause 5.7 [Operation and Maintenance Manuals]. Unless otherwise stated in the Employer's Requirements, the Contractor's Documents shall be written in the language for communications defined in Sub-Clause 1.4 [Law and Language].

The Contractor shall prepare all Contractor's Documents, and shall also prepare any other documents necessary to instruct the Contractor's Personnel. The Employer's Personnel shall have the right to inspect the preparation of all these documents, wherever they are being prepared.

If the Employer's Requirements describe the Contractor's Documents which are to be submitted to the Engineer for review and/or for approval, they shall be submitted accordingly, together with a notice as described below. In the following provisions of this Sub-Clause, (i) "review period" means the period required by the Engineer for review and (if so specified) for approval, and (ii) "Contractor's Documents" exclude any documents which are not specified as being required to be submitted for review and/or for approval.

Unless otherwise stated in the Employer's Requirements, each review period shall not exceed 21 days, calculated from the date on which the Engineer receives a Contractor's Document and the Contractor's notice. This notice shall state that the Contractor's Document is considered ready, both for review (and approval, if so specified) in accordance with this Sub-Clause and for use. The notice shall also state that the Contractor's Document complies with the Contract, or the extent to which it does not comply.

The Engineer may, within the review period, give notice to the Contractor that a Contractor's Document fails (to the extent stated) to comply with the Contract. If a Contractor's Document so fails to comply, it shall be rectified, resubmitted and reviewed (and, if specified, approved) in accordance with this Sub-Clause, at the Contractor's cost.

For each part of the Works, and except to the extent that the prior approval or consent of the Engineer shall have been obtained:

- (a) in the case of a Contractor's Document which has (as specified) been submitted for the Engineer's approval:



- (i) the Engineer shall give notice to the Contractor that the Contractor's Document is approved, with or without comments, or that it fails (to the extent stated) to comply with the Contract;
 - (ii) execution of such part of the Works shall not commence until the Engineer has approved the Contractor's Document; and
 - (iii) the Engineer shall be deemed to have approved the Contractor's Document upon the expiry of the review periods for all the Contractor's Documents which are relevant to the design and execution of such part, unless the Engineer has previously notified otherwise in accordance with sub-paragraph (i);
- (b) execution of such part of the Works shall not commence prior to the expiry of the review periods for all the Contractor's Documents which are relevant to its design and execution;
 - (c) execution of such part of the Works shall be in accordance with these reviewed (and, if specified, approved) Contractor's Documents; and
 - (d) if the Contractor wishes to modify any design or document which has previously been submitted for review (and, if specified, approval), the Contractor shall immediately give notice to the Engineer. Thereafter, the Contractor shall submit revised documents to the Engineer in accordance with the above procedure.

If the Engineer instructs that further Contractor's Documents are required, the Contractor shall prepare them promptly. Any such approval or consent, or any review (under this Sub-Clause or otherwise), shall not relieve the Contractor from any obligation or responsibility

5.3 Contractor's Undertaking

The Contractor undertakes that the design, the Contractor's Documents, the execution and the completed Works will be in accordance with:

- (a) the Laws in the Country, and
- (b) the documents forming the Contract, as altered or modified by Variations.

5.4 Technical Standards and Regulations

The design, the Contractor's Documents, the execution and the completed Works shall comply with the Country's technical standards, building, construction and environmental Laws, Laws applicable to the product being produced from the Works, and other standards specified in the Employer's Requirements, applicable to the Works, or defined by the applicable Laws.

All these Laws shall, in respect of the Works and each Section, be those prevailing when the Works or Section are taken over by the Employer under Clause 10 [Employer's Taking Over]. References in the Contract to published standards shall be understood to be references to the edition applicable on the Base Date, unless stated otherwise.

If changed or new applicable standards come into force in the Country after the Base Date, the Contractor shall give notice to the Engineer and (if appropriate) submit proposals for compliance. In the event that:



- (a) the Engineer determines that compliance is required, and
- (b) the proposals for compliance constitute a variation,

then the Engineer shall initiate a Variation in accordance with Clause 13 [Variations and Adjustments].

5.5 Training

The Contractor shall carry out the training of Employer's Personnel in the operation and maintenance of the Works to the extent specified in the Employer's Requirements. If the Contract specifies training which is to be carried out before taking-over, the Works shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections] until this training has been completed.

5.6 As-Built Documents

The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records of the execution of the Works, showing the exact as-built locations, sizes and details of the work as executed. These records shall be kept on the Site and shall be used exclusively for the purposes of this Sub-Clause. Two copies shall be supplied to the Engineer prior to the commencement of the Tests on Completion.

In addition, the Contractor shall supply to the Engineer as-built drawings of the Works, showing all Works as executed, and submit them to the Engineer for review under Sub-Clause 5.2 [Contractor's Documents]. The Contractor shall obtain the consent of the Engineer as to their size, the referencing system, and other relevant details

Prior to the issue of any Taking-Over Certificate, the Contractor shall supply to the Engineer the specified numbers and types of copies of the relevant as-built drawings, in accordance with the Employer's Requirements. The Works shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections] until the Engineer has received these documents.

5.7 Operation and Maintenance Manuals

Prior to commencement of the Tests on Completion, the Contractor shall supply to the Engineer provisional operation and maintenance manuals in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair the Plant.

The Works shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections] until the Engineer has received final operation and maintenance manuals in such detail, and any other manuals specified in the Employer's Requirements for these purposes.

5.8 Design Error

If errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the Contractor's Documents, they and the Works shall be corrected at the Contractor's cost, notwithstanding any consent or approval under this Clause.



6 Staff and Labour

6.1 Engagement of Labour

Except as otherwise stated in the Employer's Requirements, the Contractor shall make arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, feeding, transport and, when appropriate, housing.

The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labour with appropriate qualifications and experience from sources within the Country.

6.2 Rates of Wages and Conditions of Labour

The Contractor shall pay rates of wages, and observe conditions of labour, which are not lower than those established for the trade or industry where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by employers whose trade or industry is similar to that of the Contractor.

The Contractor shall inform the Contractor's Personnel about their liability to pay personal income taxes in the Country in respect of such of their salaries, wages, allowances and any benefits as are subject to tax under the Laws of the Country for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such Laws.

6.3 Persons in the Service

The Contractor shall not recruit, or attempt to recruit, staff and labour from amongst the Employer's Personnel.

6.4 Labour Laws

The Contractor shall comply with all the relevant labour Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work.

6.5 Working Hours

No work shall be carried out on the Site on locally recognised days of rest, or outside the normal working hours stated in the Contract Data, unless:

- (a) otherwise stated in the Contract,
- (b) the Engineer gives consent, or



- (c) the work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer.

6.6 Facilities for Staff and Labour

Except as otherwise stated in the Employer's Requirements, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. The Contractor shall also provide facilities for the Employer's Personnel as stated in the Employer's Requirements.

The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.

6.7 Health and Safety

The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Employer's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

The Contractor shall send, to the Engineer, details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer may reasonably require.

HIV-AIDS Prevention. The Contractor shall conduct an HIV-AIDS awareness programme via an approved service provider, and shall undertake such other measures as are specified in this Contract to reduce the risk of the transfer of the HIV virus between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.

The Contractor shall throughout the contract (including the Defects Notification Period): (i) conduct Information, Education and Communication (IEC) campaigns, at least every other month, addressed to all the Site staff and labour (including all the Contractor's employees, all Subcontractors and any other Contractor's or Employer's personnel, and all truck drivers and crew making deliveries to Site for construction activities) and to the immediate local communities, concerning the risks, dangers and impact, and appropriate avoidance behaviour with respect to, of Sexually Transmitted Diseases (STD) - or Sexually Transmitted Infections (STI) in general and HIV/AIDS in particular; (ii) provide male or female condoms for all Site staff and labour as appropriate; and (iii) provide for STI and HIV/AIDS screening, diagnosis, counselling and referral to a dedicated national STI and HIV/AIDS programme, (unless otherwise agreed) of all Site staff and labour.



The Contractor shall include in the programme to be submitted for the execution of the Works under Sub-Clause 8.3 an alleviation programme for Site staff and labour and their families in respect of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS. The STI, STD and HIV/AIDS alleviation programme shall indicate when, how and at what cost the Contractor plans to satisfy the requirements of this Sub-Clause and the related specification. For each component, the programme shall detail the resources to be provided or utilised and any related sub-contracting proposed. The programme shall also include provision of a detailed cost estimate with supporting documentation. Payment to the Contractor for preparation and implementation this programme shall not exceed the Provisional Sum dedicated for this purpose.

6.8 Contractor's Superintendence

Throughout the design and execution of the Works, and as long thereafter as is necessary to fulfil the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the work.

Superintendence shall be given by a sufficient number of persons having adequate knowledge of the language for communications (defined in Sub-Clause 1.4 [Law and Language]) and of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.

6.9 Contractor's Personnel

The Contractor's Personnel shall be appropriately qualified, skilled and experienced in their respective trades or occupations. The Engineer may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative if applicable, who:

- (a) persists in any misconduct or lack of care,
- (b) carries out duties incompetently or negligently,
- (c) fails to conform with any provisions of the Contract, or
- (d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment.

If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.

6.10 Records of Contractor's Personnel and Equipment

The Contractor shall submit, to the Engineer, details showing the number of each class of Contractor's Personnel and of each type of Contractor's Equipment on the Site. Details shall be submitted each calendar month, in a form approved by the Engineer, until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

6.11 Disorderly Conduct



The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's Personnel, and to preserve peace and protection of persons and property on and near the Site.

6.12 Foreign Personnel

The Contractor may bring in to the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required residence visas and work permits. The Employer will, if requested by the Contractor, use his best endeavours in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national, or government permission required for bringing in the Contractor's personnel.

The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their domicile. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.

6.13 Supply of Foodstuffs

The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Employer's Requirements at reasonable prices for the Contractor's Personnel for the purpose of or in connection with the Contract.

6.14 Supply of Water

The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.

6.15 Measures against Insect and Pest Nuisance

The Contractor shall at all times take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce their danger to health. The Contractor shall employ with all the regulations of the local health authorities, including use of appropriate insecticides.

6.16 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereto by Contractor's Personnel.

6.17 Arms and Ammunition

The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms, or ammunition of any kind, or allow Contractor's Personnel to do so.

6.18 Festivals and Religious Customs



The Contractor shall respect the Country's recognized festivals, days, of rest and religious or other customs.

6.19 Funeral Arrangements

The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of his local employees who may die while engaged upon the Work.

6.20 Forced Labour

The Contractor shall not employ "forced or compulsory labour" in any form. "Forced or compulsory labour" consists of all work or service, not voluntarily performed, that is extracted from an individual under threat of force or penalty.

6.21 Child Labour

The Contractor shall not employ any child to perform any work that is economically exploitative, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. Where the relevant labour laws of the Country have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.

6.22 Employment Records of Workers

The Contractor shall keep complete and accurate records of the employment of labour at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the Engineer, and these records shall be available for inspection by Auditors during normal working hours. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment].

6.23 Worker's Organizations

In countries where the relevant labour laws recognize worker's rights to form and to join workers' organizations of their choosing without interference and to bargain collectively, the Contractor shall comply with such laws. Where the relevant labour laws substantially restrict workers' organizations, the Contractor shall enable alternative means for the Contractor's Personnel to express their grievances and protect their rights regarding working conditions and terms of employment. In either case described above, and where the relevant labour laws are silent, the Contractor shall not discourage the Contractor's Personnel from forming or joining workers' organizations of their choosing or from bargaining collectively, and shall not discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organizations and bargain collectively. The Contractor shall engage with such workers' representatives. Workers' organizations are expected to fairly represent the workers in the workforce.

6.24 Non-Discrimination and Equal Opportunity



The Contractor shall give the Employer's Personnel full opportunity to carry out these activities, including providing access, facilities, permissions and safety equipment. No such activity shall relieve the Contractor from any obligation or responsibility.

The Contractor shall give notice to the Engineer whenever any work is ready and before it is covered up, put out of sight, or packaged for storage or transport. The Engineer shall then either carry out the examination, inspection, measurement or testing without unreasonable delay, or promptly give notice to the Contractor that the Engineer does not require to do so. If the Contractor fails to give the notice, he shall, if and when required by the Engineer, uncover the work and thereafter reinstate and make good, all at the Contractor's cost.

7.4 Testing

This Sub-Clause shall apply to all tests specified in the Contract, other than the Tests after Completion (if any).

Except as otherwise specified in the Contract, the Contractor shall provide all apparatus, assistance, documents and other information, electricity, equipment, fuel, consumables, instruments, labour, materials, and suitably qualified and experienced staff, as are necessary to carry out the specified tests efficiently. The Contractor shall agree, with the Engineer, the time and place for the specified testing of any Plant, Materials and other parts of the Works.

The Engineer may, under Clause 13 [Variations and Adjustments], vary the location or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or workmanship is not in accordance with the Contract, the cost of carrying out this Variation shall be borne by the Contractor, notwithstanding other provisions of the Contract.

The Engineer shall give the Contractor not less than 24 hours' notice of the Engineer's intention to attend the tests. If the Engineer does not attend at the time and place agreed, the Contractor may proceed with the tests, unless otherwise instructed by the Engineer, and the tests shall then be deemed to have been made in the Engineer's presence.

If the Contractor suffers delay and/or incurs Cost from complying with these instructions or as a result of a delay for which the Employer is responsible, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost plus profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

The Contractor shall promptly forward to the Engineer duly certified reports of the tests. When the specified tests have been passed, the Engineer shall endorse the Contractor's test certificate, or issue a certificate to him, to that effect. If the Engineer has not attended the tests, he shall be deemed to have accepted the readings as accurate.

7.5 Rejection



If, as a result of an examination, inspection, measurement or testing, any Plant, Materials, design or workmanship is found to be defective or otherwise not in accordance with the Contract, the Engineer may reject the Plant, Materials, design or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the Contract.

If the Engineer requires this Plant, Materials, design or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If the rejection and retesting cause the Employer to incur additional costs, the Contractor shall subject to Sub-Clause 2.5 [Employer's Claims] pay these costs to the Employer.

7.6 Remedial Work

Notwithstanding any previous test or certification, the Engineer may instruct the Contractor to:

- (a) remove from the Site and replace any Plant or Materials which is not in accordance with the Contract,
- (b) remove and re-execute any other work which is not in accordance with the Contract, and
- (c) execute any work which is urgently required for the safety of the Works, whether because of an accident, unforeseeable event or otherwise.

The Contractor shall comply with the instruction within a reasonable time, which shall be the time (if any) specified in the instruction, or immediately if urgency is specified under sub-paragraph (c).

If the Contractor fails to comply with the instruction, the Employer shall be entitled to employ and pay other persons to carry out the work. Except to the extent that the Contractor would have been entitled to payment for the work, the Contractor shall subject to Sub-Clause 2.5 [Employer's Claims] pay to the Employer all costs arising from this failure.

7.7 Ownership of Plant and Materials

Except otherwise specified in the Contract, each item of Plant and Materials shall, to the extent consistent with the Laws of the Country, become the property of the Employer at whichever is the earlier of the following times, free from liens and other encumbrances:

- (a) when it is incorporated in the Works;
- (b) when the Contractor is paid the corresponding value of the Plant and Materials under Sub-Clause 8.10 [Payment for Plant and Materials in Event of Suspension]".

7.8 Royalties

Unless otherwise stated in the Employer's Requirements, the Contractor shall pay all royalties, rents and other payments for:

- (a) natural Materials obtained from outside the Site, and



- (b) the disposal of material from demolitions and excavations and of other surplus material (whether natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract.

8 Commencement, Delays and Suspension

8.1 Commencement of Work

Except otherwise specified in the Particular Conditions, the Commencement Date shall be the date at which the following precedent conditions have all been fulfilled and the Engineer's instruction recording the agreement of both Parties on such fulfilment and instructing to commence the Works is received by the Contractor:

- (a) signature of the Contract Agreement by both Parties, and if required, approval of the Contract by relevant authorities in the Country;
- (b) delivery to the Contractor of reasonable evidence of the Employer's Financial arrangements (under Sub-Clause 2.4 [Employer's Financial Arrangements])
- (c) (c) except if otherwise specified in the Contract Data, effective access to and possession of the Site given to the Contractor together with such permission(s) under (a) of Sub-Clause 1.13 [Compliance with Laws] as required for the commencement of the Works; and
- (d) receipt by the Contractor of the Advance Payment under Sub-Clause 14.2 [Advance Payment] provided that the corresponding bank guarantee has been delivered by the Contractor.

If the said Engineer's instruction is not received by the Contractor within 180 days from his receipt of the Letter of Acceptance, the Contractor shall be entitled to terminate the Contract under Sub-Clause 16.2 [Termination by Contractor].

The Contractor shall commence the design and execution of the Works as soon as is reasonably practicable after the Commencement Date, and shall then proceed with the Works with due expedition and without delay.

8.2 Completion

The Contractor shall complete the whole of the Works, and each Section (if any), within the Time for Completion for the Works or Section (as the case may be), including:

- (a) achieving the passing of the Tests on Completion, and
- (b) completing all work which is stated in the Contract as being required for the Works or Section to be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections].



8.3 Programme

The Contractor shall submit a detailed time programme to the Engineer within 28 days after receiving the notice under Sub-Clause 8.1 [Commencement of Works]. The Contractor shall also submit a revised programme whenever the previous programme is inconsistent with actual progress or with the Contractor's obligations. Each programme shall include:

- (a) the order in which the Contractor intends to carry out the Works, including the anticipated timing of each stage of design, Contractor's Documents, procurement, manufacture, inspection, delivery to Site, construction, erection, testing, commissioning and trial operation,
- (b) the periods for reviews under Sub-Clause 5.2 [Contractor's Documents] and for any other submissions, approvals and consents specified in the Employer's Requirements,
- (c) the sequence and timing of inspections and tests specified in the Contract, and
- (d) a supporting report which includes:
 - (i) a general description of the methods which the Contractor intends to adopt, and of the major stages, in the execution of the Works, and
 - (ii) details showing the Contractor's reasonable estimate of the number of each class of Contractor's Personnel and of each type of Contractor's Equipment, required on the Site for each major stage.

Unless the Engineer, within 21 days after receiving a programme, gives notice to the Contractor stating the extent to which it does not comply with the Contract, the Contractor shall proceed in accordance with the programme, subject to his other obligations under the Contract. The Employer's Personnel shall be entitled to rely upon the programme when planning their activities.

The Contractor shall promptly give notice to the Engineer of specific probable future events or circumstances which may adversely affect the work, increase the Contract Price or delay the execution of the Works. The Engineer may require the Contractor to submit an estimate of the anticipated effect of the future event or circumstances, and/or a proposal under Sub-Clause 13.3 [Variation Procedure].

If, at any time, the Engineer gives notice to the Contractor that a programme fails (to the extent stated) to comply with the Contract or to be consistent with actual progress and the Contractor's stated intentions, the Contractor shall submit a revised programme to the Engineer in accordance with this Sub-Clause

8.4 Extension of Time for Completion

The Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to an extension of the Time for Completion if and to the extent that completion for the purposes of Sub-Clause 10.1 [Taking Over of the Works and Sections] is or will be delayed by any of the following causes:

- (a) a Variation (unless an adjustment to the Time for Completion has been agreed under Sub-Clause 13.3 [Variation Procedure]),
- (b) a cause of delay giving an entitlement to extension of time under a Sub-Clause of these Conditions,



- (c) exceptionally adverse climatic conditions,
- (d) Unforeseeable shortages in the availability of personnel or Goods caused by epidemic or governmental actions, or
- (e) any delay, impediment or prevention caused by or attributable to the Employer, the Employer's Personnel, or the Employer's other contractors.

If the Contractor considers himself to be entitled to an extension of the Time for Completion, the Contractor shall give notice to the Engineer in accordance with Sub-Clause 20.1 [Contractor's Claims]. When determining each extension of time under Sub-Clause 20.1, the Engineer shall review previous determinations and may increase, but shall not decrease, the total extension of time.

8.5 Delays Caused by Authorities

If the following conditions apply, namely:

- (a) the Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities in the Country,
- (b) these authorities delay or disrupt the Contractor's work, and
- (c) the delay or disruption was Unforeseeable,

then this delay or disruption will be considered as a cause of delay under sub-paragraph (b) of Sub-Clause 8.4 [Extension of Time for Completion].

8.6 Rate of Progress

If, at any time:

- (a) actual progress is too slow to complete within the Time for Completion, and/or
- (b) progress has fallen (or will fall) behind the current programme under Sub-Clause 8.3 [Programme],

other than as a result of a cause listed in Sub-Clause 8.4 [Extension of Time for Completion], then the Engineer may instruct the Contractor to submit, under Sub-Clause 8.3 [Programme], a revised programme and supporting report describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the Time for Completion.

Unless the Engineer notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Contractor's Personnel and/or Goods, at the risk and cost of the Contractor. If these revised methods cause the Employer to incur additional costs, the Contractor shall subject to notice under Sub-Clause 2.5 [Employer's Claims] pay these costs to the Employer, in addition to delay damages (if any) under Sub-Clause 8.7 below.

Additional costs of revised methods, including acceleration measures, instructed by the Engineer to reduce delays resulting from causes listed under Sub-Clause 8.4 [Extension of Time for Completion] shall be paid by the Employer, without generating, however, any other additional payment benefit to the Contractor.



8.7 Delay Damages

If the Contractor fails to comply with Sub-Clause 8.2 [Time for Completion], the Contractor shall subject to notice under Sub-Clause 2.5 [Employer's Claims] pay delay damages to the Employer for this default. These delay damages shall be the sum stated in the Contract Data, which shall be paid for every day which shall elapse between the relevant Time for Completion and the date stated in the Taking-Over Certificate. However, the total amount due under this Sub-Clause shall not exceed the maximum amount of delay damages (if any) stated in the Contract Data.

These delay damages shall be the only damages due from the Contractor for such default, other than in the event of termination under Sub-Clause 15.2 [Termination by Employer] prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract.

8.8 Suspension of Work

The Engineer may at any time instruct the Contractor to suspend progress of part or all of the Works. During such suspension, the Contractor shall protect, store and secure such part or the Works against any deterioration, loss or damage.

The Engineer may also notify the cause for the suspension. If and to the extent that the cause is notified and is the responsibility of the Contractor, the following Sub-Clauses 8.9, 8.10 and 8.11 shall not apply.

8.9 Consequences of Suspension

If the Contractor suffers delay and/or incurs Cost from complying with the Engineer's instructions under Sub-Clause 8.8 [Suspension of Work] and/or from resuming the work, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

The Contractor shall not be entitled to an extension of time for, or to payment of the Cost incurred in, making good the consequences of the Contractor's faulty design, workmanship or materials, or of the Contractor's failure to protect, store or secure in accordance with Sub-Clause 8.8 [Suspension of Work].

8.10 Payment for Plant and Materials in Event of Suspension

The Contractor shall be entitled to payment of the value (as at the date of suspension) of Plant and/or Materials which have not been delivered to Site, if:

- (a) the work on Plant or delivery of Plant and/or Materials has been suspended for more than 28 days, and



- (b) the Contractor has marked the Plant and/or Materials as the Employer's property in accordance with the Engineer's instructions.

8.11 Prolonged Suspension

If the suspension under Sub-Clause 8.8 [Suspension of Work] has continued for more than 84 days, the Contractor may request the Engineer's permission to proceed. If the Engineer does not give permission within 28 days after being requested to do so, the Contractor may, by giving notice to the Engineer, treat the suspension as an omission under Clause 13 [Variations and Adjustments] of the affected part of the Works. If the suspension affects the whole of the Works, the Contractor may give notice of termination under Sub-Clause 16.2 [Termination by Contractor].

8.12 Resumption of Work

After the permission or instruction to proceed is given, the Contractor and the Engineer shall jointly examine the Works and the Plant and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works or Plant or Materials, which has occurred during the suspension after receiving from the Engineer an instruction to this effect under Clause 13 [Variations and Adjustments].

9 Tests on Completion

9.1 Contractor's Obligations

The Contractor shall carry out the Tests on Completion in accordance with this Clause and Sub-Clause 7.4 [Testing], after providing the documents in accordance with Sub-Clause 5.6 [As-Built Documents] and Sub-Clause 5.7 [Operation and Maintenance Manuals].

The Contractor shall give to the Engineer not less than 21 days' notice of the date after which the Contractor will be ready to carry out each of the Tests on Completion. Unless otherwise agreed, Tests on Completion shall be carried out within 14 days after this date, on such day or days as the Engineer shall instruct.

Unless otherwise stated in the Particular Conditions, the Tests on Completion shall be carried out in the following sequence:

- (a) pre-commissioning tests, which shall include the appropriate inspections and ("dry" or "cold") functional tests to demonstrate that each item of Plant can safely undertake the next stage, (b)
- (b) commissioning tests, which shall include the specified operational tests to demonstrate that the Works or Section can be operated safely and as specified, under all available operating conditions; and
- (c) trial operation, which shall demonstrate that the Works or Section perform reliably and in accordance with the Contract.

During trial operation, when the Works are operating under stable conditions, the Contractor shall give notice to the Engineer that the Works are ready for any other Tests on Completion, including performance tests to demonstrate whether the Works conform with criteria specified in the Employer's Requirements and with the Schedule of Guarantees.



Trial operation shall not constitute a taking-over under Clause 10 [Employer's Taking Over]. Unless otherwise stated in the Particular Conditions, any product produced by the Works during trial operation shall be the property of the Employer.

In considering the results of the Tests on Completion, the Engineer shall make allowances for the effect of any use of the Works by the Employer on the performance or other characteristics of the Works. As soon as the Works, or a Section, have passed each of the Tests on Completion described in sub-paragraph (a), (b) or (c), the Contractor shall submit a certified report of the results of these Tests to the Engineer.

9.2 Delayed Tests

If the Tests on Completion are being unduly delayed by the Employer, Sub-Clause 7.4 [Testing] (fifth paragraph) and/or Sub-Clause 10.3 [Interference with Tests on Completion] shall be applicable.

If the Tests on Completion are being unduly delayed by the Contractor, the Engineer may by notice require the Contractor to carry out the Tests within 21 days after receiving the notice. The Contractor shall carry out the Tests on such day or days within that period as the Contractor may fix and of which he shall give notice to the Engineer.

If the Contractor fails to carry out the Tests on Completion within the period of 21 days, the Employer's Personnel may proceed with the Tests at the risk and cost of the Contractor. The Tests on Completion shall then be deemed to have been carried out in the presence of the Contractor and the results of the Tests shall be accepted as accurate.

9.3 Retesting

If the Works, or a Section, fail to pass the Tests on Completion, Sub-Clause 7.5 [Rejection] shall apply, and the Engineer or the Contractor may require the failed Tests, and Tests on Completion on any related work, to be repeated under the same terms and conditions.

9.4 Failure to Pass Tests on Completion

If the Works, or a Section, fail to pass the Tests on Completion repeated under Sub-Clause 9.3 [Retesting], the Engineer shall be entitled to:

- (a) order further repetition of Tests on Completion under Sub-Clause 9.3;
- (b) if the failure deprives the Employer of substantially the whole benefit of the Works or Section, reject the Works or Section (as the case may be), in which event the Employer shall have the same remedies as are provided in sub-paragraph (c) of Sub-Clause 11.4 [Failure to Remedy Defects]; or
- (c) issue a Taking-Over Certificate, if the Employer so requests.



In the event of sub-paragraph (c), the Contractor shall then proceed in accordance with all other obligations under the Contract, and the Contract Price shall be reduced by such amount as shall be appropriate to cover the reduced value to the Employer as a result of this failure. Unless the relevant reduction for this failure is stated (or its method of calculation is defined) in the Contract, the Employer may require the reduction to be (i) agreed by both Parties (in full satisfaction of this failure only) and paid before this Taking-Over Certificate is issued, or (ii) determined and paid under Sub-Clause 2.5 [Employer's Claims] and Sub-Clause 3.5 [Determinations].

10 Employer's Taking Over

10.1 Taking Over of the Works and Sections

Except as stated in Sub-Clause 9.4 [Failure to Pass Tests on Completion], the Works shall be taken over by the Employer when (i) the Works have been completed in accordance with the Contract, including the matters described in Sub-Clause 8.2

[Time for Completion] and except as allowed in sub-paragraph (a) below, and (ii) a Taking-Over Certificate for the Works has been issued, or is deemed to have been issued in accordance with this Sub-Clause.

The Contractor may apply by notice to the Engineer for a Taking-Over Certificate not earlier than 14 days before the Works will, in the Contractor's opinion, be complete and ready for taking over. If the Works are divided into Sections, the Contractor may similarly apply for a Taking-Over Certificate for each Section.

The Engineer shall, within 28 days after receiving the Contractor's application:

- (a) issue the Taking-Over Certificate to the Contractor, stating the date on which the Works or Section were completed in accordance with the Contract, except for any minor outstanding work and defects which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied); or
- (b) reject the application, giving reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor shall then complete this work before issuing a further notice under this Sub-Clause.

If the Engineer fails either to issue the Taking-Over Certificate or to reject the Contractor's application with the period of 28 days, and if the Works or Section (as the case may be) are substantially in accordance with the Contract, the Taking-Over Certificate shall be deemed to have been issued on the last day of that period.

10.2 Taking Over of Parts of the Works

The Engineer may, at the sole discretion of the Employer, issue a Taking-Over Certificate for any part of the Permanent Works.

The Employer shall not use any part of the Works (other than as a temporary measure which is either specified in the Contract or agreed by both Parties) unless and until the Engineer has issued a Taking-Over Certificate for this part. However, if the Employer does use any part of the Works before the Taking-Over Certificate is issued:



- (a) the part which is used shall be deemed to have been taken over as from the date on which it is used,
- (b) the Contractor shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the Employer, and
- (c) if requested by the Contractor, the Engineer shall issue a Taking-Over Certificate for this part.

After the Engineer has issued a Taking-Over Certificate for a part of the Works, the Contractor shall be given the earliest opportunity to take such steps as may be necessary to carry out any outstanding Tests on Completion. The Contractor shall carry out these Tests on Completion as soon as practicable before the expiry date of the relevant Defects Notification Period.

If the Contractor incurs Cost as a result of the Employer taking over and/or using a part of the Works, other than such use as is specified in the Contract or agreed by the Contractor, the Contractor shall (i) give notice to the Engineer and (ii) be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to payment of any such Cost plus profit, which shall be included in the Contract Price. After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this Cost and profit.

If a Taking-Over Certificate has been issued for a part of the Works (other than a Section), the delay damages thereafter for completion of the remainder of the Works shall be reduced. Similarly, the delay damages for the remainder of the Section (if any) in which this part is included shall also be reduced. For any period of delay after the date stated in this Taking-Over Certificate, the proportional reduction in these delay damages shall be calculated as the proportion which the value of the part so certified bears to the value of the Works or Section (as the case may be) as a whole. The Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these proportions. The provisions of this paragraph shall only apply to the daily rate of delay damages under Sub-Clause 8.7 [Delay Damages], and shall not affect the maximum amount of these damages.

10.3 Interference with Tests Completion

If the Contractor is prevented, for more than 14 days, from carrying out the Tests on Completion by a cause for which the Employer is responsible, the Employer shall be deemed to have taken over the Works or Section (as the case may be) on the date when the Tests on Completion would otherwise have been completed.

The Engineer shall then issue a Taking-Over Certificate accordingly, and the Contractor shall carry out the Tests on Completion as soon as practicable, before the expiry date of the Defects Notification Period. The Engineer shall require the Tests on Completion to be carried out by giving 14 days' notice and in accordance with the relevant provisions of the Contract.

If the Contractor suffers delay and/or incurs Cost as a result of this delay in carrying out the Tests on Completion, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost plus profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.



10.4 Surfaces Requiring Reinstatement

Except as otherwise stated in a Taking-Over Certificate, a certificate for a Section or part of the Works shall not be deemed to certify completion of any ground or other surfaces requiring reinstatement.

11 Defects Liability

11.1 Completion of Outstanding Work and Remedying Defects

In order that the Works and Contractor's Documents, and each Section, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable thereafter, the Contractor shall:

- (a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer, and
- (b) execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section (as the case may be).

If a defect appears or damage occurs, the Contractor shall be notified accordingly, by (or on behalf of) the Employer.

11.2 Cost of Remedying Defects

All work referred to in sub-paragraph (b) of Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:

- (a) the design of the Works, other than a part of the design for which the Employer is responsible (if any),
- (b) Plant, Materials or workmanship not being in accordance with the Contract,
- (c) improper operation or maintenance which was attributable to matters for which the Contractor is responsible (under Sub-Clauses 5.5 to 5.7 or otherwise), or
- (d) failure by the Contractor to comply with any other obligation.

If and to the extent that such work is attributable to any other cause, the Contractor shall be notified promptly by (or on behalf of) the Employer, and Sub-Clause 13.3 [Variation Procedure] shall apply.

11.3 Extension of Defects Notification Period



The Employer shall be entitled subject to Sub-Clause 2.5 [Employer's Claims] to an extension of the Defects Notification Period for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a defect or by reason of damage attributable to the Contractor. However, a Defects Notification Period shall not be extended by more than two years.

If delivery and/or erection of Plant and/or Materials was suspended under Sub-Clause 8.8 [Suspension of Work] or Sub-Clause 16.1 [Contractor's Entitlement to Suspend Work], the Contractor's obligations under this Clause shall not apply to any defects or damage occurring more than two years after the Defects Notification Period for the Plant and/or Materials would otherwise have expired.

11.4 Failure to Remedy Defects

If the Contractor fails to remedy any defect or damage within a reasonable time, a date may be fixed by (or on behalf of) the Employer, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date.

If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Employer may (at his option):

- (a) carry out the work himself or by others, in a reasonable manner and at the Contractor's cost, but the Contractor shall have no responsibility for this work; and the Contractor shall subject to Sub-Clause 2.5 [Employer's Claims] pay to the Employer the costs reasonably incurred by the Employer in remedying the defect or damage;
- (b) require the Engineer to agree or determine a reasonable reduction in the Contract Price in accordance with Sub-Clause 3.5 [Determinations]; or
- (c) if the defect or damage deprives the Employer of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use. Without prejudice to any other rights, under the Contract or otherwise, the Employer shall then be entitled to recover all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.

11.5 Removal of Defective Work

If the defect or damage cannot be remedied expeditiously on the Site and the Employer gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security.

11.6 Further Tests

If the work of remedying of any defect or damage may affect the performance of the Works, the Engineer may require the repetition of any of the tests described in the Contract, including Tests on Completion and/or Tests after Completion. The requirement shall be made by notice within 28 days after the defect or damage is remedied.



These tests shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [Cost of Remedying Defects], for the cost of the remedial work.

11.7 Right of Access

Until the Performance Certificate has been issued, the Contractor shall have the right of access to all parts of the Works and to records of the operation and performance of the Works, except as may be inconsistent with the Employer's reasonable security restrictions.

11.8 Contractor to Search

The Contractor shall, if required by the Engineer, search for the cause of any defect, under the direction of the Engineer. Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Cost of the search plus profit shall be agreed or determined by the Engineer in accordance with Sub-Clause 3.5 [Determinations] and shall be included in the Contract Price.

11.9 Performance Certificate

Performance of the Contractor's obligations shall not be considered to have been completed until the Engineer has issued the Performance Certificate to the Contractor, stating the date on which the Contractor completed his obligations under the Contract.

The Engineer shall issue the Performance Certificate within 28 days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. A copy of the Performance Certificate shall be issued to the Employer.

Only the Performance Certificate shall be deemed to constitute acceptance of the Works.

11.10 Unfulfilled Obligations

After the Performance Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.

11.11 Clearance of Site

Upon receiving the Performance Certificate, the Contractor shall remove any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site.

If all these items have not been removed within 28 days after the Employer receives a copy of the Performance Certificate, the Employer may sell or otherwise dispose of any remaining items. The Employer shall be entitled to be paid the costs incurred in connection with, or attributable to, such sale or disposal and restoring the Site.

Any balance of the moneys from the sale shall be paid to the Contractor. If these moneys are less than the Employer's costs, the Contractor shall pay the outstanding balance to the Employer.



12 Test after Completion

12.1 Procedure for Tests after Completion

If Tests after Completion are specified in the Contract, this Clause shall apply. Unless otherwise stated in the Particular Conditions, the Employer shall:

- (a) provide all electricity, equipment, fuel, instruments, labour, materials, and suitably qualified and experienced staff, as are necessary to carry out the Tests after Completion efficiently, and
- (b) carry out the Tests after Completion in accordance with the manuals supplied by the Contractor under Sub-Clause 5.7 [Operation and Maintenance Manuals] and such guidance as the Contractor may be required to give during the course of these Tests; and in the presence of such Contractor's Personnel as either Party may reasonably request.

The Tests after Completion shall be carried out as soon as is reasonably practicable after the Works or Section have been taken over by the Employer. The Employer shall give to the Contractor 21 days' notice of the date after which the Tests after Completion will be carried out. Unless otherwise agreed, these Tests shall be carried out within 14 days after this date, on the day or days determined by the Employer.

If the Contractor does not attend at the time and place agreed, the Employer may proceed with the Tests after Completion, which shall be deemed to have been made in the Contractor's presence, and the Contractor shall accept the readings as accurate.

The results of the Tests after Completion shall be compiled and evaluated by both Parties. Appropriate account shall be taken of the effect of the Employer's prior use of the Works.

12.2 Delayed Tests

If the Contractor incurs Cost as a result of any unreasonable delay by the Employer to the Tests after Completion, the Contractor shall (i) give notice to the Engineer and (ii) be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to payment of any such

Cost plus profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this Cost and profit.

If, for reasons not attributable to the Contractor, a Test after Completion on the Works or any Section cannot be completed during the Defects Notification Period (or any other period agreed upon by both Parties), then the Works or Section shall be deemed to have passed this Test after Completion.

12.3 Retesting

If the Works, or a Section, fail to pass the Tests after Completion:

- (a) sub-paragraph (b) of Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall apply, and



- (b) either Party may then require the failed Tests, and the Tests after Completion on any related work, to be repeated under the same terms and conditions.

If and to the extent that this failure and retesting are attributable to any of the matters listed in subparagraphs (a) to (d) of Sub-Clause 11.2 [Cost of Remedying Defects] and cause the Employer to incur additional costs, the Contractor shall subject to Sub-Clause 2.5 [Employer's Claims] pay these costs to the Employer.

12.4 Failure to Pass Tests after Completion

If the following conditions apply, namely:

- (a) the Works, or a Section, fail to pass any or all of the Tests after Completion,
- (b) the relevant sum payable as non-performance damages for this failure is stated (or its method of calculation is defined) in the Contract, and
- (c) the Contractor pays this relevant sum to the Employer during the Defects Notification Period,

then the Works or Section shall be deemed to have passed these Tests after Completion.

If the Works, or a Section, fail to pass a Test after Completion and the Contractor proposes to make adjustments or modifications to the Works or such Section, the Contractor may be instructed by (or on behalf of) the Employer that right of access to the Works or Section cannot be given until a time that is convenient to the Employer. The Contractor shall then remain liable to carry out the adjustments or modifications and to satisfy this Test, within a reasonable period of receiving notice by (or on behalf of) the Employer of the time that is convenient to the Employer. However, if the Contractor does not receive this notice during the relevant Defects Notification Period, the Contractor shall be relieved of this obligation and the Works or Section (as the case may be) shall be deemed to have passed this Test after Completion.

If the Contractor incurs additional Cost as a result of any unreasonable delay by the Employer in permitting access to the Works or Plant by the Contractor, either to investigate the causes of a failure to pass a Test after Completion or to carry out any adjustments or modifications, the Contractor shall (i) give notice to the Engineer and (ii) be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to payment of any such Cost plus profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this Cost and profit.

13 Variations and Adjustments

13.1 Right to Vary

Variations may be initiated by the Engineer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal. A Variation shall not comprise the omission of any work which is to be carried out by others.

The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer stating (with supporting particulars) that:



- (i) the Contractor cannot readily obtain the Goods required for the Variation,
- (ii) such Variation triggers a substantial change in the sequence or progress of the Works,
- (iii) it will reduce the safety or suitability of the Works, or
- (iv) it will have an adverse impact on the achievement of the Schedule of Guaranties.

Upon receiving this notice, the Engineer shall cancel, confirm or vary the instruction".

13.2 Value Engineering

The Contractor may, at any time, submit to the Engineer a written proposal which (in the Contractor's opinion) will, if adopted, (i) accelerate completion, (ii) reduce the cost to the Employer of executing, maintaining or operating the Works, (iii) improve the efficiency or value to the Employer of the completed Works, or (iv) otherwise be of benefit to the Employer.

The proposal shall be prepared at the cost of the Contractor and shall include the items listed in Sub-Clause 13.3 [Variation Procedure].

13.3 Variation Procedure

If the Engineer requests a proposal, prior to instructing a Variation, the Contractor shall respond in writing as soon as practicable, either by giving reasons why he cannot comply (if this is the case) or by submitting:

- (a) a description of the proposed design and/or work to be performed and a programme for its execution,
- (b) the Contractor's proposal for any necessary modifications to the programme according to Sub-Clause 8.3 [Programme] and to the Time for Completion, and
- (c) the Contractor's proposal for adjustment to the Contract Price.

The Engineer shall, as soon as practicable after receiving such proposal (under Sub-Clause 13.2 [Value Engineering] or otherwise), respond with approval, disapproval or comments. The Contractor shall not delay any work whilst awaiting a response

Each instruction to execute a Variation, with any requirements for the recording of Costs, shall be issued by the Engineer to the Contractor, who shall acknowledge receipt.

Upon instructing or approving a Variation, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine adjustments to the Contract Price and the Schedule of Payments. These adjustments shall include profit, and shall take account of the Contractor's submissions under Sub-Clause 13.2 [Value Engineering] if applicable

13.4 Payment in Applicable Currencies



If the Contract provides for payment of the Contract Price in more than one currency, then whenever an adjustment is agreed, approved or determined as stated above, the amount payable in each of the applicable currencies shall be specified. For this purpose, reference shall be made to the actual or expected currency proportions of the Cost of the varied work, and to the proportions of various currencies specified for payment of the Contract Price.

13.5 Provisional Sums

Each Provisional Sum shall only be used, in whole or in part, in accordance with the Engineer's instructions, and the Contract Price shall be adjusted accordingly. The total sum paid to the Contractor shall include only such amounts, for the work, supplies or services to which the Provisional Sum relates, as the Engineer shall have instructed. For each Provisional Sum, the Engineer may instruct:

- (a) work to be executed (including Plant, Materials or services to be supplied) by the Contractor and valued under Sub-Clause 13.3 [Variation Procedure]; and/or
- (b) Plant, Materials or services to be purchased by the Contractor, from a nominated Subcontractor (as defined in Sub-Clause 4.5 [Nominated Subcontractors] otherwise; and for which there shall be included in the Contract Price:
 - (i) the actual amounts paid (or due to be paid) by the Contractor, and
 - (ii) a sum for overhead charges and profit, calculated as a percentage of these actual amounts by applying the relevant percentage rate (if any) stated in the appropriate Schedule. If there is no such rate, the percentage rate stated in the Contract Data shall be applied.

The Contractor shall, when required by the Engineer, produce quotations, invoices, vouchers and accounts or receipts in substantiation.

As an exception to the above, the Provisional Sum for the cost of the DB shall be used for payments to the Contractor of the Employer's share (one-half) of the invoices of the DB for its fees and expenses, in accordance with GC 20.2. No prior instruction of the Engineer shall be required with respect to the work of the DB. The Contractor shall produce the DB invoices and satisfactory evidence of having paid 100% of such invoices as part of the substantiation of those Statements submitted under Sub-Clause 14.3, which contain requests for payment under the Provisional Sum toward the cost of the DB. The Engineer's certification of such Statements shall be based upon such invoices and such evidence of payment by the Contractor. Contractor's overhead, profit, etc., shall not be included in the provisional sums for the cost of the DB.

13.6 Daywork

For work of a minor or incidental nature, the Engineer may instruct that a Variation shall be executed on a daywork basis. The work shall then be valued in accordance with the Daywork schedule included in the Contract, and the following procedure shall apply. If a Daywork schedule is not included in the Contract, this Sub-Clause shall not apply.

Before ordering Goods for the work, the Contractor shall submit quotations to the Engineer. When applying for payment, the Contractor shall submit invoices, vouchers and accounts or receipts for any Goods.



Except for any items for which the daywork schedule specifies that payment is not due, the Contractor shall deliver each day to the Engineer accurate statements in duplicate which shall include the following details of the resources used in executing the previous day's work:

- (a) the names, occupations and time of Contractor's Personnel,
- (b) the identification, type and time of Contractor's Equipment and Temporary Works, and
- (c) the quantities and types of Plant and Materials used.

One copy of each statement will, if correct, or when agreed, be signed by the Engineer and returned to the Contractor. The Contractor shall then submit priced statements of these resources to the Engineer, prior to their inclusion in the next Statement under Sub-Clause 14.3 [Application for Interim Payment Certificates].

13.7 Adjustments for Changes in Legislation

The Contract Price shall be adjusted to take account of any increase or decrease in Cost resulting from a change in the Laws of the Country (including the introduction of new Laws and the repeal or modification of existing Laws) or in the judicial or official governmental interpretation of such Laws, made after the Base Date, which affect the Contractor in the performance of obligations under the Contract.

If the Contractor suffers (or will suffer) delay and/or incurs (or will incur) additional Cost as a result of these changes in the Laws or in such interpretations, made after the Base Date, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

Notwithstanding the foregoing, the Contractor shall not be entitled to an extension of time if the relevant delay has already been taken into account in the determination of a previous extension of time and such Cost shall not be separately paid if the same shall already have been taken into account in the indexing of any inputs to the table of adjustment data in accordance with the provisions of Sub-Clause 13.8 [Adjustments for Changes in Cost].

13.8 Adjustments for Changes in Cost

In this Sub-Clause, "table of adjustment data" means the completed table of Changes in adjustment data included in the Schedules. If there is no such table of adjustment data, this Sub-Clause shall not apply.

If this Sub-Clause applies, the amounts payable to the Contractor shall be adjusted for rises or falls in the cost of labour, Goods and other inputs to the Works, by the addition or deduction of the amounts determined by the formulae prescribed in this Sub-Clause. To the extent that full compensation for any rise or fall in Costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.



The adjustment to be applied to the amount otherwise payable to the Contractor, as valued in accordance with the appropriate Schedule and certified in Payment Certificates, shall be determined from formulae for each of the currencies in which the Contract Price is payable. No adjustment is to be applied to work valued on the basis of Cost or current prices. The formulae shall be of the following general type:

$$P_n = a + bL_n/L_0 + c E_n/E_0 + d M_n/M_0$$

where:

"P_n" is the adjustment multiplier to be applied to the estimated contract value in the relevant currency of the work carried out in period "n", this period being a month unless otherwise stated in the Contract Data;

"a" is a fixed coefficient, stated in the relevant table of adjustment data, representing the non-adjustable portion in contractual payments;

"b", "c", "d", ... are coefficients representing the estimated proportion of each cost element related to the execution of the Works, as stated in the relevant table of adjustment data; such tabulated cost elements may be indicative of resources such as labour, equipment and materials;

"L_n", "E_n", "M_n", ... are the current cost indices or reference prices for period "n", expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the date 49 days prior to the last day of the period (to which the particular Payment Certificate relates); and

"L₀", "E₀", "M₀", ... are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

The cost indices or reference prices stated in the table of adjustment data shall be used. If their source is in doubt, it shall be determined by the Engineer. For this purpose, reference shall be made to the values of the indices at stated dates (quoted in the fourth and fifth columns respectively of the table) for the purposes of clarification of the source; although these dates (and thus these values) may not correspond to the base cost indices.

In cases where the "currency of index" is not the relevant currency of payment, each index shall be converted into the relevant currency of payment at the selling rate, established by the central bank of the Country, of this relevant currency on the above date for which the index is required to be applicable

Until such time as each current cost index is available, the Engineer shall determine a provisional index for the issue of Interim Payment Certificates. When a current cost index is available, the adjustment shall be recalculated accordingly.

If the Contractor fails to complete the Works within the Time for Completion, adjustment of prices thereafter shall be made using either (i) each index or price applicable on the date 49 days prior to the expiry of the Time for Completion of the Works, or (ii) the current index or price: whichever is more favorable to the Employer.

The weightings (coefficients) for each of the factors of cost stated in the table(s) of adjustment data shall only be adjusted if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variations.

14 Contract Price and Payment



14.1 The Contract Price

Unless otherwise stated in the Particular Conditions:

- (a) the Contract Price shall be the lump sum Accepted Contract Amount and be subject to adjustments in accordance with the Contract;
- (b) the Contractor shall pay all taxes, duties and fees required to be paid by him under the Contract, and the Contract Price shall not be adjusted for any of these costs, except as stated in Sub-Clause 13.7 [Adjustments for Changes in Legislation];
- (c) any quantities which may be set out in a Schedule are estimated quantities and are not to be taken as the actual and correct quantities of the Works which the Contractor is required to execute; and
- (d) any quantities or price data which may be set out in a Schedule shall be used for the purposes stated in the Schedule and may be inapplicable for other purposes.

However, if any part of the Works is to be paid according to quantity supplied or work done, the provisions for measurement and evaluation shall be as stated in the Particular Conditions. The Contract Price shall be determined accordingly, subject to adjustments in accordance with the Contract.

Notwithstanding the provisions of sub-paragraph (b), the Contractor's Equipment, including essential spare parts therefor, imported by the Contractor for the sole purpose of executing the Contract shall be exempt from the payment of import duties and taxes upon importation.

14.2 Advance Payment

The Employer shall make an advance payment, as an interest-free loan for mobilisation and design, when the Contractor submits a guarantee in accordance with this Sub-Clause. The total advance payment, the number and timing of instalments (if more than one), and the applicable currencies and proportions, shall be as stated in the Contract Data.

Unless and until the Employer receives this guarantee, or if the total advance payment is not stated in the Contract Data, this Sub-Clause shall not apply.

The Engineer shall deliver to the Employer and to the Contractor an Interim Payment Certificate for the first instalment after receiving a Statement (under Sub-Clause 14.3 [*Application for Interim Payment Certificates*]) and after the Employer receives (i) the Performance Security in accordance with Sub-Clause 4.2 [Performance Security] (ii) a guarantee in amounts and currencies equal to the advance payment. This guarantee shall be issued by an entity and from within a country (or other jurisdiction) approved by the Employer, and shall be in the form annexed to the Contract Data or in another form approved by the Employer.

The Contractor shall ensure that the guarantee is valid and enforceable until the advance payment has been repaid, but its amount may be progressively reduced by the amount repaid by the Contractor as indicated in the Payment Certificates. If the terms of the guarantee specify its expiry date, and the advance payment has not been repaid by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the guarantee until the advance payment has been repaid.



Unless stated otherwise in the Contract Data, the advance payment shall be repaid through percentage deductions from the interim payments determined by the Engineer in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates], as follows:

- (a) deductions shall commence in the next interim Payment Certificate following that in which the total of all certified interim payments (excluding the advance payment and deductions and repayments of retention) exceeds 30 per cent (30%) of the Accepted Contract Amount less Provisional Sums; and
- (b) deductions shall be made at the amortisation rate stated in the Contract Data of the amount of each Interim Payment Certificate (excluding the advance payment and deductions for its repayments as well as deductions for retention money) in the currencies and proportions of the advance payment until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the time when 90 per cent (90%) of the Accepted Contract Amount less Provisional Sums has been certified for payment.

If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Clause 15 [Termination by Employer], Clause 16 [Suspension and Termination by Contractor] or Clause 19 [Force Majeure] (as the case may be), the whole of the balance then outstanding shall immediately become due and in case of termination under Clause 15 [Termination by Employer] and Sub-Clause 19.6 [Optional Termination, Payment and Release], payable by the Contractor to the Employer”.

14.3 Application for Interim Payment Certificates

The Contractor shall submit a Statement in six copies to the Engineer after the end of the period of payment stated in the Contract (if not stated, after the end of each month), in a form approved by the Engineer, showing in detail the amounts to which the Contractor considers himself to be entitled, together with supporting documents which shall include the relevant report on progress in accordance with Sub-Clause 4.21 [Progress Reports].

The Statement shall include the following items, as applicable, which shall be expressed in the various currencies in which the Contract Price is payable, in the sequence listed:

- (a) the estimated contract value of the Works executed and the Contractor's Documents produced up to the end of the month (including Variations but excluding items described in sub-paragraphs (b) to (g) below);
- (b) any amounts to be added and deducted for changes in legislation and changes in cost, in accordance with Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost];
- (c) any amount to be deducted for retention, calculated by applying the percentage of retention stated in the Contract Data to the total of the above amounts, until the amount so retained by the Employer reaches the limit of Retention Money (if any) stated in the Contract Data;
- (d) any amounts to be added and deducted for the advance payment and repayments in accordance with Sub-Clause 14.2 [Advance Payment];
- (e) any amounts to be added and deducted for Plant and Materials in accordance with Sub-Clause 14.5 [Plant and Materials intended for the Works];



- (f) any other additions or deductions which may have become due under the Contract or otherwise, including those under Clause 20 [Claims, Disputes and Arbitration]; and
- (g) the deduction of amounts certified in all previous Payment Certificates.

14.4 Schedule of Payments

If the Contract includes a Schedule of Payments specifying the instalments in which the Contract Price will be paid, then, unless otherwise stated in this Schedule:

- (a) the instalments quoted in the Schedule of Payments shall be the estimated contract values for the purposes of sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates];
- (b) Sub-Clause 14.5 [Plant and Materials intended for the Works] shall not apply; and
- (c) if these instalments are not defined by reference to the actual progress achieved in executing the Works, and if actual progress is found to be less than that on which the Schedule of Payments was based, then the Engineer may proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine revised instalments, which shall take account of the extent to which progress is less or more than that on which the instalments were previously based.

If the Contract does not include a Schedule of Payments, the Contractor shall submit non-binding estimates of the payments which he expects to become due during each quarterly period. The first estimate shall be submitted within 42 days after the Commencement Date. Revised estimates shall be submitted at quarterly intervals, until the Taking-Over Certificate has been issued for the Works.

14.5 Plant and Materials intended for the Works

If this Sub-Clause applies, Interim Payment Certificates shall include, under sub-paragraph (e) of Sub-Clause 14.3, (i) an amount for Plant and Materials which have been sent to the Site for incorporation in the Permanent Works, and (ii) a reduction when the contract value of such Plant and Materials is included as part of the Permanent Works under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates].

If the lists referred to in sub-paragraphs (b)(i) or (c)(i) below are not included in the Schedules, this Sub-Clause shall not apply.

The Engineer shall determine and certify each addition if the following conditions are satisfied:

- (a) the Contractor has:
 - (i) kept satisfactory records (including the orders, receipts, Costs and use of Plant and Materials) which are available for inspection, and
 - (ii) submitted a statement of the Cost of acquiring and delivering the Plant and Materials to the Site, supported by satisfactory evidence; and either:
- (b) the relevant Plant and Materials:



- (i) are those listed in the Schedules for payment when shipped,
 - (ii) have been shipped to the Country, en route to the Site, in accordance with the Contract; and
 - (iii) are described in a clean shipped bill of lading or other evidence of shipment, which has been submitted to the Engineer together with evidence of payment of freight and insurance, any other documents reasonably required, and a bank guarantee in a form and issued by an entity approved by the Employer in amounts and currencies equal to the amount due under this Sub-Clause: this guarantee may be in a similar form to the form referred to in Sub-Clause 14.2 [Advance Payment] and shall be valid until the Plant and Materials are properly stored on Site and protected against loss, damage or deterioration; or
- (c) the relevant Plant and Materials:
- (i) are those listed in the Schedule for payment when delivered to the Site, and
 - (ii) have been delivered to and are properly stored on the Site, are protected against loss, damage or deterioration, and appear to be in accordance with the Contract.

The additional amount to be certified shall be the equivalent of eighty percent of the Engineer's determination of the cost of the Plant and Materials (including delivery to Site), taking account of the documents mentioned in this Sub-Clause and of the contract value of the Plant and Materials.

The currencies for this additional amount shall be the same as those in which payment will become due when the contract value is included under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates]. At that time, the Payment Certificate shall include the applicable reduction which shall be equivalent to, and in the same currencies and proportions as, this additional amount for the relevant Plant and Materials.

14.6 Issue of Interim Payment Certificates

No amount will be certified or paid until the Employer has received and approved the Performance Security. Thereafter, the Engineer shall, within 28 days after receiving a Statement and supporting documents, issue to the Employer an Interim Payment Certificate which shall state the amount which the Engineer fairly determines to be due, with all supporting particulars for any reduction or withholding made by the Engineer on the Statement if any".

However, prior to issuing the Taking-Over Certificate for the Works, the Engineer shall not be bound to issue an Interim Payment Certificate in an amount which would (after retention and other deductions) be less than the minimum amount of Interim Payment Certificates (if any) stated in the Contract Data. In this event, the Engineer shall give notice to the Contractor accordingly.

An Interim Payment Certificate shall not be withheld for any other reason, although:

- (a) if any thing supplied or work done by the Contractor is not in accordance with the Contract, the cost of rectification or replacement may be withheld until rectification or replacement has been completed; and/or



- (b) if the Contractor was or is failing to perform any work or obligation in accordance with the Contract, and had been so notified by the Engineer, the value of this work or obligation may be withheld until the work or obligation has been performed.

The Engineer may in any Payment Certificate make any correction or modification that should properly be made to any previous Payment Certificate. A Payment Certificate shall not be deemed to indicate the Engineer's acceptance, approval, consent or satisfaction, and shall include any amounts due to or from the Contractor in accordance with a decision by the DB made under Sub-Clause 20.4 [Obtaining Dispute Board].

14.7 Payment

The Employer shall pay to the Contractor:

- (a) the first instalment of the advance payment within 42 days after issuing the Letter of Acceptance or within 21 days after receiving the documents in accordance with Sub-Clause 4.2 [Performance Security] and Sub-Clause 14.2 [Advance Payment], whichever is later;
- (b) the amount certified in each Interim Payment Certificate within 56 days after the Engineer receives the Statement and supporting documents or, at a time when the Bank's loan or credit (from which part of the payments to the Contractor is being made) is suspended, the amount shown on any statement submitted by the Contractor, within 14 days after such statement is submitted, any discrepancy being rectified in the next payment to the Contractor including any amounts due in accordance with a decision by the DB which have been included in the Interim Payment Certificate; and
- (c) the amount certified in the Final Payment Certificate within 56 days after the Employer receives this Payment Certificate or, at a time when the Bank's loan or credit (from which part of the payments to the Contractor is being made) is suspended, the undisputed amount shown in the Final Statement, within 56 days after the date of notification of the suspension in accordance with Sub-Clause 16.2 [Termination by Contractor].

Payment of the amount due in each currency shall be made into the bank account, nominated by the Contractor, in the payment country (for this currency) specified in the Contract.

14.8 Delayed Payment

If the Contractor does not receive payment in accordance with Sub-Clause 14.7 [Payment], the Contractor shall be entitled to receive financing charges compounded monthly on the amount unpaid during the period of delay. This period shall be deemed to commence on the date for payment specified in Sub-Clause 14.7 [Payment], irrespective (in the case of its sub-paragraph (b)) of the date on which any Interim Payment Certificate is issued.

Unless otherwise stated in the Contract Data, these financing charges shall be calculated at the annual rate of three percentage points above the discount rate of the central bank in the country of the currency of payment, or if not applicable, the interbank offered rate, and shall be paid in such currency.

The Contractor shall be entitled to this payment without formal notice or certification, and without prejudice to any other right or remedy.



14.9 Payment of Retention Money

When the Taking-Over Certificate has been issued for the Works, and the Works have passed all specified tests (including the Tests after Completion, if any), the first half of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate is issued for a Section, the relevant percentage of the first half of the Retention Money shall be certified and paid when the Section passes all tests.

Promptly after the latest of the expiry dates of the Defects Notification Periods, the outstanding balance of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate was issued for a Section, the relevant percentage of the second half of the Retention Money shall be certified and paid promptly after the expiry date of the Defects Notification Period for the Section.

However, if any work remains to be executed under Clause 11 [Defects Liability] or Clause 12 [Tests after Completion], the Engineer shall be entitled to withhold certification of the estimated cost of this work until it has been executed.

The relevant percentage for each Section shall be the percentage value of the Section as stated in the Appendix to Tender. If the percentage value of a Section is not stated in the Appendix to Tender, no percentage of either half of the Retention Money shall be released under this Sub-Clause in respect of such Section.

Unless otherwise stated in the Contract Data, when the Taking-Over Certificate has been issued for the Works, the Works have passed all specified tests (including the Tests after Completion, if any) and the first half of the Retention Money has been certified for payment by the Engineer, the Contractor shall be entitled to substitute a guarantee, in the form annexed to the Particular Conditions or in another form approved by the Employer and provided by an entity approved by the Employer, for the second half of the Retention Money. The Contractor shall ensure that the guarantee is in the amounts and currencies of the second half of the Retention Money and is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects, as specified for the Performance Security in Sub-Clause 4.2. On receipt by the Employer of the required guarantee, the Engineer shall certify and the Employer shall pay the second half of the Retention Money. The release of the second half of the Retention Money against a guarantee shall then be in lieu of the release under the second paragraph of this Sub-Clause. The Employer shall return the guarantee to the Contractor within 21 days after receiving a copy of the Performance Certificate.

If the Performance Security required under Sub-Clause 4.2 is in the form of a demand guarantee, and the amount guaranteed under it when the Taking-Over Certificate is issued is more than half of the Retention Money, then the Retention Money guarantee will not be required. If the amount guaranteed under the Performance Security when the Taking-Over Certificate is issued is less than half of the Retention Money, the Retention Money guarantee will only be required for the difference between half of the Retention Money and the amount guaranteed under the Performance Security”.

14.10 Statement at Completion



Within 84 days after receiving the Taking-Over Certificate for the Works, the Contractor shall submit to the Engineer six copies of a Statement at completion with supporting documents, in accordance with Sub-Clause 14.3 [Application for Interim Payment Certificates], showing:

- (a) the value of all work done in accordance with the Contract up to the date stated in the Taking-Over Certificate for the Works,
- (b) any further sums which the Contractor considers to be due, and
- (c) an estimate of any other amounts which the Contractor considers will become due to him under the Contract. Estimated amounts shall be shown separately in this Statement at completion.

The Engineer shall then certify in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates].

14.11 Application for Final Payment Certificate

Within 56 days after receiving the Performance Certificate, the Contractor shall submit, to the Engineer, six copies of a draft final statement with supporting documents showing in detail in a form approved by the Engineer:

- (a) the value of all work done in accordance with the Contract, and
- (b) any further sums which the Contractor considers to be due to him under the Contract or otherwise.

If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require within 28 days from receipt of the said draft and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer the final statement as agreed. This agreed statement is referred to in these Conditions as the "Final Statement".

However if, following discussions between the Engineer and the Contractor and any changes to the draft final statement which are agreed, it becomes evident that a dispute exists, the Engineer shall deliver to the Employer (with a copy to the Contractor) an Interim Payment Certificate for the agreed parts of the draft final statement. Thereafter, if the dispute is finally resolved under Sub-Clause 20.4 [Obtaining Dispute Board's Decision] or Sub-Clause 20.5 [Amicable Settlement], the Contractor shall then prepare and submit to the Employer (with a copy to the Engineer) a Final Statement.

14.12 Discharge

When submitting the Final Statement, the Contractor shall submit a discharge which confirms that the total of the Final Statement represents full and final settlement of all moneys due to the Contractor under or in connection with the Contract. This discharge may state that it becomes effective when the Contractor has received the Performance Security and the out-standing balance of this total in which event the discharge will be effective on such date.

14.13 Issue of Final Payment Certificate



Within 28 days after receiving the Final Statement and discharge in accordance with Sub-Clause 14.11 [Application for Final Payment Certificate] and Sub-Clause 14.12 [Discharge], the Engineer shall deliver, to the Employer and to the Contractor, the Final Payment Certificate which shall state:

- (a) the amount which he fairly determines is finally due, and
- (b) after giving credit to the Employer for all amounts previously paid by the Employer and for all sums to which the Employer is entitled, the balance (if any) due from the Employer to the Contractor or from the Contractor to the Employer, as the case may be".

If the Contractor has not applied for a Final Payment Certificate in accordance with Sub-Clause 14.11 [Application for Final Payment Certificate] and Sub-Clause 14.12 [Discharge], the Engineer shall request the Contractor to do so. If the Contractor fails to submit an application within a period of 28 days, the Engineer shall issue the Final Payment Certificate for such amount as he fairly determines to be due.

14.14 Cessation of Employer's Liability

The Employer shall not be liable to the Contractor for any matter or thing under or in connection with the Contract or execution of the Works, except to the extent that the Contractor shall have included an amount expressly for it:

- (a) in the Final Statement and also
- (b) (except for matters or things arising after the issue of the Taking-Over Certificate for the Works) in the Statement at completion described in Sub-Clause 14.10 [Statement at Completion].

However, this Sub-Clause shall not limit the Employer's liability under his indemnification obligations, or the Employer's liability in any case of fraud, deliberate default or reckless misconduct by the Employer.

14.15 Currencies of Payment

The Contract Price shall be paid in the currency or currencies in which the bid price was expressed in the Letter of Bid. If more than one currency is so named, payments shall be made as follows:

- (a) payment of the damages specified in GC 8.7, shall be made in the currencies and proportions specified in the Letter of Bid;
- (b) other payments to the Employer by the Contractor shall be made in the currency in which the sum was expended by the Employer, or in such currency as may be agreed by both Parties;
- (c) if any amount payable by the Contractor to the Employer in a particular currency exceeds the sum payable by the Employer to the Contractor in that currency, the Employer may recover the balance of this amount from the sums otherwise payable to the Contractor in other currencies; and
- (d) the applicable rates of exchange shall be those prevailing on the Base Date and determined by the central bank of the Country.



15 Termination by Employer

15.1 Notice to Correct

If the Contractor fails to carry out any obligation under the Contract, the Engineer may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time.

15.2 Termination by Employer

The Employer shall be entitled to terminate the Contract if the Contractor:

- (a) fails to comply with Sub-Clause 4.2 [Performance Security] or with a notice under Sub-Clause 15.1 [Notice to Correct],
- (b) abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract,
- (c) without reasonable excuse fails:
 - (i) to proceed with the Works in accordance with Clause 8 [Commencement, Delays and Suspension], or
 - (ii) to comply with a notice issued under Sub-Clause 7.5 [Rejection] or Sub-Clause 7.6 [Remedial Work], within 28 days after receiving it,
- (d) subcontracts the whole of the Works or assigns the Contract without the required agreement,
- (e) becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events, or
- (f) gives or offers to give (directly or indirectly) to any person any bribe, gift, gratuity, commission or other thing of value, as an inducement or reward:
 - (i) for doing or forbearing to do any action in relation to the Contract, or
 - (ii) for showing or forbearing to show favour or disfavour to any person in relation to the Contract,

or if any of the Contractor's Personnel, agents or Subcontractors gives or offers to give (directly or indirectly) to any person any such inducement or reward as is described in this sub-paragraph (f). However, lawful inducements and rewards to Contractor's Personnel shall not entitle termination.

In any of these events or circumstances, the Employer may, upon giving 14 days' notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in the case of sub-paragraph (e) or (f), the Employer may by notice terminate the Contract immediately

The Employer's election to terminate the Contract shall not prejudice any other rights of the Employer, under the Contract or otherwise.



The Contractor shall then leave the Site and deliver any required Goods, all Contractor's Documents, and other design documents made by or for him, to the Engineer. However, the Contractor shall use his best efforts to comply immediately with any reasonable instructions included in the notice (i) for the assignment of any subcontract, and (ii) for the protection of life or property or for the safety of the Works.

After termination, the Employer may complete the Works and/or arrange for any other entities to do so. The Employer and these entities may then use any Goods, Contractor's Documents and other design documents made by or on behalf of the Contractor.

The Employer shall then give notice that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall promptly arrange their removal, at the risk and cost of the Contractor. However, if by this time the Contractor has failed to make a payment due to the Employer, these items may be sold by the Employer in order to recover this payment. Any balance of the proceeds shall then be paid to the Contractor.

15.3 Valuation at Date of Termination

As soon as practicable after a notice of termination under Sub-Clause 15.2 [Termination by Employer] has taken effect, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the value of the Works, Goods and Contractor's Documents, and any other sums due to the Contractor for work executed in accordance with the Contract.

15.4 Payment after Termination

After a notice of termination under Sub-Clause 15.2 [Termination by Employer] has taken effect, the Employer may:

- (a) proceed in accordance with Sub-Clause 2.5 [Employer's Claims],
- (b) withhold further payments to the Contractor until the costs of design, execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Employer, have been established, and/or
- (c) recover from the Contractor any losses and damages incurred by the Employer and any extra costs of completing the Works, after allowing for any sum due to the Contractor under Sub-Clause 15.3 [Valuation at Date of Termination]. After recovering any such losses, damages and extra costs, the Employer shall pay any balance to the Contractor.

15.5 Employer's Entitlement to Termination for Convenience

The Employer shall be entitled to terminate the Contract, at any time for the Employer's convenience, by giving notice of such termination to the Contractor. The termination shall take effect 28 days after the later of the dates on which the Contractor receives this notice or the Employer returns the Performance Security. The Employer shall not terminate the Contract under this Sub-Clause in order to execute the Works himself or to arrange for the Works to be executed by another contractor or to avoid a termination of the Contract by the Contractor under Sub-Clause 16.2 [Termination by Contractor].

After this termination, the Contractor shall proceed in accordance with Sub-Clause 16.3 [Cessation of Work and Removal of Contractor's Equipment] and shall be paid in accordance with Sub-Clause 19.6 [Optional Termination, Payment and Release].



If the Contractor subsequently receives such Payment Certificate, evidence or payment (as described in the relevant Sub-Clause and in the above notice) before giving a notice of termination, the Contractor shall resume normal working as soon as is reasonably practicable.

If the Contractor suffers delay and/or incurs Cost as a result of suspending work (or reducing the rate of work) in accordance with this Sub-Clause, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost plus profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

16.2 Termination by Contractor

The Contractor shall be entitled to terminate the Contract if:

- (a) the Contractor does not receive the reasonable evidence within 42 days after giving notice under Sub-Clause 16.1 [Contractor's Entitlement to Suspend Work] in respect of a failure to comply with Sub-Clause 2.4 [Employer's Financial Arrangements],
- (b) the Engineer fails, within 56 days after receiving a Statement and supporting documents, to issue the relevant Payment Certificate,
- (c) the Contractor does not receive the amount due under an Interim Payment Certificate within 42 days after the expiry of the time stated in Sub-Clause 14.7 [Payment] within which payment is to be made (except for deductions in accordance with Sub-Clause 2.5 [Employer's Claims]),
- (d) the Employer substantially fails to perform his obligations under the Contract in such manner as to materially and adversely affect the economic balance of the Contract and/or the ability of the Contractor to perform the Contract,
- (e) the Employer fails to comply with Sub-Clause 1.6 [Contract Agreement] or Sub-Clause 1.7 [Assignment],
- (f) a prolonged suspension affects the whole of the Works as described in Sub-Clause 8.11 [Prolonged Suspension], or
- (g) the Employer becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events.
- (h) the Contractor does not receive the Engineer's instruction recording the agreement of both Parties on the fulfilment of the conditions for the Commencement of Works under Sub-Clause 8.1 [Commencement of Works]".



In any of these events or circumstances, the Contractor may, upon giving 14 days' notice to the Employer, terminate the Contract. However, in the case of sub-paragraph (f) or (g), the Contractor may by notice terminate the Contract immediately.

In the event the Bank suspends the loan or credit from which part or whole of the payments to the Contractor are being made, if the Contractor has not received the sums due to him upon expiration of the 14 days referred to in Sub-Clause 14.7 [Payment] for payments under Interim Payment Certificates, the Contractor may, without prejudice to the Contractor's entitlement to financing charges under Sub-Clause 14.8 [Delayed Payment], take one of the following actions, namely (i) suspend work or reduce the rate of work, and (ii) terminate his employment under the Contract by giving notice to the Employer, with a copy to the Engineer, such termination to take effect 14 days after the giving of the notice.

The Contractor's election to terminate the Contract shall not prejudice any other rights of the Contractor, under the Contract or otherwise.

16.3 Cessation of Work and Removal of Contractor's Equipment

After a notice of termination under Sub-Clause 15.5 [Employer's Entitlement to Termination], Sub-Clause 16.2 [Termination by Contractor] or Sub-Clause 19.6 [Optional Termination, Payment and Release] has taken effect, the Contractor shall promptly:

- (a) cease all further work, except for such work as may have been instructed by the Engineer for the protection of life or property or for the safety of the Works,
- (b) hand over Contractor's Documents, Plant, Materials and other work, for which the Contractor has received payment, and
- (c) remove all other Goods from the Site, except as necessary for safety, and leave the Site.

16.4 Payment on Termination

After a notice of termination under Sub-Clause 16.2 [Termination by Contractor] has taken effect, the Employer shall promptly:

- (a) return the Performance Security to the Contractor,
- (b) pay the Contractor in accordance with Sub-Clause 19.6 [Optional Termination, Payment and Release], and
- (c) pay to the Contractor the amount of any loss of profit or other loss or damage sustained by the Contractor as a result of this termination.

17 Risk and Responsibility

17.1 Indemnities

The Contractor shall indemnify and hold harmless the Employer, the Employer's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of:



- (a) bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the design, execution and completion of the Works and the remedying of any defects, unless attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents, and
- (b) damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss arises out of or in the course of or by reason of the design, the execution and completion of the Works and the remedying of any defects, unless and to the extent that any such damage or loss is attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, their respective agents, or anyone directly or indirectly employed by any of them".

The Employer shall indemnify and hold harmless the Contractor, the Contractor's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of (1) bodily injury, sickness, disease or death, which is attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents, and (2) the matters for which liability may be excluded from insurance cover, as described in subparagraphs (d)(i), (ii) and (iii) of Sub-Clause 18.3 [Insurance Against Injury to Persons and Damage to Property].

17.2 Contractor's Care of the Works

The Contractor shall take full responsibility for the care of the Works and Goods from the Commencement Date until the Taking-Over Certificate is issued (or is deemed to be issued under Sub-Clause 10.1 [Taking Over of the Works and Sections]) for the Works, when responsibility for the care of the Works shall pass to the Employer. If a Taking-Over Certificate is issued (or is so deemed to be issued) for any Section or part of the Works, responsibility for the care of the Section or part shall then pass to the Employer.

After responsibility has accordingly passed to the Employer, the Contractor shall take responsibility for the care of any work which is outstanding on the date stated in a Taking-Over Certificate, until this outstanding work has been completed.

If any loss or damage happens to the Works, Goods or Contractor's Documents during the period when the Contractor is responsible for their care, from any cause not listed in Sub-Clause 17.3 [Employer's Risks], the Contractor shall rectify the loss or damage at the Contractor's risk and cost, so that the Works, Goods and Contractor's Documents conform with the Contract.

The Contractor shall be liable for any loss or damage caused by any actions performed by the Contractor after a Taking-Over Certificate has been issued. The Contractor shall also be liable for any loss or damage which occurs after a Taking-Over Certificate has been issued and which arose from a previous event for which the Contractor was liable.

17.3 Employer's Risks

The risks referred to in Sub-Clause 17.4 [Consequences of Employer's Risks] below, insofar as they directly affect the execution of the Works in the Country, are:



- (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- (b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war, within the Country,
- (c) riot, commotion or disorder within the Country by persons other than the Contractor's Personnel,
- (d) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, within the Country, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity
- (e) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,
- (f) use or occupation by the Employer of any part of the Permanent Works, except as may be specified in the Contract,
- (g) design of any part of the Works by the Employer's Personnel or by others for whom the Employer is responsible, if any, and
- (h) any operation of the forces of nature which is Unforeseeable or against which an experienced contractor could not reasonably have been expected to have taken adequate preventative precautions.

17.4 Consequences of Employer's Risks

If and to the extent that any of the risks listed in Sub-Clause 17.3 above results in loss or damage to the Works, Goods or Contractor's Documents, the Contractor shall promptly give notice to the Engineer and shall rectify this loss or damage to the extent required by the Engineer.

If the Contractor suffers delay and/or incurs Cost from rectifying this loss or damage, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
- (b) payment of any such Cost, which shall be included in the Contract Price. In the case of subparagraphs (f) and (g) of Sub-Clause 17.3 [Employer's Risks], Cost plus profit shall be payable.

After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

17.5 Intellectual and Industrial Property Rights

In this Sub-Clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trade mark, trade name, trade secret or other intellectual or industrial property right relating to the Works; and "claim" means a claim (or proceedings pursuing a claim) alleging an infringement.



Whenever a Party does not give notice to the other Party of any claim within 28 days of receiving the claim, the first Party shall be deemed to have waived any right to indemnity under this Sub-Clause.

The Employer shall indemnify and hold the Contractor harmless against and from any claim alleging an infringement which is or was:

- (a) an unavoidable result of the Contractor's compliance with the Employer's Requirements, or
- (b) a result of any Works being used by the Employer:
 - (i) for a purpose other than that indicated by, or reasonably to be inferred from, the Contract, or
 - (ii) in conjunction with any thing not supplied by the Contractor, unless such use was disclosed to the Contractor prior to the Base Date or is stated in the Contract.

The Contractor shall indemnify and hold the Employer harmless against and from any other claim which arises out of or in relation to (i) the Contractor's design, manufacture, construction or execution of the Works, (ii) the use of Contractor's Equipment, or (iii) the proper use of the Works.

If a Party is entitled to be indemnified under this Sub-Clause, the indemnifying Party may (at its cost) conduct negotiations for the settlement of the claim, and any litigation or arbitration which may arise from it. The other Party shall, at the request and cost of the indemnifying Party, assist in contesting the claim. This other Party (and its Personnel) shall not make any admission which might be prejudicial to the indemnifying Party, unless the indemnifying Party failed to take over the conduct of any negotiations, litigation or arbitration upon being requested to do so by such other Party.

17.6 Limitation of Liability

Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contract or for any indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract, other than as specifically provided in Sub-Clause 8.7 [Delay Damages]; Sub-Clause 11.2 [Cost of Remedying Defects]; Sub-Clause 15.4 [Payment after Termination]; Sub-Clause 16.4 [Payment on Termination]; Sub-Clause 17.1 [Indemnities]; Sub-Clause 17.4 (b) [Consequences of Employer's Risks] and Sub-Clause 17.5 [Intellectual and Industrial Property Rights].

The total liability of the Contractor to the Employer, under or in connection with the Contract other than under Sub-Clause 4.19 [Electricity, Water and Gas], Sub-Clause 4.20 [Employer's Equipment and Free-Issue Material], Sub-Clause 17.1 [Indemnities] and Sub-Clause 17.5 [Intellectual and Industrial Property Rights], shall not exceed the sum resulting from the application of a multiplier (less or greater than one) to the Accepted Contract Amount, as stated in the Contract Data, or (if such multiplier or other sum is not so stated), the Accepted Contract Amount.

This Sub-Clause shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.



17.7 Use of Employer's Accommodation/Facilities

The Contractor shall take full responsibility for the care of the Employer-provided accommodation and facilities, if any, as detailed in the Employer's Requirements, from the respective dates of hand-over to the Contractor until cessation of occupation (where hand-over or cessation of occupation may take place after the date stated in the Taking-Over Certificate for the Works).

If any loss or damage happens to any of the above items while the Contractor is responsible for their care arising from any cause whatsoever other than those for which the Employer is liable, the Contractor shall, at his own cost, rectify the loss or damage to the satisfaction of the Engineer.

18 Insurance

18.1 General Requirements for Insurances

In this Clause, "insuring Party" means, for each type of insurance, the Party responsible for effecting and maintaining the insurance specified in the relevant Sub-Clause.

Wherever the Contractor is the insuring Party, each insurance shall be effected with insurers and in terms approved by the Employer. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause.

Wherever the Employer is the insuring Party, each insurance shall be effected with insurers and in terms acceptable to the Contractor. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause".

If a policy is required to indemnify joint insured, the cover shall apply separately to each insured as though a separate policy had been issued for each of the joint insured. If a policy indemnifies additional joint insured, namely in addition to the insured specified in this Clause, (i) the Contractor shall act under the policy on behalf of these additional joint insured except that the Employer shall act for Employer's Personnel, (ii) additional joint insured shall not be entitled to receive payments directly from the insurer or to have any other direct dealings with the insurer, and (iii) the insuring Party shall require all additional joint insured to comply with the conditions stipulated in the policy.

Each policy insuring against loss or damage shall provide for payments to be made in the currencies required to rectify the loss or damage. Payments received from insurers shall be used for the rectification of the loss or damage.

The relevant insuring Party shall, within the respective periods stated in the Contract Data (calculated from the Commencement Date), submit to the other Party:

- (a) evidence that the insurances described in this Clause have been effected, and
- (b) copies of the policies for the insurances described in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment] and Sub-Clause 18.3 [Insurance against Injury to Persons and Damage to Property].



When each premium is paid, the insuring Party shall submit evidence of payment to the other Party. Whenever evidence or policies are submitted, the insuring Party shall also give notice to the Engineer

Each Party shall comply with the conditions stipulated in each of the insurance policies. The insuring Party shall keep the insurers informed of any relevant changes to the execution of the Works and ensure that insurance is maintained in accordance with this Clause.

Neither Party shall make any material alteration to the terms of any insurance without the prior approval of the other Party. If an insurer makes (or attempts to make) any alteration, the Party first notified by the insurer shall promptly give notice to the other Party.

If the insuring Party fails to effect and keep in force any of the insurances it is required to effect and maintain under the Contract, or fails to provide satisfactory evidence and copies of policies in accordance with this Sub-Clause, the other Party may (at its option and without prejudice to any other right or remedy) effect insurance for the relevant coverage and pay the premiums due. The insuring Party shall pay the amount of these premiums to the other Party, and the Contract Price shall be adjusted accordingly.

Nothing in this Clause limits the obligations, liabilities or responsibilities of the Contractor or the Employer, under the other terms of the Contract or otherwise. Any amounts not insured or not recovered from the insurers shall be borne by the Contractor and/or the Employer in accordance with these obligations, liabilities or responsibilities. However, if the insuring Party fails to effect and keep in force an insurance which is available and which it is required to effect and maintain under the Contract, and the other Party neither approves the omission nor effects insurance for the coverage relevant to this default, any moneys which should have been recoverable under this insurance shall be paid by the insuring Party.

Payments by one Party to the other Party shall be subject to Sub-Clause 2.5 [Employer's Claims] or Sub-Clause 20.1 [Contractor's Claims], as applicable

The Contractor shall be entitled to place all insurance relating to the Contract (including, but not limited to the insurance referred to Clause 18) with insurers from any eligible source country.

18.2 Insurance for Works and Contractor's Equipment

The insuring Party shall insure the Works, Plant, Materials and Contractor's Documents for not less than the full reinstatement cost including the costs of demolition, removal of debris and professional fees and profit. This insurance shall be effective from the date by which the evidence is to be submitted under subparagraph (a) of Sub-Clause 18.1 [General Requirements for Insurances], until the date of issue of the Taking-Over Certificate for the Works.

The insuring Party shall maintain this insurance to provide cover until the date of issue of the Performance Certificate, for loss or damage for which the Contractor is liable arising from a cause occurring prior to the issue of the Taking-Over Certificate, and for loss or damage caused by the Contractor in the course of any other operations (including those under Clause 11 [Defects Liability] and Clause 12 [Tests after Completion]).

The insuring Party shall insure the Contractor's Equipment for not less than the full replacement value, including delivery to Site. For each item of Contractor's Equipment, the insurance shall be effective while it is being transported to the Site and until it is no longer required as Contractor's Equipment.

Unless otherwise stated in the Particular Conditions, insurances under this Sub-Clause:

- (a) shall be effected and maintained by the Contractor as insuring Party,



- (b) shall be in the joint names of the Parties, who shall be jointly entitled to receive payments from the insurers, payments being held or allocated between the Parties for the sole purpose of rectifying the loss or damage,
- (c) shall cover all loss and damage from any cause not listed in Sub-Clause 17.3 [Employer's Risks],
- (d) shall also cover, to the extent specifically required in the bidding documents of the Contract, loss or damage to a part of the Works which is attributable to the use or occupation by the Employer of another part of the Works, and loss or damage from the risks listed in sub-paragraphs (c), (g), and (h) of Sub-Clause 17.3 [Employer's Risks], excluding (in each case) risks which are not insurable at commercially reasonable terms, with deductibles per occurrence of not more than the amount stated in the Contract Data (if an amount is not so stated, this sub-paragraph (d) shall not apply), and
- (e) may however exclude loss of, damage to, and reinstatement of:
- (i) a part of the Works which is in a defective condition due to a defect in its design, materials or workmanship (but cover shall include any other parts which are lost or damaged as a direct result of this defective condition and not as described in sub-paragraph (ii) below),
 - (ii) a part of the Works which is lost or damaged in order to reinstate any other part of the Works if this other part is in a defective condition due to a defect in its design, materials or workmanship,
 - (iii) a part of the Works which has been taken over by the Employer, except to the extent that the Contractor is liable for the loss or damage, and
 - (iv) Goods while they are not in the Country, subject to Sub-Clause 14.5 [Plant and Materials intended for the Works].

If, more than one year after the Base Date, the cover described in sub-paragraph (d) above ceases to be available at commercially reasonable terms, the Contractor shall (as insuring Party) give notice to the Employer, with supporting particulars. The Employer shall then (i) be entitled subject to Sub-Clause 2.5 [Employer's Claims] to payment of an amount equivalent to such commercially reasonable terms as the Contractor should have expected to have paid for such cover, and (ii) be deemed, unless he obtains the cover at commercially reasonable terms, to have approved the omission under Sub-Clause 18.1 [General Requirements for Insurances].

18.3 Insurance against Injury to Persons and Damage to Property

The insuring Party shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment]) or to any person (except persons insured under Sub-Clause 18.4 [Insurance for Contractor's Personnel]), which may arise out of the Contractor's performance of the Contract and occurring before the issue of the Performance Certificate.

This insurance shall be for a limit per occurrence of not less than the amount stated in the Contract Data, with no limit on the number of occurrences. If an amount is not stated in the Contract Data, this Sub-Clause shall not apply.



Unless otherwise stated in the Particular Conditions, the insurances specified in this Sub-Clause:

- (a) shall be effected and maintained by the Contractor as insuring Party,
- (b) shall be in the joint names of the Parties,
- (c) shall be extended to cover liability for all loss and damage to the Employer's property (except things insured under Sub-Clause 18.2) arising out of the Contractor's performance of the Contract, and
- (d) may however exclude liability to the extent that it arises from:
 - (i) the Employer's right to have the Permanent Works executed on, over, under, in or through any land, and to occupy this land for the Permanent Works,
 - (ii) damage which is an unavoidable result of the Contractor's obligations to execute the Works and remedy any defects, and
 - (iii) a cause listed in Sub-Clause 17.3 [Employer's Risks], except to the extent that cover is available at commercially reasonable terms.

18.4 Insurance for Contractor's Personnel

The Contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel.

The insurance shall cover the Employer and the Engineer against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

The insurance shall be maintained in full force and effect during the whole time that these personnel are assisting in the execution of the Works. For a Subcontractor's employees, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for compliance with this Clause.

19 Force Majeure

19.1 Definition of Force Majeure

In this Clause, "Force Majeure" means an exceptional event or circumstance:

- (a) which is beyond a Party's control,
- (b) which such Party could not reasonably have provided against before entering into the Contract,
- (c) which, having arisen, such Party could not reasonably have avoided or overcome, and



- (d) which is not substantially attributable to the other Party.

Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

- (i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- (ii) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war,
- (iii) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel,
- (iv) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and
- (v) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

19.2 Notice of Force Majeure

If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.

Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

19.3 Duty to Minimise Delay

Each Party shall at all times use all reasonable endeavours to minimise any delay in the performance of the Contract as a result of Force Majeure.

A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

19.4 Consequences of Force Majeure

If the Contractor is prevented from performing substantial obligations under the Contract by Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and



- (b) if the event or circumstance is of the kind described in sub-paragraphs (i) to (iv) of Sub-Clause 19.1 [Definition of Force Majeure] and, in the case of sub-paragraphs (ii) to (iv), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment].

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

19.5 Force Majeure Affecting Sub-contractor

If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Clause.

19.6 Optional Termination, Payment and Release

If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], or for multiple periods which total more than 140 days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with Sub-Clause 16.3 [Cessation of Work and Removal of Contractor's Equipment].

Upon such termination, the Engineer shall determine the value of the work done and issue a Payment Certificate which shall include:

- (a) the amounts payable for any work carried out for which a price is stated in the Contract;
- (b) the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal;
- (c) any other Cost or liability which in the circumstances was necessarily, as well as reasonably, incurred by the Contractor in the expectation of completing the Works;
- (d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and
- (e) the Cost of repatriation of the Contractor's staff and labour employed wholly in connection with the Works at the date of termination.

19.7 Release from Performance under the Law



Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises which makes it impossible or unlawful for either or both Parties to fulfil its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance:

- (a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract, and
- (b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under Sub-Clause 19.6 [Optional Termination, Payment and Release] if the Contract had been terminated under Sub-Clause 19.6.

20 Claims, Disputes and Arbitration

20.1 Contractor's Claims

If the Contractor considers himself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Engineer, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware, or should have become aware, of the event or circumstance.

If the Contractor fails to give notice of a claim within such period of 28 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Employer shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.

The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Engineer. Without admitting the Employer's liability, the Engineer may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all these records, and shall (if instructed) submit copies to the Engineer.

Within 42 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Engineer, the Contractor shall send to the Engineer a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

- (a) this fully detailed claim shall be considered as interim;
- (b) the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Engineer may reasonably require; and



- (c) the Contractor shall send a final claim within 28 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Engineer.

Within 42 days after receiving a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Engineer and approved by the Contractor, the Engineer shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within the above defined time period.

Within the above defined period of 42 days, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause [Extension of Time for Completion], and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

Each Payment Certificate shall include such additional payment for any claim as have been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

If the Engineer does not respond within the timeframe defined in this Clause, either Party may consider that the claim is rejected by the Engineer and any of the Parties may refer to the Dispute Board in accordance with Sub-Clause 20.4 [Obtaining Dispute Board's Decision].

The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.

20.2 Appointment of the Dispute Board

Disputes shall be referred to a DB for decision in accordance with Sub-Clause 20.4 [Obtaining Dispute Board's Decision]. The Parties shall appoint a DB by the date stated in the Contract Data.

The DB shall comprise, as stated in the Contract Data, either one or three suitably qualified persons ("the members"), each of whom shall be fluent in the language for communication defined in the Contract and shall be a professional experienced in the type of construction involved in the Works and with the interpretation of contractual documents. If the number is not so stated and the Parties do not agree otherwise, the DB shall comprise three persons.

If the Parties have not jointly appointed the DB 21 days before the date stated in the Contract Data and the DB is to comprise three persons, each Party shall nominate one member for the approval of the other Party. The first two members shall recommend and the Parties shall agree upon the third member, who shall act as chairman.

However, if a list of potential members has been agreed by the Parties and is included in the Contract, the members shall be selected from those on the list, other than anyone who is unable or unwilling to accept appointment to the DB.



The agreement between the Parties and either the sole member or each of the three members shall incorporate by reference the General Conditions of Dispute Board Agreement contained in the Appendix to these General Conditions, with such amendments as are agreed between them.

The terms of the remuneration of either the sole member or each of the three members, including the remuneration of any expert whom the DB consults, shall be mutually agreed upon by the Parties when agreeing the terms of appointment. Each Party shall be responsible for paying one-half of this remuneration.

If at any time the Parties so agree, they may jointly refer a matter to the DB for it to give its opinion. Neither Party shall consult the DB on any matter without the agreement of the other Party.

If a member declines to act or is unable to act as a result of death, disability, resignation or termination of appointment, a replacement shall be appointed in the same manner as the replaced person was required to have been nominated or agreed upon, as described in this Sub-Clause.

The appointment of any member may be terminated by mutual agreement of both Parties, but not by the Employer or the Contractor acting alone. Unless otherwise agreed by both Parties, the appointment of the DB (including each member) shall expire when the discharge referred to in Sub-Clause 14.12 [Discharge] shall have become effective.

20.3 Failure to Agree on the Composition of the Dispute Board

If any of the following conditions apply, namely:

- (a) the Parties fail to agree upon the appointment of the sole member of the DB by the date stated in the first paragraph of Sub-Clause 20.2 [Appointment of the Dispute Board],
- (b) either Party fails to nominate a member (for approval by the other Party) , or fails to approve a member nominated by the other Party, of a DB of three persons by such date,
- (c) the Parties fail to agree upon the appointment of the third member (to act as chairman) of the DB by such date, or
- (d) the Parties fail to agree upon the appointment of a replacement person within 42 days after the date on which the sole member or one of the three members declines to act or is unable to act as a result of death, disability, resignation or termination of appointment,

then the appointing entity or official named in the Contract Data shall, upon the request of either or both of the Parties and after due consultation with both Parties, appoint this member of the DB. This appointment shall be final and conclusive. Each Party shall be responsible for paying one-half of the remuneration of the appointing entity or official.

20.4 Obtaining Dispute Board's Decision

If a dispute (of any kind whatsoever) arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works, including any dispute as to any certificate, determination, instruction, opinion or valuation of the Engineer, either Party may refer the dispute in writing to the DB for its decision, with copies to the other Party and the Engineer. Such reference shall state that it is given under this Sub-Clause.



For a DB of three persons, the DB shall be deemed to have received such reference on the date when it is received by the chairman of the DB.

Both Parties shall promptly make available to the DB all such additional information, further access to the Site, and appropriate facilities, as the DB may require for the purposes of making a decision on such dispute. The DB shall be deemed to be not acting as arbitrator(s).

Within 84 days after receiving such reference, or within such other period as may be proposed by the DB and approved by both Parties, the DB shall give its decision, which shall be reasoned and shall state that it is given under this Sub-Clause. The decision shall be binding on both Parties, who shall promptly give effect to it unless and until it shall be revised in an amicable settlement or an arbitral award as described below. Unless the Contract has already been abandoned, repudiated or terminated, the Contractor shall continue to proceed with the Works in accordance with the Contract.

If either Party is dissatisfied with the DB's decision, then either Party may, within 28 days after receiving the decision, give a Notice of Dissatisfaction to the other Party indicating its dissatisfaction and intention to commence arbitration. If the DB fails to give its decision within the period of 84 days (or as otherwise approved) after receiving such reference, then either Party may, within 28 days after this period has expired, give a Notice of Dissatisfaction to the other Party.

In either event, this Notice of Dissatisfaction shall state that it is given under this Sub-Clause, and shall set out the matter in dispute and the reason(s) for dissatisfaction. Except as stated in Sub-Clause 20.7 [Failure to Comply with Dispute Board's Decision] and Sub-Clause 20.8 [Expiry of Dispute Board's Appointment], neither Party shall be entitled to commence arbitration of a dispute unless a Notice of Dissatisfaction has been given in accordance with this Sub-Clause.

If the DB has given its decision as to a matter in dispute to both Parties, and no Notice of Dissatisfaction has been given by either Party within 28 days after it received the DB's decision, then the decision shall become final and binding upon both Parties.

If the decision of the DAB requires a payment by one Party to the other Party, the DAB may require the payee to provide an appropriate security in respect of such payment.

20.5 Amicable Settlement

Where a Notice of Dissatisfaction has been given under Sub-Clause 20.4 above, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, the Party giving a Notice of Dissatisfaction in accordance with Sub-Clause 20.4 above should move to commence arbitration after the fifty-sixth day from the day on which a Notice of Dissatisfaction was given, even if no attempt at an amicable settlement has been made.

20.6 Arbitration

Any dispute between the Parties arising out of or in connection with the Contract not settled amicably in accordance with Sub-Clause 20.5 above and in respect of which the DB's decision (if any) has not become final and binding shall be finally settled by arbitration. Arbitration shall be conducted as follows:



- (a) if the contract is with foreign contractors (or if the lead partner is a foreign contractor, in case of JV), international arbitration with proceedings administered by the International Chamber of Commerce (ICC) and conducted under the ICC Rules of Arbitration; by one or more arbitrators appointed in accordance with said arbitration rules.
- (b) if the Contract is with domestic contractors, arbitration with proceedings conducted in accordance with the laws of the Employer's country.

The place of arbitration shall be a neutral location determined in accordance with the applicable rules of arbitration; and the arbitration shall be conducted in the language for communications defined in Sub-Clause 1.4 [Law and Language].

The arbitrators shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer, and any decision of the DB, relevant to the dispute. Nothing shall disqualify representatives of the Parties and the Engineer from being called as a witness and giving evidence before the arbitrators on any matter whatsoever relevant to the dispute.

Neither Party shall be limited in the proceedings before the arbitrators to the evidence or arguments previously put before the DB to obtain its decision, or to the reasons for dissatisfaction given in its Notice of Dissatisfaction. Any decision of the DB shall be admissible in evidence in the arbitration.

Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, the Engineer and the DB shall not be altered by reason of any arbitration being conducted during the progress of the Works.

20.7 Failure to Comply with Dispute Board's Decision

In the event that a Party fails to comply with any decision of the DB, whether binding or final and binding decision which has become final and binding, then the other Party may, without prejudice to any other rights it may have, refer the failure itself to arbitration under Sub-Clause 20.6 [Arbitration]. Sub-Clause 20.4 [Obtaining Dispute Board's Decision] and Sub-Clause 20.5 [Amicable Settlement] shall not apply to this reference.

20.8 Expiry of Dispute Board's Appointment

If a dispute arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works and there is no DB in place, whether by reason of the expiry of the DB's appointment or otherwise:

- (a) Sub-Clause 20.4 [Obtaining Dispute Board's Decision] and Sub-Clause 20.5 [Amicable Settlement] shall not apply, and
- (b) the dispute may be referred directly to arbitration under Sub-Clause 20.6 [Arbitration].



APPENDIX

General Conditions of Dispute Board Agreement

1 Definitions

Each "Dispute Board Agreement" is a tripartite agreement by and between:

- (a) the "Employer";
- (b) the "Contractor"; and
- (c) the "Member" who is defined in the Dispute Agreement as being:
 - (i) the sole member of the "DB" and, where this is the case, all references to the "Other Members" do not apply, or
 - (ii) one of the three persons who are jointly called the "DB" (or "dispute board") and, where this is the case, the other two persons are called the "Other Members".

The Employer and the Contractor have entered (or intend to enter) into a contract, which is called the "Contract" and is defined in the Dispute Agreement, which incorporates this Appendix. In the Dispute Agreement, words and expressions which are not otherwise defined shall have the meanings assigned to them in the Contract.

2 General Provisions

Unless otherwise stated in the Dispute Board Agreement, it shall take effect on the latest of the following dates:

- (a) the Commencement Date defined in the Contract,
- (b) when the Employer, the Contractor and the Member have each signed the Dispute Board Agreement, or
- (c) when the Employer, the Contractor and each of the Other Members (if any) have respectively each signed a dispute board agreement.

This employment of the Member is a personal appointment. At any time, the Member may give not less than 70 days' notice of resignation to the Employer and to the Contractor, and the Dispute Agreement shall terminate upon the expiry of this period.

3 Warranties



The Member warrants and agrees that he/she is and shall be impartial and independent of the Employer, the Contractor and the Engineer. The Member shall promptly disclose, to each of them and to the Other Members (if any), any fact or circumstance which might appear inconsistent with his/her warranty and agreement of impartiality and independence.

When appointing the Member, the Employer and the Contractor relied upon the Member's representations that he/she is:

- (a) experienced in the work which the Contractor is to carry out under the Contract,
- (b) experienced in the interpretation of contract documentation, and
- (c) fluent in the language for communications defined in the Contract.

4 General Obligations of the Member

The Member shall:

- (a) have no interest financial or otherwise in the Employer, the Contractor or the Engineer, nor any financial interest in the Contract except for payment under the Dispute Agreement;
- (b) not previously have been employed as a consultant or otherwise by the Employer, the Contractor or the Engineer, except in such circumstances as were disclosed in writing to the Employer and the Contractor before they signed the Dispute Agreement;
- (c) have disclosed in writing to the Employer, the Contractor and the Other Members (if any), before entering into the Dispute Agreement and to his/her best knowledge and recollection, any professional or personal relationships with any director, officer or employee of the Employer, the Contractor or the Engineer, and any previous involvement in the overall project of which the Contract forms part;
- (d) not, for the duration of the Dispute Agreement, be employed as a consultant or otherwise by the Employer, the Contractor or the Engineer, except as may be agreed in writing by the Employer, the Contractor and the Other Members (if any);
- (e) comply with the annexed procedural rules and with Sub-Clause 20.4 of the Conditions of Contract;
- (f) not give advice to the Employer, the Contractor, the Employer's Personnel or the Contractor's Personnel concerning the conduct of the Contract, other than in accordance with the annexed procedural rules;
- (g) not while a Member enter into discussions or make any agreement with the Employer, the Contractor or the Engineer regarding employment by any of them, whether as a consultant or otherwise, after ceasing to act under the Dispute Agreement;
- (h) ensure his/her availability for any site visit and hearings as are necessary; and (i) treat the details of the Contract and all the DB's activities and hearings as private and confidential, and not publish or disclose them without the prior written consent of the Employer, the Contractor and the Other Members (if any); and



- (k) be available to give advice and opinions, on any matter relevant to the Contract when requested by both the Employer and the Contractor, subject to the agreement of the Other Members (if any).

5 General Obligations of the Employer and the Contractor

The Employer, the Contractor, the Employer's Personnel and the Contractor's Personnel shall not request advice from or consultation with the Member regarding the Contract, otherwise than in the normal course of the DB's activities under the Contract and the Dispute Agreement, and except to the extent that prior agreement is given by the Employer, the Contractor and the Other Members (if any). The Employer and the Contractor shall be responsible for compliance with this provision, by the Employer's Personnel and the Contractor's Personnel respectively.

The Employer and the Contractor undertake to each other and to the Member that the Member shall not, except as otherwise agreed in writing by the Employer, the Contractor, the Member and the Other Members (if any):

- (a) be appointed as an arbitrator in any arbitration under the Contract;
- (b) be called as a witness to give evidence concerning any dispute before arbitrator(s) appointed for any arbitration under the Contract; or
- (c) be liable for any claims for anything done or omitted in the discharge or purported discharge of the Member's functions, unless the act or omission is shown to have been in bad faith.

The Employer and the Contractor hereby jointly and severally indemnify and hold the Member harmless against and from claims from which he/she is relieved from liability under the preceding paragraph.

6 Payment

The Member shall be paid as follows, in the currency named in the Dispute Board Agreement:

- (a) a retainer fee per calendar month, which shall be considered as payment in full for:
- (i) being available on 28 days' notice for all site visits and hearings;
- (ii) becoming and remaining conversant with all project developments and maintaining relevant files;
- (iii) all office and overhead expenses including secretarial services, photocopying and office supplies incurred in connection with his duties; and
- (iv) all services performed hereunder except those referred to in subparagraphs (b) and (c) of this Clause.

The retainer fee shall be paid with effect from the last day of the calendar month in which the Dispute Board Agreement becomes effective; until the last day of the calendar month in which the Taking-Over Certificate is issued for the whole of the Works.



With effect from the first day of the calendar month following the month in which the Taking-Over Certificate is issued for the whole of the Works, the retainer fee shall be reduced by one third. This reduced fee shall be paid until the first day of the calendar month in which the Member resigns or the Dispute Board Agreement is otherwise terminated.

- (b) a daily fee shall be considered as payment in full for:
- (i) each day or part of a day up to a maximum of two days' travel time in each direction for the journey between the Member's home and the site, or another location of a meeting with the Other Members (if any);
 - (ii) each working day on Site visits, hearings or preparing decisions; and
 - (iii) each day spent reading submissions in preparation for a hearing.
- (c) all reasonable expenses including necessary travel expenses (air fare in less than first class, hotel and subsistence and other direct travel expenses) incurred in connection with the Member's duties, as well as the cost of telephone calls, courier charges, faxes and telexes: a receipt shall be required for each item in excess of five percent of the daily fee referred to in sub-paragraph (b) of this Clause;
- (d) any taxes properly levied in the Country on payments made to the Member (unless a national or permanent resident of the Country) under this Clause 6.

The daily fee shall be as specified in the Dispute Board Agreement. Unless it specifies otherwise, these fees shall remain fixed for the first 24 calendar months, and shall thereafter be adjusted by agreement between the Employer, the Contractor and the Member, at each anniversary of the date on which the Dispute Board Agreement became effective.

If the parties fail to agree on the retainer fee or the daily fee, the appointing entity or official named in the Contract Data shall determine the amount of the fees to be used.

The Member shall submit invoices for payment of the monthly retainer and air fares quarterly in advance. Invoices for other expenses and for daily fees shall be submitted following the conclusion of a site visit or hearing. All invoices shall be accompanied by a brief description of activities performed during the relevant period and shall be addressed to the Contractor.

The Contractor shall pay each of the Member's invoices in full within 56 calendar days after receiving each invoice and shall apply to the Employer (in the Statements under the Contract) for reimbursement of one-half of the amounts of these invoices. The Employer shall then pay the Contractor in accordance with the Contract.



If the Contractor fails to pay to the Member the amount to which he/she is entitled under the Dispute Board Agreement, the Employer shall pay the amount due to the Member and any other amount which may be required to maintain the operation of the DB; and without prejudice to the Employer's rights or remedies. In addition to all other rights arising from this default, the Employer shall be entitled to reimbursement of all sums paid in excess of one-half of these payments, plus all costs of recovering these sums and financing charges calculated at the rate specified in Sub-Clause 14.8 of the Conditions of Contract.

If the Member does not receive payment of the amount due within 70 days after submitting a valid invoice, the Member may (i) suspend his/her services (without notice) until the payment is received, and/or (ii) resign his/her appointment by giving notice under Clause 7.

7 Termination

At any time: (i) the Employer and the Contractor may jointly terminate the Dispute Board Agreement by giving 42 days' notice to the Member; or (ii) the Member may resign as provided for in Clause 2.

If the Member fails to comply with the Dispute Board Agreement, the Employer and the Contractor may, without prejudice to their other rights, terminate it by notice to the Member. The notice shall take effect when received by the Member.

If the Employer or the Contractor fails to comply with the Dispute Board Agreement, the Member may, without prejudice to his other rights, terminate it by notice to the Employer and the Contractor. The notice shall take effect when received by them both.

Any such notice, resignation and termination shall be final and binding on the Employer, the Contractor and the Member. However, a notice by the Employer or the Contractor, but not by both, shall be of no effect.

8 Default of the Member

If the Member fails to comply with any of his obligations under Clause 4 (a) - (d) above, he shall not be entitled to any fees or expenses hereunder and shall, without prejudice to their other rights, reimburse each of the Employer and the Contractor for any fees and expenses received by the Member and the Other Member (if any), for proceeding or decisions (if any) of the DB which are rendered void or ineffective by the said failure to comply.

If the Member fails to comply with any of his obligations under Clause 4 (e) - (i) above, he shall not be entitled to any fees or expenses hereunder from the date and to the extent of the non-compliance and shall, without prejudice to their other rights, reimburse each of the Employer and the Contractor for any fees and expenses already received by the Member, for proceedings or decisions (if any) of the DB which are rendered void or ineffective by the said failure to comply."

9 Disputes

Any dispute or claim arising out of or in connection with this Dispute Board Agreement, or the breach, termination or invalidity thereof shall be finally settled by institutional arbitration. If no other arbitration institute is agreed, the arbitration shall be conducted under the Rules of Arbitration of the International Chamber of Commerce by one arbitrator appointed in accordance with these Rules of Arbitration".



Annex PROCEDURAL RULES

- 1 Unless otherwise agreed by the Employer and the Contractor, the DB shall visit the Site at intervals of not more than 140 days, including times of critical construction events, at the request of either the Employer or the Contractor. Unless otherwise agreed by the Employer, the Contractor and the DB, the period between consecutive visits shall not be less than 70 days, except as required to convene a hearing as described below.
- 2 The timing of and agenda for each Site visit shall be as agreed jointly by the DB, the Employer and the Contractor, or in the absence of agreement, shall be decided by the DB. The purpose of Site visits is to enable the DB to become and remain acquainted with the progress of the Works and of any actual or potential problems or claims, and, as far as reasonable, to endeavour to prevent potential problems or claims from becoming disputes.
- 3 Site visits shall be attended by the Employer, the Contractor and the Engineer and shall be co-ordinated by the Employer in co-operation with the Contractor. The Employer shall ensure the provision of appropriate conference facilities and secretarial and copying services. At the conclusion of each Site visit and before leaving the site, the DB shall prepare a report on its activities during the visit and shall send copies to the Employer and the Contractor.
- 4 The Employer and the Contractor shall furnish to the DB one copy of all documents which the DB may request, including Contract documents, progress reports, variation instructions, certificates and other documents pertinent to the performance of the Contract. All communications between the DB and the Employer or the Contractor shall be copied to the other Party. If the DB comprises three persons, the Employer and the Contractor shall send copies of these requested documents and these communications to each of these persons.
- 5 If any dispute is referred to the DB in accordance with Sub-Clause 20.4 of the Conditions of Contract, the DB shall proceed in accordance with Sub-Clause 20.4 and these Rules. Subject to the time allowed to give notice of a decision and other relevant factors, the DB shall:
 - (a) act fairly and impartially as between the Employer and the Contractor, giving each of them a reasonable opportunity of putting his case and responding to the other's case, and
 - (b) adopt procedures suitable to the dispute, avoiding unnecessary delay or expense.
- 6 The DB may conduct a hearing on the dispute, in which event it will decide on the date and place for the hearing and may request that written documentation and arguments from the Employer and the Contractor be presented to it prior to or at the hearing.
- 7 Except as otherwise agreed in writing by the Employer and the Contractor, the DB shall have power to adopt an inquisitorial procedure, to refuse admission to hearings or audience at hearings to any persons other than representatives of the Employer, the Contractor and the Engineer, and to proceed in the absence of any party who the DB is satisfied received notice of the hearing; but shall have discretion to decide whether and to what extent this power may be exercised.
- 8 The Employer and the Contractor empower the DB, among other things, to:
 - (a) establish the procedure to be applied in deciding a dispute,
 - (b) decide upon the DB's own jurisdiction, and as to the scope of any dispute referred to it,



- (c) conduct any hearing as it thinks fit, not being bound by any rules or procedures other than those contained in the Contract and these Rules,
- (d) take the initiative in ascertaining the facts and matters required for a decision,
- (e) make use of its own specialist knowledge, if any,
- (f) decide upon the payment of financing charges in accordance with the Contract,
- (g) decide upon any provisional relief such as interim or conservatory measures, and
- (h) open up, review and revise any certificate, decision, determination, instruction, opinion or valuation of the Engineer, relevant to the dispute.

9

The DB shall not express any opinions during any hearing concerning the merits of any arguments advanced by the Parties. Thereafter, the DB shall make and give its decision in accordance with Sub-Clause 20.4, or as otherwise agreed by the Employer and the Contractor in writing. If the DB comprises three persons:

- (a) it shall convene in private after a hearing, if any, in order to have discussions and prepare its decision;
- (b) it shall endeavour to reach a unanimous decision: if this proves impossible, the applicable decision shall be made by a majority of the Members, who may require the minority Member to prepare a written report for submission to the Employer and the Contractor; and
- (c) if a Member fails to attend a meeting or hearing, or to fulfil any required function, the other two Members may nevertheless proceed to make a decision, unless:
 - (i) either the Employer or the Contractor does not agree that they do so, or
 - (ii) the absent Member is the chairman and he/she instructs the other Members not to make a decision.



BIDDING DOCUMENTS
for
Procurement of
Mumbai Trans Harbour Link Project (Package-1)
Construction of a 10.380 km long bridge section
(CH 0+000 – CH 10+380) across the Mumbai Bay
including Sewri Interchange

Volume II

PART 2 – Employer's Requirements
Section VI. Employer's Requirements

Employer: Mumbai Metropolitan Region Development Authority

Country: India

Project: Mumbai Trans Harbour Link Project

Loan No.: *[MARRDA to insert number of Loan Agreement]*



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DIVISION 1. GENERAL

1. INTRODUCTION

1.1. EMPLOYER'S REQUIREMENTS DIVISION

These Employer's Requirements are divided into six (6) divisions as follows:

- 1) **General:** Requirements set out in this division apply commonly throughout the Contract.
- 2) **Functional:** Described in this division are the specific requirements for functions of the Project and the Works to be considered in the design, Execution and defects liability of the Works.
- 3) **Design:** Requirements relating to the Contractor's design of the Works are specified in this division.
- 4) **Construction:** Requirements relating to the Execution of the Works and the defects liability services are set out in this division.
- 5) **Outline Specifications:** Outline specifications for the Contractor's design and Execution of the Works are presented in this division.

***Appendices:** Information to supplement divisions 1) through 4) above is included in these appendices.

1.2. DEFINITIONS AND INTERPRETATIONS

In addition to the words and expressions defined in the General Conditions of Contract (GC) and the Particular Conditions of Contract (PC), the following words and expressions shall have the meaning assigned to them herein except where the context requires otherwise:

"As-Built Documents"	means the As-Built Drawings and records to be prepared and submitted by the Contractor in accordance with GC Sub-Clause 5.6 and Clause 3.2 of the Employer's Requirements - Design.
"As-Built Drawings"	means those drawings to be produced and endorsed by the Contractor as true records of Execution of the Works and submitted to the Engineer for review as an important part of the As-Built Documents.
"Construction Design"	means a set of documents to be prepared and submitted by the Contractor in accordance with Clause 3.1 of the Employer's Requirements - Design.
"Construction Design Pack"	has the meaning identified in Clause 3.1 of the Employer's Requirements - Design.
"Construction Phase"	has the meaning identified in Clause 3 of the Employer's Requirements - Design.
"Contract"	means the Contract for Package-1 of the Mumbai Trans Harbour Link (MTHL) Project.
"Design Data"	means all specifications, Plans, drawings, details, levels, dimensions, calculations duly checked by the Contractor, and other documents related to the design of the Works prepared by or on behalf of the Contractor.
"Design Manual"	means the manual to be prepared and submitted by the Contractor as described in Appendix 10 of the Employer's Requirements - Design.



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- "Design Phase" has the meaning identified in Clause 2 of the Employer's Requirements - Design.
- "Design Submission Programme" has the meaning identified in Clause 6 of the Employer's Requirements - Design.
- "Drawings" means the Employer's Drawings and the drawings submitted by the Contractor and any modifications of such drawings as may be required by the Design Review process.
- "Execution of the Works" means the procurement, manufacture, supply, transportation, delivery to the Site, construction, erection, installation, testing, commissioning, performance testing and completion of the Works in accordance with the Contract; the preparation and/or delivery (as appropriate) of all information, drawings and manuals in respect of the Works required by the Contract, the provision of such spare parts, consumables, tools and spare materials as are required by the Contract to be provided by the Contractor, and the management of all such matters.
- "External Interfacing Parties" means the parties with whom the Contractor must coordinate interface during the design and/or Execution of the Works, including but not limited to the government authorities and departments of jurisdiction, regulatory bodies, utility companies, consultants, project management units and the Related Works Contractors.
- "Initial Design" has the meaning identified in Clause 2.1 of the Employer's Requirements - Design.
- "Intellectual Property" means copyright, all rights conferred under statute, common law or equity in relation to inventions (including patents), registered and unregistered trademarks and service marks, registered and unregistered designs, circuit layouts, confidential information, proprietary information and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields.
- "Key Date" means a date by which the Contractor must complete a designated activity. A Key Date is assigned to a subdivision of the Works that relate to progress and payment. Such will include:
- a) Key Date for access of the Related Works Contractor's interface with the Works, and
 - b) The Time for the Works Practical Completion.
- "Key Personnel" means individuals belonging to the Contractor or the Subcontractors who are considered by the Engineer to be critical for design and Execution of the Works in accordance with the Contract and are listed as such in the Contractor's Project Organization to be provided under Clause 15 of the Employer's Requirements - General.
- "Latent Defect" means any defect in design, materials or workmanship or defects arising from any act or omission of the Contractor or his Subcontractors or suppliers of any tier done or omitted that a reasonable examination would



	not have disclosed prior to taking-over of the Works or during the Defects Notification Period.
"Monthly Progress Reports"	are the monthly progress reports referred to in GC Sub-Clause 4.21 and have the meaning identified in Clause 9 of the Employer's Requirements - General.
"Notice of No Objection"	means a notice from the Engineer to the Contractor providing his/her formal decision that he/she has no objection to the matter or thing proposed by the Contractor.
"Outline Drawings"	means the preliminary and conceptual drawings of the Employer presented to the Contractor in a manner that enables the Contractor to develop and submit the Initial Design in accordance with the requirements set out in the Bidding Documents.
"Outline Environmental Management Plan"	means the environmental plans forming part of the Tender, setting out in summary form, the Contractor's proposed means of complying with his obligations in relation to environmental management as prescribed in the Employer's Requirements.
"Outline Quality Plan"	means the quality plan forming part of the Tender, setting out in summary form, the Contractor's proposed means of complying with his obligations in relation to quality assurance and quality control (QA/QC) as prescribed in the Employer's Requirements.
"Outline Risk Management Plan"	means the Contractor's proposed means of complying with his obligations in relation to construction risk management as prescribed in the Employer's Requirements.
"Outline Safety Plan"	means the safety plan forming part of the Tender, setting out in summary form, the Contractor's proposed means of complying with his obligations in relation to safety as prescribed in the Employer's Requirements.
"Outline Specifications"	means the Outline Drawing and Construction Specifications and has meaning identified in Clause 4 of the Employer's Requirements .
"Project"	means the Mumbai Trans Harbour Link (MTHL) Project.
"Related Works Contractors"	means the contractors whose works have interface(s) with the Works to be designed and Executed by the Contractor.
"Technical Design"	has the meaning identified in Clause 2.2 of the Employer's Requirements - Design.
"Works Programme"	means the programme showing the sequence, method and timing of investigations, design, issue of Notice of No Objection, execution, manufacture, delivery to Site, erection, installation, testing, commissioning of the Works (including Integrated Testing and Commissioning), and related activities in the form and content prescribed by the Employer's Requirements, or any amended or varied version thereof, as submitted by the Contractor and for which the Engineer has issued approval.



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"Works Specification" means the specifications describing the materials to be used and the workmanship to be adopted for Execution, along with the proposed acceptance test procedures and acceptance criteria, for the Works, to be prepared by the Contractor for submission to the Engineer as an important part of the Contractor's Documents under GC Sub-Clause 5.2.

2. CODES AND STANDARDS

2.1. COMPLIANCE WITH APPROVED STANDARDS

The design and Execution of the Works shall comply with the codes, standards and specifications as stated in the Outline Specifications.

2.2. PRE-APPROVED JAPANESE AND INDIAN STANDARDS

The pre-approved standard specifications for the Project are:

- 1) Japanese "Specifications for Highway Bridges" issued by Japan Road Association, and
- 2) Indian "Specifications for Road and Bridge Works" of the Ministry of Road Transport & Highways (MoRT&H) (hereinafter referred to as "MoRT&H Specifications").

2.3. CONFLICT BETWEEN JAPANESE AND INDIAN STANDARDS

Without derogating from the Contract that might define the order of precedence of the documents forming the Contract, should any ambiguity, discrepancy, inconsistency, divergence, design or Execution impracticality or omissions from, within or between any of the following arise:

- a) PART 2, Section VI, Employer's Requirements, and
- b) Indian and other internationally recognized standards,

then the precedence/priority shall follow the above ranking.

Without prejudice to the above, the manner in which ambiguities, discrepancies, etc. are resolved shall be as follows:

- 1) The Contractor shall immediately notify the Engineer of the ambiguity, discrepancy, inconsistency, divergence, design or Execution impracticality or omission (as the case may be found, and
- 2) The Engineer shall issue instructions and/or determinations in regard thereto, as are reasonable and necessary, in accordance with GC Sub-clause 1.9.

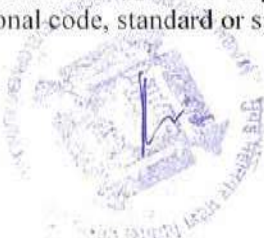
The Engineer's instructions and determinations on ambiguity, discrepancy, inconsistency, divergence, design or Execution impracticality or omission as aforesaid will be issued on assumption that these instructions and determinations will in no way vitiate the Contract. If the Contractor is in the opinion that the Engineer's instruction or determination constitutes a Variation, then the Contractor shall forthwith notify the Engineer so in accordance with GC Clause 13.

2.4. ALTERNATIVE CODES, STANDARDS AND SPECIFICATIONS PROPOSED

Alternative codes, standards and specifications proposed by the Contractor shall be internationally recognized ones and shall be equivalent to or better or stricter than the specified ones as determined at the sole discretion of the Engineer. No additional time and/or cost of the Contractor will be entertained on the account of acceptance or rejection of the alternative codes, standards and specifications proposed by the Contractor.

2.5. PRIOR APPROVAL OF ANY ALTERNATIVE

The Contractor shall be responsible to obtain the Engineer's prior approval on any alternative or additional code, standard or specification to be used by the Contractor.



3. EMPLOYER'S OR ENGINEER'S NOTICES

3.1. COMMENCEMENT AND EXECUTION OF WORKS

The Contractor is required, before it commences any Execution of the Works, to prepare and submit the Technical Design for the Engineer's review. The Contractor shall not commence Execution of the Works in part or in whole before receipt of the Engineer's Notice of No Objection to the Technical Design of the relevant part of the Works to be submitted by the Contractor.

4. WORKS PROGRAMMES

4.1. CONTRACTOR'S PROGRAMMES

The Contractor shall prepare and submit his proposed Works Programmes, including Three-Month and Five-Week Rolling Programmes, in accordance with GC Sub-Clause 8.3 and the detailed requirements contained in Appendix 6 of the Employer's Requirements.

4.2. WORKS PROGRAMME AND PROVISIONS FOR INTERFACE COORDINATION

In compiling the Works Programmes, and in all subsequent updating thereof and reporting, the Contractor shall make provision for and allow the time required for coordinating and completing the design of the Works, including, inter alia, design coordination with the External Interfacing Parties including the Related Works Contractors, in accordance with the procedures detailed in Appendix 1 of the Employer's Requirements. The Works Programmes shall take full account of the design submission Programmes.

The Contractor shall identify all of the External Interfacing Parties in his Interface Management System and other relevant requirements detailed in Appendix 1 of the Employer's Requirements.

Within 28 days after the Commencement Date, the Contractor shall submit to the Engineer the initial Three-Month Rolling Programme, as an integral part of the detailed time programmes or the Work Programmes to be submitted in accordance with GC Sub-Clause 8.3. The initial submission of the Three-Month Rolling Programmes shall show in detail all activities that have commenced or are due to commence within the first three calendar month period.

The subsequent Three-Month Rolling Programmes, after the initial submittal, shall:

- 1) cover the subject three-month time window extracted from the Contractor's Works Programmes;
- 2) provide details of all activities that will be in progress, or are due to commence, within the forthcoming two month period and of all activities that were undertaken during the previous one month period;
- 3) be updated every month and be submitted concurrent with the Monthly Progress Report set forth in GC Sub-Clause 4.21; and
- 4) highlight all required dates for transmittal or receipt of information to or from the Engineer, the Subcontractors or the External Interfacing Parties including the Related Works Contractors.

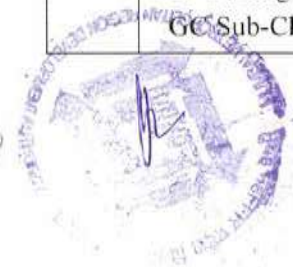
The Five-Week Rolling Programmes, showing the activities that were undertaken in the last week and the activities that will be in progress, or are due to commence, within the forthcoming four weeks period shall be updated and submitted every week.

The Contractor shall comply with the following interface requirements for each Package as attached table



Table 1.1 Interface Requirements

Item No.	Item Description	From	To	Time Limit
1a	Allow the Contractor's unobstructed access to Site (clear ROW) as stipulated in GC Sub-Clause 2.1	Employer	Package -1 Contractors	For Marine area : within 28 days after Commencement Date For Land area : within 28 days after Commencement Date (about 7.6ha out of 10ha)
1b	Ditto to the encumbered area for ROW of Package 1(See the reference Drawing)	Employer	Package -1 Contractors	180 days after Commencement Date (about 2.33ha)
1c	Allow the Contractor's unobstructed access to the land of Casting Yard as stipulated in GC Sub-Clause 2.1	Employer	Package -1 Contractors	within 28 days after Commencement Date (about 15ha)
2a	Allow the Contractor's unobstructed access to clear ROW as stipulated in GC Sub-Clause 2.1	Employer	Package -2 Contractors	For Marine area : within 28 days after Commencement Date For land area : within 28 days after Commencement Date (entire land area except about 1.6ha)
2b	Ditto to the encumbered area for ROW of Package 2(See the reference Drawing)	Employer	Package - 2 Contractors	within 180 days after Commencement Date (for Land area about 1.6ha)
2c-1	Allow the Contractor's unobstructed access to the land of Casting Yard as stipulated in GC Sub-Clause 2.1	Employer	Package - 2 Contractors	Total 25% of Casting yard within 28 days after Commencement Date (about 4.5ha)
2c-2	Allow the Contractor's unobstructed access to the land of Casting Yard as stipulated in GC Sub-Clause 2.1	Employer	Package - 2 Contractors	Total 75% of Casting yard within 90 days after Commencement Date (about 13.5ha)
2c-3	Allow the Contractor's unobstructed access to the land of Casting Yard as stipulated in GC Sub-Clause 2.1	Employer	Package - 2 Contractors	Total 100% of Casting yard within 120 days after Commencement Date (about 18ha)



3a	Allow the Contractor's unobstructed access to Site (clear ROW) as stipulated in GC Sub-Clause 2.1	Employer	Package -3 Contractors	within 28 days after Commencement Date for Land area (about ___ out of ___ ha) MMRDA to insert figure
3b	Ditto to the encumbered area for ROW of Package 3 (See the reference Drawing)	Employer	Package - 3 Contractors	within 180 days after Commencement Date (about 51.4ha)
3c-1	Allow the Contractor's unobstructed access to the land of Casting Yard as stipulated in GC Sub-Clause 2.1	Employer	Package - 3 Contractors	Total 25% of Casting yard within 28 days after Commencement Date (about 1.75ha)
3c-2	Allow the Contractor's unobstructed access to the land of Casting Yard as stipulated in GC Sub-Clause 2.1	Employer	Package - 3 Contractors	Total 75% of Casting yard within 90 days after Commencement Date (about 5.25ha)
3c-3	Allow the Contractor's unobstructed access to the land of Casting Yard as stipulated in GC Sub-Clause 2.1	Employer	Package - 3 Contractors	Total 100% of Casting yard within 120 days after Commencement Date (about 7ha)
4	Return of the land of Casting Yard after cleaning on completion	Package-1,2 & 3 Contractors	Employer	within 180 days after Completion Date
5	Allow Package-2 Contractor's unobstructed access to completed Pier No. 172 in Package 1 including box out for Bearing and Drainage	Package-1 Contractor	Package-2 Contractor	within 730 days after Commencement Date
6	Allow Package-2 Contractor's unobstructed access to completed Expansion Joint, for Package-2 Contractor's paving work	Package-1 Contractor	Package-2 Contractor(see the reference Drawing)	within 1,250 days after Commencement Date
7	Allow Package-3 Contractor's unobstructed access to completed Pier No. 321 in Package 2 including box out for Bearing and Drainage	Package-2 Contractor	Package-3 Contractor	within 550 days after Commencement Date
8	Allow Package-3 Contractor's unobstructed access to completed Expansion Joint, for Package-3 Contractor's paving work	Package-2 Contractor	Package-3 Contractor	within 750 days after Commencement Date



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9	Allow to completed Piers for Sub-station installation including box out for anchor bolts as required by Separate Agency to be appointed by the Employer	Package-1, 2 & 3 Contractors	Separate Agency to be appointed by the Employer	At least 200 days before Completion Date
10	Allow to all Foundations with box out (along dowels) of street light & with 50cm space at 30m interval for lighting poles as required by Separate Agency to be appointed by the Employer	Package-1, 2 & 3 Contractors	Separate Agency to be appointed by the Employer	At least 200 days before Completion Date
11	Allow to all Foundations with box out of VMS, CCTV, ITS and Traffic signal gantry/pole as required by Package 4 Contractor	Package-1, 2 & 3 Contractors	Package-4 Contractor	At least 270 days before Completion Date of Package-4
12	Allow unobstructed access to the area of Toll Plaza	Package-2 & 3 Contractors	Package-4 Contractor	within 1,250 days for Package-2 and within 910 days for Package-3 after respective Commencement Dates
13	Allow the Contractor's unobstructed access to the area of connection with Eastern Freeway	Highway Authority	Package-1 Contractor	within 1,095 days after Commencement Date
14	Allow the Contractor's unobstructed access to the area of connection with NH4 & SH54	Highway Authority	Package-3 Contractor	within 910 days after Commencement Date



5. LIAISON AND COOPERATION WITH OTHERS

5.1. APPROVALS FROM GOVERNMENT AUTHORITIES AND AGENCIES

The Contractor shall, at his own cost, make all necessary arrangements with and obtain all necessary approvals, consents, permits, etc. from the government departments, utility agencies and other relevant/competent authorities concerned and the relevant External Interfacing Parties.

5.2. MEETINGS WITH ENGINEER/EMPLOYER

The Contractor shall arrange and attend any meetings with the Engineer and/or the Employer as required by the Engineer and/or the Employer. The Contractor shall use his best endeavors to ensure that his Subcontractors, suppliers and consultants attend meetings, at no additional costs to the Employer, when so required by the Engineer. The Contractor shall prepare all necessary materials to be presented to the meetings.

5.3. MEETINGS WITH GOVERNMENT DEPARTMENTS AND AGENCIES

When the Contractor requires meetings with government departments and other External Interfacing Parties including the Related Works Contractors, the Contractor shall inform the Engineer of the meeting details (including the proposed agenda and list of attendants) at least seven (7) working days (excluding the Employer's holidays), or such shorter period permitted by the Engineer, before the proposed date of the meeting.

5.4. CORRESPONDENCE WITH GOVERNMENT DEPARTMENTS AND AGENCIES

The Contractor shall deliver to the Engineer for information a copy of each correspondence received from or dispatched to government departments and other External Interfacing Parties within two (2) days of the receipt or dispatch. It is recommendable that the Contractor dispatches any correspondence only after consultation with the Engineer.

5.5. DESIGN COORDINATION WITH RELATED WORKS CONTRACTORS

In addition to the liaison set out above, the Contractor shall undertake close design coordination with the Related Works Contractors in particular as and when needed for timely completion of both the Contractor's and the Related Works Contractors' interface designs. The interface designs shall be completed in a timely manner in strict compliance with the Contractor's Works Programmes. The Contractor shall commence design coordination with the Related Works Contractors once the necessary information has been developed to a level where meaningful interaction can take place. When the interface design has been agreed to by both parties, the Contractor shall obtain from the Related Works Contractors, and submit a copy to the Engineer, a written confirmation that the design coordination has been completed. Only after such confirmation, the Engineer shall review the pertinent portion of the Contractor's design submittals.

Typically, the design interaction should include:

- (a) Discussion and agreement with the Related Works Contractors on the definition of the interface areas, Contract limits, shared loads, physical work interfaces, and sequence and timing of construction, erection/installation and/or testing of the Works in the interface areas;
- (b) Discussion and agreement with the Related Works Contractors on the details of civil and structural works including the type, size and location of equipment, the access routes thereto, and the cast-in items such as conduits, lifting hooks and eyes, fixing bolts and sockets; and
- (c) Discussion and agreement with the Related Works Contractors on the details of electrical and mechanical works including the termination and connection of utility lines such as electric cables and water supply pipes.

5.6. COOPERATION

"The Contractor shall not impede and shall afford all reasonable facilities, access and/or services



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to the Employer, the Employer's Personnel including the Engineer, utility undertakings, relevant public authorities and other contractors (whether employed by the Employer or not) who are carrying out on, or in the vicinity of, the Site, works not included in the Contract but forming part of the Project.

The Contractor shall take all necessary steps to ensure that the Works are co-ordinated and integrated with such other works and shall in particular:

- i) comply with any reasonable direction which the Engineer may give for the integration of the design of the Works with the design of any other part of the Project;
- ii) consult, liaise and co-operate with those responsible for carrying out such other works including, where necessary, in the preparation of the respective designs, the preparation of co-ordinated programmes, method statements, co-ordination drawings and specifications together with arrangements of service priorities and zoning; and
- iii) participate in Test after Completion of the Works with the utility undertakings, relevant public authorities and other contractors and demonstrate to the satisfaction of the Engineer that the Works have been designed and constructed in a manner compatible with the works of other relevant parties.

The Contractor shall participate in design co-ordination activities conducted by the Engineer with the utility undertakings, relevant public authorities and other contractors who are carrying out the works forming part of the Project as described in the Employer's Requirements. At the end of each such co-ordination period, the Engineer shall state in writing that the design co-ordination activities are complete and that their respective designs of the different parties are integrated and can be finalized without interference with each other's designs or the designs with which their designs have already been integrated.

The Contractor shall provide within the Site, staging, storage and unloading areas for the use of the utility undertakings, relevant public authorities and other contractors as specified in the Employer's Requirements. The exact size and location of these staging, storage and unloading areas, and the commencement and termination dates shall be coordinated and agreed during the design interface period with each of the relevant parties.

The Contractor shall cooperate in carrying out the works of the utility undertakings, relevant public authorities and other contractors and the workmen of the Employer who may be engaged on or near the Site of any work, ancillary to the Works, but, not included in the Contract and shall not cause them inconvenience.

The Contractor shall be deemed to have made adequate allowance in the Contract Price and in the Works time programme to be submitted under Sub-Clause 8.3 [Commencement of Works] in respect of these obligations."

6. MONTHLY PROGRESS REPORTS

6.1. SUBMISSION OF MONTHLY PROGRESS REPORTS

Further to the provisions of GC Sub-Clause 4.21, the Contractor shall submit to the Engineer the Monthly Progress Reports (MPRs), as more particularly described in Appendix 7 of the Employer's Requirements. Contents of the MPRs shall be closely coordinated with the activities and matters set out in the Contractor's Works Programmes.

6.2. MPR SUBMISSION DATE

The MPRs shall be submitted by the date set out in GC Sub-Clause 4.21, unless otherwise agreed with the Engineer.



7. CONTRACTOR'S QUALITY ASSURANCE SYSTEM

The Contractor shall institute and maintain an effective quality assurance system in accordance with the requirements set out in Appendix 3 of the Employer's Requirements for the design and Execution of the Works including the interface coordination. The quality assurance system shall be in substantial compliance with ISO 9000 system. Each of the Contractor's Documents submitted to the Engineer shall accompany a quality assurance check sheet signed by the Contractor's personnel in charge thereof. The check sheet shall be prepared for each sheet of the drawings, each section of the specifications and each set of the reports and similar documents.

8. DOCUMENT SUBMISSION AND RESPONSE

8.1. DOCUMENT SUBMISSION AND RESPONSE PROCEDURE

The Contractor shall institute an efficient project management information system to transmit and record the transmission of formal correspondence, documents and information including the Contractor's Documents. For this purpose, the Contractor shall apply a web-based information management system, described more in detail in Appendix 8 of the Employer's Requirements.

8.2. TRANSMISSION OF SUBMISSIONS

The Contractor shall transmit all submissions to the Engineer according to the approved procedure as laid down in Appendix 8 of the Employer's Requirements.

9. ENVIRONMENTAL PROTECTION REQUIREMENTS

9.1. INDIAN ENVIRONMENTAL LAWS

During the design and Execution of the Works, the Contractor shall strictly conform to all requirements relating to the environmental protection as detailed in the Employer's Requirements. The Contractor shall also strictly conform to all applicable Indian environmental protection/management-related Laws and all current national/state codes and standards established by the Maharashtra Pollution Control Board (MPCB), a Government of India entity, and other government agencies for environmental protection-management.

9.2. SUBMISSION OF SITE ENVIRONMENTAL MANAGEMENT PLAN

The Contractor shall prepare and submit to the Engineer the Site Environmental Management Plan (SEP). SEP shall be consistent in all respects with the provisions of the Outline Environmental Management Plan (EMP) provided in Appendix 4 of the Employer's Requirements. Upon receipt of the Notice of No Objection, the Contractor shall implement the SEP for the entire duration of the Contract reference to JICA's related requirements.

9.3. RIGHTS AND LICENSES

The Contractor shall obtain, as required under the applicable Laws, all applicable permits and licenses including, but not limited to, the following permits and licenses on or before the starting relevant activity, save and except to the extent of a waiver granted by the relevant authorities of jurisdiction.

- a) Permission of the State Government for extraction of boulders from quarry;
- b) Permission of Village Panchayat and Pollution Control Board for installation of crushers;
- c) License for use of explosives;
- d) Permission of the State Government for drawing water from river/reservoir;
- e) License from Inspector of factories or other competent authority for setting up Batching Plant;
- f) Clearance of Pollution Control Board for setting up Batching Plant;



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- g) Clearance of Village Panchayats and Pollution Control Board for Asphalt Plant;
- h) Permission of Village Panchayat and State Government for borrow earth;
- i) Permission of State Government for cutting of trees; and
- j) Any other permits or clearances required under the applicable Laws.

Applicable permits and licenses, as required, relating to environmental protection and conservation in connection with the Project as a whole shall be deemed to have been procured by the Employer as a condition precedent for entering into the Contract.

10. SOFTWARE MANAGEMENT AND CONTROL

Where any software for the Works must be developed by the Contractor, the Contractor shall comply with the requirements of the BS EN ISO 9000-3:1997 "Guidelines for the Application of ISO 9001 to Development, Supply and Maintenance of Software", to ensure the quality of the software development process.

Where the software is to be supplied by an organization other than the Contractor, the Contractor shall ensure that the Subcontractors and/or Suppliers provide the rights (transfer of rights) to the Employer to use and maintain software in the operations and maintenance of the Works. Such transfer of right will not abrogate from the Contractor's obligations under the Contract in the design and Execution of the Works.

The Contractor must, at his own cost, ensure that it has all necessary rights and licenses to intellectual property subsisting in any matter, thing or process (including the documents forming part of the Contract and the Contractor's Documents) used or to be used in the design and Execution of the Works by the Contractor and/or his Subcontractor(s) or supplier(s) or delivered or to be delivered by it to the Employer under the Contract.

Without prejudice to GC Clause 17.5 [Intellectual and Industrial Property Rights], the Contractor shall be deemed (by signing the Contract) to have given to the Employer a non-terminable, transferable, non-exclusive, royalty-free license (including the right to sub-license) to copy, use and communicate the Contractor's Documents and any intellectual property forming part of the Works, including adapting and making and using modifications of them. This license shall entitle the Employer to copy, use and communicate the Contractor's Documents and the relevant intellectual property only for the purposes of completing, operating, maintaining, altering, adjusting, improving, repairing, extending, enlarging and demolishing the Works; and in the case of Contractor's Documents and the relevant intellectual property which are in the form of computer programs and other software, shall permit their use on any computer, including replacements of any such computers.

11. SURVEY AND SITE INVESTIGATIONS

11.1. USE OF MEAN SEA LEVEL DATUM

The datum used for vertical control of the Works shall be the Datum of the Survey of India (Mean Sea Level at Mumbai Port), except where otherwise noted.

11.2. GRID COORDINATE SYSTEM

The grid coordinate system used for horizontal control of the Works shall be the World Geodetic System (WGS84/UTM43N), except where otherwise noted.

11.3. CONTRACTOR TO CARRYOUT FURTHER INVESTIGATIONS

The Contractor shall carry out, at no additional cost to the Employer, all further site investigations and surveys necessary for the proper design of the Works and the safe and efficient Execution of the Works without causing any damage to the existing utilities including, but not limited to, the submerged high tension/voltage electricity transmission cables.



Additional geological/subsoil investigation for the foundation design and the survey and mapping of underwater utility lines (including the submerged high tension electricity transmission cables) are indispensable for minimizing risks to the Contractor and the Employer.

For any Unforeseeable physical conditions, GC Sub-Clause 4.12 shall apply. Onus of proving that the conditions were Unforeseeable shall rest solely on the Contractor.

12. CONTRACTOR'S PROJECT ORGANIZATION

12.1. CONTRACTOR'S COMPETENT STAFF

The Contractor shall have a competent team of managers, engineers, technical staff, experts and support staff so as to complete the Works with all reasonable skill and care that would be exercised by any competent contractor and in a satisfactory manner and in full compliance with the requirements of the Contract.

12.2. THE EMPLOYER'S ACCEPTANCE OF KEY PERSONNEL

The Contractor's personnel for the key positions proposed by the Contractor and accepted by the Employer at the time of bidding shall not be replaced without a prior permission of the Employer.

The Engineer shall have the right to review and accept or otherwise the qualification of the additional or replacement Key Personnel proposed by the Contractor. The procedure for consenting the Contractor's Representative set forth in GC Sub-Clause 4.3 shall apply equally to other Key Personnel, except that the consent must be obtained before the individual commences his/her services under the Contract. The Engineer's consents shall not relieve the Contractor from any of his obligations and responsibility he has under the Contract.

12.3. SPECIAL SITE COMMUNICATION ON A 24 HOURS A DAY BASIS

The Contractor's main office on the Site, equipped with round-the-clock radio communication and/or telephone switch board links with all safety officers, Contractor's works sites, other offices on the Site, batching plants, casting yards, workshops, fabrication yards, off-site offices, and the Employer's office on the Site, shall be operational and manned by the Contractor's nominated representatives on a 24 hours a day, 365 days a year basis. Vehicles for emergency use should be on stand-by on the same basis.

13. REQUIREMENTS FOR HIV/AIDS PREVENTION PROGRAMME

Any workers who are under the Contractor's control and on the site in connection with the Contract, including any workers who are under the control of any person or entity to whom the Contractor has sub-contracted any obligations under the Contract other than those responsibilities set out in this Sub-Clause.

The Engineer will undertake a major role of the implementation including formulation of the HIV/AIDS Prevention Program, co-working with other stakeholders, supervision and management of the Program implementation progress, undertaking of regular monitoring, evaluating & reporting and supervision of the Contractor's obligations. "Service Provider" means a person or entity approved by the Implementing agency and National HIV/AIDS authority (i.e. Ministry of Health, or relevant national government to have responsibility for HIV/AIDS prevention) to provide the HIV Awareness and Prevention Programme.

The Contractor is responsible for co-operating with the Service Provider in implementing the HIV Prevention Programme among the Contractor's Employees for the duration of the Contractor's contract and commencing as soon as practicable after the Contractor's Employees arrive at the site/s in conjunction with occupational health staff of the Contractor and the local health authorities involved in HIV/AIDS prevention.



14. RISK MANAGEMENT PLAN

The Contractor shall institute a risk management system to enact proactive and PDCA (Plan-Do-Check- Action) response prior to the occurrence of the risk event for resolution within the potential stage.

Within 45 days after the Commencement Day, the Contractor shall submit to the Engineer, for his approval, his proposed Risk Management System of the Employer's Requirements.

15. OUTLINE SPECIFICATIONS

In accordance with the provisions of this part of the Employer's Requirements, the requirements for the Work set out in the Outline Specifications shall be considered as the minimum requirements for the Works. The Contractor shall further develop the Outline Specifications into the Works Specification.

16. CONTRACTOR'S WORKS SPECIFICATIONS

During the Design Phase, the Contractor shall prepare and submit the Works Specifications, as part of the Contractor's Documents submission, based on the specifications contained in the Employer's Requirements and the Technical Proposals submitted by the Contractor at the time of bidding.

17. OUTLINE DRAWINGS**17.1. OUTLINE DRAWINGS SHOWS THE OUTLINE CONCEPT, INTENT AND PURPOSE**

The Outline Drawings show the Employer's requirements in terms of the outline concept, intent, purpose, structural form and architectural appearance/aesthetics of the Works in general. The intended extent and location of structures and facilities are also shown therein.

17.2. OUTLINE DRAWINGS ARE INDICATIVE

The Outline Drawings are a set of reference drawings. Unless otherwise specified in the Bidding Documents, the dimensions of specific elements and details and all other information shown on the Outline Drawings are indicative only, and the Contractor shall finalize, determine and, where relevant, coordinate them with the External Interfacing Parties including the Related Works Contractors.

17.3. LOCATION OF EXISTING UTILITIES

Where the Outline Drawings indicate the locations of existing utilities, these are for general information only and are assumed to be approximate. It is the Contractor's responsibility to ascertain the precise nature and location of all existing utilities prior to undertaking any related design and Execution of the Works in the vicinity or any diversion of the existing utilities.

17.4. GEOLOGICAL INVESTIGATION DATA

Geological/subsoil investigation data including borehole logs obtained by the Employer will be provided to the Contractor prior to the Commencement Date. The Contractor is expected to carry out sufficient geotechnical investigations as per IRC requirements to design the foundations during the Technical Design stage. The Contractor shall carry out geotechnical/subsoil investigations involving boreholes at least at every proposed pier and abutment location, to assess the nature and characteristic of founding strata to finalize the pile/base design. Additional boreholes and necessary tests shall also be taken, at no additional cost to the Employer, as may be ordered by the Engineer. The Employer will be responsible for the accuracy of the data provided by the Employer, and the Contractor shall be responsible for proper interpretation of these data. Any material errors/inaccuracies of the Employer-provided data notified by the Contractor to the Engineer and variation in data will be treated as a



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Variation under GC Clause 13. The onus of proving the errors/inaccuracies shall be on the Contractor.



DIVISION 2. FUNCTIONAL For Package 1

The completed Works shall strictly comply with all of the functional requirements set out in this Division and elsewhere in the Contract.

1. GENERAL

1.1. FUNCTION OF THE CONTRACT

The purpose and function of the Contract is to design, supply, construct, complete and test the Works in the manner and time as required under the Contract and to achieve the standards, performances and functionalities specified therein. In full recognition of this purpose, and with full acceptance of the obligations, liabilities and risks that may be involved, the Contractor has entered into the Contract and shall undertake, under the Contract, the design and Execution of the Works and hand-over the completed Works to the Employer in a condition in which the Employer can immediately use the Works for the intended purpose, and/or to make them available to a Related Works Contractor who can commence and carry out its work without delay or disruption.

1.2. COMPLIANCE WITH THE EMPLOYER'S REQUIREMENTS

The design and performance of the completed Works shall comply with the specific requirements contained in these Employer's Requirements.

1.3. DESIGN OF THE WORKS

The design of the Works shall be developed in accordance with the Employer's Requirements, the Contractor's Technical Proposals and other requirements of the Contract.

1.4. COMPLIANCE WITH THE WORKS SPECIFICATIONS

The Works shall be designed and constructed to the highest standards available using proven up-to-date good industry practice.

The Works Specification shall in any case not specify standards which, in the Engineer's opinion, are less than or inferior to those described in the Outline Specifications, the Outline Drawings and other requirements set forth in the Contract.

1.5. CONSTRUCTION METHOD STATEMENTS AND PROCEDURES

Execution of the Works shall be carried out in strict accordance with the Method Statements and procedures established by the Contractor in his Quality Assurance Plan Health plan, Safety plan and Environmental Management Plan, and other requirements contained in the Employer's Requirements.

The Method Statements, the Quality Assurance Plan, Health plan, Safety plan and Environmental Management Plan to be prepared by the Contractor for review by the Engineer shall be in strict compliance with not only the Employer's Requirements but also the relevant Laws.

The Contractor shall prepare the Method Statements, the Quality Assurance Plan, Health plan, Safety plan and Environmental Management Plan based on those outlines submitted by the Contractor and accepted by the Employer at the time of bidding.

2. SCOPE OF WORKS

2.1. OUTLINE OF THE PROJECT

2.1.1. GENERAL

The MTHL (Mumbai Trans Harbour Link) connects Sewri on the Mumbai side with Chirle on the Navi Mumbai side in Maharashtra State, India.

The Project comprises construction of approximately 21.8 km long and 6-lane wide carriageway viaduct across the Mumbai Bay. The MTHL consists about 0.5 km of land viaduct at Sewri, about 16.3km of viaducts over sea/creek and about 4.9 km of viaduct and earth sections on land on Navi



Mumbai side.

This fully access-controlled highway will have four (4) interchanges, toll collection facilities and other necessary facilities and building to safely and efficiently operate the MTHL after completion. The MTHL shall conform generally with the relevant expressway standards a design speed of 100 km/hour.

The MTHL commences from Messant Road at Sewri where it connects with the Eastern Freeway (which is a north-south elevated road and has been put into service). The alignment of the MTHL traverses on MbPT land for about 500 m near Sewri from where it heads east along Timber Depot in the MbPT area, enters Mumbai harbor and then continues in the same direction over mudflats and crosses the Pir-Pau jetty, the Thane Creek, the Panvel Creek and the intertidal zone before turning south to touch the main land at Shivaji Nagar in Navi Mumbai. The alignment then proceeds in a south-east direction to meet the National Highway (NH) 4B, which is the end point of the MTHL. On the main land on the Navi Mumbai side, the alignment traverses from Shivaji Nagar through villages of Jassai and Gavan to end at the NH 4B near Chirle. The alignment on the main land on Navi Mumbai side also crosses the Coastal Road proposed by CIDCO, the railway line under construction near this location, the State Highway (SH) 54 and the existing railway line before connecting to the NH 4B.

The MTHL is to be constructed under the following four packages;

Package-1 includes the Sewri Interchange on land on the Mumbai side and the adjoining 10.380 km (CH 0+000 km to CH 10+380 km) bridge above sea/creek including foundation and pier of No.172 at CH 10+380. The typical width of carriageway will be approximately 14 m for each way.

Package-2 includes a 7.798 km long bridge (CH 10+380 km to CH 18+187 km) above sea/creek including foundation and pier of No.321 at CH 18+187 and the Shivaji Nagar Interchange on land on the Navi Mumbai side. The typical width of carriageway will be approximately 14 m for each way.

Package-3 includes a 3.613 km long road bridge and earthwork section (CH18+187 km to CH21+800 km) having interchanges at the SH 54 and the NH 4B near Chirle and Railway-over-Bridges at two locations in Navi Mumbai. The typical width of the highway will be approximately 14 m for each way.

Package-4 includes a toll plaza including an operation and maintenance center, rescue centers/lay-bys, an administration building, an Intelligent Traffic System and a Toll Collection System and procurement of operation & maintenance equipment and facilities for the entire the MTHL.

The maximum construction period of Package-1 and Package-2 shall be 54 months respectively, whereas that of Package-3 shall be 42 months; the contract period of Package-4 is planned as 24 months.

Although three civil work packages comprising Packages-1, 2 and 3 shall be procured almost simultaneously, Package-4 will be separately procured on a design and build basis only after the bidding documents including the basis design are completed by a consultant afterwards.

2.1.2. RIGHT OF WAY (ROW)

The ROW reserved for the sea/marine part of the MTHL is 500 m wide and that for the land portion is 120 m wide. At the proposed locations of the Toll Plaza Complex and the Interchanges, and in the vicinity of the TATA Thermal Power Station and the Pir Pau Jetty, the ROW covers the areas as demarcated in the relevant drawings included in the Outline Drawings.

2.1.3. EXISTING AND PROPOSED ROAD AND RAIL CROSSING

The MTHL alignment on the main lands on both Mumbai and Navi Mumbai sides crosses over the existing roads, the proposed roads' ROWs and the existing railways as shown in the following table.

The ROWs of the roads and railways are indicative only and shall be confirmed by the Contractor with the authorities concerned e. g. MbPT, CIDCO, JNPT, Indian Railways, NHAI, etc. The



necessary minimum vertical clearances for roads and railways are also indicated.

Table 2.1 - Existing and Proposed Crossing Roads

Crossing Road	Chainage/Station	Vertical Clearance	Package No.
Eastern Freeway and B Ramp	0+000	Minimum 5.5m above road surface	1
Jetty Road	0+480		1
Nhava Road	16+820		2
Proposed CIDCO Coastal Road	17+300		2
Proposed CIDCO Road	18+050		2
Gavhan Road to School	18+170		3
Proposed CIDCO Road	18+300		3
Proposed CIDCO Road	18+540		3
Proposed CIDCO Road	18+880		3
Existing Road	20+170		3
NH 54 (Road)	20+970		3
JNPT Road (NH4B)	21+650		3

Table 2.2 - Existing Crossing Railways

Crossing Railway	Chainage/Station	Horizontal Clearance	Vertical Clearance	Package No.
Suburban Railways (Seawood – Uran)	18+421.5 to 18+491.5	Refer to Outline Drawings	6.5m above rail track	3
Railway (DFCC Corridor, Panvel Uran, JNPT railway)	21+232 to 21+427		8.5m above rail track	3

2.1.4. EXISTING PORT FACILITIES AND NAVIGATION CHANNEL

The MTHL also passes across the port facilities, navigation channel and seabed pipelines in the Mumbai Bay as listed below, which should be considered in the design and Execution of the Works. The necessary minimum vertical and horizontal clearances are shown in the table below.

Table 2.3 - Existing Port Facility, Navigation Channel and Pipelines to be considered



Utility	Chainage/ Station	Horizontal Clearance	Vertical Clearance	Package No.
Tata Thermal Power Station, Intake and Discharge Channel	3+560	1x94m	25.2m (above HHTL)	1
Tata Thermal Power Station, Coal Berth Channel	4+830	2x94m	25.2m (above HHTL)	1
Tata Power Cable (1 cable)	4+960	Comfortable separation distance is more than 25m (minimum distance is 15m)	Not applicable	1
ONGC Pipeline (2 pipelines)	5+270			1
Tata/MbPT Pipeline (13 pipelines)	5+400 ~5+575			1
Pir Pau Jetty Head	5+800	Not applicable	6.0m (above jetty surface)	1
Thane Creek	8+900	2x94m	25.2m (above HHTL)	1
ONGC Pipeline (6 pipelines)	12+20 12+200 12+300	Comfortable separation distance is more than 25m (minimum distance is 15m)	No applicable	2
BPCL Pipeline (1 pipeline)	12+350			2
Panvel Creek	13+290	2x100m	25.2m (above HHTL)	2

Note: HHTL=+5.8m of Chart Datum (0.0)

2.1.5. CASTING YARD

(1) Casting Yards

Land for Casting yards shall be made available to the Contractor, free of charge, at Sewri on the Mumbai side for Package-1(about 15.0ha), and at Section 14 near Gavan on Navi Mumbai side for Package-2(about 18.0ha), and at Section 30 near SH 54 for Package-3(about 7.0ha).

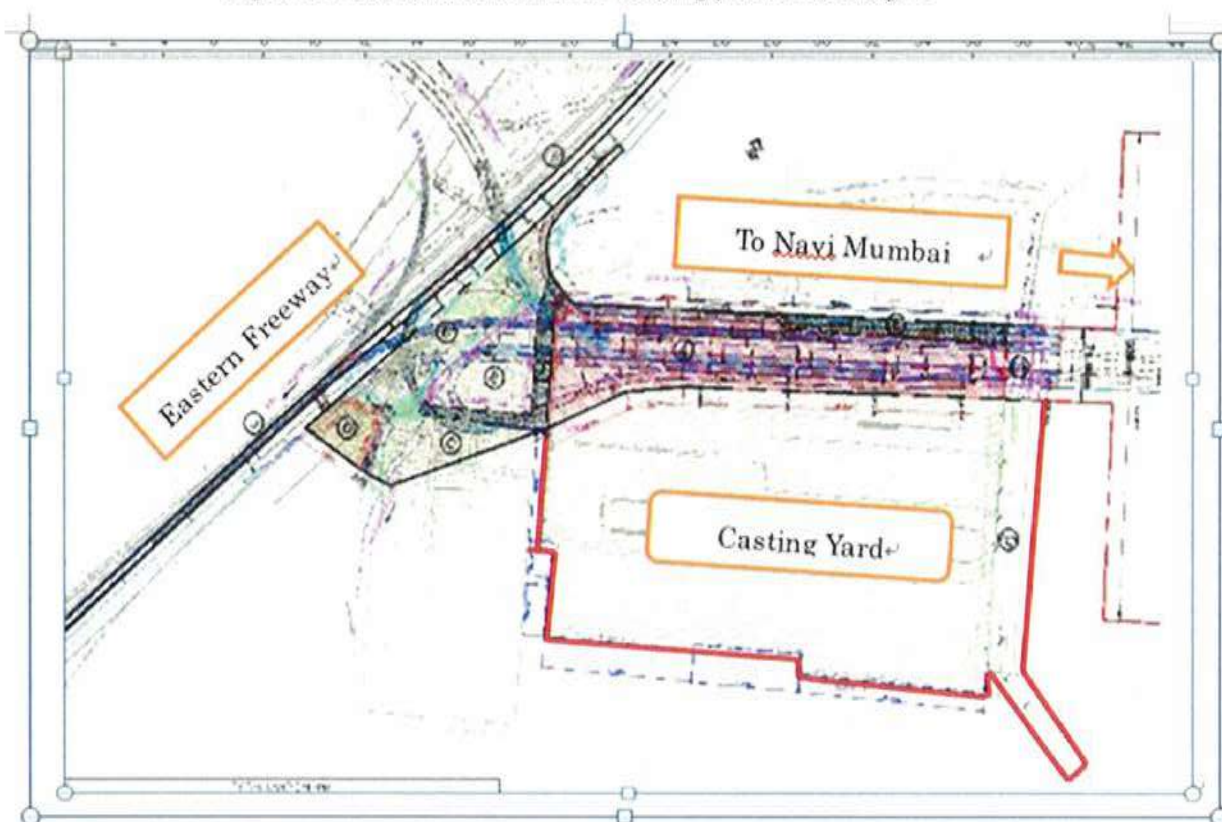
(2) Location and area of Casting Yard

The brief descriptions of the lands earmarked for casting yards at Sewri on the Mumbai side for Package-1 and at Section 14 near Gavan on the Navi Mumbai side for Package-2 and at Section 30 near SH 54 for Package 3 are given in the table below.



Table 2.4 – Casting Yards

No.	Location	Description	Area of Land Earmarked for Casting Yard (in hectares)
1	Sewri (Mumbai side)	Timber pond area under MbPT (open land)	About 15.0
2	Section 14 near Gavan (Navi Mumbai side)	Open land	About 18.0
3	Section 30 near SH 54	Open land	About 7.0

Figure 2.1 Location and area of Casting yard of Package 1

Additional land areas required for casting yards, other than those to be arranged by the Employer as indicated above, shall be secured by the Contractor at his own cost. The Employer-arranged lands specified above for the casting yards shall be returned to the Employer no later than six (6) months after Completion of the Works with the flat condition.

2.2. DEVELOPMENT OF THE MTHL UNDER PACKAGE-1

2.2.1. GENERAL

Development of the MTHL under Package-1 shall include design and Execution of a part of the MTHL as described hereunder. The following paragraphs briefly highlight the scope of the MTHL



under Package-1 for the Contractor's information. The requirements for various elements of the MTHL given hereunder are the minimum requirements. The Contractor shall carry out engineering surveys and investigations as required or needed for proper design and Execution of the Works under Package-1, despite the geotechnical/subsoil investigation/survey results to be provided by the Employer, and detailed engineering and architectural designs, and shall prepare the Contractor's Documents, including the working drawings for all components of the MTHL, to fulfil the scope of the Project as envisaged hereunder and to discharge the Contractor's obligations under the Contract in a successful manner.

2.2.2. FEATURES AND SCOPE

(I) General Features

Package-1 section of the MTHL has a length of 10.380km (CH 0+000 - CH 10+380), including foundation and pier of No.172 at CH 10+380, and a width of six lanes, with the Sewri Interchange comprising 6 ramps.

The horizontal and vertical alignments with geometric elements for the MTHL shall be as given in the Outline Drawings. The entire section of Package-1, except a small section, is composed of bridges, comprising PC box girders and steel box girders with steel decks as shown in the following table.

Although the structural profiles are given in the table below, the final details and chainages/stations shall be determined by the Contractor according to the Employer's Requirements and with the necessary approvals/permits/consents from the External Interfacing Parties.

Table 2.5 - Structural Profile for Interchange Section

Ramp	Description	Bridge Type	Span Arrangement
Ramp A	Colaba / South Mumbai to Navi Mumbai (connecting MTHL with south of Eastern Freeway)	PC box	1,698m (26m, 23m, 30m, 7x26m, 25m, 3x35m, 17x26m, 35m, 2x51m, 35m, 2x25m, 2x30m, 60m, 23m, 15x30m, 50m)
Ramp B	Navi Mumbai to Wadala, (connecting MTHL with Eastern Freeway)	PC box	1,530m (2x33m, 4x26m, 21m, 2x30m, 3x26m, 31m, 11x26m, 32m, 49m, 23m, 3x35m, 2x30m, 25m, 18x30m, 50m)
Ramp C1	Navi Mumbai to South Mumbai / Colaba (connecting MTHL with south of Eastern Freeway)	PC box	910m (12m, 22m, 11x26m, 30m, 25m, 30m, 23m, 30m, 32m, 50m, 40m, 11x30m)
Ramp C2	At grade Ramp From Navi Mumbai (Ramp down from MTHL)	PC box	500m (15x30m, 50m)
Ramp E	Wadala to Navi Mumbai (connecting Projec Highway with north of Eastern Freeway)	PC box	908m (20m, 2x26m, 32m, 4x26m, 31m, 15m, 25m, 2x30m, 44m, 25m, 15x30m, 50m)
Ramp F	At Grade Ramp towards Navi Mumbai (Ramp up to MTHL)	PC box	440m (13x30m, 50m)



(2) Typical Cross-section for Main Carriageway and Ramp

The typical cross-sections of the main carriageways and the ramp ways at the Sewri Interchange of the MTHL under Package-1 are as shown in the following figure:

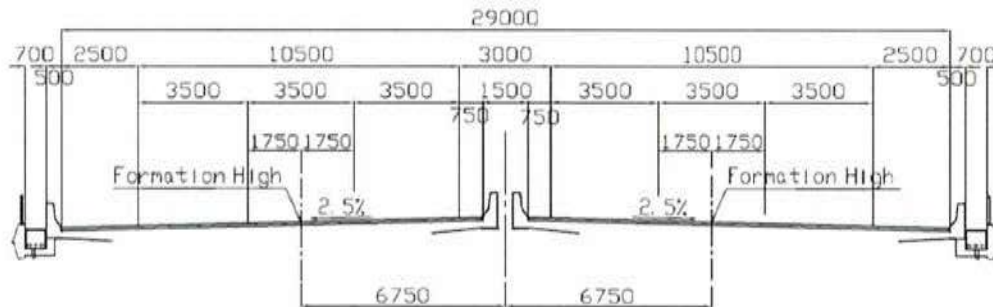


Figure 2.1 - Typical Cross-section of Main Carriageway

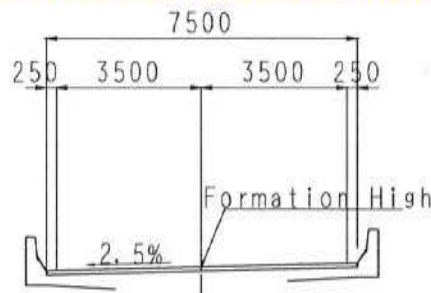


Figure 2.2 - Typical Cross-section of Ramp Ways at Sewri Interchange

There is no widening section required on the alignment of any ramp ways.

(3) Median Openings

Controlled median openings with movable steel barrier shall be provided at intervals about 2 km along the route and in front of the Second Rescue Station.

(4) Construction of Compound Wall

No compound wall is required along package 1 section of the project.

(5) Railway Over Bridges (ROBs)

Although there is no Railway Over Bridges (bridges stride over railways) in Package-1 section of the Project, Ramp "B" at the Sewri Interchange are planned to set along the existing railway.

2.2.3. PROJECT FACILITIES FOR PACKAGE 1**(1) General**

The Contractor shall construct/provide the Project Facilities for Package-1 section in accordance with the provisions hereunder. Certain additional requirements are specified elsewhere in the Employer's Requirements.

(2) Description of the Project Facilities

Each of the Project Facilities is briefly described below:

1) Toll Plaza

There is no toll plaza in Package-1 section (it will be installed under Package-4 contract).

2) Road Furniture



Traffic signs and pavement markings to be provided by the Contractor shall include roadside signs, overhead signs, curb mounted signs and road markings along the MTHL. All other road furniture/traffic control devices/ road safety devices shall be provided by the Contractor as per IRC SP: 87-2010 and the Employer's Requirements - Outline Specifications.

3) Utility Troughs on Marine Viaduct

The bridges shall be provided with dedicated utility service troughs, with the minimum internal clear dimensions of 700mm wide by 600mm high, on either side of MTHL.. A removable maintenance walkway shall be provided over and along the utility service troughs to permit ease of access for maintenance of utility. Partitioning of Utility Troughs by no metallic material to segregate power and OFC shall be provided as directed by the Engineer.

4) Road Lighting

Road lighting and the associated electrical installations (sub-stations, transformers, generator sets, etc.) to be provided along the MTHL shall be installed over the entire length of the MTHL including all of the Interchanges, the Dispersals, the Toll Plaza Complexes, etc by the **Separate Agency to be appointed by the Employer.**

For the emergency purpose, power line of the Road Lighting shall cross at a Gantry to secure the alternative supply line in case of block out of either line, in which two (2) locations for package 1, one (1) location for Package 2 and one (1) location for Package 3

5) Pedestrian Facilities

Pedestrian facilities in the form of pedestrian footbridges/crossings, guard rails, footpaths, lighting, etc. shall be provided wherever required in compliance with the relevant provisions of the applicable Laws and standards. The exact location of pedestrian footbridges/crossings shall be agreed with the Engineer.

6) Noise Barriers, View Barriers and Safety Fences

Noise barriers of 3m in height as measured from the road surface shall be installed at both sides of the MTHL within the mudflat area, for not to cause "Fly-kill" of migratory birds.

View Barriers shall be installed along north side of the Project on the Bhabha Atomic Research Center side as indicated in the Outline Specifications.

Safety fences of 3 m in height as measured from the road surface shall be installed on both sides of the MTHL above the existing navigation channels, in order to prevent illegal disposal of things from the vehicles to the navigation channels in order for keeping the vessels underneath safe.

Further details of these noise barriers, view barriers and safety fences shall be given in the Employer's Requirements - Outline Specifications and Outline Drawings.

7) Landscaping and Tree Plantation

Landscaping shall be undertaken through planting of trees and ground cover of appropriate varieties in the exposed land areas within the MTHL ROWs, interchange areas, medians, etc., as per IRC standards or directed by the Engineer. Only shrubs of low height shall be planted in the island of the roundabouts, if any, and the specified line of sight shall not be impaired. The proposed landscaping/planting schemes shall be submitted to the Engineer in advance.

8) Primary Rescue Station on the ground

A Primary Rescue Station will be provided under Package-4 contract. The Contractor shall make all necessary arrangements for the interface coordination.

9) Secondary Rescue Station

Secondary Rescue Station shall be provided as indicated in the Outline Specification



10) Intelligent Traffic System and Toll Collection System

ITS and Toll Collection System will be provided under Package 4 contract. The Contractor shall make all necessary arrangements for the interface coordination.

11) Kilometer Stone Marker

Kilometer Stone Marker shall be installed as stated in the Outline Specifications.

12) Navigation Aids Facilities

Navigation Aids Facilities shall be installed according to the Outline Specifications in consultation with Maharashtra Maritime Board / Port Authorities

2.3. TEMPORARY WORKS

All Temporary Works required for the construction of the Works including, but not limited to, traffic diversions to allow uninterrupted flow of traffic in and around the Site, shall be provided by the Contractor at his own cost.

2.4. ADDITIONAL SURVEYS AND INVESTIGATIONS

Although the Employer's Requirements provide the results of both the topographical survey and the geotechnical/subsoil investigation conducted by the Employer, the Contractor is responsible for their interpretation of the data and information contained therein and for conducting all necessary additional surveys and investigations that are indispensable for the design and execution of the Works in a proper manner.

2.5. PROTECTION OF EXISTING BUILDINGS AND STRUCTURES

The Contractor is responsible for underpinning and/or otherwise protecting existing buildings and structures against damages, whenever and wherever required. Any damages caused by the Contractor shall be made good to the satisfaction of the owner of the building or structure at no additional cost to the Employer.

2.6. UTILITY MANAGEMENT AND DIVERSION DURING CONSTRUCTION**(1) Existing utilities and roads**

Notwithstanding anything to the contrary contained herein, the Contractor shall ensure that he enables the respective entities owning and/or managing the existing roads, right of way or utilities on, under or above the Site to keep such roads, ROWs or utilities in satisfactory use or service continuously, if necessary, by providing suitable temporary or permanent diversions as agreed with the relevant authority of jurisdiction, and the Employer shall, upon written request from the Contractor, assist the Contractor in the legal proceedings for acquisition/lease of any right of way indispensable for such diversion.

(2) Shifting of obstructing utilities

The Contractor shall, subject to Applicable Laws, agreements with the entities involved, and with assistance of the Employer as the case may be, undertake, at his own cost, shifting of any utility including electric lines, water pipes and telephone cables, to an appropriate location or alignment within or outside the Site if and only if such utility causes or will cause a material adverse effect on Execution of the Works and/or operation and/or maintenance of the MTHL. The cost of such shifting shall be borne by the Employer or by the entity owning such utility and an extension of the Time for Completion granted in accordance with GC Sub-Clause 4.12, only when the pertinent physical conditions were proven Unforeseeable.

(3) New utilities and roads

The Contractor shall allow, subject to such conditions as the Employer may specify, access to, and use of the Site for laying telephone lines, water pipes, electric cables or other public utilities.



Where such access or use causes any financial loss to the Contractor, then the Contractor may subject to GC Sub-Clause 20.1 claim compensation for such loss from the Employer. For the avoidance of doubt, it is agreed that use of the Site under this Clause shall not in any manner relieve the Contractor of its obligation to maintain the Works and the MTHL in accordance with this Employer's Requirements and any damage caused by such use shall be restored forthwith at the Contractor's cost.

The Employer may by notice require the Contractor to connect any adjoining road to the MTHL and the Contractor shall forth with comply with the requirement. Upon receipt of such a notice, the connecting portion thereof falling within the Site shall be constructed by the Contractor and the maintenance during the construction phase of the Works thereof shall be undertaken by the Contractor. This additional work and service will be treated as a Variation under GC Clause 13.

(4) Felling of trees

The Employer shall assist the Contractor in obtaining the necessary permits for felling of trees only if such trees cause a material adverse effect on Execution of the Works and/or operation and/or maintenance of the MTHL. Only when the requirements for felling of trees were proven Unforeseeable, this additional work will be treated as a Variation under GC Clause 13.

2.7. RESTORATION DURING CONSTRUCTION

The Contractor is responsible for restoration of roads, utilities and other services dislocated or otherwise damaged by him during Execution of the Works.

2.8. WORKS AND SERVICES ANCILLARY TO COMPLETION OF WORKS

All works and services ancillary or related for the full completion of the Works and other obligations of the Contractor under the Contract shall be undertaken by the Contractor at his own cost.

3. ALIGNMENT OF CARRIAGEWAYS

3.1. CONTRACTOR'S OBLIGATION FOR DESIGN AND CONSTRUCTION

The carriageway alignment shall be as shown in the Outline Specifications and Outline Drawings. The alignment shown has been developed by the Employer to meet the operational and technical criteria of the MTHL. Whilst the Contractor is not required to evaluate the alignment for compliance with the operational and technical criteria, the Contractor shall review the same with respect to his own design and construction proposals and shall satisfy himself that there is no conflict with existing structures and utilities which are to be preserved.

3.2. NO DEVIATIONS IN THE HORIZONTAL ALIGNMENT

The Contractor is not permitted to propose deviations from the given horizontal alignment and deviations at interface section; unless for reasons to avoid physical obstructions from third party's foundations encroaching the Works, save that the Contractor shall demonstrate compliance of the proposed deviation with the specified alignment requirements and obtain the Engineer's prior consent to propose the deviation.

The Contractor is permitted to propose minor deviations from the given vertical alignment as needed to suit his construction proposals without interface locations, save that the Contractor shall demonstrate compliance of the proposed deviation(s) with the specified alignment requirements, including the vertical clearance requirements, and obtain the Engineer's prior consent to propose the deviation(s).



4. CLEARANCES

4.1. ROAD CLEARANCE

Vertical clearances over the existing/proposed roads shall be as per the stipulations in clause 2.1.3. EXISTING AND PROPOSED ROAD AND RAIL CROSSING according to the Indian Roads Congress and Railway requirements.

4.2. RAILWAY CLEARANCE

There is no railway crossing in the Package-1 section.

4.3. HIGH TENSION LINES

Wherever high tension lines cross the MTHL, the vertical and horizontal clearances shall conform to the requirements of the concerned authority of jurisdiction.

4.4. NAVIGATION CLEARANCE

The navigation channels and the port facilities that the MTHL passes under, over or through are indicated in Clause 2.1.4. EXISTING PORT FACILITIES AND NAVIGATION CHANNEL. Within the Package-1 section, the Thane Creek, the Tata Thermal Power Station Coal Berth Channel, the Tata Thermal Power Station Intake and Discharge Channels for Water Cooling, and the Pir Pau Jetty exist. At the non-navigation spans (other than those navigation channels and port facilities mentioned above), a minimum vertical clearance of 9.1m above HHTL (+5.8m of C. D.) shall be provided to allow for the safe passage of small boats. The minimum horizontal center-to-center spacing between piers of a marine bridge shall be 50m, except at the immediate approaches to special navigation spans and spans that cross the submerged buried pipelines. Specific requirements for the respective navigation channels and the port facilities are given below.

Thane Creek: The Thane Creek bridge shall be provided with two navigation spans, to cater for two navigation channels, each with a clear horizontal width of 94.6 m between dolphins and measured perpendicular to the navigation channel. A minimum vertical clearance of 31.0m above the chart datum shall be provided.

Tata Thermal Power Station Coal Berth Channel: The Coal Berth Channel bridge shall be provided with two navigation spans, to cater for two navigation channels, each with a clear horizontal width of 94.6m measured perpendicular to the navigation channel. A minimum vertical clearance of 31.0 m above the chart datum shall be provided.

Tata Thermal Power Station Intake and Discharge Channels for Water Cooling: A single navigation span shall be provided to cater for a navigation channel with a clear horizontal width of 94.6m measured perpendicular to the navigation channel. A minimum vertical clearance of 31.0m above chart datum shall be provided.

Pir Pau Jetty: The definitive span arrangement at the Pir Pau Jetty shall be agreed with MbPT. The vertical clearance above the deck level of the Pir Pau Jetty shall not be less than 6.0m

Other Section: The definitive span arrangement at other section shall be minimum 50m span of length and a minimum vertical clearance of 14.9m above chart datum shall be provided.

5. TRAFFIC MANAGEMENT

5.1. GENERAL

Traffic management shall be undertaken by the Contractor during scheduled and non-scheduled construction activities including any emergency situation, whereas the Employer will be responsible for the traffic management after Taking-Over of the Works including the Defects Notification Period.

Extent of the traffic management to be undertaken by the Contractor shall be assessed and determined to suit the site conditions.



The Contractor shall provide, erect, maintain, cover, uncover and remove traffic signs as required during construction of the Works. An adequate level of safety shall be ensured during night time by providing mobile emergency lighting units with electrically flashing and/or illuminated warning signs at important locations and reinstated upon completion of the Works. A prior approval on the proposed provisions shall be obtained from the Engineer.

The basic principles to be followed for the traffic management on and around the MTHL during construction shall be as follows:

- Construction schedules shall be prepared such that traffic diversions are minimized; and
- An overall traffic management plan and programme for a planned, scheduled construction activity shall be prepared in advance of commencement of the activity and an approval thereon obtained from the Engineer and/or the Employer.

The plan shall be based on the following minimum operational parameters:

- At major intersections, all turning traffic movements as usual will be allowed at all times;
- Lane closure adopted for diverting the main traffic during construction of the Works shall be compatible with the approved construction programme;
- Speed of traffic through the construction zone shall be reduced by speed-breakers/humps and warning signs;
- For the safety of construction workers, as well as the road users, a minimum physical separation of 1.5 m between the work area boundary and the traffic shall be maintained;
- All construction vehicles shall enter and exit the construction site at designated and manually controlled entrances that must be provided with adequate signage and safety precautions;
- All short and long term temporary road detours (diversions) proposed shall be approved by the Engineer in advance; and
- Provision of adequate advance/preliminary warning and information signs shall be incorporated in the traffic management plan in accordance with the applicable IRC/MoRTH standards and specification.

6. SAFETY REQUIREMENTS

6.1. GUIDING PRINCIPLES

Safety requirements aim at reduction in injuries, loss of life and damage to property resulting from accidents on the MTHL during the construction, irrespective of cause of the accidents.

Safety requirements apply to all phases of construction with emphasis placed on identification of potential factors associated with accidents, analysis of the same, and implementation of appropriate preventive and corrective measures.

Safety requirements include measures associated with traffic management and regulation such as road signs, pavement marking, traffic control devices, roadside furniture, highway design elements, regulation enforcement and emergency responses.

6.2. OBLIGATIONS OF THE CONTRACTOR

The Contractor shall abide by the following, insofar as they relate to safety of the road users:

- Applicable Laws and applicable permits;
- "Manual for Safety in Road Design" issued by MOSRTH;
- Relevant standards/guidelines of IRC relating to safety, road geometries, bridges, culverts, road signs, pavement marking and roadside furniture;
- Provisions of the Employer's Requirements; and
- Good industry practice.
- Language of signboard/information shall be made in English, Hindi and Marathi.

6.3. SAFETY MEASURES DURING CONSTRUCTION PERIOD

The Contractor shall make adequate arrangements during the construction period for the safety of



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both the workers and the road users in accordance with the guidelines of IRC for safety in construction zones, and notify in advance the Employer and the Engineer about such arrangement. In this respect, the Contractor shall submit his Safety Plan for approval of the Engineer within x 28 days from the Date of Commencement, and update and resubmit the Plan as and when may be requested by the Engineers



DIVISION 3. DESIGN

The Works, including the Temporary Works, shall be designed in strict accordance with the design-related requirements set out in this Division and elsewhere in the Contract.

1. GENERAL

1.1. EMPLOYER'S REQUIREMENTS - DESIGN

The Employer's Requirements - Design specifies the requirements for the preparation and submission of the design of the Works. These requirements are subdivided into those that are to occur during the Design Phase, those that are to occur during the Construction Phase, and those that are of general application.

1.2. CONTRACTOR RESPONSIBLE FOR THE DESIGN

The Contractor shall, in accordance with the Conditions of the Contract Clause 5.1 [*General Design Obligations*], undertake and prepare designs of the Works including the Temporary Works. The Contractor shall establish an office for his core design team at the Contractor's Project Site offices in Mumbai, as agreed with the Engineer. All meetings and discussions relating to the designs shall be held in this office. In addition to the requirements expressed herein, the Contractor shall, whenever the Engineer so requests, provide information and participate in discussions that relate to the Works and/or the Works design matters.

1.3. CONTRACTOR'S CONTINUED PRESENCE IN MUMBAI

The Contractor shall ensure that the Contractor's core design team continues to be represented in Mumbai area at all required times by the team staff whose seniority and experience are to the satisfaction of the Engineer and whose representative is available on Site as necessary or as required by the Engineer.

1.4. THREE STAGES OF DESIGN

There are following three stages of the Contractor's design preparing and submitting design drawings and other design documents to the Engineer:

- Technical Design involving:
 - the Initial Design and
 - the Technical Design (or Detailed Design);
- Construction Design (or Final Installation Design); and
- As-Built Documents including Operation and Maintenance Manuals.

The requirements for each stage are detailed in Appendix 9 of Employer's Requirements - Design.

1.5. REVIEW OF THE CONTRACTOR'S DESIGN SUBMISSION

The Engineer will review the Contractor's design documents to satisfy himself that the submission(s) are in accordance with the Contract, cover the obligations, extent and intended purpose of the design of the Works and fully complies with the Contract. The Engineer's receipt, approval, consent or Notice of No Objection shall not release the Contractor from its obligations under the Contract.

Construction activities and Contract dates are indicated in the Works Programme. The designs shall be submitted in accordance with the approved Design Submission Programme.

1.6. DESIGN IN ACCORDANCE WITH THE QUALITY ASSURANCE SYSTEM

The design of the Works shall be carried out in accordance with the Contractor's Quality Assurance System as described in the Clause 10 of the Employer's Requirements - General



1.7. SUBMISSION OF ALL DRAWINGS

All drawings and documents shall be produced and submitted in accordance with the requirements described in Appendices 8, 9 and 10 of the Employer's Requirements - Design.

2. REQUIREMENTS DURING DESIGN PHASE

The principal requirements of the Design Phase are the production of the Technical Design for the Works.

2.1. INITIAL DESIGN

The Initial Design shall be the development of the Preliminary/Bidding Design and Technical Proposals to provide an Initial Design submission for the Engineer's review as fully detailed in Appendix 10 of the Employer's Requirements - Design. This will be in sufficient detail to show the main elements of the design including but not limited the final vertical and horizontal profiles, final span arrangement with bearing positions, final bridge type with its girder depth, pile cap elevation and pile type with number for each pier and the main documents required to allow subsequent preparation and development of the Technical Design.

2.2. TECHNICAL DESIGN

The Technical Design shall be the Initial Design developed to the stage at which all elements of the Works are fully designed and specified in full saves as the Contract dictates otherwise, the Works as detailed in Appendix 10 of the Employer's Requirements - Design.

During the preparation of the Technical Design, the Contractor shall in particular:

- Complete all calculations and analysis;
- Delineate all main and all other significant elements;
- Complete all Interface Requirements
- Complete all tests and trials and all selection of materials and equipment;
- Take full account of the effect on the Works of the proposed methods of construction.
- Complete all surveys, investigations and testing necessary to complete the design of the Works in accordance with the Contract.

The Technical Design shall include the Technical Design Drawings, Works Specification, Technical Design Report, Method Statement and all other contents of the Technical Design as detailed in Appendix 10 of the Employer's Requirement - Design.

The issue of separate Notices for such sub-division shall be conditional upon the Contractor having demonstrated, to the satisfaction of the Engineer, that all loadings and load combinations including temporary loadings and the effect of each structure on other structures, utilities, etc., and the effects of Related Works Contractors for the whole Design Segment has been fully accommodated in the Technical Design.

The Contractor shall submit the Technical Design as described herein, and as detailed in Appendix 10 of the Employer's Requirements - Design, to the Engineer for consent in accordance with Conditions of Contract Clause 5 and issue of a Notice of No Objection.

3. REQUIREMENTS DURING CONSTRUCTION PHASE

The principal requirements during the Construction Phase are the production, submission and consent of the Construction Design and As-Built Documents.

3.1. CONSTRUCTION DESIGN

Upon the issue of a Notice of No Objection in respect of a Technical Design the Contractor shall produce the respective Construction Design Pack which shall include, inter alia, the Construction



Technical Drawings, Work Specification, Working Drawings, and all other associated documents necessary to supplement the design covered in the Technical Design and to comply with the Contract regarding the construction of the Works such as detailed Method Statements, M&E Equipment Test Plans, Safety Risk Assessment etc. and as further detailed in Appendices 9 and 10 of the Employer's Requirements.

The Construction Technical Drawings shall be derived directly from the Technical Design Drawings by the Contractor and shall be identical to the Technical Design except for the amendments that may be necessary to resolve and respond to any comments attached to the Notice of No Objection and shall be upgraded to Construction Design in accordance with the CAD Standards. Similarly the other Technical Design documents are likewise revised, upgraded and included in the Construction Design Pack. The Construction Technical Drawings shall form part of the Drawings to be used for construction purposes.

The Working Drawings shall be additional drawings developed by the Contractor as necessary to supplement the Construction Technical Drawings and to specify additional details and procedures for construction of the Works, such as shop drawings, fabrication drawings, erection drawings, Temporary Works drawings, bar bending schedules, bar reference drawings, and the like. All such drawings shall comply with the consented Technical Design and other requirements of the Contract.

The Construction Design Pack shall be prepared as required under the Contract and be fully checked and certified by the Independent Design Checker as being in accordance with the Technical Design and compliant with all requirements of the Contract.

The Contractor shall submit the Construction Design Pack as described herein, and as further detailed in Appendix 10 of the Employer's Requirements - Design, to the Engineer, in accordance with Conditions of Contract Clause 5, for consent and issue of a Notice of No Objection.

The Contractor shall submit the Construction Design in a timely manner in segments to suit his Construction Programme, as only those drawings and documents that have been endorsed and certified and have received consent as above shall be issued to the Site for construction. No Construction of the Works shall be allowed to proceed without issue of the Construction Drawings strictly in accordance with the Construction Design Pack.

3.2. AS-BUILT DOCUMENTS

The Contractor shall maintain all Records necessary for the preparation of the As-Built Documents. In accordance with the Conditions of Contract Clause 5 the Contractor shall prepare and submit the As-Built Drawings and Records, which, subject to the Engineer's agreement, shall become the contents of the As-Built Documents.

The As-Built Drawings shall be a full set of the latest revisions of the Construction Technical Drawings (updated to incorporate all Design Change Notices and Field Change Notices) and as many Working Drawings as necessary to convey a full and true record of the as-built condition of the Works. The As-Built Drawings shall show all changes from the Construction Design, all construction deviations and all other features relevant to the future maintenance and management of the MTHL and its facilities. The Contractor shall endorse As-Built Drawings as true records of the construction of the Works.

The As-Built Records shall include all record photographs, survey results including geotechnical, all inspection records, and other documents as detailed in Appendix 10 of the Employer's Requirements - Design and shall be endorsed by the Contractor as true records of the construction of the Works.

The As-Built Documents shall be submitted to the Engineer, in accordance with Conditions of Contract Clause 5, for consent and issue of a Notice of No Objection.

4. DESIGN INTERFACES WITH OTHERS

4.1. RELATED WORKS CONTRACTORS

The Contractor shall fully co-ordinate the design of the Works with the design of Related Works Contractors and shall follow the interfacing requirements detailed in Appendix 1 of the Employer's Requirements - General.



4.2. EXTERNAL INTERFACING PARTIES.

The Contractor shall fully co-ordinate the design of the Works with all relevant bodies and entities, in particular Government Authorities, Departments and regulatory bodies, utility companies, and the consultants, Project Management Units and contractors of adjacent Projects whether on-going or planned. The Contractor shall identify such Related Works Contractors in his Interface Management Plan (IMP) and other relevant requirements detailed in Appendix 1 of the Employer's Requirements - General.

5. DESIGN REVIEW PROCEDURES

5.1. DESIGN STAGES

The designs for all three Design Stages shall be submitted for review and consent to the Engineer. The form and detail of the review shall be as determined by the Engineer and will not release or remove the Contractor's responsibility for the design under the Contract.

5.2. NO OBJECTION NOTICE

The issue of a Notice of No Objection will be without prejudice to the issue of any future Notices.

5.3. STATUTORY APPROVALS

The Contractor shall, prior to the submission of the Detailed Design, obtain all required and/or statutory approvals that relate to that submission including, where appropriate, the approval of the concerned government authorities and utility companies, and demonstrate that all required approvals have been obtained.

5.4. EMPLOYER'S REQUEST FOR INFORMATION

Supplemental, supporting information to the design submission under review may be requested by the Engineer. The Contractor shall supply such information quickly and efficiently.

6. DESIGN SUBMISSION PROGRAMME

6.1. DESIGN SUBMISSION PROGRAMME

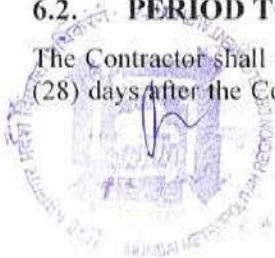
The Contractor shall prepare the Design Submission Programme that sets out fully the Contractor's anticipated programme for the preparation, submission and review of the issue of Notices for all stages of design. The Design Submission Programme shall cover all submissions during the Design Phase and the Construction Phase.

The Design Submission Programme shall:

- a) be consistent with and its principal features integrated into the Works Programme, and shall show all relevant Milestones and Key Dates;
- b) Identify dates and subjects by which the Engineer's decisions should be made however, designs shall not be submitted to near nor too far the time when design approval is required in accordance with the Construction Programme;
- c) Make adequate allowance for periods of time for review by the Engineer and other review bodies and sufficient time should be allowed in case resubmission is required;
- d) Make adequate allowance for the design and development of specialist works; and
- e) Indicate the Design Interface and Co-ordination periods for each Related Works Contractor.

6.2. PERIOD TO SUBMIT DESIGN SUBMISSION PROGRAMME

The Contractor shall submit the Design Submission Programme to the Engineer within twenty-eight (28) days after the Commencement Date, and thereafter up-dated versions thereof at intervals of not



more than one (1) month throughout the Design Phase. Such updates shall be included as an exhibit in the Contractor's Monthly Progress Report.

7. CALCULATIONS

Unless otherwise required by the Engineer, calculations shall be submitted with the respective Design submissions.

7.1. CALCULATIONS OF TECHNICAL DESIGN

For the Initial Design typical calculations may be submitted. In respect of the Technical Design and the Construction Design the Contractor shall prepare and submit, in a form acceptable to the Engineer, a comprehensive set of calculations for the whole of the Technical Design and the Construction Design respectively. Should the design of the Works be revised thereafter and such revision render the submitted calculations superseded, then the Contractor shall prepare and submit revised calculations.

7.2. SUBMISSION OF PROGRAMME LOGIC AND SOFTWARE

The Engineer may require the submission of applicable software, computer input and programme logic prior to the acceptance of any computer output.

7.3. CONSTRUCTION METHODS-SUPPORT CALCULATIONS

The Contractor shall submit all calculations necessary to support proposals relating to the construction methods.

8. DOCUMENT FORMAT REQUIREMENTS

Detailed requirements regarding the number of copies of drawings and documents required for submissions, the acceptable file formats and content formats are given in the CADD and Documents Manual in Appendix 10 of the Employer's Requirements - Design.



DIVISION 4. CONSTRUCTION**1. CONTRACTOR'S SUPERINTENDENCE****1.1. CONTRACTOR'S ORGANIZATION PLAN**

The Contractor shall submit a Staff Organization Plan in accordance with the Conditions of Contract. This plan shall be updated and resubmitted whenever there are changes to the Contractor's Management and Key Personnel. The plan shall show the management structure and state clearly the duties, responsibilities and authority of each Key Personnel and supporting staff.

1.2. EMPLOYEES QUALIFICATIONS AND EXPERIENCE

The Contractor's Project Manager (or Director as the case may be) and his associates/supervisors shall have experience and qualification appropriate to the type and magnitude of the Works. Full details shall be submitted of the qualifications and experience of all proposed staff to the Engineer for his consent.

2. CHECKING OF TEMPORARY WORKS DESIGN

The Contractor shall, prior to commencing the construction of the Temporary Works, submit a certificate to the Engineer signed by him certifying that the Temporary Works have been properly and safely designed and checked and that the Contractor has checked the effect of the Temporary Works on the Works and has found this to be satisfactory.

3. THE SITE

- 1) The Works is identified in the Clause 2 (Scope of Works) of the Employer's Requirements - Functional.
- 2) The timings, sequence and conditions relating to the Contractor's possession of the Site are variously set out as follows:

Project site will be allowed to the Contractor within 28 days after Commencement Date and encumbered area will be given to the Contractor within 180 days after Commencement Date

The location of encumbered area is as shown in the attached map. The Contractor shall be responsible to acquire, provide and maintain suitable sites for Works at the Contractor's sole expense.
- 3) The Contractor shall comply with the requirements described in Clause 1 of Appendix 11 of the Employer's Requirements - Construction.

4. SURVEY

The Contractor shall be responsible for the survey reference points. The Contractor shall comply with the requirements described in Clause 2 of Appendix 11 of the Employer's Requirements - Construction.

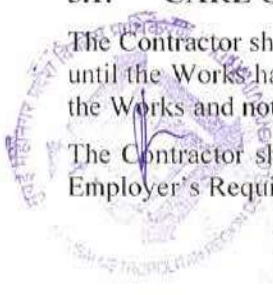
5. CARE OF THE WORKS

Pursuant to the provisions of Conditions of Contract Clause 17.2;

5.1. CARE OF THE WORKS

The Contractor shall be responsible to take care of the Works during construction of the Works and until the Works have been Taken-Over by the Employer and the completion of outstanding parts of the Works and notified defect works.

The Contractor shall comply with the requirements described in Clause 3 of Appendix 11 of the Employer's Requirements - Construction.



6. DAMAGE AND INTERFERENCE

6.1. PROTECT THE EXISTING FACILITIES AND STRUCTURES

The Works shall be carried out in such a manner that there is no damage to or interference with:

- a) watercourses or drainage systems;
- b) utilities;
- c) structures (including foundations), roads, including street fixtures, or other properties;
- d) public or private vehicular or pedestrian access, and
- e) monuments, graves or burial grounds,

other than to the extent that is necessary for them to be removed or diverted to permit the execution of the Works. Heritage structures shall not be damaged or disfigured on any account. The Contractor shall inform the Engineer as soon as practicable of any items which are not stated in the Contract to be removed or diverted but which the Contractor considers necessary to be removed or diverted to enable the Works to be carried out. Such items shall not be removed or diverted until the Engineer's consent for such removal or diversion has been obtained.

6.2. REINSTATEMENT OF DAMAGED OR INTERFERED ITEMS

Items which are damaged or interfered with as a result of the Works and items which are removed to enable the Works to be carried out shall be reinstated to the satisfaction of the Engineer and to at least the same condition as existed before the removal or diverted Item work started.

6.3. COMPLIANCE WITH THE CLAUSE 4, APPENDIX 11

The Contractor shall comply with the requirements described in Clause 4 of Appendix 11 of the Employer's Requirements - Construction.

7. WORK ON ROADS

The Contractor shall carry out the Works so as to minimize disruption to the existing road and pedestrian traffic. In order for that to happen, the Contractor shall comply with the requirements and described in Clause 5 of Appendix 11 of the Employer's Requirements – Construction.

8. SITE ESTABLISHMENT

Pursuant to the Conditions of Contract Clause 4.23, the Contractor shall provide, maintain and remove the Site accommodations, facilities, etc. established by the Contractor. The Contractor shall comply with the requirements described in Clause 6 of Appendix 11 of the Employer's Requirements – Construction.

9. SECURITY

The Contractor shall be responsible for the security of the Site, forming part of the Works. In order to fulfil this, the Contractor shall comply with the requirements described in Clause 7 of Appendix 11 of the Employer's Requirements – Construction.

10. TESTING OF CIVIL WORKS AND ARCHITECTURAL WORKS

The Contractor shall be responsible for all On-Site and Off-Site testing and for all in-situtesting.

Daily On-Site testing shall be coordinated with the Engineer. A programme of proposed tests shall be provided on a weekly basis, at least one week in advance of such events.

The Contractor shall comply with the requirements described in Clause 8 of Appendix 11 of the Employer's Requirements – Construction.



11. RECORDS

The Contractor shall comply with the requirements described in Clause 9 of Appendix 11 of the Employer's Requirements – Construction.

12. MATERIALS

The Contractor shall comply with the requirements described in Clause 10 of Appendix 11 of the Employer's Requirements – Construction.

13. INTERFACING WITH RELATED WORKS CONTRACTORS

The Contractor shall construct the Works in full interface and co-ordination with Related Works Contractors and shall comply with the requirements described in Appendix 1 of the Employer's Requirements – Construction.

14. RESTORATION OF AREAS DISTURBED BY CONSTRUCTION

Unless otherwise directed by the Engineer, any areas disturbed by the Contractor's construction activity, either inside or outside the Right of Way, shall be reinstated as follows:

- a) All areas affected by the construction work shall be reinstated to their original condition, with new materials, including but not necessarily limited to, sidewalks, parking lots, access roads, adjacent roads, properties and landscaping. Grass cover shall be provided for any bare earth surface areas, along with proper provisions for surface drainage.
- b) Landscaping design must be submitted to the relevant authorities and match the remaining areas. In addition the Contractor shall carry out the design and construction of landscaping for all works areas and will submit his proposals to the relevant authorities for approval before commencement of landscaping works.

15. OFFICE BUILDING FOR EMPLOYER'S PERSONNEL

An Office Building for the Employer and the Engineer shall be provided generally at the Casting yard for each Package. The minimum facilities for the office building of the Employer are as given below with Equipment and Furniture approved by the Engineer. (Equipment and Furniture exclusive use by the Engineer will be provided by himself).

(i) Providing Office, Equipment and Furniture

- provision of the site for the office at Casting yard for each Package
- preparation and clearance of the site;
- provision of the buildings with Air Condition;
- water, sanitation, power and lighting services, including standby electricity generation;
- connection and subsequent disconnection of electrical, telephone and water services or alternative provision of same.
- provision of drainage systems for both sewerage and surface waters.
- hard standings, access roads, footways, perimeter fencing, security lighting, ancillary works;
- protective clothing;
- one land line telephone connection
- provision of internet services
- provision of temporary accommodation until the permanent office is available
- provision of all furniture and equipment for the Employer
- provision of 24 hour security



(ii) **Maintenance of all facilities for the duration of the Contract, such maintenance shall include but not be limited to**

- Keeping buildings in good repair and decorative order, and free from pests, insects etc;
- Cleaning offices and laboratory daily;
- Maintaining the grounds around buildings;
- Supplying kitchen-ware and crockery and cleaning materials;
- Supplying toilet and cleaning equipment and materials;
- Providing power, drainage, telephone services, fax and e-mail facilities, stationery and
- All other consumables and payment of all bills in connection with these for as long as they are required by the Engineer
- Servicing and repairing all fittings and equipment installed air-conditioners, fans

Table 4.1 Office for the Employer with Furniture, Equipment and Vehicle

DESCRIPTION	No.
A. Offices around 500m²	
Main room	1
Conference room for 50~60 persons	1
Meeting room	1
Toilets – male	1
Toilets – female	1
Kitchen	1
Store room	1
Lunch room	1
Guest room	3
B. Furniture	
Executive office desks with at least 3 drawers, one of which is lockable.	3
Office desks, 120x70cm and each having at least 3 drawers, one of which is lockable.	12
Executive chairs, adjustment, arm rests.	3
Typist chairs, adjustment, arm rests.	12
Visitor's chairs.	10
Steel filing cabinets with four drawers.	10
Book shelves, 1m. x 2m. with 3 shelves and lockable cupboard at base.	10
Storage cabinets 1mx2m, two doors, lockable.	3
Conference Table	2
Conference room chairs	60
Bulletin board 0.9x0.6m.	1
White marker board 1.2mx0.8m.	2
Waste paper baskets	15
Window blinds/curtains to all windows.	1 set
Wall clock (branded)	2
Dining Table with 6 chairs	2



***Parking and other Facilities**

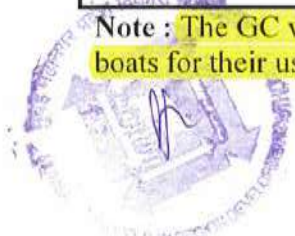
C. Equipment	
Laptop computer, Intel core TM i7 Processor (approved/specified by Engineer)	4
Desk top computer, Branded PC- Intel Core i7- Processor	15
Compatible A3/A4 ink jet colour printers	2
Compatible A4 Laser jet colour printers	2
Uninterrupted Power Supply, On line Unit 1 kVA with sealed maintenance free battery and 60 minutes backup time.	15
Heavy duty copy/printer machine with laser /digital technology, minimum 50 copies per minute, magnification of +25 to 400% original paper size A3 to A6	2
Plain paper fax machine	1
LAN (24 hub) wiring loops for desktop computers and printers	1
Computer software, licensed copies of MS Project – latest available version.	2
Computer software, licensed copies of AUTOCAD 2014 or latest available version.	5
Telephone lines	2
Intercom Telephone lines for each room and conference room	5
Mobile cellular phones with SIMM cards.-branded latest model	5
Digital Camera,	5
Digital Video Camera	2
Heavy duty Stapler	2
Binding Machine	1
D. Vehicles	
Vehicles are used for around 3000 km /month up to the end of Defect Notification Period	
Mini bus (minimum 22 seater)	1
INNOVA or equivalent	2
Sedan type	2
Motorized speed boat (capacity of 10 passengers) for supervision works for MMRDA staff	1

Covered Car Parking: 30 Bays, each measuring 5mx2.5m

Table 4.2 Office for the Engineer without Furniture

DESCRIPTION	No.
A. Offices around 400m²	
Main room	1
Meeting room	1
Toilets – male*	1
Toilets – female*	1
Store room	1
Lunch room	1

Note : The GC will provide for the furniture, electronic gadgets / hardware and vehicles / boats for their use.



DIVISION 5. OUTLINE SPECIFICATIONS for Package 1

1. GENERAL

1.1. EMPLOYER'S REQUIREMENTS - OUTLINE SPECIFICATIONS

The Employer's Requirements - Outline Specifications present the design and construction specifications for the Works. The Works shall be designed and constructed in strict compliance with the specifications presented herein.

The Outline Specifications are divided into 2 major parts as follows:

- 1) Specifications for Design and Construction of the MTHL including Pavements; and;
- 2) Specifications for Design and Construction of the Bridge Structures.

2. DESIGN AND CONSTRUCTION OF MTHL

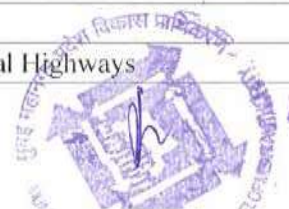
The Outline Specifications for the design and construction of the MTHL involved in the Works are given below.

2.1. DESIGN STANDARDS

Except where specifically permitted otherwise by the Engineer in writing, the Contractor's design of the MTHL shall be in strict accordance with the following design standards and/or specifications applicable.

Table 2.1.1 - IRC Standards and Specifications

Code No.	Title
IRC: 2-1968	Route Marker Signs for National Highways
IRC: 8-1980	Type Designs for Highway Kilometer Stone
IRC: 12-2009	Recommended Practice for Location and Layout of Roadside Motor Fuel Filling and Motor Fuel Filling-cum Service Stations
IRC: 15-2011	Standard Specification and Code of Practice for Construction of Concrete Roads
IRC: 25-1967	Type Designs for Boundary Stones
IRC: 26-1967	Type Design for 200-metre stones
IRC: 27-2009	Specifications for Bituminous Macadam
IRC: 30-1968	Standard Letters and Numbers of Different Heights for Use on Highway Signs
IRC: 32-1969	Standards for Vertical and Horizontal Clearances of Overhead Electrical Power Communication Lines as Related to Roads
IRC: 35-1997	Code of Practice for Road Markings
IRC: 36-2010	Recommended Practice for the Construction of Earth Embankment for Road Works
IRC:37-2001	Guidelines for the Design of Flexible Pavements
IRC: 38-1988	Guidelines for Design of Horizontal Curves for Highways and Design Tables
IRC: 56-2011	Recommended Practice for Treatment of Embankment Slopes for Erosion Control
IRC: 57-2006	Recommended Practice for Sealing of Joints in Concrete Pavements
IRC: 58-2002	Guidelines for the Design of Rigid Pavements for Highways
IRC: 61-1976	Tentative Guidelines for the Construction of Cement Concrete Pavement in Hot Weather
IRC: 62-1976	Guidelines for Control of Access on Highways
IRC: 64-1990	Guidelines for Capacity of Roads in Rural Areas
IRC: 66-1976	Recommended Practice for Sight Distance on Rural Highways



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IRC: 67-2010	Code of Practice for Road Signs
IRC: 69-1977	Space Standards for Road in Urban Areas
IRC: 70-1977	Guidelines on Regulation and Control of Mixed Traffic in Urban Areas
IRC: 73-1980	Geometric Design Standards for Rural (Non Urban) Highways
IRC: 75-1979	Guidelines for the Design of High Embankments
IRC: 79-1981	Recommended Practice for Road Delineators
IRC: 82-1982	Code of Practice for Maintenance of Bituminous Surfaces of Highways
IRC: 84-1983	Code of Practice for Curing of Cement Concrete Pavements
IRC: 86-1983	Geometric Design Standards for Urban Roads in Plain Areas
IRC: 87:2011	Guidelines for Formwork, Falsework and Temporary Structures
IRC: 90-2010	Guidelines of Selection, Operation and Maintenance of Bituminous Hot Mix Plant
IRC: 92-1985	Guidelines for the Design of Interchanges in Urban Areas
IRC: 93-1985	Guidelines on Design and Installation of Road Traffic Signals
IRC: 98-1997	Guidelines on Accommodation of Under Ground Utility Services along and across Roads in Urban Areas
IRC:103-1988	Guidelines for Pedestrian Facilities
IRC:106-1990	Guidelines for Capacity of Urban Roads in Plain Areas
IRC:110-2005	Standard Specification and Code of Practice for Design and Construction of Surface Dressing
IRC:111-2009	Specifications for Dense Graded Bituminous Mixes
IRC:SP-11-1984	Handbook of Quality Control for Construction of Roads and Runways (Second Revision)
IRC:SP-12-1973	Tentative Recommendations on the Provision of Parking Spaces for Urban Areas
IRC:SP-21-2009	Guidelines on Landscaping and Tree Plantation
IRC:SP-23-1983	Vertical curves for Highways
IRC:SP-31-1992	New Traffic Signs
IRC:SP-41-1994	Guidelines on Design of At-Grade Intersections in Rural and Urban Areas
IRC:SP-42-1994	Guidelines on Road Drainage
IRC:SP-44-1996	Highway Safety Code
IRC:SP-50-1999	Guidelines on Urban Drainage
IRC:SP-53-2010	Guidelines on Use of Modified Bitumen in Road Construction
IRC:SP-55-2001	Guidelines for Safety in Construction Zones
IRC:SP-57-2000	Guidelines for Quality Systems for Road Construction
IRC:SP-59-2002	Guidelines for Use of Geotextiles in Road Pavements and Associated Works
IRC:SP-88-2010	Road Safety Audit Manual
IRC:SP-90-2010	Manual for Grade Separators and Elevated Structures
IRC:SP:93-2011	Guidelines on Requirements for Environmental Clearance for Road Projects
IRC:SP-94-2010	Guidelines for Variable Message Signs

Table 2.1.2 - Design Standards and Codes for Steel Box Girder with Steel Deck

Name
Specifications for Highway Bridges, Japanese Highway Bridge Standards, published by Japan Road Association, March 2002

Note:

1. IRC Codes and Guidelines may be subject to review. Hence the latest revision shall be adopted for the design.



2. The priority order of Design Standards and Codes for Pre-stressed Concrete Bridge is,
 - 1) IRC, IS
 - 2) BS or AASHTO
 - 3) Internationally-recognized standards
3. If there is no standards for specific design items for the MTHL in the codes listed above, equivalent international standards shall be applied after obtaining approval from the Engineer.

2.2. GEOMETRIC DESIGN CONDITIONS FOR MAIN CARRIAGEWAY

The Contractor's design of the main carriageway for the MTHL (other than the lanes in the interchange ramp sections set out below) shall strictly comply with the following design conditions set for the Project.

Table 2.2 – Geometric Design Conditions for Main Carriageway of MTHL

No.	Particulars	Unit	Value
1	Design Speed	kmph	100
2	Width of Carriageway (3 lanes)	m	3X3.50
3	Shoulder (Right side)	m	0.75
4	Shoulder (Left side)	m	2.50
5	Width of Central Median	m	1.00
6	Cross Fall (Carriageway, Paved Shoulder)f	%	2.5
7	Maximum Super-elevation	%	6.0
8	Minimum Horizontal Radius	m	1,800
9	Minimum Vertical Gradient	%	0.5
10	Maximum Vertical Gradient	%	2.5
11	Minimum Length of Vertical Curve	m	60

2.3. GEOMETRIC DESIGN CONDITIONS FOR INTERCHANGE RAMP WAYS

The Contractor's design of the ramp ways of the interchanges for the MTHL shall comply with the following geometric design conditions set for the Project.

Table 2.3 – Geometric Design Conditions for Ramp Ways of Interchanges

No.	Particulars	Unit	Value
1	Design Speed	kph	40
2	Width of Carriageway (2 lanes)	m	2X3.50
3	Shoulder width (Each side)	m	0.25
5	Minimum Horizontal Radius	m	60
6	Cross Fall (Carriageway, Paved Shoulder)	%	2.5
7	Max. Super elevation	%	7.0
8	Max. Longitudinal Gradient	%	3.3

2.4. HORIZONTAL AND VERTICAL ALIGNMENTS FOR MAIN CARRIAGEWAY

As mentioned in Clause 3. Employer's Outline Drawings in the Employer's Requirements - General, whereas it is impermissible to change the horizontal alignment significantly, minor changes to the vertical alignment will be acceptable in the sections other than the sections of the steel box girders shown in the table below. When proposing minor changes to the vertical alignment, the Contractor must comply with the geometric design conditions mentioned in 2.3 above as well as the clearance requirements mentioned in the Employer's Requirements - Functional.



Application of Structural Type for MTHL

Chainage/Station	Category	Structural Type	Package
No. 0+495~No. 3+395	General Section (marine area)	2,900m, PC box girder (2@50m, 3@50m, 3 x2@50m, 5@50m, 7x6@50m)	1
No. 3+395~No. 3+715	Special Section (marine area)	320m, Steel Box Girder with Steel Deck (85m+150m+85m)	
No. 3+715~No. 4+625	General Section (marine area)	910m, PC Box Girder (2 x6@50m, 40m+2@50m+40m, 40m+50m+40m)	
No. 4+625~No. 6+078	Special Section (marine area)	1,453m, Steel Box Girder with Steel Deck (90m+2@150m+2@100m+93m, 120m+180m+120m+140m+120m+90m)	
No. 6+078~No. 8+620	General Section (marine area)	2,542m, PC Box girder (6 x6@50m, 2 x5@50m, 46m+3@50m+46m)	
No. 8+620~No. 9+180	Special Section (marine area)	560m ,Steel Box Girder with Steel Deck (100m+2@180m+100m)	
No. 9+180~No. 10+380	General Section (marine area)	1,200m (4x6@50m), PC Box Girder	
No. 10+380 ~ No. 11+880	General Section (marine area)	1,500m (5x6@50m), PC Box Girder	2
No. 11+880 ~ No. 13+610	Special Section (marine area)	1,730m, Steel Box Girder (Mumbai→Navi Mumbai) (84m+2@130m+180m+115m, 74m+4@95m+65m, 112m+2@180m+100m) (Navi Mumbai→Mumbai) (98m+140m+150m+180m+90m, 55m+4@95m+65m, 100m+2@180m+112m)	
No. 13+610 ~ No. 16+610	General Section (marine area)	3,000m, PC Box Girder (10 x6@50m)	
No. 16+610 ~ No. 16+840	Mangrove Section	230m, PC Box Girder (40m+3@50m+40m)	
No. 16+840 ~ No. 16+880	Crossing Road Section	40m	
(Mumbai→Navi Mumbai) No. 16+880 ~ No. 17+320 (Navi Mumbai→Mumbai) No. 16+880 ~ No. 17+341	Mangrove Section	(Mumbai→Navi Mumbai) 440m, PC Box Girder (45m+4@50m, 45m+3@50m) (Navi Mumbai→Mumbai) 461m, PC Box Girder (45m+3@50m+30m+20m, 45m+3@50m, 21m)	
(Mumbai→Navi Mumbai) No. 17+320 ~ No. 17+471 (Navi Mumbai→Mumbai) No. 17+341 ~ No. 17+482	Crossing Road Section	(Mumbai→Navi Mumbai) 151m, PC Box Girder (45m+49m+57m) (Navi Mumbai→Mumbai) 141m, PC Box Girder (57m+34m+50m)	



Chainage/Station	Category	Structural Type	Package
(Mumbai→Navi Mumbai) No. 17+471 ~ No. 18+087 (Navi Mumbai→Mumbai) No. 17+482 ~ No. 18+087	Mangrove Section	(Mumbai→Navi Mumbai) 616m, PC Box Girder (46m, 2@30m, 2@20m, 14@30m, 2@25m) (Navi Mumbai→Mumbai) 605m, PC Box Girder (35m, 2@30m, 2@20m, 14@30m, 2@25m)	
No. 18+087 ~ No. 18+127	Crossing Road Section	40m, PC Box Girder	
No. 18+127 ~ No. 18+187	General Section (land area)	60m, PC Box Girder (2@30m)	
No. 18+187~No. 18+217	Crossing Road Section	30m, PC Box Girder	3
No. 18+217~No. 18+317	General Section (land area)	100m. PC box girder (2@30m+2@20m)	
No. 18+317~No. 18+357	Crossing Road Section	40m. PC box girder	
No. 18+357 ~ No. 18+421.5	General Section (land area)	64.5m. PC box girder (30m+34.5m)	
No. 18+421.5 ~ No. 18+491.5	Crossing Railway Section	70m, Steel Truss	
(Mumbai→Navi Mumbai) No. 18+491.5 ~ No. 18+574 (Navi Mumbai→Mumbai) No. 18+491.5 ~ No. 18+554	General Section (land area)	(Mumbai→Navi Mumbai) 82.5m, PC box girder (37.5m+45m) (Navi Mumbai→Mumbai) 62.5m, PC box girder (37.5m+25m)	
(Mumbai→Navi Mumbai) No. 18+574 ~ No. 18+644 (Navi Mumbai→Mumbai) No. 18+554 ~ No. 18+644	Crossing Road Section	(Mumbai→Navi Mumbai) 70m, PC box girder (2@35m) (Navi Mumbai→Mumbai) 90m, PC box girder (40m+50m)	
No. 18+644 ~ No. 18+884	General Section (land area)	240m. PC box girder (8@30m)	
No. 18+884 ~ No. 18+929	Crossing Road Section	45m, PC box girder	
No. 18+929 ~ No. 20+070	Land Area	Earthwork Section	
No. 20+070 ~ No. 20+225	General Section (land area)	155m, PC box girder (4@30m+35m)	
No. 20+225 ~ No. 20+260	Crossing Road Section	35m, PC box girder	
No. 20+260 ~ No. 21+012	General Section (land area)	752m. PC box girder (35m+23@30m+27m)	
No. 21+012 ~ No. 21+079	Crossing Road Section	67m, PC box girder	
No. 21+079 ~ No. 21+232	General Section (land area)	4@30m+33m=153m, PC box girder	



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Chainage/Station	Category	Structural Type	Package
No. 21+232 ~ No. 21+427	Crossing Railway Section	3@65=195m, Steel Truss	
No. 21+427 ~ No. 21+467	Crossing Road Section	40m, PC box girder	
No. 21+467 ~ No. 21+660	General Section (land area)	193m, PC box girder (38m+2@37m+3@27m)	
No. 21+660 ~ No. 21+730	Crossing Road Section	70m, PC box girder (2@35m)	
No. 21+730 ~ No. 21+811	General Section (land area)	81m, PC box girder (3@27m)	

2.5. DESIGN AND DRAWING SOFTWARE

The computer software for the design of the MTHL shall be approved by the Engineer prior to commencement of the design works.

All of the Contractor's drawing for submission to the Engineer shall be prepared using the Autodesk of the version acceptable to the Engineer, unless otherwise permitted in writing by the Engineer.

2.6. PAVEMENT

2.6.1. Site Investigation

The Contractor shall undertake, at his own cost, the necessary geotechnical/subsoil investigations/surveys as needed for the proper Technical Design of the MTHL including CBR tests for pavement design at earthwork sections.

2.6.2. Design Conditions for Pavement Design

Traffic demand forecast data (by vehicle type) for a period of 20 years after commencement of the MTHL operation are shown in the Table below for the Technical Design. Other design conditions and criteria shall be set by the Contractor for approval by the Engineer prior to commencement of the respective design. The pavements shall be designed for the minimum service life of 20 years.



Future Traffic Volume on MTHL (PCU/day(both directions))

(Unit : vehicle/day/direction)

Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Car	12,050	14,170	16,290	18,400	20,510	22,630	24,740	26,860	28,970	31,090	33,200
Taxi	1,350	1,920	2,490	3,060	3,630	4,200	4,770	5,340	5,910	6,480	7,050
Bus	450	470	480	500	520	530	550	570	580	600	620
LCV	730	800	860	930	990	1,050	1,110	1,180	1,240	1,310	1,370
HCV	500	560	620	680	730	790	850	910	970	1,030	1,080
MAV	510	560	610	660	710	760	810	860	910	960	1,010
Total	15,990	18,480	21,340	24,230	27,090	29,960	32,830	35,720	38,580	41,470	44,330

Vehicle Type	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Car	34,590	35,970	37,360	38,740	40,130	41,510	42,900	44,280	45,670	47,050
Taxi	7,360	7,660	7,970	8,270	8,580	8,880	9,190	9,490	9,800	10,100
Bus	620	620	620	620	620	620	620	620	620	620
LCV	1,420	1,470	1,520	1,570	1,620	1,670	1,720	1,770	1,820	1,870
HCV	1,110	1,140	1,160	1,190	1,220	1,240	1,270	1,300	1,320	1,350
MAV	1,060	1,120	1,170	1,220	1,270	1,320	1,380	1,430	1,480	1,530
Total	46,160	47,980	49,800	51,610	53,440	55,240	57,080	58,890	60,710	62,520

* Traffic volume by direction was calculated as one half of traffic volume for both direction

2.6.3. Types of Pavement to be constructed

The following pavement types shall be applied to the bridge section depending on the bridge type. The minimum thickness are specified only for the bridge sections. The pavement structure and the thickness at the toll plaza section and the embankment section shall be determined based on the traffic data and geotechnical data of the sub-grade. Cement concrete pavement shall be constructed in the toll gate section (tentatively from No. 19+365 to No. 19+465)

Table 2.4 – Pavement Type and Minimum Thickness

Section		Pavement Type		Min. Thickness	Min. Total Thickness	Package
Bridge	Steel Deck	Base Course	Stone Mastic Asphalt Pavement	40 mm	80 mm	1&2
		Surface Course	Stone Mastic Asphalt Pavement	40 mm		
	Concrete Deck	Base Course	Stone Mastic Asphalt Pavement	40 mm	80 mm	1,2&3
		Surface Course	Dense Graded Asphalt Pavement	40 mm		
Asphalt & Grade			Dense Graded Asphalt Pavement			3
Toll Gate			Cement Concrete Pavement		To be designed by the Contractor. Supplied by appropriate Sub-grade	4

2.6.4. Design Procedure

The pavement shall be designed by a certified Professional Engineer who has sufficient experiences of design of asphalt concrete pavements and cement concrete pavements of highways/roads, and the designer shall be approved by the Engineer in accordance with GC Sub-Clause 5.1. The Contractor shall design the pavements taking into account the structural features of bridge type, type of the deck to be paved, strength of the ground/road bed, climatic and environmental conditions, traffic volume and loading conditions. The pavement designs, as an integral part of the Contractor's Documents, shall be approved by the Engineer in accordance with GC Sub-Clause 5.2.



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Stone Mastic Asphalt (SMA) Pavement shall be designed to the established international design standards and practices such as SPECIFICATION FOR DENSE GRADED AND STONE MASTIC ASPHALTS, NZTA M10:2014, NZ TRANSPORT AGENCY. The Contractor shall obtain a prior approval of the Engineer on the standards to be used.

The binder of SMA shall be the polymer-modified binder. The Contractor shall select, for approval by the Engineer, the most suitable materials for the bonding coat and the waterproofing membrane to secure the sufficient adhesion and waterproofing between the deck and the SMA pavement, taking the climatic, loading and surface conditions of the deck into account. A bonding coat of bituminous emulsion type shall be applied to the cleaned surface of the deck prior to applying the waterproofing membrane. Waterproofing membranes shall be as mentioned at para 3.6.

Cement concrete pavements shall be designed to IRC and/or AASHTO or other internationally recognized design standards acceptable to the Engineer. The cement concrete pavements shall comprise Pavement Quality Concrete (PQC) of flexural strength of M-45 Grade. The pavement shall be laid over Dry Lean Concrete (DLC) of M-15 Grade, over the drainage layer of Granular Sub Base (GSB). To ensure internal drainage of the pavements on the embankment, the GSB shall extend, right across the carriageway on the embankment, to the side drains, if marine clay is encountered, the pavement of embankment will have to be designed accordingly.

2.6.5. Mix Design and Job-Mix Formula

The Contractor shall prepare mix designs of all types of pavements to be used and submit them to the Engineer for approval prior to its usage. The Contractor shall provide the information listed in the following table for approval of the job-mix formula by the Engineer prior to commencement of the mixing production.

Table 2.5 - Information for Engineer's Approval of Job-Mix Formula

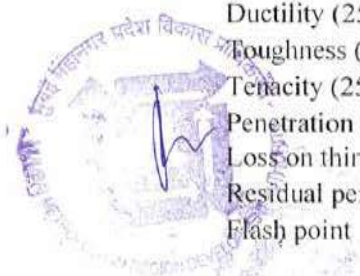
No.	Information
1	Properties of aggregates, filler, binder
2	Grading, binder content and design air voids
3	Test results of trial mixes to decide design mix
4	Test results of mix properties
5	Test results on a batch of proposed mix to be used
	1) Grading
	2) Max. specific gravity of mix
	3) Bulk density of compacted mix
	4) Bulk density of combined mineral aggregates
	5) Air voids
	6) Total binder content
	7) Binder density
	8) Voids in mineral aggregate
	9) Binder film thickness

2.6.6. Materials

The polymer-modified binder to be used for SMA pavements shall be in accordance with the following Table. The Contractor shall submit the test results of the polymer modified binder to the Engineer for approval.

Table 2.6 - Property of Polymer-Modified Binder

Item	Unit	Type II	Type III
Softening point	°C	56.0 <	70.0 <
Ductility (25°C)	cm	30 <	50 <
Toughness (25°C)	Nm	8.0 <	16 <
Tenacity (25°C)	Nm	4.0 <	-
Penetration (25°C)	1/10mm	40 <	40 <
Loss on thin film oven test	%	0.6 >	0.6 >
Residual penetration after thin film oven test	%	65 <	65 <
Flash point	°C	260 <	260 <



2.6.7. Construction

The pavement construction works shall be in accordance with the relevant IRC standards. The works of SMA pavement shall comply with the established international standards acceptable to the Engineer. The Contractor shall submit the proposed method statements of the pavement works to the Engineer for approval prior to commencement of the subject works. The following acceptance criteria shall apply:

1) Level

The finished level at the top of each layer shall not differ from the specified level by more than 10 mm.

2) Thickness

The finished thickness of asphalt pavement placed on the deck of bridge shall be not be less than the specified thickness by more than 10%, and the total thickness of any core taken shall not be less than the specified thickness by more than 5mm.

2.7. DRAINAGE

An effective surface and sub-surface drainage system in both the bridge section and the earthwork section shall be designed as stipulated in IRC SP: 42-1994. The drainage system shall be planned and designed for drainage of main carriageways, the Toll Plaza Complex, interchanges, etc., ensuring that there shall be no water pooling on the carriageway at any time.

Surface drainage channels for intercepting and removing the surface run-off from the MTHL and the adjacent areas shall have an adequate capacity for the design run-off, and should be located and shaped to avoid creating traffic hazards or erosion of soil at the dispersals.

Direct discharge of surface run-off to the sea will be permitted in the ordinary areas, subject to a prior approval of the Engineer. No direct discharge will be permitted in the inter-tidal zone. Adequate devices for trapping silt and catching large debris being discharged into the sea shall be provided at suitable locations. The devices shall also be adequate for manual removal of the debris and silt collected without difficulties.

Within the area of the inter-tidal zone, surface run-off shall be collected and discharged in a proper manner without causing erosion of the inter-tidal mud.

Utility troughs shall be provided with adequate drainage outlets to avoid excessive weight of pooled/stagnant water in the utility troughs caused by rainfalls or failure of the water main(s) installed therein.

Unless stated otherwise, separate collection and discharge systems shall be provided for the drainage of surface water, the groundwater and the foul water based on the site investigation results and to the acceptance of the relevant authorities. In addition, separate drainage systems shall be provided for viaduct section and at-grade section.

All drainage facilities and materials shall be designed to resist saline attack.

2.8. VEHICULAR CRASH BARRIERS

Various barriers to be installed along the MTHL shall be designed in accordance with the applicable IRC design standards. The Contractor shall select, in principle, the type of the barriers on the MTHL, which has visual continuity with the barriers of the adjoining road sections.

Vehicular crash barriers to be installed on both sides of the main carriageways in the bridge/viaduct section and the ramp ways of the interchanges shall be of reinforced concrete type conforming to the relevant IRC codes. The vehicular crash barriers shall be designed to withstand the impact of the potential maximum vehicular collision force and other loads in accordance with IRC standards.

The vehicular crash barriers shall house three tiers of steel conduits of 100 mm diameter within the structure as indicated on the Outline Drawings for accommodating utility lines for the MTHL. Alternatively, where approved by the Engineer, steel-fabricated vehicular crash barriers may be provided as per the applicable IRC codes.

The Contractor shall select barriers of the most suitable type and/or structure for installation under the Contract. The Contractor shall submit the proposed design of the barriers to the Engineer for approval.

The vehicular crash barriers shall be durable in the saline environment.

Locations and structural details of the median openings to be provided at intervals shall be decided



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through consultation with the Engineer.

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2.9. NOISE BARRIERS, VIEW BARRIER AND SAFETY FENCES

The Contractor shall design the noise barriers, view barriers and safety fences to be installed at the designated locations along the main carriageway of the MTHL. They shall be fixed to the reinforced concrete vehicular crash barriers with cast-in anchor bolts. They shall be safe and durable under the given loading, climatic and environmental conditions. The Contractor shall select and design the most suitable type, quality, materials and supporting structures to meet the requirements, and shall submit the proposed design to the Engineer for approval.

The proposed locations of the noise barriers, view barriers and safety fences are shown in the following tables. The view barriers shall be installed along the north edge line only of the main carriageway. The heights indicated in the tables mean heights measured from the road surface.

Materials to be used for the noise barriers, view barriers and safety fences including the fixings shall be durable in the saline environment.

2.9.1. Noise Barriers

The panels of noise barrier shall be transparent / opaque as approved by Engineer and made of Acrylic, Polycarbonate panels, or equivalent materials to meet the following function of Sound transmission loss. Test method of sound transmission loss shall be based on JIS A 1416 (Acoustic-Method for laboratory measurement of airborne sound insulation of building elements).

Frequency of target noise	Sound transmission loss (in one direction)
400 Hz	25dB
1000 Hz	30dB

Source: DESIGN MANUAL FOR EXPRESSWAY, Quality and Test of Noise Barrier Panel, NEXCO EAST, JAPAN

The frames of noise barriers shall be made of steel and shall be hot-dip galvanized. The noise barrier and its frame shall be safe against dead loads and wind loading, and weatherproof as well as corrosion resistant. The panels shall not scatter even after its breaking by impacts of such as vehicle collisions. Prior to its manufacturing and construction, the Contractor shall submit the design conditions, design methods, design results, name of manufacturer, and Quality Control Plan about the noise barriers to the Engineer for his approval. The Engineer will perform inspections and testing during manufacturing of the noise barriers to ensure that the materials and workmanship meet the required quality.

Number of inspections during manufacturing	Min. 2
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Table 2.7 - Noise Barriers

Section (Station)	Length	Height (Above finished road level)	Package
No. 0+500 - No. 4+000 (North only)	3,500 m	3 m	1
No. 0+500 - No. 5+500 (South only)	5,000 m	3 m	1
No. 16+980 - No. 17+580 (Both sides)	1,200 m	3 m	2

2.9.2. View Barriers

The panels for view barriers shall be opaque and made of Acrylic, Polycarbonate, Polyethylene, or other resin. The frames of view barriers shall be made of steel and shall be hot-dip galvanized. The view barrier shall be safe and durable against dead loads and wind loading, and weatherproof and corrosion resistant. The panels shall not scatter even after its breaking by impact of vehicle collision.

Prior to its manufacturing and construction, the Contractor shall submit the design conditions, design methods, design results, name of manufacturer, and Quality Control Plan about the view barriers to the Engineer for his approval and the design of view barrier shall be got approved from BHABHA Atomic Research Center (BARC). The Engineer will perform inspections and testing during manufacturing of the view barriers to ensure that the materials and workmanship meet the



required quality.

Number of inspections during manufacturing	2
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Table 2.8 – View Barriers

Section (Station)	Length	Height (Above finished road level)	Package
No. 4+000 - No. 10+000 (North only)	6,000 m	3 m	1

2.9.3. Safety Fences

Safety fence shall be designed and constructed to be safe and durable against dead loads and wind loading acting on it. The frame of the safety fence shall be steel structure with steel netting of appropriate size as approved by the Engineer. All the steel used for safety fence shall be hot-dip galvanized of adequate quality. Prior to its manufacturing and construction, the Contractor shall submit the design conditions, design methods, and design results to the Engineer for his approval.

Table 2.9- Safety Fences

Section (Station)	Length	Min. Height	Facilities to be Protected	Package
No. 5+500 – No. 6+078 (South only)	578 m	3 m	Pipeline, conveyer, etc.	1
No. 8+720 – No. 9+080 (South only)	360 m	3 m	Thane Coal Berth Channel	1
Both sides for the following chainages				
No. 13+138 – No. 13+510	744 m	3 m	Panvel Navigation Channel	2
No. 16+840 – No. 16+880	80 m	3 m	Road	2
No. 18+087 – No. 18+127	80 m	3 m	Road (Planned)	2
No. 18+187 – No. 18+217	60 m	3 m	Road	3
No. 18+317 – No. 18+357	80 m	3 m	Road (Planned)	3
No. 18+421.5 – No. 18+491.5	140 m	3 m	Subran Railway/Road	3
No. 18+574 – No. 18+644	140 m	3 m	Road (Planned)	3
No. 18+884 – No. 18+929	90 m	3 m	Road (Planned)	3
No. 20+225 – No. 20+260	70 m	3 m	Road	3
No. 21+012 – No. 21+079	134 m	3 m	SH54	3
No. 21+232 – No. 21+427	390 m	3 m	Railway	3
No. 21+660 – No. 21+730	140 m	3 m	NH4B	3

2.10. LIGHTING FACILITY

The separate agency to be appointed by the Employer will plan and design the lighting facility for both the main carriageways and the ramp ways of the MTHL in accordance with the applicable IRC design standards. The types of lighting indicated in the table below shall be applied. The barrier-embedded type lighting facility, which is an environmental mitigation measure for migrating birds, shall be mounted on, or the foundation directly embedded in, the reinforced concrete vehicular crash barriers. The separate agency to be appointed by the Employer shall select the most suitable type, materials, supporting and fixing devices and lamps taking into account the effectiveness, costs of construction and O&M and consumables, and ease of the maintenance work. All materials and fixings shall be durable in the saline environment.

Individual platform with own pile and pier for the substation of 5m×5m area and 5.0 t weights shall be constructed at every 3.0 km by the Contractor.

Interface requirements for handing over of completed Piers for Sub-station installation and all foundations of street light & lighting pole as required by the separate agency to be appointed by the Employer is mentioned in Clause 4.2 of Employer's Requirements - General

The location of electricity supply points for lighting facilities shall be decided through consultations with the concerned authorities, subject to the Engineer's approval.

The design and providing the lighting facility will be in the scope of the third party contractor. The scope of this contract shall include box-out provisioning with dowels to accommodate the lighting facility to be provided by the third party contractor.



Table 2.10 - Lighting Facility

Section (Station)	Length	Type of Lighting	Package
No. 0+500 – No. 10+000 (Both sides)	19,000 m	Barrier-embedded Type	1
No. 10+000 – No. 16+980 (Both sides)	13,960 m	Pole-mounted Type	1&2
No. 16+980 – No. 17+580 (Both sides)	1,200 m	Barrier-embedded Type	2

2.11. SECONDARY RESCUE STATIONS

Two secondary rescue stations, 7m (width) x one span (min. 50m length), shall be designed and constructed on south side at around STA 7+000 and on north side at around STA 14+000. The facility can be supported by the independent structure from the bridge but shall be accessible from the carriageway. The location of the facility shall be determined to avoid navigation spans and the median opening shall be adjusted so that it is at the center of the rescue station. The substructures of the secondary rescue station shall be located not to obstruct the clearance under the bridge.

The design and construction of the rescue stations shall be in accordance with the provisions of 3. DESIGN AND CONSTRUCTION OF BRIDGE STRUCTURES. The secondary rescue stations shall be designed to support as many as vehicles loaded on the deck. Thickness of asphalt pavement shall be same as for the bridge section. The outside edges of rescue stations shall be provided with crash barriers except carriageway side. All steel components used for the rescue stations shall be painted or hot-dip galvanized. Prior to its manufacturing and construction, the Contractor shall submit the design conditions, design methods, and design results to the Engineer for his approval.

2.12. KILOMETER STONE MARKING

The Kilometer and 200m markings shall be installed along the MTHL in accordance with IRC:2 and IRC:26. When the Contractor finds it is not possible or appropriate to follow the above IRC Standards considering the structural features of MTHL, the Contractor shall propose his plan to the Engineer. Kilometer and 200m markings shall be durable in the marine environment. The Contractor shall submit the design of Kilometer and 200m markings to the Engineer for his approval prior to construction of them.

2.13. SIGNAGE AND PAVEMENT MARKING

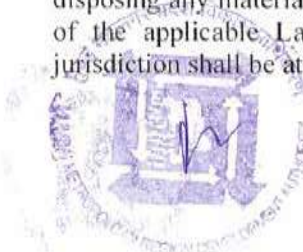
The Contractor shall design, supply/furnish and construct the permanent signage for traffic safety and information and the pavement marking in accordance with the applicable IRC standards. The Contractor shall submit the proposed designs of the signage and pavement marking to the Engineer for approval.

2.14. BORROW PLAN

If borrowed materials are required for the Works, the Contractor shall submit the proposed Borrow Plan, including the proposed location of the borrow site, to the Engineer for approval prior to commencement of the subject portion of the Works containing the borrowed materials. The proposed method of borrow, including clearing, excavation and transportation, shall be strictly in compliance with all of the applicable Laws. Where applicable, a permit issued by the concerned authority of jurisdiction shall be attached to the Borrow Plan.

2.15. DISPOSAL PLAN

If any surplus material needs to be disposed of, the Contractor shall submit the proposed Disposal Plan, including the proposed location of the disposal site, to the Engineer for approval prior to disposing any material. The proposed method of disposal shall be strictly in compliance with all of the applicable Laws. Where applicable, a permit issued by the concerned authority of jurisdiction shall be attached to the Disposal Plan.



3. DESIGN AND CONSTRUCTION OF BRIDGE STRUCTURES

The Outline Specifications for the design and construction of the substructure and superstructure of the bridge section of the Works are given below.

3.1. DESIGN CRITERIA AND STANDARDS

3.1.1 Design Service Life

The bridge structures of the MTHL shall be designed for the service life of one hundred (100) years on the conditions that regular inspection and maintenance is properly conducted during the operation period. Certain elements may require replacement during the design service life. The minimum Target design services life of the main bridge components are given in the following table:

Table 3.1 - Design Service Life Required as Target

Bridge Component	Design Service Life (years)
Foundations	100
Piers	100
Deck	100
Bearings	40 (20 years for minor components only)
Expansion Joints	20 (10 years for minor components only)
Parapets (metal parts only)	40
Parapets (concrete parts only)	100
Drainage system	20

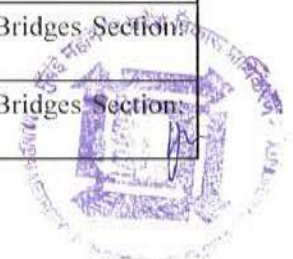
Before expiry of the Defects Notification Period, a joint visit to the Works by the Contractor and the Engineer (and/or the Employer's representative, as the case may be) shall be organized and conducted by the Contractor. In case any of the elements, including but not limited to the bearings, expansion joints, parapets and drainage system, are found defective and need repair or replacement, the repair or replacement as agreed with the Engineer (and/or the Employer's representative, as the case may be) shall be done by the Contractor at no additional cost to the Employer.

3.1.2 Design Standards and Codes

The bridges on the MTHL shall comply with the following design standards and codes in general. If there is no standard for specific design items for the bridges for the MTHL, the Contractor shall propose internationally-recognized standards to the Engineer for his approval before commencement of the design works.

Table 3.3 - Design Standards and Codes for Pre-stressed Concrete Bridge

Codes	Name
IRC: 5-1998	Standard Specifications and Code of Practice for Road Bridges Section: I General Features of Design
IRC: 6-2014	Standard Specifications and Code of Practice for Road Bridges Section: II Loads and Stresses
IRC: 18-2000	Design Criteria for Prestressed Concrete Road Bridges (Post-Tensioned Concrete)
IRC: 21-2000	Standard Specifications and Code of Practice for Road Bridges Section: III Cement Concrete
IRC: 78-2014	Standard Specifications and Code of Practice for Road Bridges Section: VII Foundations and Substructure



IRC: 112-2011	Code of Practice for Concrete Road Bridges
MORTH&H	Specifications for Road And Bridge Works

Table 3.4 - Design Standards and Codes for Steel Box Girder with Steel Deck

Name
Specifications for Highway Bridges, Japanese Highway Bridge Standards, published by Japan Road Association, March 2002

3.1.3 Bridge Loading**3.1.3.1 Dead Loads**

The unit weights of the construction materials shall be as defined in IRC: 6-2014, unless otherwise confirmed using weights of representative samples. Unit weight of the High Performance Concrete (HPC) shall be considered as 2.6 t/m³.

A load intensity of 5 kN/m along each outer parapet/vehicular crash barrier and central median parapet shall be allowed for the utility services such as lighting, emergency telephones and fire hydrants. The actual intensity shall be confirmed after the details and layout of such utility services have been finalized.

Design of the vehicular crash barrier/parapet, pedestrian parapet, noise barrier, view barrier and safety fences shall be proposed by the Contractor.

Adequacy of all Superimposed Dead Loads (SDL's) shall be re-confirmed in the detailed design against actual loads involved in the Works.

3.1.3.2 Differential Settlement

Differential settlement shall be taken as a permanent load, which shall be assessed separately for each bridge support taking into account the foundation type, loading intensity and the subsoil conditions.

The elastic modulus of concrete to be used in conjunction with the differential settlement effect shall be the long-term elastic modulus.

Forces and moments induced by differential settlements shall be considered as being modified by creep.

A minimum of 20 mm differential settlement shall be adopted for design of the bridge/viaduct structures to allow for the effects such as out-of-tolerance installation of bearings and elastic shortening of piles.

3.1.3.3 Environmental Loads

Regional meteorological data can be obtained from the Regional Meteorological Station, Mumbai. However, for design loads the relevant sections of the IRC codes and this Specification shall be adopted.

3.1.3.3.1 Wind Loads

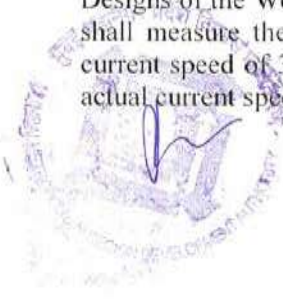
Winds loads shall be determined based on the basic wind speed for Mumbai, as defined in IRC: 6-2014.

3.1.3.3.2 Temperature Loads

Temperature effects/loads shall be determined based on the basic maximum and minimum temperatures for Mumbai, as defined in IRC: 6-2014.

3.1.3.3.3 Water Currents

Designs of the Works exposed to water currents shall be done as per IRC: 6-2014. The Contractor shall measure the actual current speed for consideration in the designs. However, a minimum current speed of 3m/sec in any direction shall be adopted for the purposes of designs, where the actual current speeds as measured are found to be less than 3 m/sec.



3.1.3.3.4 Wave and Abnormal Wave Loads

The effects of normal wave and abnormal wave loads shall be considered in the designs. The Central Water and Power Research Station (CWPRS) guidelines and reports should be consulted with for data on tides, currents and wave heights. IS: 4651-Part-III-1997 together with "Shore Protection, Planning & Design" Technical Report No.4, U.S. Army Coastal Research Centre, shall be used for calculation of the forces. In addition, the latest edition of the "Shore Protection Manual" published by the Coastal Engineering Research Centre, Department of the Army (USA) shall be used for computation of wave forces.

3.1.3.3.5 Seismic Actions

The seismic design shall be based on the IRC 6: 2014 and IS 1893 (Latest edition) except that the dynamic analysis method shall be adopted using spectra as defined in IS for Seismic Zone-III using "Z" factor of 0.16 for Maximum Considered Earthquake (MCE) and Operating Basis Earthquake (OBE) of $Z/2 = 0.08$, with importance factor of 1.5.

Effective live loads of 20% of design live loads shall be considered while evaluating seismic characteristics and load combinations as per IRC.

Two levels of earthquake shall be considered as follows:

(i) **Operating Basis Earthquake (OBE)**

Loading and load combinations should be as per IRC: 6-2014 for operating basis earthquake of $Z/2$. Damping level of 5% of critical damping for RCC, 2% for PSC and steel shall be used.

All parts of the bridge/viaducts should meet the requirements of the code for stresses and displacement as per IRC: 6-2014 (Working Stress Method).

For superstructure using segmental construction where reliance is put on pre-stressing tendon alone at joints of segments, the maximum stress in tendon steel shall be in linear elastic range at all times.

(ii) **Maximum Considered Earthquake (MCE)**

All the bridge components shall be verified for elastic state only for occurrence of maximum Considered Earthquake of $Z=0.16$ using linear analysis and load factors as given by IRC: 6-2014 Annex B.

All the main structural components shall remain safe and be repairable but the secondary components of the bridge including such as safety rails, expansion joints, may be allowed to be damaged but should be replaceable.

For superstructure using segmental construction where reliance is put on pre-stressing tendon alone, the maximum stress in tendon steel shall be in linear elastic range at all times.

Response Spectrum shall be developed according to the geological data by the contractor for the design.

Natural frequency of the longest bridge shall be computed with 3-D model to get the rigorous result and shall be compared with the result by Annex D of IRC: 6-2014.

Seismic clamps to resist up-lift due to Vertical action shall be installed on the Bearings or near it.

Anti-dislodgment devices shall be installed on pier to prevent the superstructure from falling down. The anti-dislodgment devices may be allowed to be damaged, if repairable.

3.1.3.4 Live Loading

3.1.3.4.1 Traffic Loads

Traffic loading shall be as defined in IRC: 6-2014 with Class 70R design vehicle and Class A as specified for 6 notional lanes.

In the design of superstructure, a combination of IRC loading as per the Clause 204.3 (IRC: 6-2014)



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For bridges classified under Clause 201.1 (IRC: 6 - 2014), the design live load shall consist of standard wheeled or tracked vehicles or trains of vehicles as illustrated in Figs. 3.1 and 3.2 . The trailers attached to the driving unit are not to be considered as detachable.

Within the kerb to kerb width of the roadway, the standard vehicle or train shall be assumed to travel parallel to the length of the bridge and to occupy any position which will produce maximum stresses provided that the minimum clearances between a vehicle and the roadway face of kerb and between two passing or crossing vehicles, shown in Figs. 1 to 3, are not encroached upon.

For each standard vehicle or train, all the axles of a unit of vehicles shall be considered as acting simultaneously in a position causing maximum stresses.

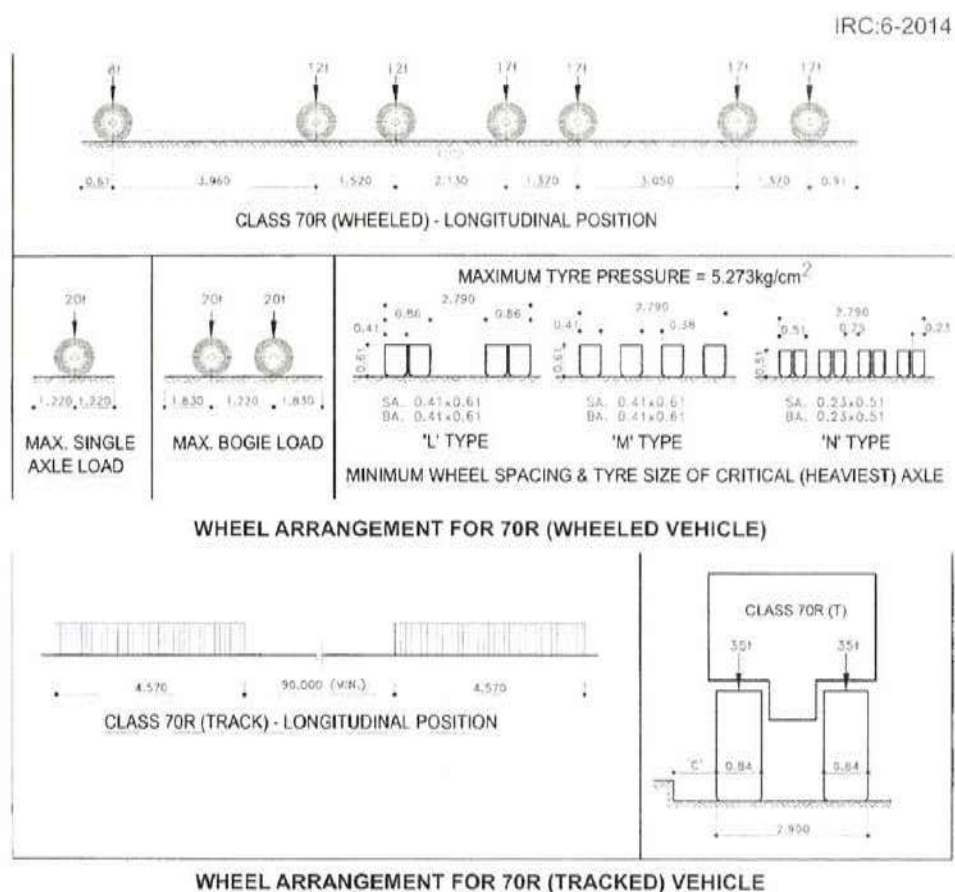


Fig. 3.1 Class 70R Tracked and Wheeled Vehicles (Clause 204.1)



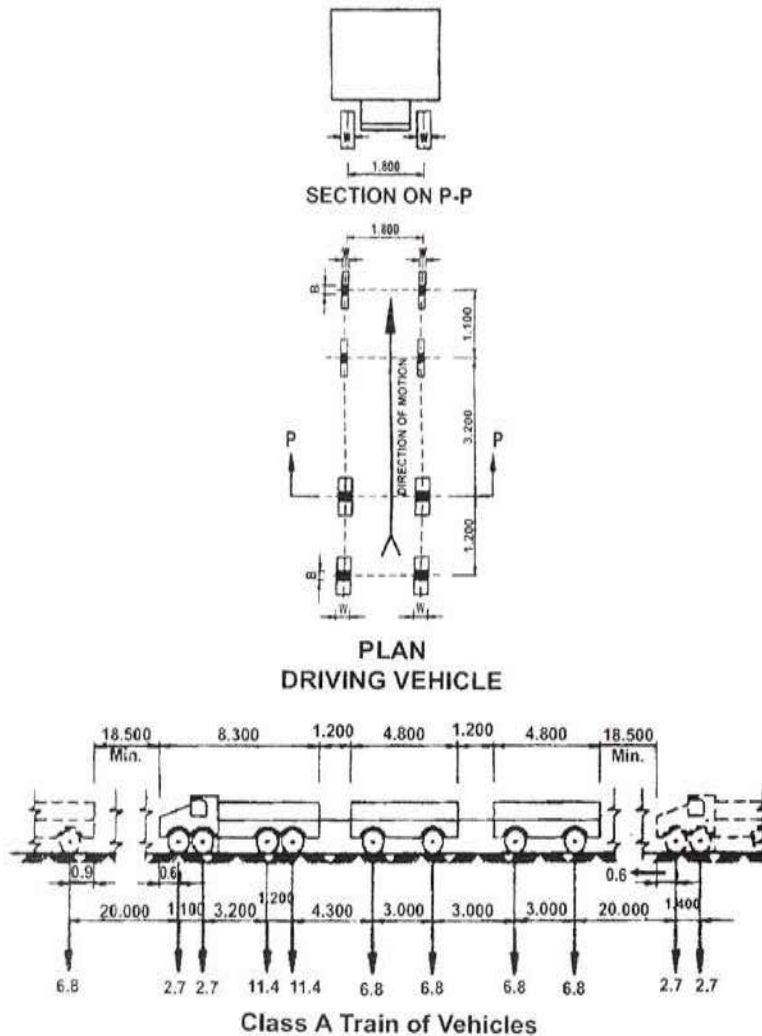


Fig. 3.2 Class A Train of Vehicles(Clause 204.1)

The ground contact areas shown in the above figure shall be as follow:

Table 3.5 - Ground Contact Areas (each type)

	Axle load(tonne)	"B" Along Traffic	"W" Across Traffic
1	11.4	250 mm	500 mm
2	6.5	200 mm	380 mm
3	2.7	150mm	200 mm

Congestion Factor:

The additional check for congestion of vehicular live load on the carriageway shall be considered. In the absence of any stipulated value, the congestion factor, as mentioned in IRC:6-2014.204.4 shall be considered. This factor shall be used as a multiplying factor on the global effect of vehicular live load only. Under this condition, horizontal force due to braking/acceleration, centrifugal action and temperature gradient effect need not be included, but the effect of live load impact shall be included.



Longitudinal Effects: Train of Vehicles

Reduction in the longitudinal effect on bridges having more than two traffic lanes due to the low probability that all lanes will be subjected to the characteristic loads simultaneously shall be in accordance with the IRC:6-2014.205.

Provision for impact or dynamic action shall be made by an increment of the live load by an impact allowance expressed as a fraction or a percentage of the applied live load.

3.1.3.4.2 Foot Over Bridge, Footway, Kerb, Railings, Parapet, and Crash Barriers

The horizontal force specified for footway, kerb, railings, parapet and crash barriers in this section need not be considered for the design of main structural members of the bridge, as per the Clause 206 (IRC: 6 - 2014) .

However, the connection between kerb/railings/parapet, crash barrier and the deck should be adequately designed and detailed

3.1.3.5 Accidental Loads

(i) Barge Impact on Piers:

Piers on either side of navigation channels shall be designed for Barge impact as per the Clause 220 (IRC: 6 - 2014)

The design vessel for the Thane and the Panvel Creek navigation spans, the Tata Thermal Power Station Coal Berth Channel, and the Tata Thermal Power Station Intake and Discharge Channels for Water Cooling shall be as follows:

Type: Barge
Class of Waterway :VI & VII
DWT: 4,000 tones
Speed:10 knots

The assumed vessel sailing paths shall be the center line of each navigation channel.

Vessel Impact Protection Systems shall be provided for the piers adjacent to the navigation channels.

Other piers may either be provided with the Vessel Impact Protection Systems or be designed to resist the impact force.

Approval of the Vessel Impact Protection System and the design ship impact forces adopted for both types of piers above must be obtained from the Engineer.

3.1.3.6 Construction Loads

Construction loads shall be considered according to the method to be used for construction/erection.

In addition, for deck structures subject to mobile construction plant and/or equipment essential for the assumed method of construction, the structures shall also be designed for the assumed temporary loads of the construction plant and/or equipment at each construction stage. The assumed temporary loads shall be clearly indicated on the relevant documents.

A minimum dynamic amplification of 50% of the loads during normal lifting operations shall be assumed, unless a lower factor can be justified to the approval of the Engineer considering the specific construction method and the actual construction plant and/or equipment which will be used.

Where precast or pre-fabricated segments are installed, the consequences to the stability of the structure due to sudden loss of a segment (failure of the lifting equipment) shall be determined. The consequences shall not be disproportionate to the event. A minimum dynamic amplification of 100% of the loads due to the sudden loss of a deck segment (as a construction condition) shall



be assumed.

3.1.3.7 Inspection and Maintenance Loading and Requirements

(i) General

Maintenance and repair activities consist primarily of:

- Replacement of bearings,
- Replacement of external tendons,
- Resurfacing,
- Loads due to equipment and inspection vehicles, and
- Maintenance access loading.

Loads due to repair and maintenance activities shall be considered in association with reduced primary loads.

(ii) Replacement of Bearings and Movement Joints

Provision for replacement of the bridge bearings shall be incorporated in As-build Drawings. Clearly defined zones/locations shall be marked on the Contractor's Technical Design drawings and As-Built Drawings as well as on the structure with suitably indestructible/renewable means to indicate where the structure may have temporary jacks inserted. Any restrictions on the positioning of the jacks shall be clearly noted on the drawings. The safe working load needed for these jacks shall be clearly marked on the drawings and the structure.

To allow future replacement of bearings in the bridge structure with minimal disruption to traffic on the bridge, the bridge structure shall be designed to allow a 20mm vertical jacking at any bridge bearing support with no traffic closure. However, no special vehicle loading needs to be considered during bearing replacement. The requirement of special vehicle loading during bearing replacement shall be stated clearly on the relevant Contractor's Technical Design drawings and As-Built Drawings and also in the proposed method statement for bearing replacement to be shown in the Maintenance Manual prepared by the Contractor.

The Contractor shall take into account the need for movement joint replacement in future and address the relevant provisions in their proposed design of the viaduct and bridges and the details, to the approval of the Engineer.

(iii) Replacement of External Prestressing Tendons

For external prestressing tendons adopted in the Technical Design, provision shall be made for the replacement of external prestressing tendons. External prestressing tendons shall be replaceable one by one by installing additional temporary tendons through the spare ducts provided in the bridge deck. Load effect of such operation shall be considered in the Technical Design.

(iv) Pavement Resurfacing

The design shall account for the forces that may occur as a result of resurfacing works when some of the superimposed dead load is removed.

Superimposed dead loads due to surfacing and parapets may be removed entirely from one carriageway or lane. This carriageway or lane may be closed to traffic and may not be loaded. These cases shall be considered in the designs.

(v) Maintenance Walkway Loading

A uniformly distributed load of 2 kN/m² and a concentrated load of 3 kN applicable to a square surface of 0.20m x 0.20m per span shall be used for the design of maintenance walkway on either side.



3.2. GENERAL REQUIREMENTS OF BRIDGE STRUCTURE DESIGN**3.2.1 Restrictions on Bridge / Type of Structure**

- (i) The spanning arrangement for the MTHL shall be generally in accordance with the table in Clause 2.4. Particularly, for the steel box girder sections, the span arrangement specified in the Outline Drawings shall not be changed unless the locations of the submerged pipelines on the seabed are found to be different from the locations specified in the Outline Drawings. For the ramps of the interchanges, structures of PC hollow slab or PC box girder type shall be in accordance with the Outline Drawings.
- (ii) Superstructures involving Cable elements such as suspension bridges, cable-stayed bridges and extradosed bridges are not allowed in the marine section.
- (iii) Bridges/viaducts structures involving steel and concrete composite construction shall not be used except for Rail over Bridges (ROBs).
- (iv) Reinforced Concrete superstructures shall not be used for spans more than 15.0m.
- (v) Any new solutions / technologies which have not been used over a long period and have not been used successfully for a large number of projects in a marine environment may be liable to rejection by the Engineer at his sole discretion.
- (vi) Multi-girder concrete superstructure with open section shall not be permitted in marine portion.

3.2.2. Aesthetic Requirements for Bridges/Viaducts**3.2.2.1 Aesthetic Strategy Report**

Overall aesthetics and architectural detailing of the structural and non-structural members shall be given proper attention. The Contractor shall develop an Aesthetic Strategy Report for the MTHL presenting a comprehensive aesthetic strategy and theme, together with supporting design guidelines. The theme concept shall include architectural elements such as railings, fences, building facades, tollbooths, lighting standards, finishes, aesthetic lighting and other significant visual elements. An architect experienced with similar major public development shall develop the Aesthetic Strategy Report with the bird's-eye animation showing the aesthetic appearance for the MTHL. Appointment of the architect/aesthetic designer shall be subject to prior approval by the Engineer.

The Engineer shall coordinate with the Contractors of other packages as needed to unify the aesthetic strategy for the whole MTHL.

3.2.2.2 Final Design Consistency with Aesthetic Strategy Report

The Aesthetic Strategy Report shall be subject to the approval of the Engineer after coordination with the Contractors in other package. The final design of the Works shall be consistent in all material respects with the approved Aesthetic Strategy Report.

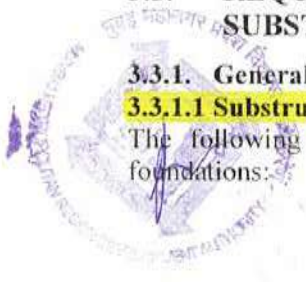
3.2.2.3 Aesthetic Design Requirements

In general, the aesthetic design of the viaduct and bridge structures for the MTHL should comply with the following requirements.

- (i) Lighter and visually pleasant structural profile shall be proposed. All proposed structures shall ensure a simple and elegant structural form.
- (ii) The span length of the bridges/viaducts shall be designed with regular rhythm and odd span length shall be minimized given that all site constraints and requirements need to be satisfied.
- (iii) The visual experience from the main carriageway by users and outside of the MTHL shall be considered in the aesthetic design of the viaduct structure.

3.3. REQUIREMENTS FOR CONCRETE SUPERSTRUCTURE, SUBSTRUCTURE AND FOUNDATION**3.3.1. General Requirements****3.3.1.1 Substructures and Foundations**

The following requirements shall apply to the design and construction of the piers and foundations:



- (i) At the time of bidding, for the purpose of preparing the preliminary/bidding design, the Contractor has to set an estimated line of bearing stratum based on the geological/subsoil investigation report issued by the Employer. The bearing stratum level at a location between two adjoining boreholes shall be determined by straight line interpolation based on the geological/subsoil investigation data provided by the Employer. In the Technical Design stage after award of the Contract, the Contractor shall determine the final bearing stratum levels at the proposed locations of the piers, abutments, etc. based on additional geological/subsoil investigation may be carried out by the Contractor as his own cost. The Contractor is expected to carry out geotechnical investigations conforming to provisions of IRC for design of the foundations during the Technical Design stage. The Contractor shall carry out geotechnical/subsoil investigations involving boreholes at least at every proposed pier or abutment location, to assess the nature and characteristic of founding strata to finalize the pile/base design. Additional boreholes shall also be taken, at no additional cost to the Employer, as may be ordered by the Engineer, as needed to confirm the strata as per requirement emerging during the design or Execution of the Works.
- In case there is a variation found in the information presented in the geological/subsoil investigation report provided by the Employer and the depth of foundations assumed in the preliminary/bidding design is required to be changed due to the difference in sub-soil strata, costs for the difference in the depth of foundation shall be adjusted equitably under GC Clause 13. The onus of proving the variation in the information presented by the Employer in the geological/subsoil investigation report shall be on the Contractor.
- (ii) The Contractor shall take necessary measures to prevent siltation.
- (iii) Scour
The effect of scour on the bridge structures shall be considered in the Technical Design. Predicted scour shall be accounted for in the Design. Alternatively, provisions shall be made to prevent/control scour through appropriate measures or provisions shall be included in maintenance plans to detect and remedy scour effects which may occur in the future, so as to avoid any unacceptable negative impacts on the structural safety of the MTHL. The Contractor shall at his own cost repair any scour occurred during the construction period and take necessary measures to prevent scour in the future, to the approval of the Engineer.
- (iv) Pile End Bearing Capacity and Rock Socket Friction Capacity
The pile end bearing capacity and rock socket friction capacity in the founding strata shall be finally verified based on Dynamic loading test (2% of the total number of piles) as specified in the relevant IRC 78 (IS 2911). The pile end bearing capacity and rock socket friction capacity analysis shall be submitted to and approved by the Engineer before commencing the permanent piling work.
- (v) The concrete piles shall be verified the integrity by Sonic echo test. Sonic tubes shall be installed in all of piles, and the test shall be carried out randomly at one pile per one pier according to the Engineer's decision.
- (vi) Foundation types shall be End bearing pile foundation for all marine and CRZ area. Spread foundation shall be permitted on the land area if founding stratum is at a shallow depth. Friction pile shall not be allowed. Other types of foundation can be proposed to the Engineer by the Contractor for his approval, but no diagonal pile will be accepted.
- (vii) The construction method for installation of piles within the inter-tidal zone shall not cause significant disturbance to the mud-flats.
- (viii) Piles for the marine viaduct and bridges shall be provided with permanent steel liners which thickness is shown as follows;

Up to and including 1.5m dia	: 8mm
Greater than 1.5m dia and up to and including 2.0m dia	: 12mm
Greater than 2.0m dia	: 16mm

The liner plate shall be embedded in concrete to at least 50mm from the bottom of the pile cap.



The minimum cut-off level of the steel liner and pile shall be +6.05m above Chart Datum (C.D.). The structural design of the piles shall not rely on any structural capacity contribution from the permanent steel liners in its structural analysis of the piles

- (ix) For pile caps to piers adjacent to navigation spans and ones to piers adjacent to submerged pipelines on the seabed, the top surface of the pile caps shall be set out at a minimum level of +6.00 m above C.D.
- (x) For marine pile caps not adjacent to navigation spans, the bottom surface of the pile caps shall not be set lower than +6.00 m above C.D.
- (xi) The top of pile cap / open foundation shall be kept at least 1.2m below the finished ground level, unless otherwise agreed with the relevant authorities.
- (xii) Plan shape of single piers shall be rectangular with round edges. The shape of piers shall be uniform throughout the alignment, except for unavoidable cases such as changes in the width of road or pier interval for reasons of reducing the adverse effect on landscape or aesthetics.
- (xiii) Bridge piers/foundations flanking the navigation channels shall be designed to resist potential barge impact forces as mentioned in para 3.1.3.5. These piers shall also be protected by Vessel Impact Protection Systems structurally independent from the bridge piers/foundations.
- (xiv) Mono (Single) Pile foundation system for a pier should not be applied.
- (xv) Rock/soil anchors of prestressed or non-prestressed type should not be applied for resisting tension and/or anchoring foundations to rock/soil for piers and abutments.

3.3.1.2 Concrete Superstructure

The following requirements shall apply to the design and construction of concrete superstructure:

- (i) The minimum span length of the superstructure for the inter-tidal zone and sea zone shall be 50m.
- (ii) Superstructure for the pre-stressed concrete (PC) bridges for the MTHL shall be of box girder type. The girder shall have a diagonal web with angle and the length of the cantilever slab shall be uniform with 1.5m ~ 3.0m, except for the unavoidable case, such as changes to the width of road or pier interval for reasons of reducing the adverse effect on landscape or aesthetics.
- (iii) The minimum thickness of concrete deck slab shall be 250mm except for the edge of cantilever slab.
- (iv) Superstructure shall be continuous for 200m or more, without any movement joint on the bridge/pavement surface, in order to improve the travelling performance and reduce operation and maintenance burden.
- (v) Where possible, PC superstructure of marine bridges shall be rigidly connected with piers.
- (vi) Both superstructures and piers for the main carriageway of each direction shall be structurally independent from the other in order to meet the security requirements.
- (vii) Where possible, an abutment for a ramp bridge for interchange shall be set as lower as possible unless the girder depth of the superstructure does not disturb the finishing ground level around the abutment.
- (viii) Should the prestress design of PC bridges be based on post-tensioning by the use of internal prestress tendons only or a combination of internal and external prestress tendons, then provision shall be made in the design to replace at least 25% of the internal prestress tendons with structurally equivalent external prestress tendons, should replacement of internal tendons become necessary due to deterioration of some of the internal prestress tendons.
- (ix) It is permissible to conduct the prestress design for PC bridges with pre-tensioning method.
- (x) Full prestressed system should be applied but not application of partially prestressed structures.
- (xi) Over the inter-tidal zones, the construction of the superstructure shall be by overhead gantry methods only in order to avoid or minimize disturbance to the mud flats and the marine ecology.
- (xii) Facilities for inspection and maintenance activities shall be included in the bridge design. Access to the inside of the box girders for main carriageway and ramps shall be located in the soffit of the box girders and shall be provided at minimum intervals of 1.0 km.



3.3.2. Specific Requirements

3.3.2.1. Reinforced Concrete

3.3.2.1.1 Concrete Grades

All the concrete to be used in the Works shall be of Grade 45 MPa at a minimum, and the minimum concrete grades to be used for components of the bridge shall be as per the following table.

Table 3.6 – Concrete Grades

Location of Use	Minimum Grade, in MPa
Concrete for foundation including bored pile	45
Pile caps	45
Pile cap skirts	55
Walls , Abutments	45
Piers	55
Deck	55
Parapets and median	45

Pulverised Fly Ash (PFA)/ Ground Granulated Blast Furnace Slag(GGBS) and Ultrafine additives (silica fume/ Ultrafine Slag) must be incorporated in all concretes of Grade 45 and above. Ultrafine additives shall have particle size (d95) less than 11 microns and mean particle size (d50) not more than 6 microns. The minimum cementitious content (including PFA/GGBS and Ultrafine additive) shall be 400kg/m³ for all concrete Grade 45 and above. Maximum water to binder ratio shall not exceed 0.38 for all concrete Grade 45 and above.

The ultrafine mineral admixtures shall comply with IRC:SP.70-2005 and IRC:112-2011.

The ultrafine mineral admixtures shall not exceed 10% of total cementitious/binder content OPC shall not exceed 400kg/cm.

When PFA is incorporated in the concrete as a separate material, it shall not exceed 40% of the total cementitious content.

When GGBS is incorporated in the concrete as a separate material, it shall not be less than 50% and more than 70% of the total cementitious content.

The Contractor shall propose and conduct a program of trial mixes for all grades of concrete to demonstrate their suitability for use in the Works and to meet the Outline Specifications.

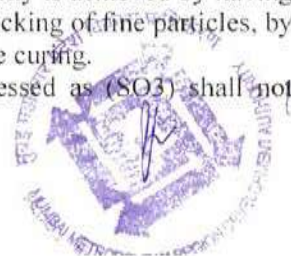
3.3.2.1.2. Concrete performance

High performance concrete (HPC) can be used for any type of concrete members. However, the application of the concrete member, its purpose and the mix design to be made of HPC shall require the Engineer's approval. Applicable specifications for HPC shall be IRC, BS EN and AASHTO, etc.

3.3.2.1.3 Durability

Concrete should be durable to provide satisfactory performance in the anticipated exposure conditions during service. The materials and mix proportions specified and used, and the workmanship employed should be such as to maintain its integrity and to protect embedded metal from corrosion. One of the main characteristics influencing the durability of concrete is its impermeability to the ingress of water, oxygen, carbon dioxide, chloride, sulphate and other potentially deleterious substances. Impermeability is governed by the constituents and workmanship employed in making the concrete. A suitably low permeability is achieved by having an adequate cement content, sufficiently low water-cement ratio, dense packing of fine particles, by ensuring thorough compaction of the concrete, and by timely and adequate curing.

Total water-soluble sulphate (SO₃) content of the concrete mix, expressed as (SO₃) shall not exceed 4 per cent by mass of cement used in the mix.



Section VI-1. Employer's Requirements

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Total chloride content in concrete, expressed as chloride-ion, shall not exceed the following values by mass of cement used:

Type	Amount (percent)
Prestressed concrete	0.10
Reinforced concrete	-
(i) in severe condition of exposure	0.20
(ii) in moderate condition of exposure	0.30

The following test shall be made in order to secure the durability of concrete.

(1) Chloride Migration Coefficient Test

Chloride Migration Coefficient Test shall be tested as per NT Build 492.

Concrete quality classification based on the migration coefficient

Non-steady state migration coefficient ($\times 10^{-12} \text{ m}^2/\text{s}$)	Concrete quality
< 2	Very good
2 – 8	Good
8 – 16	Normal
> 16	Poor

For Substructure, Chloride migration coefficient shall be less than $2 \times 10^{-12} \text{ m}^2/\text{s}$. For Superstructure, Chloride migration coefficient shall be 2 to $8 \times 10^{-12} \text{ m}^2/\text{s}$

(1) Water Permeability Test:

Water Permeability Test shall be carried out as per BS EN 12390-8:2000 or DIN 1048 part 5-1991. Depth of Water penetration shall not be more than 10 mm.

(2) Initial Surface Absorption Test (ISAT):

Initial surface absorption tests shall be tested as per BS 1881: part 208 – 1996. For Substructure, ISAT shall not be more than 0.25ml/m²/sec. For Superstructure, ISAT shall be 0.25 to 0.5 ml/m²/sec

3.3.2.1.4 Cement

Cement for various structural elements shall be the following types.

- Pile (Severe Exposure): PSC as per IS 455, PPC as per IS 1489 Part 1 with minimum compressive strength of 53 MPa at 28 days as per IS 14343
- Pile Cap, Raft Foundation: PSC as per IS 455, PPC as per IS 1489 Part 1 with minimum compressive strength of 53 MPa at 28 days as per IS 14343
- Superstructure: OPC, PSC as per IS 455, PPC as per IS 1489 Part 1 with minimum compressive strength of 53 MPa at 28 days as per IS 14343

Cement to be used in the works shall be any of the following types with the prior approval of the Engineer :

- a) Rapid Hardening Portland Cement, conforming to IS:8041.
- b) Ordinary Portland Cement, 43 Grade, conforming to IS:8112.
- c) Ordinary Portland Cement, 53 Grade, conforming to IS: 12269.

Cement conforming to IS: 8112 and IS: 12269 may be used provided the minimum cement content mentioned elsewhere from durability considerations is not reduced. From strength considerations, these cements shall be used with a certain caution as high early strengths of cement in the 1 to 28-day range can be achieved by finer grinding and higher constituent ratio of C₃S/C₂S, where C, S is Tricalcium Silicate and C₂S is Dicalcium Silicate. In such cements, the further growth of strength beyond say 4 weeks may be much lower than that traditionally expected. Therefore, further



strength tests shall be carried out for 56 and 90 days to fine-tune the mix design from strength considerations.

Cement conforming to IS: 8041 shall be used only for precast concrete products after specific approval of the Engineer.

3.3.2.1.5 Chloride Resistance

Chloride resistance testing shall be conducted on specimens prepared from cylinders cast at the same time as routine cube prepared during concrete delivery. Cylinders shall be cured in water and tested at 28 days to AASHTO T277-98. Action shall be taken to improve the chloride resistance of the concrete mix in the event of failure to achieve the specified values. One test shall be conducted per 50m³ of concrete.

3.3.2.1.6 Sulphate Content of Fresh Concrete

The total acid soluble sulphate content of the concrete mix, expressed as SO₃, shall not exceed 4% SO₃ by mass of total cement in the mix. The sulphate content shall be calculated as the total from the various constituents in the mix. Evidence of compliance before using any concrete shall be provided to the Engineer.

3.3.2.1.7 Corrosion Inhibitor

For all bored piles, buried concrete and concrete in every part, bipolar, migrating, non-nitrite based concrete penetrating corrosion inhibiting admixture shall be added at a dose of 3 kgs per cum of concrete. The admixture should be accredited by Indian Roads Congress, enlisted in Engineers India Limited list of approved products and have a 4 year track record of supply and use in the Gulf Region or areas having similar corrosive environments. The admixture shall also have evaluated test reports demonstrating a corrosion rate of zero coulombs after 45 test cycles as per ASTM G-109-2005 when tested from any one of the internationally ranked among the following top 4 research institutions in the world in Annual Survey conducted by Georgia Institute of Technology on Ranking of Research Institutions:

- Massachusetts Institute of Technology(MIT), USA
- Delaware University, USA
- Georgia Institute of Technology, USA
- Institute of Chemical Technology, India

Further, admixture must indicate significant reduction in corrosion after accelerated corrosion test based on JIS Z 1535 and must have undergone long term performance tests as per ASTM G1 and ASTM G3, indicating negligible rebar weight loss of less than 5 mpy (mils per year) for both tests. pH of admixture should be alkaline in nature, specific gravity of 0.99 – 1.1. Admixture must not have any adverse effect on concrete compressive strength. The Contractor must intimate the Engineer in charge prior to addition in concrete for recording. If the admixture is put in the concrete mix at the batching plant, a written record of the amount of admixture used and the total mixing time shall be supplied to the Engineer. The Engineer must ensure the specified dosage of admixture added in concrete mix.

3.3.2.2. Reinforcement

3.3.2.2.1 Material

Reinforcement steel shall conform to the relevant IRC codes.

3.3.2.2.2 General Reinforcement Cover and Crack Widths

For the targeted service life of 100 years, the durability recommendation given under Clause 14 of IRC:112-2011 for "extreme condition" for structures lying in intertidal zone and for land viaduct prone under "very severe" condition shall be modified as given in the following table.

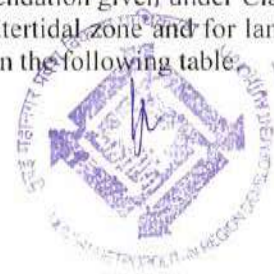


Table 3.7 – Modifications Required

Element	IRC Exposure Category	Crack Width to IRC (mm)	Nominal Cover for Crack Width Determination (mm)	Actual Cover for Durability to achieve design life (mm)
Piles below level -0.50m CD	Severe	0.3	30	75
Piles from level -0.50m to +10.5m CD	Extreme	0.25	30	75
Piles from level +10.5m CD to u/s of Pile Bent Cross Head	Very Severe	0.25	30	50
Pile caps	Extreme	0.25	30	75
Pile bent Cross Head from level +10.5m CD upwards	Very Severe	0.25	30	50
Pier Columns up to level +10.5m CD	Extreme	0.25	30	75
Pier Columns from level +10.5m CD upwards	Very Severe	0.25	30	50
Prestressed Concrete Decks	Severe	0.25	30	45

3.3.2.2.3 Reinforcement

The bridge is located in marine environment and suitable protection needs to be provided to reinforcement to prevent corrosion. The anticorrosive treatment shall be epoxy coating shall be used as a minimum protection against corrosion with the specified cover for only pile cap and piers shown on the above table irrespective of the grade of concrete and exposure condition.

3.3.2.2.4 Reinforcement Couplers

The use of the type A and B couplers shall be allowed for re-bar joints with more than 16mm dia. and above, for which the international codes shall be adopted

3.3.2.2.5 Wire Mesh

Wire Mesh shall be installed at the location where the actual cover is more than 50mm..

3.3.2.3. Prestressed Concrete**3.3.2.3.1 General**

In terms of Concrete grade, Concrete performance, Durability, Cement, Chloride Resistance, Sulphate Content of French Concrete, Corrosion Inhibitor, provisions in clause 3.3.2.3 shall be referred.

3.3.2.3.2 Segmental Concrete Construction

All precast segmental concrete decks shall be designed to ensure minimum residual compression as per IRC SP 65 under any service load combination. All joints shall be glued and the deck waterproofed to its full width to minimize water leakage from the joints. Surfacing trials shall be arranged to demonstrate the suitability and compatibility of the waterproofing layer and the surfacing.

3.3.2.3.3 External Pre-stressing

If fully external pre-stressing tendons are adopted, bridges/viaducts shall be checked to ensure that failure of any two external tendons or of 25% of those at one section, whichever is the greater, shall not lead to collapse at ultimate limit state under the design ultimate permanent loads. In assessing the loss of tendon, torsion effect on the deck and the shock loading due to the sudden release of tension shall be included.

For use of the external prestressing, reference shall be made to IRC:SP:67-2005 (Guidelines for Use of External Unbonded Prestressing Tendons in Bridge Structures) and the following UK Highways Agency documents for design aspects not covered by the documents mentioned in IRC



Guidelines and this Outline Specification:

- (i) BD 58/94 - The Design of Concrete Highway Bridges and Structures with External and Unbonded Prestressing; and
- (ii) BA 58/94 - Advice Note to BD 58/94.

All external tendons shall be replaceable and provisions shall be made within the design for inspection, removal and replacement of any external tendon within each group of tendons.

3.3.2.3.4 Pre-stressing Strand Steel

Epoxy coated seven-wire low relaxation strand conforming to the pertinent IRC Codes shall be adopted.

3.3.2.3.5 Pre-stressing Ducts and Anchorages

Pre-stressing components used with ducts that are partially or completely external to a concrete section shall be designed to allow the sheath and tendon to be replaced.

The system of sheaths, sheath connectors, grouting connections, vents, vent connections, drains, transitions to anchorages and deviators and caps for anchorages shall form a complete encapsulation for the tendon that is resistant to the passage of air and water. Sheaths shall be of proven corrosion-resistant durable non-metallic materials such as high-density polyethylene or polypropylene. Sheathing that may degrade or corrode during the expected life of the structure in the presence of contaminants permeating the surrounding concrete is not permitted. Recycled polyethylene or polypropylene shall not be used.

The prestressing system shall be fully compatible with the prestressing anchorages, couplers and other details.

Where sheaths are non-conductive, metal parts of anchorages shall be electrically bonded to the adjacent reinforcement at each end of the tendon and electrical continuity of the structure over the length of the tendon shall be tested. The minimum manufactured wall thickness of sheathing for internal tendons shall be 5 mm for HDPE sheaths. The sheath rigidity and the type and spacing of fixings and supports shall be such as to maintain line, position and cross-section shape during concreting. Local deformation of the sheath at supports shall be avoided. The minimum manufactured wall thickness of sheathing for external tendons shall be not less than the internal diameter of the sheathing divided by 16.0 for durability, or such thicker wall as required to withstand the grouting pressures of 1.0 N/mm² normally, for the particular duct configuration.

The design of ducts shall allow for grout to be injected from either end. There shall be no sudden changes in the diameter of the duct. Evidence of testing to demonstrate that the wall thickness after tensioning of the internal tendons shall not be less than 1.5mm, shall have to be provided immediately to the Engineer.

3.3.2.3.6 Tendon Grouting

Grouting for pre-stressing system shall strictly conform to the pertinent IRC code stipulations and grout shall be admixed with bipolar, migrating, non-nitrite based concrete penetrating corrosion inhibiting admixture at a dose of 5% by weight of cementitious in tendon grout. The admixture should be accredited by Indian Roads Congress, enlisted in Engineers India Limited list of approved products and have a 4 year track record of supply and use in the Gulf Region or areas having similar corrosive environments. The admixture shall also have evaluated test reports demonstrating a corrosion rate of zero coulombs after 45 test cycles as per ASTM G-109-2005 when tested from any one of the internationally ranked among the following top 4 research institutions in the world in Annual Survey conducted by Georgia Institute of Technology on Ranking of Research Institutions.

- Massachusetts Institute of Technology(MIT), USA
- Delaware University, USA
- Georgia Institute of Technology, USA
- Institute of Chemical Technology, India



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Further, admixture must indicate significant reduction in corrosion after accelerated corrosion test based on JIS Z 1535 and must have undergone long term performance tests as per ASTM G1 and ASTM G3, indicating negligible rebar weight loss of less than 5 mpy (mils per year) for both tests. pH of admixture should be alkaline in nature, specific gravity of 0.99 – 1.1. The Contractor must intimate the Engineer prior to addition in tendon grout for recording. A written record of the amount of admixture used and the total mixing time shall be supplied to the Engineer. The Engineer must ensure the specified dosage of admixture added in tendon grout.

3.4. REQUIREMENTS FOR STEEL SUPERSTRUCTURE**3.4.1. General Requirements**

The following requirements shall apply to the design and construction of the steel box girder bridges:

- (i) The steel deck of the steel box girder shall be designed as Orthotropic Plate consisted of the longitudinal ribs and the floor beams with the special attention against the fatigue crack in welding part between the deck plate and the ribs.
- (ii) Minimum thickness of the deck plate shall be 12mm with use of open rib. In case of the close rib such as trough, the minimum thickness of the deck plate shall be 16mm.
- (iii) The steel deck shall be checked both as acting with main girder and acting as floor system.
- (iv) The shape of the steel box girder shall be determined after checking aerodynamic stability by wind tunnel tests.
- (v) The steel box girder on the marine shall be erected by Large Block Erection Method using floating cranes or other adequate equipment/system.

3.4.2. Specific Requirements**3.4.2.1. General**

Contractor's responsibilities include, but not be limited to, the following.

The Contractor shall provide all materials and equipment required to complete the Works in every respect, whether such materials and equipment are required as part of the permanent structures or temporary for fabrication or erection or maintenance including specifically structural steel plates, shapes, flats, bars, welding rods, rivets, bolts and nuts, paint, welding sets in the shop and at site, all workshop facilities, derricks, cranes, pulley blocks, wire ropes, slings, hemp or manila ropes, winches, small tools and tackles, jacks, erection cleats and temporary braces or supports and all other materials required to deliver the Works complete in every respect.

The Contractor shall supply all labour required for fabrication and erection for any cleaning, making good, rectifying, hauling, and painting and for any other ancillary work required to complete fabrication and erection.

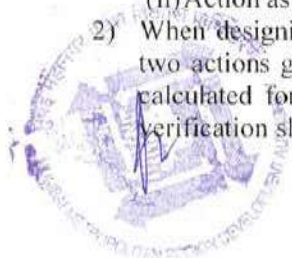
The Contractor shall observe all safety requirements for erection of structural steelwork as covered in IS: 7205 as a minimum and other relevant Indian / international standards.

3.4.2.2. Design

All steel bridges in the marine section shall be of "Steel Box Girder with Steel Deck" type designed as the orthotropic steel deck which consists of a deck plate stiffened by longitudinal and transverse ribs and supported by stringers, crossbeams or other floor structures, or main girders as mentioned in "3.2.1 Restriction on Bridge Type/Structure."

When the orthotropic steel deck acts as part of a main girder, the design shall be made in accordance with the following stipulations:

- 1) The orthotropic steel deck shall be checked for safety from the following two actions:
 - (i) Action as part of a main girder, and
 - (ii) Action as a deck and floor system.
- 2) When designing an orthotropic steel deck, it shall be verified for safety in the case where the two actions given in 1) those are considered at the same time. In this case the stress shall be calculated for each action in the most adverse load state of the orthotropic steel deck, and verification shall be made for the sum of the stresses thereby calculated in accordance with the



allowable stress provided in Design Criteria shown in 3.4 Design Criteria and Specifications for Bridges/Viaduct. For a weld zone or a high strength bolt joint, verification shall be made against the allowable stress given in Design Criteria shown in 3.4 Design Criteria and Specifications for Bridges/Viaduct. The allowable stress/force increased by 40 percent, shall be applied for the verification.

3.4.2.3. Wind Tunnel Test

The Contractor shall verify the aerodynamic stability of the designed steel bridges by wind tunnel tests. Especially, the safety against the galloping action shall be verified on the tests.

The wind tunnel test shall be carried out at the Contractor's own cost according to "Manual of Design of Steel Highway Bridges for Aerodynamic Stability" published by Japan Road Association and "Design Specification of Honshu-Shikoku Bridges for Aerodynamic Stability" published by Honshu-Shikoku Bridge Authority.

When the structure develops problems with the stability as a result of the wind tunnel test, the shape of the box girder shall be improved or the parts to make the girder stable shall be installed.

3.4.2.4. Drawings

- (i) The Contractor can refer to the Outline Drawings attached in the Employer's requirements for preparation of his Preliminary/Bidding Design, which shows bridge type by sections, sizes of all structural members and typical connection details.
- (ii) Should there be any discrepancy in the Drawings, the Contractor is to refer the matter to the Engineer for the Engineer's decisions and instructions during the bidding period
- (iii) The Contractor shall prepare all the necessary fabrication shop drawings for submission to the Engineer in duplicate. The drawings shall be approved by the Engineer before fabrication is commenced. All such drawings shall show the dimensions of all parts, method of construction, welding and bolting. A further set of all approved fabrication drawings shall be supplied by the Contractor for use of the Engineer as required.
- (iv) Approval by the Engineer of drawings or any other particulars submitted by the Contractor shall not relieve the Contractor of full responsibility for any discrepancies, errors or omissions therein. The Contractor shall at his own expense supply such additional copies of his working drawings as are required for the use of the interested parties.

3.4.2.5. Materials

All materials for the steel bridges shall conform with the "Specifications for Highway Bridges - Part 1 Common - Chapter 3 Materials - March 2002" published by Japan Road Association.

3.4.2.6. Workmanship for Design, Fabrication and Erection

The Works in whole shall be representative of the highest class of workmanship. The greatest accuracy shall be observed in the design, manufacture and erection of every part of the Works to ensure that all parts will fit accurately together on erection.

All workmanship and fabrication for steel bridges shall conform to the "Specifications for Highway Bridges - Part 2 Steel Bridges - Chapter 17 Fabrication - March 2002" published by Japan Road Association.

3.4.2.7. Supplementary Specifications for Steelworks

- (i) All parts assembled for bolting shall be in close contact over the whole surface and all bearing stiffeners shall bear tightly at top and bottom without being drawn or caulked. The component parts shall be so assembled that they are neither twisted nor otherwise damaged as specified cambers, if any, shall be provided. Drilling done during assembling shall not distort the metal or enlarge holes. The butting surfaces at all joints shall be so cut and milled so as to butt in close contact throughout the finished joints.
- (ii) Cutting shall be done automatically. Hand flame cutting will not be permitted.
- (iii) The edges and ends of all cut/sheared flange plates, web plates of steel girders, and all cover



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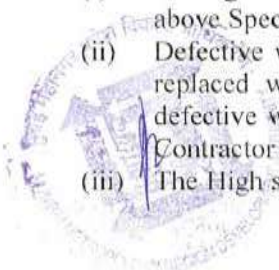
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plates, and the ends of all angles, tees, channels and other sections forming the flanges of steel girders, shall be planed/ground.

- (iv) Holes for bolts shall be drilled to conform to clause 17.3.1 of the above Specification. Punching of holes will not be permitted. All drilling shall be free from burrs. No holes shall be made by gas cutting process.
- (v) All welding for the works shall be carried out by first class welders and shall be in accordance with clause 17.4 "Welding" of the above Specification. The Engineer may at his discretion order periodic tests of the welder and/or of the welds produced by them. All such tests shall be carried out by the Contractor at his own cost.
- (vi) Safety requirements should conform to SP:70, IS: 7205, IS: 7273 and IS: 7269 as applicable and should conform to safety, economy and rapidity.
- (vii) As much work as possible shall be welded in shops. The pieces shall be manipulated to ensure down-hand welding for all shop joints as far as practicable. All parts to be welded shall be arranged so as to fit properly on assembly. After assembly and before the general welding is to commence, the parts are to be tack-welded with small fillet or butt welds as the case may be. The tack welding must be strong enough to hold the parts together but small enough to be covered by the general welding. The welding procedure shall be so arranged that the distortion and shrinkage stresses are reduce to a minimum.
- (viii) All joints required in structure to facilitate transport or erection shall be shown on the approved drawings or as specified by the Engineer. Should the Contractor need to provide joints in locations other than those approved or specified by the Engineer he shall submit his proposals and obtain the prior sanction of the Engineer for such joints. The lengths of structural members shall be the maximum normally available in the market; jointing of members of shorter length in order to make up the required lengths shall not be permitted.
- (ix) Each piece of steel structural members shall be marked distinctly before delivery, indicating the position and direction in which it is to be fixed. Three (3) copies of each complete marking plan are to be supplied to the Engineer before erection commences.
- (x) In the case of welded fabrication, any distortion remaining in the structural members after completion of the welding operations shall be rectified by the Contractor at the expense of the Contractor to the approval of the Engineer.
- (xi) All of the templates and jigs used throughout the steel fabrication work shall be steel. In cases where actual materials have been used as templates for drilling similar pieces, the Engineer shall decide whether they are fit to be used as parts of the finished structure.
- (xii) Apart from the requirements of welding specified above, the Contractor shall ensure the following requirements in the welded joints:
 - a) Strength-quality with parent metal,
 - b) Absence of defects, and
 - c) Corrosion resistance of the weld shall not be less than that of parent material in an aggressive environment.
- (xiii) No gasket or other flexible material shall be placed between the holes. The holes in parts to be joined shall be sufficiently well aligned to permit bolts to be freely placed in position. Driving of bolts is not permitted. The nuts shall be placed so that the identification marks are clearly visible after tightening. Nuts and bolts shall always be tightened in a staggered pattern and, where there are more than four (4) bolts in any one joint, they shall be tightened from the center of the joint outwards.
- (xiv) Field joint shall be by welding or high strength bolting. Rivet shall not be allowed.
- (xv) Fastening of high strength bolts shall be in accordance with clause 17.5 "High Strength Bolt" of the above Specification.

3.4.2.8. Testing and Inspection of Welds and High Strength Bolt

- (i) Testing and Inspection of Welds shall be in accordance with clause 17.4 "Welding" of the above Specification.
- (ii) Defective welds shall be repaired or replaced as decided by the Engineer. The repaired or replaced welds shall be tested using the same methods as above. Additionally, when defective welds are found, the cause of the defective welding shall be determined and the Contractor shall institute immediate corrective actions.
- (iii) The High strength bolt shall undergo inspection after tightening to confirm that the required



- tightening has been performed.
- (iv) In case of rejection in inspection, an appropriate treatment shall generally be applied in order to secure the required quality.
 - (v) No extra payment to the Contractor shall be made for the tests indicated above.

3.4.2.9. Heavy Duty Anti-Corrosion Painting for Surface of Steel Bridge

A. External painting

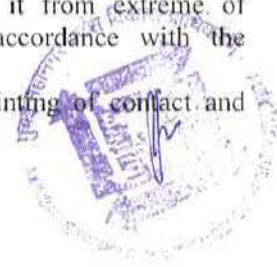
- (i) Blasting, where specified, and painting work shall be carried out in accordance with C5 of "Painting Manual for Steel Highway Bridges" published by Japan Road Association. Specification of Recommended Thick Anticorrosion Coating for the C5 is shown on Table 3.8.

Table 3.8 Specification of Recommended Thick Anticorrosion Coating

Outer Surface painting System		Paint Name	Standard Thickness (µm)
Pre-treatment	First base plate conditioning	Primitive plate blasting	-
	Primer	Inorganic zinc primer	(15)
Factory paint	Secondary base plate conditioning	Assembled member blasting	-
	Under coating 1	Inorganic zinc paint	75
	Mist coating	Under coat epoxy resin paint	-
	Under coating 2	Under coat epoxy resin paint	120
	Intermediate coat	Intermediate fluororesin paint	30
	Top coat	Top coat fluororesin paint	25

Source: Handbook of Coating and Anticorrosion Handbook, Japan

- (ii) The paint shall have adequate capabilities in accordance with Appendix –II.2.3 on "Coating and Anticorrosion Handbook for Steel Highway Bridges", published by Japan Road Association
- (iii) Painting shall be applied under the temperature requirement specified by the manufacturer.
- (iv) The steel work, prior to delivery, shall be cleaned form scale, rust, dirt, oil/grease, etc., by means of chipping, scraping and wire-brushing using skilled operators as described in the painting systems below. The cleaning shall proceed each day over the extent of surfaces which can be painted on that day. The paint shall be applied by brushing or spraying as per approval of the Engineer.
- (v) Painting with brushing shall be as approved by the Engineer.
- (vi) The spraying equipment shall be compatible with the paint material, fitted with necessary gauges and controls, as approved by the Engineer.
- (vii) Site weld locations shall be left free from paint within 50mm of the weld position, and contact surfaces in connection using high strength friction grip bolts shall not be painted. Immediately after completion of erection, all damaged paint shall be scraped off and made good to the approval of the Engineer.
- (viii) The workmen shall clean down and apply one coat of primer to all site bolts, site bolted connections and site weld locations, and the paint work generally shall be left in sound condition for any subsequent painting.
- (ix) All paints and primers shall be of best quality and delivered to the site of application in original sealed containers as packed by the paint manufacturer conforming to the relevant Indian Standards and shall be procured directly from the manufacturers. All paint to be used shall be stored under cover in such conditions as will preserve it from extreme of temperature. The paint shall be used and applied strictly in accordance with the manufacturer's written instructions.
- (x) In addition, the following specifications shall apply to the shop painting of contact and inaccessible surfaces:



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- (a) Surfaces to be painted shall be thoroughly cleaned from scale, rust, dirt, grease, etc. by means of grit/shot blasting or other equivalent means.
- (b) Surfaces which are to be brought permanently into close contact or made inaccessible either in the shops or upon erection shall, after cleaning, be given two coats of red lead priming paint. The surfaces shall be brought into contact while the paint is still wet.
- (c) Contact surfaces in connection using high strength friction grip bolts shall not be painted or oiled and shall be free from dirt, loosed scale, burrs, pits and any other defects which would prevent the solid seating of the parts and would interfere with the development of friction between them.
- (d) All enclosed surfaces of box members shall be completely sealed by oiling or by coating with approved bitumen paint and all such members and tubes shall have their ends closed by suitable plates welded in position.
- (xi) Surfaces in contact during shop assembly shall not be painted. Surfaces which cannot be painted, but require protection, shall be treated as specified in the approved drawings.
- (xii) Surfaces to be in contact with concrete shall not be painted.
- (xiii) Surfaces to be in contact with pavement shall be followings;
 - a. At shop, Inorganic zinc paint.
 - b. At site, Repair painting for damaged part by Organic zinc paint,
 - c. Before pavement, stripping of rust by blasting or other method according to the rusting condition.

B. Internal Painting

- (i) Blasting, where specified, and painting work for inside of steel box girder shall be carried out in accordance with D5 of "Painting Manual for Steel Highway Bridges" published by Japan Road Association. Specification of Recommended Thick Anticorrosion Coating for the D5 is shown on Table 3.9.

Table 3.9 Specification of Recommended Thick Anticorrosion Coating (Inside of Box Girder)

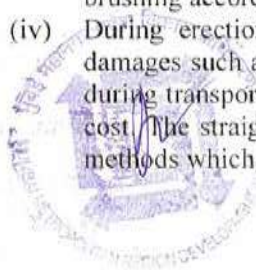
Outer Surface painting System		Paint Name	Standard Thickness (μm)
Pre-treatment	First base plate conditioning	Primitive plate blasting	-
	Primer	Inorganic zinc primer	(15)
Factory paint	Secondary base plate conditioning	Assembled member blasting	-
	Under coating	Modified epoxy resin paint	120
	Top coat	Modified epoxy resin paint	120

Source: Coating and Anticorrosion Handbook, Japan

- (ii) The inside paint shall be bright color for easily viewable at the future inspection.
- (iii)-(xi) are same as the above "3.4.9.2.1 External Painting"

3.4.2.10 Erection and Site Work

- (i) The Contractor shall be responsible for checking the alignment and level of foundation and correctness of foundation bolt centers, well in advance of starting erection work, and shall be responsible for any consequences for non-compliance thereof. Discrepancies, if any, shall immediately be brought to the attention of the Engineer for his advice.
- (ii) The steel box girders shall be divided into erectable modules with the length of as long as practicable, as per the total scheme. This should be pre-assembled in a suitable yard/platform and its matching with members of the adjacent module checked by trial assembly before erection. The erection shall be applied "Large Block Erection Method" using floating cranes or other adequate Contractor's Equipment depending on the site conditions. The erection method to be applied is a subject to be approved by the Engineer.
- (iii) Immediately prior to erection, any rust in the paint area shall be removed by power wire-brushing according to a standard equivalent to the Specification
- (iv) During erection, rough handling of fabricated materials shall be avoided not to cause damages such as bending, straining or pounding with sledges. Any damage to the structure during transportation or erection shall be immediately rectified by the Contractor at his own cost. The straightening of bend edges of plates, angles and other sections shall be done by methods which will not cause fracture.



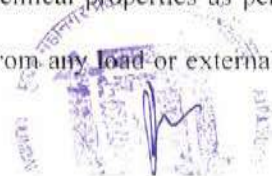
- (v) Following the completion of the straightening, the surface of the member shall carefully be inspected for damage and approved by the Engineer before further use.
- (vi) The Contractor shall be responsible for accurately positioning, leveling and plumbing of all steelwork and placing of every part of the structure in accordance with the approved drawings and to the satisfaction of the Engineer. All stanchion base, beam and girder bearings, etc. shall be securely supported on suitable steel packs. All reference and datum points shall be fixed near the work site for facilitating the erection work.
- (vii) All of the Contractor's Equipment used by the Contractor shall be adequate and sufficient for the purpose and for safe and efficient erection of the steel work, within the designated time. Any lifting or erecting machinery shall be to the approval of the Engineer and shall be removed from the Site if he considers such appliances dangerous or unsuitable for the intended purposes/functions. The approval of the Engineer shall not relieve the Contractor of the responsibilities for the loads to which the erection equipment shall be called upon to carry. Adequate arrangement shall be made to resist wind loads and lateral forces arising at the time of erection.
- (viii) The Contractor shall be entirely responsible for the safety and stability of the structure during erection and shall arrange that sufficient tack bolts, braces or guy ropes are used to ensure that the work being erected will remain rigid until final bolting, riveting or welding is completed. The Contractor shall supply and fix, without extra charge, any temporary bracing which may be necessary.
- (ix) All steelwork shall be erected in the exact position as shown on the approved drawings. All vertical members shall be truly vertical throughout, and all horizontal members shall be truly horizontal. All members shall be accurately assembled and erected. No permanent bolting, welding or grouting shall be done until proper alignment based on calculation of the camber value has been obtained and approved by the Engineer.
- (x) The camber is the value by which the girder profile at the time of the erection stage must differ from the theoretical geometric profile grade in order to compensate for all structural dead-load including the intermediate erection stages and effects.
- (xi) At stanchion splices and at other positions where concrete cover to the steel is liable to be restricted, bolts shall be placed with their heads on the outside of the members.
- (xii) All field assembly bolting and welding shall be executed in accordance with the requirements for shop fabrication excepting such as manifestly applying to shop conditions only. Where steel structural members must be delivered painted, the paint shall be removed before field welding for a distance of at least 50 mm on either side of the joints. The number of washers on permanent bolts shall not be more than two for the nut and one for the bolt head.
- (xiii) Only workmen experienced and skilled in steel erection shall be employed for the erection work. The safety of the workmen and the structural members shall be the Contractor's prime responsibility.

3.4.2.11 Rectification of Damaged Materials

Any error in shop work which prevents the proper assembly and lifting up of the members/parts by moderate use of drift pins or reaming or cutting shall be immediately reported to the Engineer for his prior written approval of the proposed method of rectification. Correction of fabrication errors to the approval of the Engineer shall be the responsibility of the Contractor. The entire costs of such operations including the replacement of defective members/parts, if required, shall be solely borne by the Contractor.

3.4.2.12. Inspection

- (i) The Contractor shall inform the Engineer of the progress of fabrication and as to when individual members/parts are ready for inspection. All gauge templates necessary to satisfy the Engineer shall be supplied by the Contractor. The Engineer may at his discretion check the results obtained at the Contractor's works by independent tests and, should the material so tested be found unsatisfactory, the cost of such tests shall be borne by the Contractor.
- (ii) Structural steel members/parts and the associated components viz. bolts, nuts, washers, welding consumables, etc. shall be tested for mechanical and/or chemical properties as per the requirements of the specification.
- (iii) During the inspection, the members/parts shall be maintained free from any load or external



3.4.2.13. Tolerances

All tolerances shall be in accordance with clause 18.3.2 "Tolerances of Members" and clause 18.3.3 "Tolerances for Fabrication" of the Specification, unless otherwise specified or approved by the Engineer.

3.5 GENERAL REQUIREMENTS DURING CONSTRUCTION**3.5.1. Construction and Demolition Materials**

A Construction and Demolition Materials Management Plan (C&DMMP) for reuse or disposal of materials shall be formulated by the Contractor and submit to the Engineer for his approval. The Contractor shall review the C&DMMP based on his detailed design, and submit an updated C&DMMP to the Engineer, relevant authorities and parties for approval prior to the commencement of and/or during construction.

3.5.2. Marine Sediment Excavation and Disposal

- (i) For the excavated marine sediment generated from the construction of bridge/viaduct foundations for the MTHL, the Contractor shall comply with the requirements stipulated in Environmental Permit shown in Appendices of the Employers Requirements in handling and disposing of the excavated marine sediment to a designated site to the approval of the Engineer. The Contractor shall carry out ground investigation to determine the quality and quantity of sediment to be excavated and disposed of off the Site. The Contractor shall prepare Sediment Quality Report (SQR) for approval of the Engineer and the statutory authorities concerned, and carry out disposal of any marine sediment to the designated/approved disposal facilities/sites. The Contractor shall submit a detailed proposal for the above ground investigation for the Engineer's approval (and for the approval of the statutory authorities concerned as may be required) before commencement of the ground investigation works.
- (ii) The amount of marine sediments excavated for the Works (e.g. excavation for foundation structures including boring for piles and dredging for pile caps below seabed) shall be minimized as far as practicable. The construction operations involving disturbance to marine sediments (e.g. excavations) shall also be carried out in a manner that does not impact on the marine ecology, and the methods to be used, including but not limited to use of silt curtains, shall be subject to the prior approved of the Engineer. The excavated materials shall be disposed of in a safe manner to the designated disposal facilities/sites as approved by the Engineer (and the statutory authorities concerned as the case may be).

3.5.3. Monitoring of Adjacent Buildings/Structures by Instrumentation during Construction

- (i) The Contractor shall propose the location and details of instrumentation for monitoring the effects of the Works on adjoining buildings, viaduct/bridge structures and other structures such as the Eastern Freeway, the Pir Pau Jetty, the ONGC pipelines, roads/streets and land (including the change in groundwater conditions in the adjoining ground) during construction, to the approval of the Engineer.
- (ii) The proposed instrumentation and monitoring points shall be sufficient to demonstrate conformance with the design of the geotechnical works and will be subject to review and approval by the Engineer.
- (iii) The Contractor shall propose, based on the proposed designs, suitable alert, alarm and action levels associated with each type of instrumentation measurement, for approval by the Engineer. The Contractor shall also propose, to the Engineer for his approval, the actions to be implemented when these trigger levels are reached.

3.5.4. Temporary Traffic Arrangement

Where the Project interfaces and/or affects the existing road network in the vicinity, the Contractor shall formulate and submit a detailed Temporary Traffic Arrangement (TTA) together with temporary traffic impact assessment, contingency plans and measures, etc. to all relevant parties, including the Engineer, the Police, the Employer, the Fire Services Department, MbPT and CIDCO, for agreement prior to commencement of the relevant construction. Implementation of TTA shall be at the expense of the Contractor.



3.5.5 Marine Aspects Coordination

A Marine Management Liaison Group (MMLG) shall be established to co-ordinate and expedite the construction of the MTHL while maintaining the safe and efficient normal marine navigation operation in the vicinity of the Project and operation of marine vessels for construction of the MTHL. The MMLG shall comprise representatives from the Contractors, the Engineer, various government departments and authorities such as MMB, MbPT, JNPT, the Police, and other stake holders. External Interfacing Parties. It shall be the Contractor's responsibility to obtain all necessary approvals from the MMLG at no additional cost to the Employer.

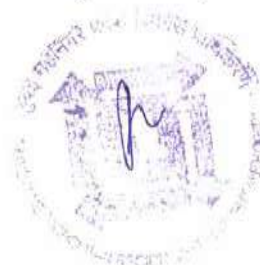
3.6 BRIDGE DECK WATERPROOFING

All the concrete bridge decks including in-situ and precast segmental decks shall be waterproofed using a polymer waterproofing membrane free from Isocyanates of a minimum thickness of 3 mm included the tack coat, in accordance with the requirements of the following:

- (i) UK Highways Agency , Design Manual for Roads and Bridges;
- (ii) Volume 2 Highway Structures: Design (Sub Structures and Special Structures), Materials;
- (iii) Section 3 Part 4 and Part 5 BA 47/99 Waterproofing and Surfacing of Concrete Bridge Decks;
- (iv) UK Highways Agency Specifications for Highways Works and BD 47;
- (v) In addition, the waterproofing system shall have a current BBA certificate for Bridge Deck Waterproofing in accordance with the UK Product Approval Scheme (HAPAS);
- (vi) A sheet waterproofing system will not be permitted;
- (vii) The waterproofing system shall have a range of bond coats and be able to demonstrate the durability of bond to asphaltic surfacing and substrate such that the wearing course can be removed and replaced during general maintenance without the need to replace the waterproofing membrane and protection if any. The system must be able to demonstrate long term physical compatibility with asphaltic surfacing materials specified on the project and demonstrate sufficient shear and tensile bond to the specified thickness of surfacing material such that imposed traffic loads do not lead to a breakdown of the membrane/surfacing bond;
- (viii) The waterproofing membrane shall be fully resistant to Sea Water, Fuel Oils, Diesel, Lubricants, Acid Rain and 30% Concentrated Sulphuric acid;
- (ix) The waterproofing membrane shall have resistance to Chisel Impact at 40 Degrees C, Chloride Ion Penetration max 0.04%;
- (x) The waterproofing membrane shall have third party testing for Heat Ageing In accordance to BS 903 Part A2 and BS 2782 confirming minimal change of less than 10% in tensile strength @ 37degC and @ 80 Degrees C temperatures, even after 3 years test signifying durability up to the design life of the bridge;
- (xi) The waterproofing membrane shall have Resistance to aggregate indentation @ 80 Degrees C under 500N Force to confirm less than 50% indentation as per original thickness, to confirm suitability of membrane to sustain itself during application of hot applied surfacing / wearing course;
- (xiv) The waterproofing membrane shall have a Minimum Tensile Strength of 9MPa and Minimum Elongation at break should be 100% as per ASTM D412;
- (xv) The waterproofing membrane shall possess a minimum 2 mm dynamic crack bridging ability;
- (xvi) The waterproofing membrane must have an international track record of minimum 20 years use in Bridge Deck Application and shall have a current INDIAN ROADS CONGRESS Accreditation; and
- (xvii) The Contractor shall submit to and obtain the approval from the Engineer on his proposed waterproofing system.

All the steel decks of the steel bridges shall be waterproofed using the adequate materials providing the following features.

- (i) Waterproofing property,
- (ii) Adherence property,
- (iii) Flexibility,



- (iv) Thermostability,
- (v) Load bearing ability.

3.7 EXPANSION JOINTS

The following components of relative movements between the two sides of a deck movement joint shall be considered in the calculations of design movements of the joint:

- (i) Vertical movement,
- (ii) Longitudinal movement (horizontal movement perpendicular to the length of the joint), and
- (iii) Transverse movement (horizontal shear type movement along the length of the joint).

Top surfaces of piers below movement joints shall be coated with an epoxy waterproofing membrane coating.

On completion of the deck joint assembly installation, the joint shall be subjected to a water test over its entire length as follows: water shall be continuously ponded for a minimum period of two (2) hours with a minimum depth of 25mm and with sufficient width to extend 50mm beyond the mortar bunds on both sides of the deck joint assembly. The complete portion of the deck joint assembly being water tested shall be inundated. At no time shall the measurement between the water level at the curb line and the high point of the preformed seal in the curb be less than 25mm. Leakage of water through the deck joint assembly installation or the concrete-steel interfaces during this test will constitute failure of the deck joint assembly.

For better riding quality, spacing of movement joints shall not be less than 200 m for bridges/viaducts for main carriageway of the MTHL.

3.8 BEARINGS

All bearing for concrete bridges shall comply with the relevant IRC Codes.

All bearing for steel bridges shall comply with "Specifications for Highway Bridges" published by Japan Road Association, March 2002.

All bearings of all bridges shall be easily accessible for inspection and maintenance.

3.9 PARAPETS AND BARRIERS

Vehicular crash barriers on both sides of the carriageways for the MTHL shall be in concrete of the type "P3 High Containment" as per IRC Codes, which is indicated in the Outline Drawings.

Concrete profiled barriers shall be used, and shall be provided with an aluminum top rail on the concrete barrier of bridges and viaduct structures. Stainless steel fixing shall be used where these are in contact with aluminum. Standardized details shall be adopted for ease of replacement.

Alternatively, steel vehicular crash barriers may be provided as per the relevant IRC codes.

3.10 CENTRAL MEDIANS OPENING

The MTHL is a full-access controlled dual expressway with a central median (in the form of continuous barrier separating its two carriageways). The proposed "openings" at the central median shall be provided at about 2 km intervals, but at not more than 3km intervals, along the MTHL to provide access from one carriageway to the other under special/emergency situations. These "openings" will be known as "Dual-purpose (for both emergency & contingency) Crossings".

The Contractor shall design and construct the openings in consultation with the relevant External Interfacing Parties to facilitate maneuver of emergency vehicles and such that Moveable Steel Barriers (MSBs) at the openings can be opened and closed in a few minutes. They shall have containment capacity comparable to or better than that of the normal barriers when they are closed. The specification for the MSB barrier is as follows:

- (i) The Contractor shall provide details of the proposed MSB and a copy of the relevant crash



- test certificates for approval of the Engineer before delivery of the barrier system to the site of installation or commencement of the relevant site work, whichever is the earlier.
- (ii) The MSB shall be able to be opened by swinging about end anchors towards road on either side smoothly up to 45 degrees on site (taking into account the longitudinal and transverse gradients of the carriageway and the central reserve), and then closed properly without affecting its containment capability. After the MSB is swung opened, the passageway created along the central reserve should be at least 8m or 16m long depending on the type of the MSB installed.
 - (iii) Opening together with closing of the MSB by hands shall be able to be completed within a few minutes by 2 (for 8m MSB) to 4 (for 16m MSB) local adults of normal built, with a non-powered mechanical system without the need of any other tool. The system shall also have a built-in mechanism to prevent it from sliding when being opened or closed on site.
 - (iv) The protruding ends of any bolts on a MSB or its anchors exposed to traffic shall be capped by dome-shape-headed nuts.
 - (v) The MSB shall be corrosion resistant.

3.11 UTILITIES TROUGHS

A number of utilities will need to be carried along the viaduct for the operation of the facilities along the marine section of the MTHL as well as for utility providers. Utility troughs shall be provided along the outermost edge of the entire viaduct with cable containment for carrying the cables/utilities. A partition shall be placed in the trough to separate optical fiber cables and electric power cables. The utilities troughs shall be covered with removable concrete covers so that the troughs can be used for maintenance walkway. The Contractor shall design and construct the utility troughs for accommodating the utilities along the marine section of the MTHL and the associated utilities containment according to the Outline Design Drawings attached in the Employers Requirements. The utility troughs shall be provided with drain holes at suitable intervals (not less than 3 m c/c).

3.12 INSPECTION WAGON (GANTRY) and FOOTWAY

Inspection wagon (Gantry) shall be installed under the steel box girder of every bridge for the future inspection and repair work. The capacity and size shall be approved by the Engineer.

Footway shall be installed on all pier top.

3.13 NAVIGATION AIDS FACILITIES

Appropriate navigation aids shall be installed to the spans crossing over the navigational channels in accordance with the regulations and directions by port authorities including Mumbai Maritime Board and other institutions responsible for safe navigation in Mumbai Bay. Typical navigation aids to be attached to the bridge over the navigation lane is a set of center mark (light), left edge mark (light), and right edge mark (light) indicating the location of the navigation lane. They must be visible and effective in both daytime and night time.

The Contractor shall consult with MMB and / or port authority to select the necessary types and locations of such equipment and obtain the approval of the authorities if requested. The Contractor shall submit the design of the navigation aids to the Engineer for approval prior to commencement of the work.

The contractor shall also abide by the following conditions



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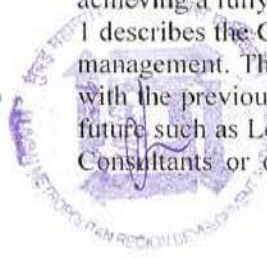
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1. The contractor, in consultation with MMB, will mark at a suitable place on the MTHL, suitable signs indicating the general direction of traffic flow in the channel passing under the MTHL. These marks should be visible both during day and night.
2. The height restriction of the vessels, which can safely pass under the bridge in this span (at all states of tide) should also be indicated (in this case 31 meters above Mean High Waters Spring) and marked suitably and be visible both during day and night hours. This can also be indicated by creating a height barrier kind of system visible during day and night hours.
3. The limits of the Navigational Channel passing below the MTHL shall be marked by 'lateral buoys' in accordance with IALA buoyage system for Region-A, for a distance as required by MMB.
4. Since there will be separate channels for Incoming and Outgoing traffic passing below the MTHL, and hence in accordance with IALA Region-A Maritime buoyage system, the buoys specified for a "**Preferred Channel**" that is **Preferred Channel buoys** be positioned suitably for indicating this at two suitable locations on either side of the MTHL for both incoming and outgoing traffic.
5. The piers of the MTHL, forming the extremities of the Navigational Channel passing below the MTHL should be well lit and cordoned off by appropriate day and night signal as per IALA Region-A buoyage system.
6. The contractor shall ensure that the required and stipulated 'horizontal and vertical clearances as mentioned in this letter must be got verified by MMB at a suitable stage during the construction phase of the bridge so that any deviations observed can be brought to the notice and can be corrected to comply with the directives. It should be also additionally ensured that once the drawing of the bridge is finalised, the position of the bridge where the horizontal spans are planned should be sent to MMB along with coordinates to check that the two clear horizontal spans (of 100 m & 95 m each) as required by MMB are falling in the center of the navigational channel, where the depths are adequate.
7. The contractor shall undertake the construction activity without adversely affecting the smooth voyage/ movement of vessels through the waterway. Notice Boards indicating "CONSTRUCTION UNDER PROGRESS" shall be erected 500 m upstream and 500 m downstream from the construction site in both creeks for cautioning the vessels. Necessary warning signals (both by day and night) must be provided to ensure safety of voyage of vessels while passing close to the construction site.
8. The contractor shall ensure that under no circumstances, any debris/ construction material generated during the construction of Road Bridge shall not be dumped in the Panvel & Thane Creeks.
9. The contractor shall be required to pay necessary charges as applicable in accordance with the extant rules, if the vessels involved in the survey work and subsequently any construction activity use MMB's jetty or piers etc.

APPENDIX 1 Contractor's Coordination with Others

1. INTRODUCTION

Careful co-ordination, interface and integration of all physical and technical matters with Related Works Contractors as defined in the Employer's Requirements-General is a critical element in achieving a fully coordinated and integrated design and construction of the Works. This Appendix 1 describes the Contractor's responsibilities with regard to co-ordination, interface and integration management. The Contractor's responsibility for interface co-ordination shall include interfacing with the previously described Related Works Contractors and those who may be identified in the future such as Local Authorities, Statutory Bodies, Utility Companies, Private Service Providers, Consultants or other Contractors whether or not specifically mentioned in this Contract. This



responsibility is not limited to a particular number of Related Works Contractors.

2. GENERAL RESPONSIBILITY OF THE CONTRACTOR

2.1. CO-ORDINATION OF THE CONTRACTOR'S WORKS

The Contractor shall, in accordance with these Employer's Requirements, co-ordinate the Contractor's own Works under this Contract with that of Related Works Contractors. In addition, the Contractor shall take all necessary steps to ensure that the Works are coordinated and integrated with the Related Contractors Works and shall comply with any directions which the Engineer may give.

2.2. PROGRAMMING OF THE WORKS WITH RELATED WORKS CONTRACTORS

The Contractor shall carefully review pertinent information made available by the Engineer relating to the nature and programming of the Related Works Contractors and use such information in its planning of the Works.

2.3. EXCHANGE OF INFORMATION WITH RELATED WORKS CONTRACTORS

The Contractor shall communicate, co-ordinate and exchange information directly with Related Works Contractors. Information necessary to fulfil the Contractor's interface obligations shall be directly requested and obtained from the Related Works Contractors; receipt and acknowledgment procedures is required. Conversely, the Contractor shall provide directly to the Related Works Contractors information within the Contractor's scope.

2.4. REQUEST FOR INFORMATION

All requests for information (RFI), acknowledgement of receipt of information and any official communication between the Contractor and the Related Works Contractors shall be made in writing with a copy to the Engineer for information.

2.5. INTERFACE AND CO-ORDINATION WITH RELATED WORKS CONTRACTORS

The Contractor shall advise the Engineer in writing of any problems encountered in obtaining necessary information and/or lack of co-operation from any Related Works Contractor. In the event that the Engineer considers that the resolution of an interface is not proceeding satisfactorily, the Engineer will review the matter and establish a coordinated plan directing the Contractor and the Related Works Contractors as to the required action.

2.6. MEETINGS WITH RELATED WORKS CONTRACTORS

The Contractor shall conduct regular meetings with Related Works Contractors to clarify particular aspects of the interface requirements of the Works and the Related Works. The party who convenes the meeting shall prepare minutes recording all matters discussed and agreed at the meeting. The Contractor shall inform the Engineer in advance the date, time and location of such meetings as he may elect to attend.

2.7. ISSUANCE OF INFORMATION RELATED TO INTERFACES AND CO-ORDINATION

The Contractor shall ensure that copies of all correspondence, drawings, meeting minutes, programmes etc. relating to the Contractor's co-ordination with Related Works Contractors are issued to all concerned parties and the Engineer no later than two (2) calendar days from the date of such correspondence and meetings.

2.8. LIABILITY FOR FAILED INTERFACES

Any claim of additional costs by Related Works Contractors resulting directly from the



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Contractor's failure to keep to specified dates shall be borne by the Contractor. The Contractor shall note that the information exchange is an iterative process requiring the exchange and update of information at the earliest opportunity and shall be carried out on a regular and progressive basis in order for the process to be completed for each Design Stage.

The procedures for the settlement of Related Works Contractor's claims shall be made to the Employer for settlement, and the Employer recovers from his Related Works Contractor. Any Contractor who fails to fulfill interface requirements, the consequences/claims arising thereof shall be at his risk and cost.

2.9. INTERFACE MANAGEMENT SYSTEM

The Contractor shall establish an Interface Management System and participate in activities that include but are not limited to:

- 1) Providing a person in charge of Interface Management System who has the responsibility, experience and authority to resolve interface matters to the satisfaction of the Engineer, and providing the necessary support team for the above person.
- 2) Responding to, confirming and making written agreements with regard to interfaces.
 - 3) Attending interface meetings that may be arranged by the Engineer, with a representative empowered to make agreements on interfaces. The Engineer may arrange regular meetings to monitor the status of interfaces, and may require special meetings as may be necessary to resolve specific issues. The Contractor may request assistance from the Engineer to arrange meetings on particular subjects.
 - 4) Providing the Engineer with regular status information and/or details of interfaces, including copies of relevant correspondence and material.
 - 5) Providing the Engineer access to information for the purpose of conducting audits on interface compliance and for confirming that interface.

2.10. ASSIGNMENT OF INTERFACE LEADING ROLE

The Engineer may, should there be discord between the Contractor and Related Works Contractors, assign a leading Role from The Contractor to ensure proper and timely coordination of interfaces—Such assignment shall not relieve the Contractor or any of the Related Works Contractors from their respective obligations under the respective Prime Contracts.

3. DESIGN

3.1. FULLY COORDINATED DESIGN OF THE WORKS

The Contractor shall support Related Works Contractors and the process of achieving a fully coordinated design for the Works, including undertaking the following:

- 1) Provide timely information when requested by Related Works Contractors.
- 2) Anticipate, as an experienced contractor, the information needs of Related Works Contractors and transmit such information as soon as it is available.
- 3) Pro-actively keep Related Works Contractors informed of any development of the Works related to the interfaces.
- 4) Advise Related Works Contractors of potential problems related to the interfaces, together with proposed solutions likely to be acceptable to Related Works Contractors and which fulfils the requirements of this Contract.
- 5) Arrange and/or attend meetings with Related Works Contractors as necessary to resolve interface issues.
- 6) Communicate and co-operate with Related Works Contractors to identify and resolve potential interface problems.

3.2. TIMING OF INTERFACES

In accordance with Sub-clause 2.2 above the Contractor's programme shall allow for the timing of



availability of necessary interface information from the External Interfacing Parties. If necessary, the design of a particular element shall be programmed on a "late-start" basis to allow receipt of necessary interface information. If a design activity is programmed earlier than necessary and without sufficient interface information, this activity shall be proceeded entirely at the Contractor's own risk.

The Contractor shall allow for the fact that many of the design activities of Related Works Contractors may proceed concurrently to the design under this Contract. Specific dates for the delivery of this and other required information shall be confirmed between the Contractor and Related Works Contractors. Such shall only relate to Related Works Contractor that has commenced their design of the Related Works concurrent with this Contract.

In order to achieve a fully coordinated design the Contractor should also note that the level of information provided to and requested from others should be appropriate for the particular Design Stage. The Contractor shall ensure that allowances for receipt of increasing levels of information from Related Works Contractors are made for each Design Stage. The Contractor shall also recognize and allow for times when it may be necessary to modify its design process to accommodate the timing of information availability from Related Works Contractors in order to achieve a coordinated design. Similarly at times it will be necessary for the Contractor to modify its design process to allow necessary information needed to modify the Contractor's design process to accommodate the timing of information required from Related Works Contractors to achieve timely completion of their coordinated design.

3.3. MINIMIZING INTERFACE DIFFICULTIES

The Contractor's attention is drawn to the need to undertake and develop the design in such a way as to ensure that interface difficulties are either removed or minimized. Design schemes that impose unnecessary or unreasonable construction challenges on Related Works Contractors will not be considered suitable for a statement of no objection.

3.4. LIMIT OF DEPENDENCY ON RELATED WORKS CONTRACTORS

The Contractor shall design the Works so as to minimize the dependency on detailed requirements of Related Works Contractors. To the extent reasonably possible, the design should be based on conservative assumptions that avoid the need to interface at a detailed level.

3.5. DESIGN CO-ORDINATION

For the purpose of design co-ordination, the Contractor shall use the Co-ordination Drawings described in this Appendix and other drawings as necessary from the Contractor's design.

3.6. INTERFACE INFORMATION

In advance of each Design Stage, the Contractor shall:

- 1) Request in writing and obtain from Related Works Contractors interface information required for that Design Stage.
- 2) Review the interface information received and agreed in writing with Related Works Contractors that the interface information is adequate for that Design Stage.

In advance of External Interfacing Parties' Design Stages", the Contractor shall, when requested by External Interfacing Parties:

- 1) Provide to Related Works Contractors the interface information needed for their respective pending Design Stage.
- 2) Confirm in writing that the interface information suitably represents the Contractor's interface requirements for that Design Stage.



3.7. ACHIEVE A FULLY Coordinated DESIGN

During each Design Stage, the Contractor shall communicate and coordinate with External Interfacing Parties as necessary to achieve a fully coordinated design.

3.8. TRANSMISSION OF DESIGN INFORMATION TO RELATED WORKS CONTRACTORS

The Contractor shall at the completion of each Design Stage:

- 1) Transmit those portions of the design relevant to Related Works Contractors interface for review.
- 2) Agree in writing with Related Works Contractors the incorporation of applicable review comments.

3.9. RECEIPT OF RELATED WORKS CONTRACTOR'S DESIGNS

The Contractor shall at the completion of each Design Stage and upon receipt of Related Works Contractors designs for review:

- 1) Review those portions of the design relevant to interface and transmit comments to the Related Works Contractors.
- 2) Agree in writing that subject to the incorporation of the applicable comments, the design reflects the Employer's Requirements for the interface.

3.10. CO-ORDINATION OF TECHNICAL INFORMATION WITH RELATED WORKS CONTRACTORS

Design co-ordination shall include definition, approach and agreement with Related Works Contractors, the interface areas, contract limits, shared loads and sequence of design activities; and the definition and design approach for type, size and location of equipment, access thereto, cable routing and protection, agreement of installation programming, preparation of Interface Control Documents.

3.11. DEVELOPMENT OF IDENTIFICATION CODE SYSTEM

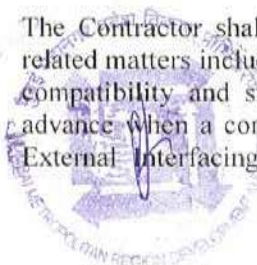
The Contractor shall liaise with the Engineer in developing a uniform identity code system that will be used to uniquely identify each item of equipment and software components provided under this Contract. Such identity codes shall be used for labelling each item of equipment and shall also be used in design reports, drawings and operations and maintenance manuals. This identity code system shall be generally compatible with principles to be established by the Engineer and shall specifically be compatible with the use of the Engineer's defined names, mnemonics and codes for Stations.

4. CONSTRUCTION**4.1. CONTRACTOR'S INTERFACE CO-ORDINATION TEAM**

The Contractor shall establish a dedicated co-ordination team, led by an Interface Co-coordinator based in Mumbai area reporting to the Contractor's Site representative. The primary function of the team is to provide a vital link between the Contractor's design, construction teams and Related Works Contractors.

The Contractor shall co-ordinate with Related Works Contractors to allow the efficient execution of the respective construction activities.

The Contractor shall co-ordinate and co-operate with Related Works Contractors on all Site-related matters including but not limited to Site access and occupation, safety, verification of work compatibility and survey control. The Contractor shall advise Related Works Contractors in advance when a construction item is ready for field inspection to verify compatibility with the External Interfacing Parties' needs and shall facilitate access to the Site for Related Works



Contractors.

At or near the completion of the construction of any interface-related element of the Contractor's work it shall:

- 1) Advise Related Works Contractors that the as-constructed interface-related work can be inspected, provide the necessary Site access and occupation.
- 2) Agree in writing with Related Works Contractors on the adoption of any applicable comments on the constructed work.

4.2. AS -CONSTRUCTED INTERFACE ELEMENTS READY FOR INSPECTION

On advice from the External Interfacing Parties that an as-constructed interface-related element is ready for inspection, the Contractor shall:

- 1) Conduct on-Site inspections of the work elements, and give comments in writing to Related Works Contractors.
- 2) Agree in writing to the External Interfacing Parties that the as-constructed work meets the interface requirements.

4.3. RELATED WORKS CONTRACTORS' VERIFICATION OF COMPLETED INTERFACE ELEMENTS

The Contractor shall, prior to applying for a Taking-Over Certificate, obtain written confirmation from each applicable Related Works Contractor, that the interface elements meet the interface requirements of Related Works Contractors. If any Related Works Contractors unreasonably withholds such confirmation, the Engineer shall decide on further action, if any, required by the Contractor prior to the issue of a Taking-Over Certificate.

Where the Works fail to meet the requirements of this Contract and where such will impact Related Works Contractors' Works, the Contractor shall submit the proposed remedial measures to the Engineer for review and shall copy the same to the Related Works Contractor(s).

4.4. INSTALLATION IN ACCORDANCE WITH THE WORKS PROGRAMME

The Contractor shall undertake installation in accordance with the consented Works Programme.

4.5. PLANNING AND CO-ORDINATING TESTING ACTIVITIES

The Contractor shall plan and co-ordinate the execution of Works testing activities. This shall, unless otherwise specified to the contrary, include the following:

- 1) Prepare and submit all of Test Plans and procedures;
- 2) Prepare and maintain detailed time schedules covering the testing activities and any subsequent re-testing;
- 3) Provide early notice to the Engineer and, as may be required, Related Works Contractors of the impending tests to be performed;
- 4) Seek the Engineer's formal acceptance of each test;
- 5) Maintain a log of all outstanding items that require re-testing;
- 6) Co-ordinate resources for the execution of the tests; and
- 7) Recording and reporting all test results.



APPENDIX 2 PROJECT CALENDAR**1. PROJECT CALENDAR****1.1. PROJECT WEEKS AND DAYS**

The Project Weeks shall commence on Monday. A day shall be deemed to commence at 0001 hour on the morning of the day in question. Where reference is made to the completion of an activity or Milestone by a particular week, this shall mean by midnight on the Sunday of that week.

1.2. BASIC WORK UNIT

Basic Work Unit shall be "days" for scheduling purposes. The presentation shall be in "Week" units for Project purposes.



APPENDIX 3. QUALITY ASSURANCE REQUIREMENTS

1. GENERAL REQUIREMENTS

1.1. APPLICABLE REGULATIONS AND STANDARDS

The Contractor shall maintain and implement a Quality Management System that shall remain in effect during the execution of the Works. The Contractor's quality management system shall be in accordance with ISO 9001 - Quality Management System, the latest edition of the International Standard ISO 9001, and shall submit its quality management system documentation for Engineer's review as specified in this section.

1.2. QUALITY MANAGEMENT SYSTEM

The Quality Management System documentation shall include, but shall not be limited to the following:

- 1) project quality plan;
- 2) quality procedures, work instructions and standard forms;
- 3) design quality plan, site quality management plan and manufacturing quality plan; and
- 4) inspection and test plan

2. QUALITY CONTROL

The Contractor shall plan, perform and record all quality control activities to ensure that all work is performed in accordance with the requirements of the Contract and is detailed in the quality plans that are required under this section. Such activities shall include, without limitation, the inspections and/or test expressly or implicitly required by the Contract.

2.1. QUALITY AUDITS

Quality audits will be conducted by the Engineer to verify the Contractor's implementation and compliance with the quality management system as specified herein.

3. SUBMISSION OF QUALITY DOCUMENTATION

3.1. QUALITY SYSTEM DOCUMENTS

Quality system documents to be submitted shall embrace all activities of the Contractor and his Subcontractors of any tier, including his suppliers, Subcontractors and any consultants, for the execution of the Works.

3.2. SUBMISSION

Within 28 days after the Commencement Date, the Contractor shall submit the following documents for review by the Engineer:

- 1) project quality plan;
- 2) project quality procedures; and
- 3) design quality plan and any associated work instruction and/or standard forms that the Contractor proposes to be used for the Contract.

3.3. DEVELOPMENT OF QUALITY MANAGEMENT SYSTEM

The Contractor shall note and install a Quality Management System for Construction of the Works.



3.4. QUALITY MANAGEMENT PLAN AND MANUFACTURING QUALITY PLAN

The Contractor shall submit the separate Site Quality Management Plan and Manufacturing Quality Plans for managing and controlling the on-Site and manufacturing process for individual key items of the Works. These quality plans shall be submitted for review by the Engineer 28 days after the commencement date of the Works and manufacturing process covered by the plans respectively.

3.5. INSPECTION AND TEST PLANS

The Contractor shall submit separate Inspection and test plans for managing and controlling the inspection and testing activities covering all key elements of the Works. These plans shall be submitted for review by Engineer one week prior to the date of commencement of the inspection and testing activities covered by the plans.

3.6. AMENDMENT

The Contractor shall, and/or as requested by the Engineer, continuously review and update the quality system documents to meet the requirements and development of the Works throughout the duration of the Contract. For any amendment to the quality system documents, the Contractor shall as soon as practicable prepare and submit the proposed amendment for review by Engineer.

4. CONTROLLED COPY OF QUALITY SYSTEM DOCUMENTATION

The Contractor shall promptly supply the Engineer with two (2) controlled copies of his quality system documents upon such documents being reviewed without objection by Engineer. The Contractor shall maintain such controlled documents throughout the duration of the Contract. In addition, the Engineer may request further copies of the quality system documents and these documents shall reach to Engineer office within fourteen (14) days of notification.

5. FORMAT OF QUALITY SYSTEM

The quality system documents shall have a standardized format and show clearly on the document:

- 1) The document title, the document number (if any) and the page number on each page;
- 2) The approval signatures and the dated of such approval; and
- 3) The revision status, with the amendments identified within the revised documents.

6. PROJECT QUALITY PLAN

The Project Quality Plan shall define the Contractor's management structure and the quality management system for the execution of the Works and shall, without limitation, define as follows:

- 1) The Contractor's organization-managerial staff, with particular reference to any member of a partnership, consortium or joint venture, and the main Subcontractors. Organization charts shall be produced to illustrate the subdivision of the Works into elements for effective technical and managerial control, the reporting structure and the relationship between all parties involved;
- 2) The appointment of a Quality Assurance Manager;
- 3) The specific allocations of responsibility and authority given to managerial and technical staff with particular reference to the design and Site supervision of the Works;
- 4) The hierarchy and structure of the overall quality system documents to be applied to the Contracts, and clearly indicating any particular documents to be followed by individual key members of the Contractor if applicable;
- 5) The Contract specific quality procedures, works instruction and/or standard forms, if applicable;
- 6) A full list of quality procedures, works instructions, and/or standard forms, including any contract specific documents, to be applied to the Contract. It shall be defined the specific ways to



perform the related activities and the records to be generated as objective evidence of the activities performed or result achieved, and shall cover all the requirements of the International Standard ISO 9001 and the Contract including, but not limited to, the following activities:

- a) The review, approval and updating of the quality system documents to ensure their continuing suitability and effectiveness;
- b) Design control to all Works and/or Temporary Works, including design works carried out by Subcontractors and sub-consultants. The procedures shall clearly define the review, verification, Certificates as appropriate and validation processes of the design;
- c) Drawing management in main office and Site office(s), including production, approval, updating, maintaining, storage and distribution;
- d) Project document management, including registration, updating, indexing, filing, maintenance, storage and distribution;
- e) Monitoring and control of Subcontractors with respect to program, submission and quality of works;
- f) Monitoring of the submission and re-submission to the Engineer;
- g) Monitoring of the ordering and delivery of materials, plant and equipment;
- h) Quality control of the Works;
- i) Quality audits on the Contractor and Subcontractors of any tiers; and
- k) Establish and maintain a record in accordance with the Contract requirement provision.

7. DESIGN QUALITY PLAN

The Contractor shall prepare a design quality plan for its design works. The design quality plan shall define the Contractor's and the Designer's policy for the design works.

- 1) The organization of the Contractor's and the Designer's design staff;
- 2) The specific allocations of responsibilities and authorities given to identified design staff or Subcontractors for particular design works;
- 3) The hierarchy of quality management system documentation for managing and controlling design works, including design works of Subcontractors of any tier; and
- 4) The list of procedures and instructions to be applied to manage and control the quality of the design works.

8. SITE QUALITY PLAN

8.1. PREPARATION

The Contractor shall prepare a Site Quality Plan for its construction and installation works. The Site Quality Plan shall define, without limitation:

- 1) The organization of the Contractor's staff directly responsible for the day-to-day management of the construction and installation activities on the Site;
- 2) The specific allocations of responsibilities and authorities given to identified personnel or Subcontractors for particular construction and installation works;
- 3) The hierarchy of quality management system documentation for managing and controlling construction and installation works, including construction and installation works of Subcontractors of any tiers; and
- 4) The list of procedures and instructions to be applied to manage and control the construction and installation works together with the procedures and instructions that have not been previously submitted for review.



9. MANUFACTURING QUALITY PLANS**9.1. PREPARATIONS**

Manufacturing quality plans shall define the Contractor's management structure and quality management system for the manufacture of the key items of the Works, and for the items as requested by the Engineer. Separate manufacturing quality plans shall be prepared for each item of the Works.

9.2. SUBMISSIONS

The Contractor shall prepare and maintain a full list of all the manufacturing quality plans required for the Contract with submission status, and shall submit to the Engineer upon request.

9.3. MANUFACTURING QUALITY PLAN STRUCTURE

Each manufacturing quality plan shall define, without limitation:

- 1) The scope of works and the item covered by the plan;
- 2) The organization of the Contractor and/or the Subcontractor responsible for the day-to-day management of the manufacture of the item;
- 3) The specific allocations of responsibility and authority given to personnel for the day to day management of the manufacturing activities with particular reference to the supervision, inspection and testing of works;
- 4) The specific methods of manufacture, including but not limited to the following:
 - a) The particulars of the material to be incorporated into the items;
 - b) The manufacturing process in compliance with drawings and specifications;
 - c) The identification or referencing requirements for traceability of the manufactured items;
 - d) The identification of the inspection and test status of the materials and final manufactured items;
 - e) The disposition of nonconforming materials and manufactured items; and
 - f) The handling, storage, packaging, preservation and delivery of the manufactured items.

10. INSPECTION AND TEST PLAN**10.1. GENERAL REQUIREMENT**

Inspection and test plans shall be produced for all activities requiring inspection and/or test.

10.2. SUBMISSION

The Contractor shall prepare and maintain a full list of all the inspection and test plans required for the Contract with submission status and review status, and shall submit to the Engineer upon request.

10.3. INSPECTION AND TEST PLAN

Each inspection and test plan shall define, without limitation:

- 1) The scope of activity covered by the plan;
- 2) The sequence of work related to the activity covered by the plan;
- 3) The personnel responsible for undertaking the inspection and/or test;
- 4) The personnel responsible for certifying the inspection and test;
- 5) The inspection and/or test method or a reference to the relevant standard of inspection and/or test;
- 6) The frequency of the inspection and/or test;



- 7) The compliance criteria of the inspection and/or test;
- 8) The quality hold point and quality control points;
- 9) The documents to be used for reporting the results of the inspection and/or test, and with examples of such documents incorporated into the Inspection and Test Plan; and
- 10) The storage locations and filing of the records of the inspection and/or test.

11. QUALITY ASSURANCE MANAGER

11.1. APPOINTMENT

The Contractor shall appoint a suitably qualified and experienced full-time person as the Quality Assurance Manager to be responsible for the task of establishing the documented quality management system and ensuring that the quality management system is implemented and maintained effectively.

11.2. OBLIGATION

The Quality Assurance Manager shall be directly responsible to the senior level of management and is able to discharge his duties without hindrance or constraint. In addition, the Contractor shall make available any such resources that are necessary to ensure the effective implementation of the quality management system.

11.3. ENGINEER'S REVIEW

The Contractor shall submit for review by the Engineer details of qualifications, experience, authority and responsibility of the proposed Quality Assurance Manager, as part of the Project Quality Plan.

12. QUALITY AUDITS

12.1. REPORT PROGRESS

The Contractor shall carry out Quality Audits on the Works at regular intervals, or at such other intervals as the Engineer may require at his own cost, ensuring the continuing suitability and effectiveness of the quality management system. Reports of each such audit shall be submitted promptly to the Engineer for review.

12.2. ENGINEER'S REVIEW

The Contractor shall submit for review by the Engineer details of the authority, qualifications and experience of personnel assigned to quality audit activities before carrying out quality audits.

12.3. QUALITY AUDITS CARRIED OUT BY EMPLOYER'S PERSONNEL

The Engineer may require Quality Audits on the Contractor and his Subcontractors of any tier to be carried out by his representative or the Employer's staff. In such case, the Contractor shall afford to such auditors all necessary facilities and access to the activities and records to permit this function to be performed.

12.4. CORRECTIVE AND PREVENTIVE ACTIONS

Upon receipt of Corrective Action Request (CAR) or similar document issued by the Engineer as a result of Quality Audits, the Contractor shall promptly investigate the matter and submit the proposed corrective and preventive actions within 14 days to the Engineer for review. The Contractor shall take timely corrective and preventive actions to rectify the matter and to prevent re-occurrence. Evidence to demonstrate effective implementation of corrective and preventive actions shall be submitted by the Contractor to the Engineer for review.



13. NOTIFICATION OF NONCONFORMITIES**13.1. NOTIFICATION OF THE CONTRACTOR**

If, prior to issue of the Taking-Over Certificate for the Works or the relevant Section, the Contractor has used or proposes to use or repair any item of the Works that does not conform to the requirements of the Contract, the Contractor shall immediately submit for review by the Engineer of such proposal and supplying full particulars of the non-conformity and, if appropriate, the proposed means of repair.

13.2. NOTIFICATION OF THE ENGINEER

If the Engineer issues nonconformity report or similar documents to notify the Contractor of any item of the Works which does not conform to the requirements of the Contract, the Contractor shall promptly investigate the matter and, within 14 days of notification by the Engineer, submit to the Engineer for review the remedial measures and necessary actions to be taken to rectify the item and to prevent re-occurrence.

13.3. NONCONFORMITY REGISTER

The Contractor shall maintain and update a Nonconformity Register to indicate the status of all nonconformities that are identified by the Engineer/ and or the Contractor. The Contractor shall submit the register for review upon request by the Engineer.

14. MONTHLY PROGRESS REPORT ON QUALITY MANAGEMENT SYSTEM

The Contractor shall continuously monitor the performance of the quality management system and shall include in each Monthly Progress Report:

- 1) The submission status and review status of the quality system documents;
- 2) An up-to-date audit schedule and status;
- 3) An up-to-date nonconformity register providing the status of all nonconformity identified by the Engineer or the Contractor within the reporting period and those nonconformities not yet satisfactorily closed; and
- 4) A narrative appraisal of the performance of the quality management system, including any nonconformity, shortcomings or problem areas identified and the corrective and preventative action taken or proposed.

The Contractor shall provide and maintain at all stages of the Works a quality control register or registers to identify the status of inspections, sampling and testing of the work and all certificates. Such register shall be updated by the Contractor to show all activities in previous months.

Each register shall:

- 1) List the certificates received for each batch of goods and materials incorporated in the Works and compare this against the certification required by the Contractor and the Contractor's quality plans;
- 2) List the inspection and testing activities undertaken by the Contractor on each element of the Works and compare these activities against the amount of inspection and testing required by the Contract and the Contractor's quality plans;
- 3) Show the results of each report of inspection and/or test and any required analysis of these results and compare these results against the pass/fail criteria; and
- 4) Summaries any actions proposed by the Contractor to overcome any nonconformity identified in Clause 12.

15. QUALITY RECORDS

The Contractor shall ensure that all the quality records as objective evidence of the implementation of the quality management system are properly indexed, filed, maintained, updated and stored in an



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Section VI-I. Employer's Requirements

acceptable software system. These records will be delivered to the Engineer in CD form upon completion of the Works.



APPENDIX 4 ENVIRONMENTAL PROTECTION REQUIREMENTS

1. GENERAL

The Contractor shall comply with following environmental requirements for Execution of Works and Temporary Works for the Project;

1.1. REGULATIONS AND CLEARANCES

The following Regulations and Clearances provided by the Employer shall be referred by the Contractor before design and construction activity.

- 1) The CRZ Clearance issued by the Ministry of Environment, Forest and Climate Change (MoEF & CC) vide letter No.F.No.11-65/2012-IA.III dated 10th July, 2013 (Table4.1.1)
- 2) The recommendations of the Maharashtra Coastal Zone Management Authority (MCZMA) letter No.CRZ 2015/CR236/TC 4 dated 26th November, 2015 (Table4.1.2)
- 3) The clearance for division of forest land issued by the Ministry of Environment, Forest and Climate Change (MoEF & CC) vide letter No.F.No.8-89/2013-FC Dt dated 22nd January, 2016 (Table4.1.3)
- 4) The CRZ Clearance issued by the Ministry of Environment, Forest and Climate Change (MoEF & CC) vide letter No.F.No.11-65/2012-IA.III dated 25th January, 2016 (Table4.1.4)

1.2. ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan described in Rapid EIA in 2012 and Supplemental EIA 2015 prepared by MMRDA

The Contractor shall conduct all mitigation measures and periodical monitoring stipulated in the Environmental Management Plan of the EIAs.

45 days after the Commencement Day, the Contractor shall submit a detailed and comprehensive Environmental Management Plan based on the Outline Environmental Management Plan.

Upon the Engineer notifying his approval to the Environmental Management Plan, or any supplemental part thereof, the Contractor shall adhere to the principles and procedures contained in such document save to the extent that the Engineer may give his approval to any amended or varied version thereof.

Outline of Environmental Management Plan is indicated below Table 4.1.5 and Mitigation Measure on CRZ Clearance for MTHL is stated in Table 4.1.6.

1.3. OTHER NECESSARY PERMISSIONS

Other Necessary Permissions to be obtained by the Contractor including, but not limited to, the following permissions shall be obtained by the Contractor before the actual construction activities;

- ✓ Maharashtra High Court Permission for Mangrove Cutting by the Proponent based on the final affected area.
- ✓ Non Objection Certificate from Maharashtra Pollution Control Board (MPCB) for plant and facility to be used by the Contractor at site for the Project.



Table 4.1.1 Regulations and Clearances

F.No.11-65/2012-IA-III
 Government of India
 Ministry of Environment & Forests
 (IA.III Division)

Paryavaran Bhawan,
 CGO Complex, Lodhi Road,
 New Delhi - 110 003.

Dated: 19th July, 2013

To
 Metropolitan Commissioner,
 Mumbai Metropolitan Region
 Development Authority (MMRDA),
 Bandra - Kurla Complex, Bandra (East),
 Mumbai - 400 051, Maharashtra

Subject: CRZ Clearance for Mumbai Trans Harbour Sea Link (MTHL) by M/s
 Mumbai Metropolitan Region Development Authority (MMRDA) -
 Reg.

This has reference to letter No: CRZ-2012/CR-52/7C-3 dated 15.06.2012 from Member Secretary, Maharashtra Coastal Zone Management Authority (MCZMA) and your letters dated 14.02.2013 and 17.06.2013 seeking prior CRZ Clearance for the above project under the Coastal Regulation Zone (CRZ) Notification, 2011. The proposal has been appraised as per prescribed procedure in the light of provisions under Coastal Regulation Zone Notification, 2011 on the basis of the mandatory documents enclosed with the application viz., the Questionnaire, recommendation of State Coastal Zone Management Authority, EMP and the additional clarifications furnished in response to the observations of the Expert Appraisal Committee constituted by the competent authority in its meeting held on 19th - 21st September, 2012.

2. It is interalia, noted that the proposal involves construction of 6 lanes Road Bridge across the Mumbai harbor. The proposed Mumbai Trans Harbour Link (MTHL) which aims at facilitating decongestion of Mumbai by improving connectivity between the Island city and main land (Navi Mumbai) and development of Navi Mumbai Region was envisaged about 30 years back. The alignment was approved by Prime Minister's Office in 1984. The project involves the construction of a bridge across the Mumbai harbour between Sewri on the island city side (in the Mumbai Port Trust area) and Chirle on the Navi Mumbai side. The link is about 22 km long with a 16.5 km bridge across the sea and a 5.5 km long viaduct on the land. The exit and entry into the six lane freeway would be through interchanges at the end points and at the intermediate points on the Navi Mumbai side.

3. MTHL project received environmental clearance under the CRZ Notification, 1991 from MoEF on 11th March 2005. On receipt of the same, GoM through MSRDC Ltd had initiated the bidding process for construction of Sea Link but it could not be concluded. The validity of environmental clearance granted was for a period of five years for commencement of the construction or operation of project. The proposed alignment passes through coastal regulation zone (CRZ).



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The Eastern Freeway, which is a north-south 4 lane elevated road presently under construction, and the proposed Sewri-Worli East West connector would integrate with MTHL. From the interchange, the alignment will follow the approved alignment passing along Timber Depot Road and enter Sewri Mudflats and then continue towards the east and traverse over Sewri mudflats, pir-pau jetty, Thane Creek Channel, Panvel Creek Channel and the intertidal zone before turning south to enter the main land at Shivaji Nagar in Navi Mumbai. Vertical clearance of min 9.1m all along the length and maximum 25.2m for navigation purposes is proposed. The project will have Toll Plaza on land on Navi Mumbai side, Bridge Control Station and state of the art intelligent transport system. Casting yards are proposed at Sewri and Nhava outside the CRZ area. However, two temporary jetties will be constructed for movement of the materials.

4. Rapid EIA has been carried out as per the CRZ Notification, 2011. Mitigation measures are proposed to ameliorate the impacts due to the proposed construction and operation of the MTHL especially addressing the issues of mudflats/migratory birds. It is proposed to construct a temporary bridge in the mudflats for transportation of men and machinery at the execution site, thus minimizing the effect on the mudflats. The proposed alignment of MTHL passes through the Coastal Regulation Zone (CRZ) as per the Coastal Zone Management Plans (CZMP) of Mumbai and Navi Mumbai. Out of 22 km length of MTHL, 2.25km of length passes through the CRZ (2km in CRZ-I and 0.25km in CRZ-II). Since entire sea link is proposed on viaduct, area occupied by piers will be affected. Compensatory mangrove plantation in an area of 30 ha on the Nava side is proposed for loss of 0.1776 ha of mudflats/mangroves.

5. The project was considered by the MCZMA in its 73rd meeting held on 23rd April 2012 and MCZMA recommended it to the MoEF vide letter No: CRZ-2012/CR-52/TC-3 dated 15.06.2012.

6. The Expert Appraisal Committee, after due consideration of the relevant documents submitted by the project proponent and additional clarifications furnished in response to its observations, have recommended for the grant of CRZ Clearance for the project. Accordingly, the Ministry hereby accords necessary CRZ Clearance for the above project as per the provisions of Coastal Regulation Zone Notification, 2011, subject to strict compliance of the terms and conditions as follows:

7. **SPECIFIC CONDITIONS:**

- (i) As per the CRZ notification, 2011, at least five times the number of mangroves destroyed/cut during the construction process shall be replanted. Mangrove plantation in an area of 30 ha shall be carried out as committed against loss of 0.1776 ha of mudflats/mangroves. Permission from the High Court of Bombay shall be obtained with respect to mangrove cutting.
- (ii) Proponent shall provide lighting in consulting with the Bombay Natural History Society so as to minimise the likely impacts to the migratory birds.
- (iii) All the construction equipment's shall be provided with exhaust







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silencers as committed.

- (iv) Noise containment barriers shall be provided on both sides of the bridge in mudflat areas (CRZ-IA) so as to minimise the likely impacts to the migratory birds as committed.
- (v) There shall be no dredging and reclamation for the project.
- (vi) Pre - stressed super structure shall be used in the mud flat area for construction as committed.
- (vii) The muck materials shall be analysed prior to dumping/ disposal in the identified locations with the approval of the competent authority to ensure that it do not cause any impact to the environment.
- (viii) Proponent informed that there is no fishing activity in the area since it is a navigation channel for the near-by ports. However, navigational channel is provided with 25m for ships and 9.1 m for fishing boats.
- (ix) All the recommendations of the MCZMA shall be strictly complied with.
- (x) There shall be no building construction beyond 20,000 sqm.
- (xi) There shall be no water drawal in CRZ area.
- (xii) There shall be no disposal of solid or liquid wastes on coastal area. Solid waste Management shall be as per Municipal Solid (Management and Handling) Rules, 2000.
- (xiii) Sewage shall be treated and the Treatment Facility shall be provided in accordance with the Coastal Regulation Zone Notification, 2011. The disposal of treated water shall conform to the regulations of State Pollution Control Board.
- (xiv) The project proponent shall set up a separate environmental management cell for effective implementation of the stipulated environmental safeguards under the supervision of a Senior Executive.
- (xv) The funds earmarked for environment management plan shall be included in the budget and this shall not be diverted for any other purposes.

8. **GENERAL CONDITIONS :**

- (i) Full support shall be extended to the officers of this Ministry/Regional Office at Bhopal by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.
- (ii) A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bhopal regarding the implementation of the stipulated conditions.

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- (iii) Ministry of Environment & Forests or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.
- (iv) The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with to the satisfaction of the Ministry.
- (v) In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment and Forests.
- (vi) The project proponents shall inform to the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.
- (vii) A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion/representation has been made a received while processing the proposal.
- (viii) State Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's Office/Tehsildar's office for 30 days.

9. These stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter.

10. All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, and clearances under the Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.

11. The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forests at <http://www.envfor.nic.in>. The advertisement should be made within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bhopal.

12. This Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.



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13. Any appeal against this clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

14. Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent on its website.

15. A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parishad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.

16. The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.

17. The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.

18. The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail.


(Lalit Kapur)
Director (IA-III)

Copy to:

1. The Secretary, Department of Environment, Govt. of Maharashtra, Mantralaya, Mumbai - 400 032.
2. The Chairman, CPCB, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32.
3. The Chairman, Maharashtra Coastal Zone Management Authority, Room No.217 (Annexe), Mantralaya, Mumbai - 400 032.
4. The Chairman, Maharashtra Pollution Control Board, Kalpataru Points, 3rd & 4th floor, Opp. Cine Planet, Sion Circle, Sion (E), Mumbai - 400 022.
5. The Chief Conservator of Forests, Ministry of Environment and Forests, Regional Office, Western Region, Kendriya Paryavaran Bhavan, Link, Road No. 3, Ravishankar Nagar, Bhopal- 462016 (M.P.)
6. Guard File.
7. Monitoring Cell.



Table 4.1.2 Regulations and Clearances

MAHARASHTRA COASTAL ZONE MANAGEMENT AUTHORITY

Tel. No. : 2285 2696
e-mail : mahamezma@gmail.com

No. CRZ 2015 /CR 2364 TC 4
Office of the -
Maharashtra Coastal Zone Management Authority,
Environment Department, 15th floor, New
Administrative Building, Mantralaya,
Mumbai- 400 032.

26th November, 2015

To,

✓ Director (IA-III), Coastal Zone Regulation,
Government of India,
Ministry of Environment, Forests & Climate Change,
Indira Paryavaran Bhavan,
Jor Bagh Road, New Delhi - 110 003.

Subject: Proposed Mumbai Trans Harbour Link (MTHL) project by
Mumbai Metropolitan Regional Development Authority
(MMRDA)

The proposal of Mumbai Trans Harbour Link (MTHL) project by Mumbai Metropolitan Regional Development Authority (MMRDA) was considered in 107th meeting of the MCZMA held on 7th November, 2015.

2. The Additional Metropolitan Commissioner, MMRDA presented the proposal of Mumbai Trans Harbour Link (MTHL) before the Authority, in light of judgment dated 15.10.2015 of the Hon. NGT, Western Zone, Pune given in the appeal no. 4/2013. He stated that the NGT, Pune has set aside the CRZ clearance accorded to the said project by MoEF, New Delhi with a direction to remit the matter to MoEF to consider it afresh. The NGT, in particular has ordered to examine the impacts of the project on mangroves ecosystem, habitat of flamingos, mudflats besides other impacts. Hon. NGT has also directed to ascertain whether provisions of EIA Notification, 2006 are applicable to the said project. He further stated that directions have been given to MoEF to take decision independently on merit in eight (8) weeks and CRZ clearance given to the project by MoEF has been kept in abeyance for six (6) months.

3. The MMRDA officers presented the proposal before the Authority covering issues like impacts on flamingos, mudflats, mangroves, fisheries etc. and mitigation measures along with Environmental Management Plan. It was stated that Salim Ali Centre for Ornithology and Natural History has carried out studies on Flamingos and other migratory birds in the Sewri-Mahul and Nhava Mudflats in the Dec, 2008 and suggestions / observations of the report would be complied with during construction & operation phase of the project. He also informed that MMRDA has formulated a committee to assess the impact of the proposed activity on fishing communities and compensatory policy for them. Rapid Environment Impact Assessment report prepared in the year 2012, Coastal Zone Management plan prepared by IRS, Chennai, mitigation measures proposed by IRS, Chennai and report of CWPRS pertaining to the hydrodynamics is



4. The MCZMA noted that as per the CZMP, the 22 Km long & six lane carriages MTHL project passes through CRZ I, CRZ II and CRZ IV. The Sewri end of the 1.5 km alignment having chainage 1.0 to 2.5 Km passes through mudflats, sparse mangroves and abuts the flamingos breeding site. Further it was stated that the Nhave end of the 0.6 km alignment having chainage 16.98 to 17.5 km also passes through mudflats and sparse mangroves. As per the report, 14.48 km (66%) alignment falls in creek water, 2.1 Km (12%) passes through mudflats and 4.92 km (22%) alignment is on land. CRZ I areas particularly Sewri mudflat and shivaji nagar mudflat are ecological important. The mangroves area affected at Sewri end is 576 Sqm and is 9306 Sqm at Chirle side of the proposed Sea link.

5. During presentation on EIA report & other documents, the Authority observed that typically major construction work will be done in sea area by water transportation. The approach jetties at the two ends will be in the form of piled jetties causing less obstruction to water flow. Large number of precast units will be used. As regards to CWPRS report, it was noted that i) the hydrodynamic model was well validated with actual tide, current observations ii) the centre to centre distance between two piers is large (typically 50 meters) causing minimum obstruction to the flow. Further, only small reduction in the current strength immediately upstream and downstream (upto 400 m or so) of the bridge piers was seen. From the consideration of currents, only Pir Pau Jetty may face maximum 10% reduction. iii) Most of the vital installations in the harbor channel and thane creeks, such as Mumbai and JN port, BARC Jetty, Mazgaon Dock, Oil jetties of the Jawahar dweep are less likely to get affected in terms of water levels, tidal flux and currents. As the strength and pattern of the current may not appreciably change beyond the vicinity of the MTHL piers. The sediment transport process at vital installations may not get affected.

6. The Authority further observed that to protect the bird habitat and ensure minimize damage into the mudflat area, viaducts are proposed instead of embankments in the mudflat area. The piers for the viaduct would occupy small area on mudflat and hence would not cause serious erosion. However, these pillars would alter biological diversity and invite large variety of benthic algae enabling formation of secondary community as result of ecological succession. To minimize disturbance to ecological important mudflats, it is observed that operations in the mudflats or intertidal zones would be done by using temporary jetty which will be parallel to permanent structure in the Right of Way for the transportation of labour, construction material, precast elements, machinery etc on the either ends. As per the report presented, in order to avoid the disturbance to mudflats & bird habitat especially flamingos, no reclamation in mudflats or in the water area on Sewri and Navi Mumbai side is proposed. As per the report, it is observed that all construction equipments fully fitted with mufflers and exhaust silencers to contain the noise levels. Machinery used during construction should be properly maintained to minimize the air and noise emissions. MMRDA has also proposed noise barriers of 3 m height on both side of the sea link passing through mudflat area. It is also proposed that construction machinery movement would bypass the locations having habitation of migratory birds during construction.

7. The Authority further observed that post construction vegetation of the mangroves below viaduct in mudflat area on either side will be conserved and protected to maintain ecosystem integrity. MMRDA would develop a corpus fund for restoration of mudflat and bird habitat.



silencers as committed.

- (iv) Noise containment barriers shall be provided on both sides of the bridge in mudflat areas (CRZ-1A) so as to minimise the likely impacts to the migratory birds as committed.
- (v) There shall be no dredging and reclamation for the project.
- (vi) Pre - stressed super structure shall be used in the mud flat area for construction as committed.
- (vii) The muck materials shall be analysed prior to dumping/ disposal in the identified locations with the approval of the competent authority to ensure that it do not cause any impact to the environment.
- (viii) Proponent informed that there is no fishing activity in the area since it is a navigation channel for the nearby ports. However, navigational channel is provided with 25m for ships and 9.1 m for fishing boats.
- (ix) All the recommendations of the MCZMA shall be strictly complied with.
- (x) There shall be no building construction beyond 20,000 sqm.
- (xi) There shall be no water drawal in CRZ area.
- (xii) There shall be no disposal of solid or liquid wastes on coastal area. Solid waste Management shall be as per Municipal Solid (Management and Handling) Rules, 2000.
- (xiii) Sewage shall be treated and the Treatment Facility shall be provided in accordance with the Coastal Regulation Zone Notification, 2011. The disposal of treated water shall conform to the regulations of State Pollution Control Board.
- (xiv) The project proponent shall set up a separate environmental management cell for effective implementation of the stipulated environmental safeguards under the supervision of a Senior Executive.
- (xv) The funds earmarked for environment management plan shall be included in the budget and this shall not be diverted for any other purposes.

8. **GENERAL CONDITIONS :**

- (i) Full support shall be extended to the officers of this Ministry/Regional Office at Bhopal by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.
- (ii) A six-monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bhopal regarding the implementation of the stipulated conditions.



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- xiii. MMRDA should take the expert opinions from the BNHS regarding safeguards to be placed so as to mitigate the disturbance to flamingo's habitat.
- xiv. MMRDA to formulate a Environment Cell (EMC) to monitor impacts on environment during construction as well as during operations, under Chairmanship of Additional Metropolitan Commissioner, MMRDA. The said Cell would comprises of internal cell with Joint project Director (Environment), MMRDA and the Chief Engineer, MMRDA and other members will be from Forest Department, Maharashtra Pollution Control Board, Environment Dept and other Environmental Specialists.
- xv. MMRDA to set aside an amount of about 2% of the project cost towards mitigation measures: restoration & Conservation of mangroves/birds/flora/fauna and mudflats restoration.
- xvi. MMRDA to undertake training programmes for construction personnel regularly so as to cause minimum disturbance to birds, due to construction activities.
- xvii. MMRDA to develop a nature interpretation centre in the appropriate place to create awareness about importance of conservation of flora and fauna and migratory birds.
- xviii. MMRDA to consult expert agency to minimize the damage to the mudflats before commencement of the construction work near the mudflats.
- xix. MMRDA should obtain the Forest Clearance since, the proposed alignment of MFHL is passing through mangroves patches at Sewri and Nhava End of the project. Prior permission from the High Court of Mumbai should also be obtained as per the Hon. High Court order dated 27.1.2010 & 6.10.2005 in WP No. 3246/2004 & PIL 87/2006
- xx. MMRDA to consult and implement suggestions given by committee constituted for fisheries issues in the project area. Representative of fisheries commissioner, local fisherman community etc should be appointed on the committee. The committee to ensure all mitigation measures for fisheries protection and issues of the local fisherman are considered and implemented during construction by conducting regular meeting during construction phase.
- xxi. MMRDA to ensure that no fishing activity is hampered during construction and operation phase of the project. Mudflats and creek are of vital importance to fisheries. Therefore during construction and after completion of the project, MMRDA to assess the project affected fishermen and loss of business to fishermen that may occur due to the project.
- xxii. MMRDA to formulate project specific disaster management plan and standard operating procedures before commencement of the project.
- xxiii. MMRDA to constitute Environmental monitoring committee over and above to internal environmental cell as proposed. This committee will ensure third party monitoring of implementation of ecological compliances. The structure of the committee should comprise experts from National Institute of Oceanography; Representative of BNHS; renowned expert in Ornithology; Director, Fisheries Institute, Versova, Andheri; Head of Coastal Engineering, IIT, Mumbai and Representative of Environment Dept and Maharashtra Pollution Control Board. The officer of MMRDA will act as a Member Secretary to coordinate the quarterly meetings of the committee during construction phase.



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General Conditions:

- i. The MCZMA reserves the right to revoke this recommendation, if the conditions stipulated are not complied with to the satisfaction of the MCZMA or Environment Department.
- ii. The MCZMA or any other competent authority, MCGM may stipulate any additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with.
- iii. A copy of the recommendation letter shall be marked to the concerned local body/ local NGO, if any, from whom any suggestion/ representation has been received while processing the proposal.
- iv. The environmental safeguard measures should be implemented in letter and spirit.
- v. This recommendation will be valid for 5 years from the date of issue of recommendation for commencement of construction & operation.
- vi. The recommendation from CRZ point of view is being issued without prejudice to the action initiated under EP Act or any court case pending in the court of law and it does not mean that project proponent has not violated any environmental laws in the past and whatever decision under EP Act or of the Hon'ble court will be binding on the project proponent. Hence this recommendation does not give immunity to the project proponent in the case filed against him, if any or action initiated under EP Act.

10. The agenda item, minutes and the copy of this letter is also available on the website of MCZMA i.e. <http://mczma.maharashtra.gov.in>.

Member Secretary (MCZMA)

Copy for information to:

1. Additional Chief Secretary, Environment Dept, Room No. 217, Annex Building, Mantralaya, Mumbai.
2. Metropolitan Commissioner, MMRDA, Bandra Kurla Complex, Mumbai. District Collector, Raigad.
3. District Collector, Mumbai City, Old Custom House, Fort, Mumbai
4. District Collector, Raigad, Alibag, Dist. Raigad
5. Select File - TC 4



MINUTES OF THE 107th MEETING OF MAHARASHTRA COASTAL ZONE MANAGEMENT AUTHORITY (MCZMA) HELD ON 7th NOVEMBER, 2015

Centre for Ornithology and Natural History has carried out studies on Flamingos and other migratory birds in the Sewri- Mahul and Nhava Mudflats in the Dec, 2008 and suggestions / observations of the report would be complied with during construction & operation phase of the project. He also informed that MMRDA has formulated a committee to assess the impact of the proposed activity on fishing communities and compensatory policy for them.

It was noted that as per the CZMP, the 22 Km, six lane carringes long MTHL project passes through CRZ I, CRZ II and CRZ IV. The sewri end of the 1.5 km alignment having chainage 1.0 to 2.5 Km passes through mudflats, sparse mangroves and abuts the flamingos breeding site. Further it was stated that the Nhava end of the 0.6 km alignment having chainage 16.98 to 17.5 km also passes through mudflats and sparse mangroves. As per the report 14.48 km (66%) alignment falls in creek water, 2.1 Km (12%) passes through mudflats and 4.92 km (22%) alignment is on land. CRZ I areas particularly sewri mudflat and shivaji nagar mudflat are ecological important. The mangroves area affected at Sewri end is 576 Sqm and is 9306 Sqm at Chirle side of the proposed Sealink.

During presentation on EIA report, the Authority observed the following:

1. As reported, typically major construction work will be done in sea area by water transportation. The approach jetties at the two end will be in the form of piled jetties falling less obstruction to water flow. Large number of precast units will be used.
2. As regards to CWPRS report, it was noted that i) the hydrodynamic model was well validated with actual tide, current observations ii) the centre to centre distance between two piers is large (typically 50 meters) causing minimum obstruction to the flow. Further, only small reduction in the current strength immediately upstream and downstream (upto 400 m or so) of the bridge piers was seen. From the consideration of currents, only Pir Pau Jetty may face maximum 10% reduction. iii) Most of the vital installations in the harbor channel and thane creeks, such as Mumbai and JN port, BARC Jetty, Mazgoan Dock, Oil jetties of the Jawahar dweep are less likely to get affected in terms of water levels, tidal flux and currents. As the strength and pattern of the current may not appreciably change beyond the vicinity


Member Secretary

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2/3/2015

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of the MTHL piers. The sediment transport process at vital installations may not get affected.

3. It is observed that to protect the bird habitat and ensure minimize damage into the mudflat area, viaducts are proposed instead of embankments in the mudflat area. The piers for the viaduct would occupy small area on mudflat and hence would not cause serious erosion. However, this pillars would alter biological diversity and invite large variety of benthic algae enabling formation of secondary community as result of ecological succession. To minimize disturbance to ecological important mudflats, it is observed that operations in the mudflats or intertidal zones would be done by using temporary steel jetty which will be parallel to permanent structure in the Right of Way for the transportation of labour, construction material, precast elements, machinery etc on the either ends.
4. As per the report presented, in order to avoid the disturbance to mudflats & bird habitat especially flamingos, no reclamation in mudflats or in the water area on Sewri and Navi Mumbai side is proposed
5. As per the report, it is observed that all construction equipments fully fitted with mufflers and exhaust silencers to contain the noise levels. Machinery used during construction should be properly maintained to minimize the air and noise emissions. MMRDA has also proposed noise barriers of 3 m height on both side of the sealink passing through mudflat area. It is also proposed that construction machinery movement would bypass the locations having habitation of migratory birds during construction.
6. Post construction vegetation of the mangroves below viaduct in mudflat area on either side will be conserved and protected to maintain ecosystem integrity. MMRDA would develop a corpus fund for restoration of mudflat and bird habitat. Further, bird monitoring and management plan is proposed to be evolved before construction activity which will comprise monitoring of active construction area, listing of bird species, monitoring during pile driving and other construction activities etc. Mangroves restoration programme /compensatory afforestation on 7 Ha. suitable areas will be taken by MMRDA through Forest Dept/ Mangroves cell.
7. The Authority also observed that casting yard is proposed in CRZ I (mangroves) and CRZ II area and opined that casting yard to be shifted from CRZ I (mangroves area)



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Chairperson

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8. The Authority also discussed the applicability of the Environment Clearance under EIA Notification, 2006 and opined that though activity *per se* is not covered in EIA Notification, 2006, however, considering the scale and ecological settings of the project area, MoEFCC, New Delhi may decide appropriately on the applicability of the EC for the said project.

After detailed deliberation on the submissions of the MMRDA & directions of the Hon. NGT, Pune, the Authority decided to recommend the project from CRZ point view under the provisions of CRZ Notification, 2011 to MoEFCC, New Delhi for appropriate consideration subject to compliance of following conditions:

1. MMRDA to ensure that mangroves restoration on the identified areas is undertaken immediately through Mangroves Conservation Cell, Mumbai.
2. MMRDA to explore the possibility of increase in the distance between two piers of viaduct in the mudflat area, which may be more than 50 m. This will minimize the disturbance in ecologically important mudflats and bird habitat area.
3. The Sewri End of the Jetty should be used for transportation of construction material to avoid disturbance to the mudflats.
4. No reclamation is allowed in CRZ I & CRZ IV area except for viaducts & piers. MMRDA should ensure the same.
5. MMRDA to install noise barriers of 3 m height on both side of the Sealink passing through CRZ I (mudflat & mangroves area) and CRZ IV area.
6. Casting yard proposed on 16.15 ha on mangroves area on Navi Mumbai side should be shifted from CRZ I (mangroves area).
7. MMRDA to ensure that Construction activities near flamingo habitat area may be restricted to the season when flamingos are not on the site or not in larger flocks.
8. MMRDA to ensure that all construction equipments are fully fitted with mufflers and exhaust silencers to contain the noise levels. Machinery used during construction should be properly maintained to minimize the air and noise emissions.
9. MMRDA to ensure that minimum damage is caused to mangroves ecosystem.


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10. MMRDA to ensure that operations in the mudflats or intertidal zones will be done by using temporary jetty which will be parallel to permanent structure in the Right of Way for the transportation of labour, construction material, precast elements, machinery etc on the either ends.
11. MMRDA to declare entire MTHL as 'No Honking area'
12. MMRDA to ensure that no hoardings are allowed to displayed on the MTHL to avoid disturbance due to light illumination to Marine flora, fauna and birds during night.
13. MMRDA should take the expert opinions from the BNHS regarding safeguards to be placed so as to mitigate the disturbance to flamingos habitat.
14. MMRDA to undertake training programmes for construction personnel regularly so as to cause minimum disturbance to birds, due to construction activities.
15. MMRDA to develop a nature interpretation centre in the appropriate place to create awareness about importance of conservation of flora and fauna and migratory birds.
16. MMRDA to formulate a Environment Cell (EMC) to monitor impacts on environment during construction as well as during operations, under Chairmanship of Additional Metropolitan Commissioner, MMRDA. The said Cell would comprises of internal cell with Joint project Director (Environment), MMRDA and the Chief Engineer, MMRDA and other members will be from Forest Department, Maharashtra Pollution Control Board, Environment Dept and other Environmental Specialists.
17. MMRDA to set aside an amount of about 2% of the project cost towards mitigation measures; restoration & Conservation of mangroves/birds/flora/fauna and mudflats restoration.
18. MMRDA to consult expert agency to minimize the damage to the mudflats before commencement of the construction work near the mudflats.
19. MMRDA should obtain the Forest Clearance since, the proposed alignment of MTHL is passing through mangroves patches at Sewri and Nhava End of the project. Prior permission from the High Court

[Signature]
Member Secretary


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- of Mumbai should also be obtained as per the Hon. High Court order dated 27.1.2010 & 6.10.2005 in WP No. 3246/2004 & PIL 87/2006
- 20.MMRDA to consult and implement suggestions given by committee constituted for fisheries issues in the project area. Representative of fisheries commissioner, local fisherman community etc should be appointed on the committee. The committee to ensure all mitigation measures for fisheries protection and issues of the local fisherman are considered and implemented during construction by conducting regular meeting during construction phase.
- 21.MMRDA to ensure that no fishing activity is hampered during construction and operation phase of the project. Mudflats and creek are of vital importance to fisheries. Therefore, during construction and after completion of the project, MMRDA to assess the project affected fishermen and loss of business to fishermen that may occur due to the project.
- 22.MMRDA to formulate project specific disaster management plan and standard operating procedures before commencement of the project.
- 23.MMRDA to constitute Environmental Monitoring Committee, over and above to internal Environmental Cell as proposed. This committee will ensure third party monitoring of implementation of ecological compliances. The structure of the committee should comprise experts from National Institute of Oceanography; Representative of BNHS; renowned expert in Ornithology, Director, Fisheries Institute, Versova, Andheri; Head of Coastal Engineering, IIT, Mumbai and Representative of Environment Dept and Maharashtra Pollution Control Board. The officer of MMRDA will act as a Member Secretary to coordinate the quarterly meetings of the committee during construction phase.


Member Secretary

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Table 4.1.3 Regulations and Clearances

F. No. 8-89/2013-FC
Government of India
Ministry of Environment, Forest and Climate Change
(FC Division)

Indira Paryavaran Bhawan,
Aliganj, Jorbagh Road,
New Delhi - 110003

Dated: 22nd January, 2016

To
The Principal Secretary (Forests),
Department of Environment & Forests,
Government of Maharashtra,
Nagpur.

Sub: Diversion of 47.4170 ha of forest land in favour of the Executive Engineer (MTHL), MMRDA, Bandra Kurla Complex, Bandra (E), Mumbai for six laning of Mumbai Trans Harbour Link Road in Raigad & Thane district in the State of Maharashtra.-regarding.,

Sir,

I am directed to refer to the Government of Maharashtra letter No. ELD-1313/CR-206/F-10 dated 30th September 2013 on the above mentioned subject seeking prior approval of Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980 and to say that the proposal has been examined by the Forest Advisory Committee constituted by the Central Government under Section-3 of the said Act.

After careful examination of the proposal of the State Government and on the basis of the recommendations of the Forest Advisory Committee, the Central Government hereby conveys the 'in-principle' approval for diversion of 47.4170 ha of forest land in favour of the Executive Engineer (MTHL), MMRDA, Bandra Kurla Complex, Bandra (E), Mumbai for six laning of Mumbai Trans Harbour Link Road in Raigad & Thane district in the State of Maharashtra, subject to fulfillment of the following conditions:-

- i. Legal status of the diverted forest land shall remain unchanged
- ii. Compensatory afforestation over the non-forest land equal in extent to the forest land being diverted shall be raised and maintained by the State Forest Department at the cost of the User Agency.
- iii. The land identified for the purpose of CA shall be clearly depicted on a Survey of India toposheet of 1:50,000 scale.
- iv. The User Agency shall transfer the cost of raising and maintaining the compensatory afforestation, at the current wage rate, to the State Forest Department. The scheme may include appropriate provision for anticipated cost increase for works scheduled for subsequent years.
- v. The State Government shall charge the Net Present Value (NPV) of the forest land being diverted under this proposal from the User Agency as per the orders of the Hon'ble Supreme Court of India dated 28.03.2008, 24.04.2008 and 09.05.2008 in Writ Petition (Civil) No. 202/1995 and the guidelines issued by this Ministry vide its letter No. 5-3/2007-FC dated 05.02.2009 in this regard.



- xx. The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Central Government.
- xxi. No damage to the flora and fauna of the adjoining area shall be caused.
- xxii. The user agency in consultation with the State Government shall create and maintain alternate habitat/home for the avifauna, whose nesting trees are to be cleared in this project. Birds nests artificially made out of eco-friendly material shall be used in the area, including forest area and human settlements, adjoining the forest area being diverted for the project.
- xxiii. Felling of trees on the forest land being diverted shall be reduced to the bare minimum and the trees should be felled under strict supervision of the State Forest Department.
- xxiv. The User Agency shall raise strip plantation on either sides of the road and central verge at the project cost, as per IRC specification, with maintenance of 7-10 years. The User Agency shall also submit design of providing at least 2-3 rows of long rotation indigenous trees, as per provision of IRC-SP-21-2009 (Guidelines on landscaping & tree plantation), on either sides of the road before final clearance.
- xxv. Wherever possible and technically feasible, the User Agency shall undertake afforestation measures along the roads within the area diverted under this approval, in consultation with the State Forest Department at the project cost.
- xxvi. The reclamation of quarry should be done under the supervision of the State Forest Department. The quarry shall be reclaimed and afforested completely before the project is closed.
- xxvii. Overburden shall not be dumped outside the width of the road. The muck generated in the earth cutting will be disposed off at the designate dumping sites and in no case the muck/debris shall be allowed to roll down the hill slopes.
- xxviii. The User Agency will provide retaining walls, breast wall and drainage as per requirement to make the slope stable.
- xxix. The User Agency will undertake comprehensive soil conservation measures at the project cost in consultation with the State Forest Department.
- xxx. The State Government shall complete settlement of rights, in terms of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence as prescribed by this Ministry in its letter No. 11-9/1998-FC (pt.) dated 03.08.2009 and 05th February, 2013, in support thereof.
- xxxi. The User Agency will assist the State Government in preservation of flora and fauna of the area in accordance with the plan prepared by the Chief Wildlife Warden of the State. Attention will be particularly given to providing safe crossing and corridors for wildlife species and protecting sensitive habitat like wetlands, grasslands and woodlands from degradation. Where canopy continuity is required for particular species, special measures shall be prescribed by the CWLW for providing crossing points. Where certain trees used for nesting/rookeries of species like birds of prey, herons, storks, hornbills, etc., are to be destroyed, alternative structure shall be provided and the trees transplanted.
- xxxii. The User Agency shall not collect any toll from the vehicles carrying forest officers on duty.
- xxxiii. The designing of culverts/bridges, if any, over the natural streams/rivers/canals should be done in such a manner that it does not hamper the natural course of water, does not give rise to water-logging, and also does not hamper movement of wild animals.

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- vi. At the time of payment of the Net Present Value (NPV) at the then prevailing rate, the User Agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India.
- vii. All the funds received from the User Agency under the project, shall be transferred to Ad-hoc CAMPA in the Saving Bank Account pertaining to the State concerned.
- viii. The user agency shall take prior permission from Hon'ble National Green Tribunal before issue of order for diversion of forest land in accordance with the Hon'ble Mumbai High Court, Nagpur Bench orders dated 27/4/2005 and 7/6/2006 in Writ Petition No. 1277/2000 as per which permission of Hon'ble High Court is necessary for taking up projects and activities in forest areas within 10 Km from protected areas. in accordance with Accordingly, this condition may be stipulated in the in-principle approval.
- ix. The state government/user agency shall take prior permission from Hon'ble High Court for Mangrove cutting before issue of order for diversion of the forest land in accordance with Hon'ble Mumbai High Court order dated 27/1/2010 in PIL 87 of 2006.
- x. The state government/MMRDA shall implement the mitigation measures recommended by the BNHS as modified by the State Board for Wild Life, at the project cost. The state government shall identify the recommendations which are to be implemented by the state forest department, if any, and cost of such activities shall be deposited with Ad-hoc CAMPA. For the activities to be taken up by MMRDA they shall submit an undertaking to the effect that the the activities will be taken up at the project cost.
- xi. Final notification for declaration of the area of 16.90 sq. km. in Thane creek of Thane district as sanctuary shall be issued before grant of Stage II approval. MMRDA shall contribute in establishment and management of the sanctuary, modalities for which shall be worked out by the state government.
- xii. Maharashtra Forest Department, through its Mangroves and Marine Biodiversity Conservation Foundation shall prepare a Mangroves and Marine Biodiversity Conservation Plan which shall be implemented at the project cost.
- xiii. Non-forest land to be transferred and mutated in favour of the State Forest Department for raising Compensatory Afforestation shall be notified as reserved Forest under Section-4 or Protected Forest under Section-29 of the Indian Forest Act, 1927 or under the relevant Section(s) of the local Forest Act.
- xiv. The User Agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required.
- xv. No labour camp shall be established on the forest land.
- xvi. The User Agency shall provide fuels preferably alternate fuels to the labourers and the staff working at the site so as to avoid any damage and pressure on the nearby forest areas.
- xvii. The boundary of the diverted forest land, as applicable, shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, forward and back bearing and distance from pillar to pillar.
- xviii. The layout plan of the proposal shall not be changed without the prior approval of the Central Government.
- xix. The forest land shall not be used for any purpose other than that specified in the proposal.

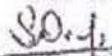
S.P.



- xxxiv. The User Agency shall submit the annual self compliance report in respect of the above conditions to the State Government and to the concerned Regional Officer of the Ministry regularly.
- xxxv. Any other condition that the concerned Regional Office of this Ministry may stipulate, from time to time in the interest of conservation, protection and development of forests & wildlife.
- xxxvi. The User Agency and the State Government shall ensure compliance to provisions of the all Acts, Rules, Regulations and Guidelines, for the time being in force, as applicable to the project.

After receipt of the compliance report on fulfilment of the conditions mentioned above, the proposal shall be considered for final approval under Section-2 of the Forest (Conservation) Act, 1980. Till receipt of the said final/Stage-II approval of the Central Government from this Ministry, transfer of the said forest land to the User Agency shall not be affected by the State Government.

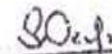
Yours faithfully,


(Sandeep Sharma)

Assistant Inspector General of Forests (FC)

Copy to:

1. The PCCF, Government of Maharashtra, Nagpur.
2. The Nodal Officer, Office of the PCCF, Govt. of Maharashtra, Nagpur.
3. The Add. PCCF (Central) Regional Office, Nagpur.
4. User Agency
5. Guard file/Monitoring Cell.


(Sandeep Sharma)

Assistant Inspector General of Forests (FC)



Table 4.1.4 Regulations and Clearances

F.No.11-65/2012-IA.III
Government of India
Ministry of Environment, Forest and Climate Change
(IA-III Section)

Indira Prayavaran Bhawan,
Jor Bagh Road, New Delhi-3
Dated: 25th January, 2016

To,
The Metropolitan Commissioner,
Mumbai Metropolitan Region Development Authority (MMRDA),
Bandra - Kurla Complex, Bandra (East),
Mumbai - 51 (Maharashtra)

Sub: **Mumbai Trans Harbour Link by Mumbai Metropolitan Region Development Authority (MMRDA) - CRZ Clearance - reg.**

Sir,
This has reference to your proposal forwarded by the Member Secretary, Maharashtra Coastal Zone Management Authority (MCZMA) vide their letter No.CRZ 2015/CR 236/TC 4 dated 26th November, 2015 to this Ministry for grant of clearance in terms of the provisions of the Coastal Regulation Zone (CRZ) Notification, 2011 under the Environment (Protection) Act, 1986.

2. The Hon'ble National Green Tribunal (WZ) at Pune, vide their order dated 15th October, 2015 in Appeal No.4/2013 has set aside the CRZ Clearance dated 19th July, 2013 accorded to the above project by the Ministry with the direction to remit the matter to MoEFCC to consider it afresh. The Hon'ble Tribunal has ordered to examine the impacts of the project on mangroves eco-system, habitat of flamingos, mudflats besides other impacts. They have also directed to ascertain whether provisions of the Environment Impact Assessment (EIA) Notification, 2006 are applicable to the said project. Directions have been given to MoEFCC to take decisions independently on merit in eight weeks, and CRZ Clearance given to the project by MoEFCC has been kept in abeyance for six (6) months.

3. In compliance of the directions of the Hon'ble NGT, the proposal for '**Mumbai Trans Harbour Link (MTHL)**' by Mumbai Metropolitan Region Development Authority (MMRDA) was considered by the Expert Appraisal Committee (EAC) in the Ministry for Infrastructure Development, Coastal Regulation Zone, Building/ Construction and Miscellaneous projects, in its meetings held on 22-23 December & 30th December, 2015.

4. The details of the project, as per the documents submitted by the project proponents (PP), and also as informed during the above said EAC meetings, are reported to be as under:-

(i) The project was first accorded Environmental Clearance under the CRZ Notification, 1991 and the EIA Notification, 1994, vide letter dated 11th March, 2005. However, the project could not take off within the validity period of 5 years of the EC due to irrational offers received from bidders. Subsequently, the CRZ Clearance dated 19th July, 2013 was issued under CRZ Notification, 2011, based on the recommendations of MCZMA vide their letter dated 15th June, 2012, and taking into consideration the submissions of the project proponent that the proposal is to construct sea link and it does not attract the provisions of EIA Notification, 2006.

(ii) The present project '**Mumbai Trans Harbour Link**' (MTHL) envisages construction of 6 lanes road bridge across the Mumbai Harbour, which aims at facilitating decongestion of



Mumbai by improving connectivity between the Island City & main land (Navi Mumbai). The project involves construction of a bridge across the Mumbai harbour between Sewri on the island city side (in the Mumbai Port Trust area) and Chirle on the Navi Mumbai side. The link is about 22 km long with a 16.5 km bridge across the sea and a 5.5 km long viaduct on the land. The exit and entry into the six and freeway would be through interchanges at the end points and at the intermediate points on the Navi Mumbai side.

(iii) As per the Coastal Zone Management Plans (CZMP) of Mumbai and Navi Mumbai, the proposed alignment of 22 km MTHL project passes through CRZ-I, CRZ-II, CRZ-IV. The Sewri end of 1.5 km alignment (chainage 1.0 to 2.5 km) passes through mud flats, sparse mangroves and abuts the flamingos breeding site. The Nhave end of the 0.6 km alignment (chainage 16.98 to 17.5 km) also passes through mudflats and sparse mangroves.

(iv) The Maharashtra Coastal Zone Management Authority (MCZMA) has recommended the project vide their letter No. CRZ 2015/CR 236/TC 4 dated 26th November, 2015.

(v) The total cost of the project is Rs.11,370 crore.

(vi) As per the report, 14.48 km (66%) alignment falls in creek water, 2.1 km (12%) passes through mudflats and 4.92 km (22%) alignment is on land. CRZ-I areas particularly Sewri mudflat and Shivaji Nagar mudflat are ecological important. The mangroves area affected at Sewri end is 576 sqm and is 9306 sqm at Chirle side of the proposed Sea link.

(vii) For navigational spans, a minimum vertical clearance of 2.5 m below the bridge above the highest HTL, whereas it is 9.1 m elsewhere is envisaged.

(viii) Rapid EIA studies were carried out for preparation of EIA/EMP reports wherein, mitigation measures were proposed to ameliorate the impacts due to the proposed construction/operation of the project, especially addressing the issues of mudflats/migratory birds.

(ix) Since the entire sea link is proposed on viaduct, area occupied by piers only will be affected. Compensatory mangrove plantation in area of 30 ha in Nhave side is proposed for loss of 0.1776 ha of mudflats/mangroves due to piers.

(x) The BNHS, an expert institution, has been engaged for addressing various aspects on environmental management, especially related to migratory birds and other issues.

(xi) The project proponent presented the EMP with the details as under:-

S.No.	Environmental attribute	Remark	Cost (in Rs.)
1.	Environmental Monitoring- Air Act, Water Act, Noise levels	Air Noise Water-Marine and Land Solid waste Ecology and Eco-system Fishing etc- Quarterly during CP	8 crore
2.	Compensatory Mangrove Restoration Plan	With the help of Forest department	25 crore
3.	Implementation of the suggestions given by BHNS	In accordance with their report	25 crore
4.	Noise barriers	Along 4.5 x 2 = 9 km stretch abutting mudflats where flamingos gather	45 crore



5.	Mitigation of marine water pollution caused due to the surrounding industries and Sewage from Urban Bodies, by providing Funding and Capacity Building for Enabling Effluent Treatment	Identifying sources, treatability report, implementation of restoration and ETP	40 crore
6.	Contribution to Mangroves Fund, an initiative by Govt. of Maharashtra for Conservation and Protection of Mangroves in Coastal areas by depositing Seed Money. This can be used for Survey & Demarcation of Notified areas; Purchase of vehicles and equipments for anti Encroachment drives, etc.	In accordance with their report this money will be deposited with GoM for restoration, conservation and Protection of mangroves in coastal areas	25 crore
7.	Oil Spill Mitigation Plan	State of the air Oil Spillage mitigation equipment, etc	10 crore
8.	<ul style="list-style-type: none"> • Habitat quality assessment and monitoring • Surveillance management and monitoring team for migratory birds, marine flora, turbidity in sea floor, etc • Corpus fund for mudflat restoration program 	Carrying out detailed habitat quality monitoring of mudflats, migratory birds, marine flora and fauna and surveillance study	20 crore
9.	Appointment of Bird Monitor and his assistant till Restoration of Baseline data	Monthly monitoring during CP and Seasonal monitoring during OP	4 crore
10.	DMP, Fire fighting, Risk Analysis	Necessary equipment, Quick Response Vehicles etc for implementation of the detailed DMP	15 crore
11.	Sustainable development including establishing Nature Interpretation Centre	Establishing a centre for training and workshops at schools and college level	10 crore
12.	Safety and Security	It includes setting up safety measures and security measures including telecommunication systems, safety boats, wireless communications etc for emergency	15 crore
13.	Energy conservation	To use LED, Solar lamps on the bridge, ROW's etc	10 crore
14.	Landscaping-Plantation of trees, flowering plants etc.	Along the entire bridge alignment	8 crore
15.	Compensation and Capacity Building of Fisher folks due to Temporary and Permanent Loss of Fishing ground	Compensating affected fisher folk community welfare, etc	75 crore



5. The EAC, after deliberation on the proposal in its 155th meeting held on 30 December, 2015, recommended the project for grant of CRZ Clearance. As per recommendations of the EAC, the Ministry of Environment, Forest and Climate Change hereby accords CRZ Clearance to the above project 'Mumbai Trans Harbour Link (MTHL)' by Mumbai Metropolitan Region Development Authority (MMRDA), under the provisions of the CRZ Notification, 2011 and amendments thereto, and circulars issued thereon, and subject to the compliance of the specific and general conditions as below:-

A. SPECIFIC CONDITIONS:

- (i) All the terms and conditions stipulated by the MCZMA in their letter No.CRZ 2015/CR 236/TC 4 dated 26th November, 2015, shall be strictly complied with.
- (ii) All the terms and conditions as mentioned in the earlier CRZ Clearance dated 19th July, 2013, shall also be complied with in letter and spirit.
- (iii) The Environment Management Plan as presented during the meeting shall be implemented in consultation with all the stakeholders.
- (iv) The project/activity shall be carried out strictly be in accordance with the provisions of CRZ Notification, 2011, and shall not affect the coastal ecology of the area including flora and fauna.
- (v) The project proponent shall obtain all permissions from concerned authorities prior to commencement of the project, and shall observe all safety requirements onshore and offshore.
- (vi) The project proponent shall not undertake any blasting/construction activities during night hours.
- (vii) The proposal indicates the diversion of 47.417 ha forest land for which the proponent shall obtain the requisite Forest Clearance. The project may be executed in the entire stretch in non-forest land, and while making application to get the Forest Clearance, the execution of work on non-forest land shall not be cited as a reason for grant of FC and in case FC is declined, the forest land shall be maintained at its existing condition. The PP shall submit an undertaking to this effect at the earliest to the concerned Regional Office to this Ministry.
- (viii) All the wildlife mitigation measures as proposed by BNHS in their report dated 23.09.2015 for original alignment shall be implemented with the following modification:-
- (a) construction of jetty on both the ends passing through mud flats and mangroves must not exceed 30 months and construction of actual spans must not exceed more that further 12 months.
- (b) the distance between the supporting pillars shall remain 50 m as currently proposed by the MMRDA.
- (c) MMRDA will partly bear the cost of setting of effluent treatment plant in the region as suggested by BNHS.
- (ix) The project proponent shall not undertake any blasting/construction activities during night hours.



B. GENERAL CONDITIONS:

- (i) Adequate provision for infrastructure facilities including water supply, fuel and sanitation must be ensured for construction workers during the construction phase of the project to avoid any damage to the environment.
- (ii) Full support shall be extended to the officers of this Ministry/Regional Office at Nagpur by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.
- (iii) A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Nagpur regarding the implementation of the stipulated conditions.
- (iv) MoEFCC or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.
- (v) The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with to the satisfaction of the Ministry.
- (vi) In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the MoEFCC.
- (vii) The project proponents shall inform to the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.
- (viii) A copy of the clearance letter shall be marked to concerned Panchayat/ local NGO, if any, from whom any suggestion/ representation has been made received while processing the proposal.
- (ix) A copy of the CRZ Clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The Clearance letter shall also be displayed at the Regional Office, District Industries centre and Collector's Office/Tehsildar's Office for 30 days.
6. The above stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter.
7. All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, and clearances under the Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.
8. The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment, Forest & Climate Change at <http://www.envfor.nic.in>. The advertisement should be made within Seven



days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Nagpur.

9. This Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.

10. Any appeal against this clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

11. Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent on its website.

12. A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parishad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.

13. The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.

14. The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEFCC, the respective Zonal Office of CPCB and the SPCB.

15. The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEFCC by e-mail.

S.K.
25/11/2016
(S.K. Srivastava)
Scientist E

Copy to:-

- 1) The Secretary, Department of Environment, Govt. of Maharashtra, Mantralaya, Mumbai - 32
- 2) The Chairman, CPCB, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32
- 3) The Chairman, Maharashtra Coastal Zone Management Authority, Room No.217 (Annexe), Mantralaya, Mumbai - 32
- 4) The Member Secretary, Maharashtra Pollution Control Board, Sion (E), Mumbai
- 5) The APCCF (C), Ministry of Environment, Forests and Climate Change, Regional Office (WCZ), Ground Floor, East Wing, New Secretariat Building, Civil Lines, Nagpur - 1
- 6) Guard File/Monitoring Cell

S.K.
25/11/2016
(S.K. Srivastava)
Scientist E



Table 4.1.5 Outline of Environmental Management Plan

Project Related Issues	Action to be Taken	Responsible/Supervision Organization/Authority	
		Implementation	Supervision
Construction Phase:			
Borrow pits and quarry sites development	<ul style="list-style-type: none"> • Only existing and licensed/approved quarries and borrow areas shall be used. • Firm up contract for obtaining the quarry material • Resurfacing and landscaping of the borrow pits. 	Contractor	Engineer
Prevention of erosion and scouring	<ul style="list-style-type: none"> • Stabilizing embankment with appropriate technique. 	Contractor	Engineer
Water logging and stagnation of water in borrow pits	<ul style="list-style-type: none"> • Uncontrolled digging of borrow pits shall be avoided to prevent water accumulation, which results in breeding of vector disease. 	Contractor	Engineer
Drainage system	<ul style="list-style-type: none"> • Providing adequate drainage structure • Avoiding obstruction of existing drainage during filling. 	Contractor	Engineer
Site for storage and construction camp	<ul style="list-style-type: none"> • Casting yard and labor camp will be located on Mumbai and Navi Mumbai side. The mitigation measures would be implemented to ameliorate the impacts. 	Contractor	Engineer
Location of hot mix and batching plant	<ul style="list-style-type: none"> • Hot mix and batching plants shall be located away from habitation, agricultural operations and forest area at Navi Mumbai • Asphalt mixing plant shall be over 500 m away from any communities and 300 m from the road as far as possible 	Contractor	Engineer
Water quality	<ul style="list-style-type: none"> • Prior permission of the Engineer and regulatory authorities shall be taken regarding discharging or disposing of any material arising from the execution of works. 	Contractor	Engineer



Project Related Issues	Action to be Taken	Responsible/Supervision Organization/Authority	
		Implementation	Supervision
Dust	<ul style="list-style-type: none"> • Vehicles carrying construction material shall be covered to avoid spilling • Water sprinkling in morning & evening hours at construction yard and unpaved sections of the road to avoid dust generation • Exhaust and noise emissions of construction equipment shall adhere to emission norms as lay out by MoEF/CPCB. 	Contractor	Engineer
Noise level	<ul style="list-style-type: none"> • Stationary equipment shall be placed as far away as possible from inhabited areas to minimize noise impacts • Construction activities shall be scheduled near habitation • Provision of using ear plugs by workers exposed to high noise levels • Provision of noise barriers on both side of the MTHL in the mudflat area i.e. in the CRZ I stretch of the sea link. (About 1.5km on Sewri side and 0.6km on the Shivaji Nagar side of the MTHL). • DG sets, if used, will adhere to the noise standards of MoEF 	Contractor	Engineer
Tree plantation and enhancement measures	<ul style="list-style-type: none"> • Prepare action plan • Budget allocation • Implementation of action plan 	Contractor	Engineer
Basic amenities and sanitation facilities for construction labourers	<ul style="list-style-type: none"> • Adequate Sanitary facilities shall be provided to the workers to avoid health related problem • Periodic health check-up shall be done 	Contractor	Engineer
Sewerage & solid waste disposal at construction camp	<ul style="list-style-type: none"> • Proper sanitation facilities at construction workers camp • Collection of domestic refuse and its suitable disposal 	Contractor	Engineer
Fuel for construction laborers	<ul style="list-style-type: none"> • Adequate supply of fuel (kerosene/gas) shall be provided to construction laborers to avoid felling of trees for cooking and other household 	Contractor	Engineer



Project Related Issues	Action to be Taken	Responsible/Supervision Organization/Authority	
		Implementation	Supervision
Traffic management	<ul style="list-style-type: none"> Secure assistance from local police for traffic control during construction phase Safety measures shall also be undertaken by installing road signs and marking for safe and smooth movement of traffic. 	Contractor in consultation with local traffic police.	Engineer
Occupation health & safety	<ul style="list-style-type: none"> Laborers shall be equipped with proper safety gears like helmets gloves and gumboot Periodic health checkup of construction workers 	Contractor	Engineer
Construction of approach road in Mudflats	<ul style="list-style-type: none"> Temporary bridge should be constructed in the mudflats for movement of vehicles and machinery to avoid the disturbance to mudflats/mangroves 	Contractor	Engineer

Table 4.1.6 Mitigation Measures on CRZ Clearance for MTHL

No	Conditions	Response on Mitigation Measures
1	As per the CRZ notification, 2011, at least five times the number of mangroves destroyed/cut during the construction process shall be replanted. Mangrove plantation in an area of 30 ha shall be carried out as committed against loss of 0.1776 ha of mudflats/mangroves. Permission from the High Court of Bombay shall be obtained with respect to mangrove cutting.	MMRDA will replant 5 times of cutting mangrove in the appointed area by MoEF.
2	Proponent shall provide lighting in consulting in consulting with the Bombay Natural History Society so as to minimize the likely impacts to the migratory birds.	MMRDA will setup traffic light inside of bridge handrail especially in CRZ and flamingo roosting area.
3	All the construction equipment's shall be provided with exhaust silencers as committed.	Low noise construction machines and with exhaust silencer is installed during construction.
4	Noise containment barriers shall be provided on both sides of the bridge in mudflat areas (CRZ-IA) so as to minimize the likely impacts to the migratory birds.	Noise barrier is installed in CRZ and roosting /feeding are of migratory birds such as flamingo.
5	There shall be no dredging and reclamation for the project.	Dredging and reclamation is not planned on this project in the CRZ.
6	Pre-stressed super structure shall be used in the mud flat area for construction as committed.	Pre-stressed super structure will be used in the mud flat area CRZ.
7	The muck materials shall be analysed prior to dumping / disposal in the identified locations with the approval of competent authority to ensure that it do not cause any impact to the environment.	The muck soil is generated from excavated points of piles. The excavated soil is analysed and disposed at designated and authorized dumping site.
8	Proponent informed that there is no fishing activity in the area since it is a navigation channel for the nearby ports. However, navigation channel is provided with 25m for ships and 9.1 m for fishing boats.	Sufficient prescript vertical clearance under discussion with relevant authorities.
9	All the recommendations of the MCZMA shall be strictly compiled with.	All recommendation of the Maharashtra Coastal Zone



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can only cross if the sea level is higher than 0.5m and there is minimum freeboard of 1.5m. If the jetty surface is raised 1.0 m (H.H.W.L +2.00 m), it is possible to increase the tidal window for 20.0 hours per day. In this case, the temporary jetty will need a 3% gradient (~33 m length ramp), which is not a problem considering structural or constructive aspects. The fishing boat navigation channel cross section is shown in Figure .

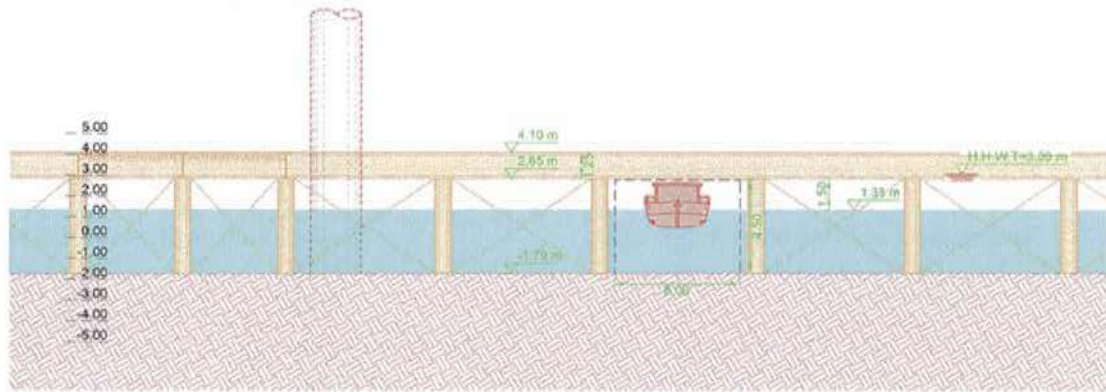


Figure 1.4.2 Temporary Jetty (Fishing Boat Passage at Navi Mumbai Side)



APPENDIX 5 REQUIREMENTS FOR SITE SAFETY PLAN

1. CONTRACTOR'S SAFETY OBLIGATIONS

The Contractor shall be solely and completely responsible for safety conditions on the Site, including the safety of all persons and property inside and adjacent to the Site during the Contract. These requirements shall apply continuously for the duration of the Contract and shall not be limited to normal business hours or other time constraints, nor be reduced or diminished in any way because the Contractor is not given sole occupation of the Site. The Contractor is fully responsible for the safety of workers engaged upon the Works, and of all other persons working at or visiting the Site including any employees of other Contractors working within the Site, and for the protection of the public in the vicinity of the Site. The Contractor shall formulate and implement his Site Safety Plan, in accordance with the requirements of this Appendix.

The Contractor shall within 28 days of the Commencement Date submit his proposed Contractor's Site Safety Plan.

This Site Safety Plan shall be based on JICA's Guidance for management of Safety for Construction Works as stated below and the proposals contained in the Bid submission, updated as appropriate, and, following receipt of the Engineer's written Notice of No Objection shall become the Contractor's Site Safety Plan.

- 1) The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects (September 2014)
 - 2) Works Training Materials for Hazard Prediction (February 2012)
 - 3) Samples of Practical Tool for Safety Construction Management on site (July 2013)
- * All above documents issued by JICA are available in website of JICA.

2. SAFETY VIOLATIONS

The Engineer reserves the right to empower its Site staff to order verbally the immediate stoppage of any process or activity which is in violation of any Applicable Law, the Contract or the Contractor's Site Safety Plan or Method Statements or any other disregard for the health and safety by any person directly or indirectly associated with the works and may result in the Engineer exercising his authority in requiring the removal from the Site of the Contractor's Site Manager and/or other personnel.

The Contractor shall develop a system of disciplinary measures and procedures, which shall be implemented immediately when Site activities commence. These measures and procedures should include amongst other things:

- 1) The issue of Warning Notices
- 2) The removal from Site of personnel who disregard safety instructions

Any person who is removed from the Site for breach of safety measures shall not be allowed to be re-employed on the work Site.

3. CONTRACTOR'S SAFETY ORGANISATION

The Contractor shall designate a Senior Representative of its Project organization as Contractor's Representative, who shall be responsible and directly accountable to the Engineer in all matters concerning construction safety.

The Contractor shall be responsible for all safety related matters including those of sub-contractors and any suppliers. The Contractor shall indemnify the Employer against all safety related claims arising out of the execution of the Contract.

The Contractor shall provide and maintain an organizational structure of safety staff to effectively



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implement and manage occupational safety and health on Site. Such staff shall be engaged solely in construction safety activities. Responsibilities and task subdivision shall be clearly identified in the Site Safety Plan, and shall show direct lines of communication and reporting between the Contractor's Health officer and safety officer and the designated board director and between the Contractor's Health officer and safety officer and the Contractor's Representative.

The Contractor shall within 28 days of the Commencement Date appoint the Health officer and safety officer whose full time duties shall be solely connected with the safety (environmental, industrial health and hygiene) aspects of the Works and who shall report directly to the designated board director. Such an appointment shall be subject to a statement of no objection by the Engineer. The Health officer and safety officer is a Key Personnel appointment and he shall implement, maintain and monitor compliance with the Site Safety Plan and all safety procedures, and be based full time on Site.

The Contractor shall not remove the appointed Health officer and safety officer without the prior written consent of the Engineer, and any replacement shall be nominated by the Contractor at the same time consent to remove the incumbent Health officer and safety officer is sought.

The Contractor shall provide adequate numbers of supporting staff for the Health officer and safety officer. Such staff shall include at least one deputy Health officer and safety officer, whose qualifications and experience shall be similar to the Health officer and safety officer, and he shall be capable of assuming the duties and functions of the Health officer and safety officer. He shall work full time on the Site and be employed solely in a safety role.

All Subcontractors shall be able to demonstrate a successful track record with regard to management of safety and industrial health. The type of information that shall be requested from the Subcontractors in order to determine their suitability shall include amongst other things the following information relating to their activities over the last five years;

- 1) Fatal accidents
- 2) Major lost time accidents
- 3) Accidents involving members of the public
- 4) Dangerous Occurrences

The Contractor shall authorize the Health officer and safety officer and safety staff to issue stop orders to employees of the Contractor and its subcontractors of any tier, including labor-only, to cease operations and take urgent and appropriate action to make safe the Site and prevent unsafe working practices or other infringements of the Site Safety Plan or breach of any Applicable Laws.

The Contractor shall ensure that each subcontractor of every tier, including labor-only, shall have Safety Supervisory staff that has appropriate experience and training. Such staff shall be responsible for implementing and maintaining the appropriate elements of the Site Safety Plan, regular safety inspections, safety promotion, and safety audits, and for retention of records of all such activities for inspection by employer's safety personnel. All subcontractors shall, at all times, conform to the Site Safety Plan.

Both Contractors and Subcontractors are responsible for providing safety training to all workers and supervisors on Site, and for retention of records of such activities for inspection by the Engineer.

If a subcontractor has at any time more than 50 employees in direct employment on Site, such subcontractor shall retain a full time Health officer and safety officer. The Health officer and safety officer shall have relevant experience, have appropriate safety qualifications and shall be responsible for implementing and maintaining the subcontractor's safety plan.

The Contractor shall not commence any work on Site until the Health officer and safety officer has been appointed and commenced duties on the Site and the appropriate Subcontractor's safety staffs are in place.



4. HAZARD IDENTIFICATION AND RISK ASSESSMENT

4.1. GENERAL

In order to formulate a specific and competent Site Safety Plan, the Contractor shall carry out a detailed risk assessment against the scope and nature of the Works and the particular Site conditions. The risk assessment shall be conducted by a qualified and suitably experienced team comprising planning, design and supervisory staff led by the Health officer and safety officer. The documentation arising from this process shall contain a comprehensive schedule of all perceived risks throughout the life of the Contract and the proposed elimination and mitigation measures necessary to reduce the risk to a minimum. Risk assessment documentation shall form part of the auditable safety records.

Prior to the commencement of any potential high risk operations the Contractor shall conduct a detailed hazard analysis and risk assessment of the task and shall record his findings on appropriate worksheets. The worksheets should then show what measures the Contractor is going to take to reduce the level of risk to acceptable levels.

As a result of the Hazard Identification and Risk Assessment detailed method statements shall need to be produced for medium and high risk activities including, but not limited to, amongst others the following:

- 1) Erection of steel / precast concrete structures
- 2) Excavations
- 3) Piling
- 4) Erection of steel bar / formwork
- 5) High tension power line works
- 6) Installation of heavy equipment
- 7) Demolition

A component part of the detailed method statement shall be the inclusion of the completed Hazard and Risk Worksheet. Method statements should be cross referenced to the Contractor's site Safety Plan. A method statement should contain sufficient information to enable the task to be undertaken safely and should contain as a minimum, the following information:

- 1) Introduction – A brief outline of the Task
- 2) Details of the Risks involved
- 3) A step by step description of how the task is to be undertaken detailing
 - a) What needs to be done;
 - b) The order in which the task will be carried out;
 - c) What plant or equipment is required;
 - d) Who the task will be done by;
 - e) Who will supervise the task;
 - f) Where will the task take place;
 - g) The precaution which must be taken before the task is undertaken; and
 - h) Mitigation measures.

4.2. PERMITS TO WORK

The Contractor shall develop a permit to work system which is a formal written system used to control certain types of work that are potentially hazardous. A permit to work is a document which specifies the work to be done and the precautions to be taken to ensure the safety of both the



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workforce and the equipment. Permits-to-work form an essential part of safe systems of work for many construction activities. They allowed work to start only after safe procedures has been defined and they provide a clear record that all foreseeable hazards have been considered. Permits to work are usually required in high risk areas as identified by the Risk Assessments.

A permit is needed when construction work can only be carried out if normal safeguards are dropped or when new hazards are introduced by the work. Examples of high risk activities include but are not limited to:

- 1) the works concerning the placing of girders for temporary works;
- 2) movement & operation of hydraulic drilling rigs on road
- 3) diaphragm wall works
- 4) work on roads, piling, excavation, shuttering, concrete involving traffic regulations/diversion;
- 5) work in close proximity to overhead / underground utilities, pipelines, services and cables;
- 6) working on electrical apparatus and power driven equipment;
- 7) hand excavation e.g. for sumps, tunnel break-in or breakout and etc;
- 8) false work / formwork;
- 9) hot work;
- 10) working with heavy moving machinery;
- 11) working with radioactive isotopes;
- 12) heavy lifting operations and lifting operations near to live power lines;
- 13) working adjacent to or on the live railways; and
- 14) working on or along the railway track.
- 15) entry into confined spaces.

16) diving into well foundation entering into sewer lines etc. The permit to work should contain:

- 1) clear identification of who may authorize particular jobs (and any limits to their authority);
- 2) clear identification of who is responsible for specifying the necessary precautions (e.g. isolation, emergency arrangements, etc);
- 3) a detailed description of the task clearly identifying the work to be done and the associated hazards
- 4) plans and diagrams be used if appropriate to assist in the description of the work to be done, its location and limitations;
- 5) identity of the hazards and the precautions to be taken;
- 6) clear rules about how the job should be controlled or abandoned in the case of an emergency;
- 7) the time limitations should be stated.
- 8) design certificate to comply with procedure if applicable

The Contractor will clearly define the accountability for the works being done under "Permit to work Operations." A copy of each Permit to Work shall be displayed, during its validity, in a conspicuous location in close proximity to the actual works location to which it applies.



5. SITE SAFETY PLAN

5.1. GENERAL

The Site Safety Plan, for which a statement of no objection has been issued, shall be subject to regular review against evolving legislation, the scope and programme of the Works, ambient conditions or as directed by the Engineer. For it to be considered adequate, the Site Safety Plan shall contain, but not be limited to, the following elements developed to suit this Works;

- 1) A policy statement signed by the Health officer and safety officer declaring that occupational health and safety shall be given the highest practicable priority in all aspects of this Contract and in the discharge of his contractual obligations. It shall also clearly state that the Contractor's Representative shall be directly accountable in all matters of safety at the Site.
- 2) An organization chart that shall identify all full time safety personnel and all Site staff with particular responsibilities for safety under this Contract and the Site Safety Plan. The chart shall indicate seniority and show reporting lines. In particular, the direct relationship between the Health officer and safety officer and the Contractor's Representative shall be clearly shown. A safety responsibility statement for each position shown on the chart shall be appended to the chart.
- 3) Details of the authority vested in the Health officer and safety officer and his staff, which would enable them to take or instruct appropriate action, including the stoppage of activities likely to cause injury, in the event of a contravention of the Safety Plan.
- 4) Details of radio, or other, communication facilities necessary to enable the Health officer and safety officer and the Contractor's Key Staff to communicate efficiently and effectively on safety matters with the Contractor's personnel at all Site and with the Employer's staff.
- 5) The means by which the Contractor shall ensure that specialist health and safety procedures proposed by Subcontractors of all levels will be reviewed and assimilated into the Contractor's Site Safety Plan;
- 6) The means by which the Contractor shall ensure that Subcontractors of all levels comply with their occupational health and safety standards and all Applicable Laws. This section should include details of any health and safety promotion initiatives and award scheme;
- 7) Emergency procedures that detail the organization of rescue and damage limitation teams to deal with emergency situations on Site such as, but not limited to, seismic activity, fire, loss of power, cyclone, flooding, or the evacuation of a seriously injured person from a remote or difficult Site location etc. The emergency procedures shall specify the equipment, its location and the frequency of practice drills. The Contractor shall also detail how information on such services and arrangements will be made known to those at work on the Site.
- 8) Arrangements for the training of the Contractor's entire Site staff to enable them to properly undertake their health and safety responsibilities. The Contractor shall keep records of such training for health and safety audit purposes. Upon completion of their training, Contractor's Site staff shall sign a copy of their assigned safety responsibilities statement which shall also be kept by the Contractor for audit purposes;
- 9) Arrangements for the induction and job specific health and safety training of all workers including those of Subcontractors at all level. The proposals shall include the syllabus, frequency and application of such training courses. Such training shall be conducted by suitably qualified persons and repeated at intervals of six months. All workers shall receive the agreed induction training before they are allowed to commence work on Site. The ID card numbers and names of attendees shall be kept for audit purposes;
- 10) Arrangements that will allow the Contractor to positively identify each individual who has successfully completed safety training. Those who cannot be identified positively shall not be allowed to work on the Site.
- 11) Arrangements to ensure that, at least once every month, all workers shall receive a toolbox talk from their immediate supervisor. Records of this activity shall be kept for audit purposes. The topic of these talks shall be decided at the Site safety meeting. Guidance notes and advice on how



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to present the talks shall be prepared by the Health officer and safety officer and issued to those giving the talk.

- 12) Details of the quantity and specification of all necessary safe condition monitoring equipment which shall include as a minimum, but not be limited to, sound level meters and appropriate gas monitors;
- 13) The means and frequency by which safety facilities such as scaffolds, guardrails, working platforms, ladders and other means of access, lifting appliances, lighting, signing and guarding equipment, shall be inspected, tested and maintained. Maintenance and monitoring records for all of the aforementioned equipment shall be kept for audit purposes. The Contractor shall ensure that all the inspections and verifications are undertaken by qualified and competent persons;
- 14) Details of how the Contractor will ensure the protection of authorized visitors and the prevention of unauthorized entry to the Site;
- 15) Details of the proposed first aid provisions including medical personnel and facilities, appropriate to the Site conditions. This shall include arrangements for transporting the injured (ambulance, stretcher etc.).
- 16) Details of how, where and by whom, auditable health and safety related records shall be kept and maintained. In addition to these records the Health officer and safety officer should keep a safety diary to record all safety-related activities and events on a daily basis. The diary shall be made available to the Engineer.
- 17) Details of the Contractor's arrangements for Site Safety Inspections to be conducted by the Contractor's Representative. These inspections shall take place monthly. A report of this activity, which shall include the actions taken to resolve any problems or shortcomings discovered during the inspection, shall be made available for audit purposes;
- 18) Terms of reference, membership and the proposed frequency of Site Safety Meetings. These meetings shall be chaired by the Contractor's Representative;
- 19) A comprehensive health and safety inspection checklist for the use of the Contractor's Site staff when inspecting the Site. The checklist should indicate the standard to be achieved, on any particular aspect of health and safety, and be compiled in such a way that will allow the inspector to easily record his or her actual findings. Critical substandard Items shall be rectified on the spot and signed off as such. Non-critical substandard items that are not rectified on the spot shall be brought to the attention of the appropriate manager, via the sign off portion of the checklist, for subsequent rectification. When completed the checklist shall be kept for audit purposes.
- 20) Details of the internal safety audit scheme to be implemented by the Contractor on both his safety management system and the physical Site conditions. The audits shall be performed, against the conditions specified in the Site Safety Plan at least every three Months. The audit shall include the work of Subcontractors of all levels. The documentation generated by the audit process, including score sheets, shall be made available to the Engineer.
- 21) Detailed procedures covering all health and safety aspects of the Contract, including but not limited are shown in the following list, where they are applicable. The Contractor is advised that, in order to facilitate efficient document and standards review, he shall consult with the Employer's safety staff for guidance and assistance when formulating these procedures for inclusion in the Site Safety Plan.
 - a) Work at height
 - b) Control of noise
 - c) Control of dust
 - d) Temporary illumination
 - e) Worker's welfare and hygiene facilities.
 - f) Housekeeping
 - g) Traffic control and Site transportation



- h) Fire control precautions and fire procedures,
- i) Working in confined spaces,
- j) Excavation,
- k) Diving,
- l) Hand held electrical tools,
- m) Temporary electrical distribution network
- n) Welding/cutting operations and equipment,
- o) Personal protective equipment and clothing
- p) Lifting accessories (slings and shackles etc.)
- q) Cranes, Hoists and lifting appliances,
- r) Scaffolding and work platforms,
- s) Ladders,
- t) Contractor's Plant, machinery and vehicles,
- u) Work over water
- v) Structural steel erection
- w) Blasting and explosives
- x) Control of hazardous substances
- y) Hot working
- z) Floor and wall openings and stairways
- aa) Protection from falling object; and
- bb) Protection of the public and the others.

5.2. REVISIONS OF SITE SAFETY PLAN INCLUDING PROCEDURES

At any time and in accordance with Sub-Clause 4.8 of the Conditions of Contract, a revision to the Site Safety Plan or any safety procedure may be required in order to ensure compliance with the Contract, the Contractor shall, following discussion with the Engineer, issue such revision which shall include an addition, omission or revision as applicable.

The Contractor shall review, on a continuous basis, the Site Safety Plan and procedures and shall revise them as required in accordance with activities and experiences on the Site. Such revision from time to time shall enhance the standards of safety being implemented on the Site. Procedures shall be reviewed and new procedures issued whenever the character or extent of any activity is changed or a new activity of different nature is introduced which necessitates such revision.

In addition to such revision the Contractor shall make a formal review once every 12 months on the anniversary of the Commencement Date. Such formal review, which shall take no more than 30 days, shall consider all matters pertaining to safety planning and implementation, including accident reports, inspections, and audits, suggestions from meetings and other sources, and hazard analysis reviews. Within 7 days of finishing this review the Contractor shall issue a review report to the Engineer giving the conclusions of the review and identifying the revisions to be made to the Site Safety Plan.

Within 30 days of the issue of the review report if required, the Contractor shall issue a revised Site Safety Plan for consideration by the Engineer in accordance with Sub-Clause 4.8 of the Conditions of Contract.



6. GENERAL SAFETY REQUIREMENTS**6.1. EMERGENCY AND SAFETY RESCUE REQUIREMENTS**

The Contractor shall develop Site emergency response and rescue procedures before any work commences at the worksite. These procedures shall provide clear instructions to be followed in the event of an emergency, naming of responsible personnel, notification and co-operation proposals with appropriate rescue services and other authorities who would be involved and methods of evacuation. The procedures shall be coordinated with local fire and rescue and emergency services as required. Emergency procedures giving full instructions and telephone numbers shall be posted at appropriate locations and in both the Indian and English languages.

For underground/over the sea works and any enclosed space working, trained rescue teams shall be designated for each working shift. These teams shall receive professional training in emergency response, rescue and first aid, particularly suited for the work at hand. Members of the rescue teams may be workers assigned to underground/ over the sea work or other duties.

Emergency drills including both the rescue teams and outside rescue and emergency services shall be executed within 1 month of commencing construction on any Section and shall be repeated at no less than 6-month intervals. Where circumstances justify it, the Contractor may be required to carry out emergency drills more frequently.

6.2. PUBLIC CONVENIENCE AND SAFETY

All work shall be conducted so that obstructions to traffic are minimized. The safety and convenience of the public and the protection of persons and property shall be provided as specified in the Contract.

The Contractor shall provide, erect, and maintain barriers, barricades, lights, signals, signs and other traffic control devices in accordance with the Applicable Laws and to the extent necessary to enable the Contractor to meet his obligations under the Contract.

Structural steel beams and other major structural components or heavy and potentially hazardous components shall not be lifted and/or placed over roadways, bicycle paths or walkways that are open to the public.

6.3. PERSONAL PROTECTIVE EQUIPMENT (PPE)

The Contractor shall ensure that all persons working on or visiting the Site wear, at least, a safety helmet, of an approved type, and strong, appropriate safety footwear. The Contractor shall assess all works areas and specify the appropriate personal protective equipment according to the Applicable Laws, standards and codes of practice. The Contractor shall ensure that subcontractor's workers of any tier, including labor-only, are issued with the specified PPE.

All PPE shall be properly maintained and replaced before period of permitted use expires.

The Contractor shall ensure that all persons on Site use the appropriate PPE at all times. Training in its use shall be provided where necessary. Failure to use such equipment shall be considered as conduct prejudicial to safety and grounds for immediate removal from the Site. The use of safety helmets on Site shall be mandatory except in designated areas such as offices and canteens.

6.4. CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH**6.4.1. GENERAL**

The Contractor shall assess all materials for their occupational health and environmental compatibility. A less hazardous product shall be used to replace any material that is toxic, explosive, carcinogenic, flammable, or which may otherwise create a hazard. Where this cannot be done, the Contractor shall conduct a risk assessment and, if appropriate, produce a method statement specifying the safe method of use or application which shall be sent to the Engineer, in advance, for his statement of no objection.

For Non-prescription Drugs and Alcohol, controls shall be established and maintained to prevent persons under the influence of drugs or alcohol entering and/or working on the Site. No alcohol or beverages containing alcohol or non-prescription drugs shall be allowed on the Site.



6.4.2. STORAGE OF DANGEROUS OR HAZARDOUS MATERIALS

The Contractor shall ensure dangerous substances are stored and handled in a way that minimizes the risks posed by those substances and which limits people's exposure to them.

The Contractor shall assess the risks of storing and handling dangerous substances – including the possibility of environmental damage caused by leaks and spills.

The Contractor shall ensure the following minimum requirement with regard to store and handle dangerous substances;

- 1) Storing dangerous materials according to the manufacturer's instructions on the safety data sheet;
- 2) Keeping the minimum quantity of hazardous substances necessary;
- 3) Storing incompatible substances separately;
- 4) Taking steps to prevent release or leakage of dangerous substances;
- 5) Keeping a spill kit near to storage area, and ensuring staff are trained in what to do in the event of a spill;
- 6) Cleaning up any leaks or spills that occur;
- 7) Providing adequate equipment to clean up spills of the types and quantities of stored materials;
- 8) Using appropriate precautions when handling substances – for example, wearing protective clothing or ensuring adequate ventilation;
- 9) Ensuring employees who store and handle dangerous substances are properly trained;
- 10) Checking containers used for short-term storage are properly labelled;
- 11) Providing any personal protective equipment (PPE) staff need to store or move materials;
- 12) Providing first aid kit against the dangerous materials;
- 13) Training staff in use of PPE and first aid kit; and
- 14) Taking unused materials back to storage areas rather than leaving them lying around.

6.5. FIRST AID

All parts of the Site where work is being carried out and all Site offices shall be provided with appropriately equipped first aid kits. First aid kits shall be in sturdy weatherproof containers clearly identified in English and Indian and fixed in an obvious and readily accessible location. All work sites shall have readily accessible first aid facilities fully equipped and staffed during working hours by at least one appropriately qualified medical personnel or registered medical technician. Such facility shall be able to provide immediate medical assistance for serious injuries, and to deal with minor injuries. The Contractor shall maintain an adequate number of personnel trained in basic first aid. Such number shall be not less than one (1) trained personnel per one hundred (100) employees.

In each Site office and location one employee, suitably trained in first aid, should be available at all working hours for the purpose of attending to emergencies.

Emergency Telephone numbers of medical assistance available nearby to be maintained and displayed, such as;

- a) Hospital;
- b) Police Station;
- c) Fire Brigade;
- d) Ambulance;
- e) Traffic Police.



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Telephone numbers of office and residences of key persons to be contacted in case of accident to be displayed at notice boards together with the names and designation of staff trained for providing first aid.

6.6. NOISE

The Contractor shall comply with all Applicable Laws and establish and maintain all necessary procedures to prevent people working on Site or members of the public in the area being exposed to unreasonable levels of noise. Such procedures shall where necessary include the provision of noise containment barriers and the issue of protective equipment for people working on the Site.

6.7. CONTRACTOR'S PLANT, EQUIPMENT AND VEHICLES

All construction plant, equipment and vehicles brought onto Site shall be inspected and tested by a competent and qualified person. Each vehicle, item of Contractor's plant and equipment shall be given a unique identity number. This number shall be clearly displayed on the machine at all times. Contractor's plant, equipment and vehicles shall fully comply with the Applicable Laws, be properly licensed and certificated and be maintained in line with the manufacturer's specification. The Contractor shall ensure that only safe and well maintained plant and equipment would be allowed to operate on the Site.

The operators and drivers of all such plant, equipment and vehicles shall be trained in the use of the plant, equipment or vehicle that they are given charge of and hold current licenses to drive or operate as required under the relevant Applicable Laws. Copies of all such licenses, certificates and maintenance sheets etc. shall be kept in the safety-related documentation files. A system to control delivery vehicles and short-term hired plant shall also be established. The Contractor must comply with the following safety criteria;

- 1) All operators of heavy plant shall be medically fit, over eighteen years of age and be thoroughly trained and experienced to operate the equipment;
- 2) No unauthorized person shall be permitted to ride on plant;
- 3) Operators shall conduct daily inspections of their respective items of plant with the results of these inspections being recorded and the records kept available for inspection by the Engineer;
- 4) All mobile heavy plant shall be equipped with at least one 5 kg Dry Powder Fire Extinguisher, carried at a suitable position so as to ensure its easy availability;
- 5) Whenever heavy plant is operating in congested areas, thoroughly trained and experienced banks-men shall be deployed to control the plant and personnel movement and interface;
- 6) Any waste engine oil and filters following any on Site servicing and maintenance shall be removed from the sites and disposed of in an environmentally conscious manner at authorized disposal locations;
- 7) All drums of fuel oil shall be stored on drip trays or the fuel shall be kept in bulk storage fuel tanks sited within bunds, with quantities stored being kept to a minimum; and
- 8) The storage areas shall have dry powder fire extinguishers positioned in close proximity to their location for use in an emergency.

6.8. COMMUNICATIONS AND SIGNS**6.8.1. GENERAL COMMUNICATION REQUIREMENTS**

All signs, labels, warnings, posters and safety information directed at people working on Site shall be in both Indian and English, and shall include amongst others the following;

- 1) Wear Safety Helmets;
- 2) Wear Safety Harnesses;
- 3) Permit to Work Areas;
- 4) Wear Safety Footwear;
- 5) Wear Hearing Protection;



- 6) Wear Eye Protection;
- 7) Danger Electricity;
- 8) Danger Crane Overhead;
- 9) First Aid;
- 10) No Entry signs; and
- 11) Fire Precautions.

All safety signs shall comply with the internationally recognized Safety Colors as indicated below;

- 1) Blue: Mandatory;
- 2) Yellow: Danger;
- 3) Red: Prohibition; and
- 4) Green: Safe Condition.

6.8.2. ELECTRIC COMMUNICATIONS

The Contractor shall ensure that radio and telephone communication is available at all times between all parts of the Site and Site offices. Such communication system shall provide a dedicated channel for use in case of emergencies involving accidents, injuries, fatalities, serious damage or dangerous occurrences.

6.9. TEMPORARY ACCESS AND TEMPORARY WORKS

The Contractor shall provide all necessary temporary access facilities, which shall be constructed, installed and maintained in accordance with the Indian Applicable Laws and Codes of Practice. In particular, ladders and any supporting structures shall be regularly inspected to ensure that they are fit for purpose and free from defects. Any temporary access shall be secured against movement, provide a good walking surface and incorporate protection measures against falling.

All Temporary Works shall be checked in accordance with the requirements of the Contract.

6.10. MATERIAL ARRANGEMENT AND STORE

The Contractor shall ensure the following minimum requirement with regard to material arrangement and store during construction;

- 1) Permanent materials used in construction, have the quality and performance specified in the design documents, shall be approved by the Engineer;
- 2) Transported materials into the Site shall be stored with keeping the quality and performance until use for the construction;
- 3) Location of material yard shall be selected at a suitable place for works with avoiding the position in front of walkways, emergency exits, power distribution and operation panels etc.;
- 4) Materials at the work Site and in the yard shall be arranged properly;
- 5) Lightweight materials shall be treated to prevent dispersal by strong winds;
- 6) Stacked materials shall be collated in a manner to prevent collapse;
- 7) Materials shall not be put on height position such as scaffold where they fall easy;
- 8) Materials shall not be accumulated within 1 m of the end of work stage, open area and top of the slope; and
- 9) Curved surface materials such as pile and pre-cast concrete pipe shall be treated to prevent rolling when they are accumulated.

6.11. CONTROL OF EMPLOYEES AND VISITORS

Securing safety and industrial health at work requires the full co-operation of Contractors and



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Subcontractors and the persons employed by them. It is imperative that there is no ambiguity with regard to the responsibilities of any individuals in connection with duties relating to safety and industrial health.

Every person employed by Contractors and Subcontractors on the construction Site are obliged to comply with the general duties imposed on them under Indian law and the Contract. Every person employed should, not only avoid careless or reckless behavior, but should also take positive steps to understand workplace hazards. They must follow all necessary safety rules and procedures, and ensure that their acts or omissions at work do not put the safety and industrial health of self or others at risk.

The responsibilities shall be clearly detailed in the Site Safety Plan from the level of the most Senior Manager down

Responsibilities for safety and industrial health would be allocated amongst others to the following personnel of the Contractors and Subcontractors;

CEO/ Managing Director;
 Project Director/Project Manager
 Site Agent/Manager;

 Engineers;
 Safety Officer;
 Supervisors; and

 General Workers.

The Contractor shall prepare procedures that shall be established to control the entry of visitors onto the Site. Visitors shall include all those who are not regularly on Site and who have not undergone an initial safety briefing. All visitors shall be issued with appropriate permits for entry. The permit shall be in English and Indian, dated and clearly show the person's name and his employer.

The Contractor shall ensure that representatives and workmen of a Related Works Contractor and/or an External Interfacing Party working within the Site are each issued with a particular form of access permit which clearly and positively identify the individual and the company he works for and shall show that the holder has successfully completed the Contractors safety training course.

The Contractor shall ensure that visitors viewing or inspecting any work Site wear the appropriate personal protective equipment and shall provide appropriate safety instruction to the visitors. They shall be accompanied at all times by a full-time Site employee of the Contractor, or subcontractor as the case may be.

The Contractor shall establish a system, which shall effectively control access to any high-risk, restricted or other designated areas of the Site, to those persons with a valid reason to be there.

Access to such areas shall require Special access control, permits which shall be easily distinguishable from the ordinary Site access identification.

6.12. ELECTRICAL EQUIPMENT

All electrical equipment, including the construction Site supply layout, shall be supplied, operated and maintained by registered electrical technicians, in accordance with Indian Applicable Laws, manufacturers' instructions and Site procedures. Procedures for the operation of the construction supplies and the repair and maintenance of electrical equipment shall be developed as part of the Safety Plan.

The Contractor shall nominate a representative whose name and qualifications shall be submitted in writing to the Engineer for review not later than four (4) weeks before the appointment and who shall be solely responsible for ensuring the safety of all temporary electrical equipment on Site. The Contractor shall not install or operate any temporary Site electrical systems until this representative is appointed and has commenced duties.

The name and contact telephone number of the representative having been reviewed without



objection by the Engineer shall be displayed at the main distribution board for the temporary electrical supply so that he can be contacted in case of an emergency.

The Contractor shall submit schematic diagrams and the details of the equipment for all temporary electrical installations, and these diagrams, together with the temporary electrical equipment, shall also be submitted to the Engineer for review.

All electrical installation work on Site shall be carried out in accordance with the requirements laid down in the Specification. All work shall be supervised or executed by qualified and suitably categorized electricians.

6.13. HAND TOOLS

The Contractor shall ensure the following minimum requirement with regard to use of hand tools;

- 1) Following inspection shall be carried out before work;
 - Condition of tools;
 - Right size of tools for the job; and
 - Proper working condition or not.
- 2) Hand tools shall be used for its intended purpose;
- 3) Worn tools shall not be used;
- 4) Hand tools shall not be used beyond their capacity;
- 5) Pointed tools such as chisels, screwdriver etc. shall not be carried in clothing pockets. Tool belts designated for carrying tools shall be used;
- 6) Proper PPE shall be worn to protect eyes, hands, ears and other body parts.

6.14. HEALTH AND PUBLIC SAFETY

The Contractor shall ensure that health and safety matters are given a high degree of publicity on Site. Posters and signs, written in Indian and English, which draw attention to Site safety, rescue and occupational health, shall be made or obtained from appropriate sources and shall be displayed prominently in relevant areas of the Site.

Pedestrians have the right of way. Pedestrians should use walkways where provided. Shortcuts shall not be taken through operating areas, buildings, or other areas.

7. SAFETY MEETINGS

7.1. SAFETY INSPECTION

The Contractor's supervisory safety staff are required to carry out frequent inspections and prepare reports of such inspections. Copies of the completed inspection reports shall be kept on Site and available for inspection by the Engineer, authorized Government Bodies and other competent authorities.

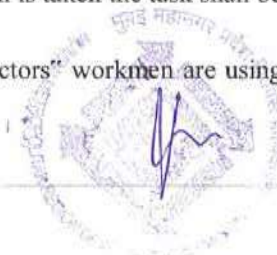
The frequency of the inspections shall be determined by Site activities and general conditions. However, the inspections should be conducted at a minimum of once a week. Where high-risk activities are being carried out inspections should be carried at least once daily.

The inspection reports should be discussed with the relevant Site Managers. These shall also be discussed with the Subcontractors and other levels of Site management in the Site Safety Meetings.

7.2. FOLLOW-UP ACTION

Remedial action to rectify any deficiency identified or unsafe practices discovered during the safety inspections should be implemented immediately. Until the remedial action is taken the task shall be discontinued.

In cases where the Engineer believes that the Contractor's or Subcontractors' workmen are using



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unsafe working methods, the Contractor's Site agent should be informed by them as soon as possible.

If the Contractor's working method is deemed so unsafe as to represent a risk to life, the Engineer may require specific actions by the Contractor, such as proposals on preventive/remedial measures, or suspension of relevant portions of the works, and introduction of safety and industrial health measures deemed necessary. All such instructions shall be confirmed in writing and shall include a proviso that the issue of the instruction shall not relieve the Contractor of his responsibilities under the Contract.

7.3. SITE SAFETY COMMITTEE, COMPOSITION AND FUNCTION

The Contractor shall establish a Site Safety Committee.

The terms of reference for the committee should be as follows;

- 1) monitor the adequacy of the Contractor's safety plan and ensure its implementation;
- 2) monitor safety inspection reports;
- 3) study accident and incident reports;
- 4) study accident statistics and trends so as to identify unsafe practices and conditions;
- 5) review the emergency and rescue procedures;
- 6) review Site safety training;
- 7) promote safety and industrial health on Site;
- 8) discuss the Contractor's monthly safety report; and
- 9) take follow up actions on minutes of meeting.
- 10) The membership of the committee should be as follows;
 - Chairman: The Contractor's most Senior Manager for the Contract
 - Secretary: The Contractor's Safety Officer
 - Members: Contractor's and Sub- Contractor's management representatives and safety Staff.

Meetings should be held at least once every month and be scheduled to precede the Employer's safety management committee meeting.

Minutes of the Site Safety Committee shall be sent to all members within two working days of the meeting. Copies of the minutes should be displayed on notice boards so that employees are kept informed of the Site safety committee's activities and decisions.

7.4. EMPLOYER'S SAFETY MEETINGS

The Employer will establish a Safety Management Committee to formally review the safety management performance of the Contractor and to monitor the implementation and sufficiency of the Site Safety Plan. The Engineer, or his nominee, shall act as chairman of this committee with members of the Employer's staff attending as appropriate. Attendance from the Contractor shall include the Contractor's Representative, the Health officer and safety officer and Key Staff as appropriate. Representatives from third parties, including statutory bodies, may be invited as necessary by the Employer. The committee shall meet at least once per month. The Contractor shall act without delay upon such decisions or recommendations as may be made by the committee on matters of health and safety.



8. SAFETY RELATED DOCUMENTATION

All safety related documentation including, but not limited to, permits, certificates, reports and records shall be kept on the Site in a readily accessible location in an auditable indexed system.

All safety records shall be kept in a properly indexed and readily accessible system.

8.1. SITE SAFETY DIARY

The Health officer and safety officer will maintain a daily Site safety diary. It shall comprehensively record all matters pertaining to safety including, but not limited to, records of inspections, audits, injuries, dangerous occurrences, and safety violations. It shall be brought up to date by the end of each shift.

The Health officer and safety officer shall maintain a Site safety diary. This diary shall comprehensively record all matters pertaining to safety including records of inspections, audits, accidents, dangerous occurrences, safety violations and rectification, notices of non-compliance and stop orders and other related matters.

8.2. NON-COMPLIANCE NOTICE SYSTEM

The Contractor shall establish a system for the Health officer and safety officer to issue non-compliance notices for safety violations and procedures for expeditiously rectifying such violations.

8.3. REPORTING ADVERSE EVENTS

The Contractor shall notify the Engineer immediately of any dangerous occurrence or incident that results in, or had the potential to cause, bodily injury or incapacity of any person for more than 3 days. This will include, but not be limited to, the overturning, collapse or failure of any lifting equipment or structure. Initial notification may be verbal but shall, in every event, be followed by a detailed resolution report within 5 days. The Contractor shall at the same time provide the Engineer with a copy of any statutory accident, injury or dangerous occurrence report that he submits to any Statutory Authority under the Regulations.

8.4. MONTHLY SAFETY REPORT

The Contractor shall submit a comprehensive safety report to the Engineer in the Monthly Progress Report each month in an agreed format. The report shall be submitted in line with a timescale agreed with the Engineer. Prior to submission, the Contractor's Representative shall endorse the report. The report shall comprehensively address all relevant aspects of occupational safety and health and shall contain certain standard forms, supplied by the Engineer, for use in statistical analysis of the whole Project.



APPENDIX 6 PLANNING AND PROGRAMME REQUIREMENTS**1. GENERAL****1.1. PURPOSE OF PROGRAMME**

There are two primary purposes for the requirements of Programme (Schedule) information described in this document:

1) Evaluation of Bid

To provide the Engineer with sufficient information on proposed programmes and costs to facilitate evaluation of Bid; and

2) Works Programme & Supporting Reports

To provide the Engineer with programmes and status reports for managing, monitoring and coordinating the awarded contracts during their execution within the overall multi- contract Project programme.

1.2. TWO STAGE SUBMISSION

The requirements are organized in two stages. The first stage is a requirement for all Bidders and shall be submitted as part of the Bid. The second stage is a requirement of the Employer and describes a series of deliverables to be submitted by the Contractor to the Engineer during the execution of the Contract.

1.3. MONITOR AND REPORT

The Bidder/Contractor shall programme his work at all times to meet the Key Dates. During the progress of the Works the Contractor shall constantly monitor and report to the Engineer his progress against the programmes described herein.

1.4. WORKS ACTIVITIES AND DESIGN ACTIVITIES

Programme activities shall be discrete items of the Work, which when combined, produce definable elements, components, Milestones, Stages and Sections of the Works and clearly identify the completion obligations of the Contractor. Design programmes shall be organized by Design Stages and Plans as described in Employer's Requirements - Design.

1.5. KEY DATES

Key Dates shall be an integral part of all programmes and all activities, and sequencing and interrelationships required to achieve each completion obligation shall be shown.

1.6. CRITICAL PATH

The critical path shall be clearly identified in the programme and fully described in the accompanying programme narrative.

1.7. ACTIVITIES DESCRIPTION

Activity descriptions shall clearly convey the nature and scope of the Works. Programmes shall take into account the activities of precursor, concurrent, adjacent and follow on Related Works Contractors as well as utility service diversions, new utilities and connections and any other activity that may affect the progress of the Works under this Contract.

1.8. ADDITIONAL ACTIVITIES

The Contractor shall also incorporate the Engineer's requirements for additional activities, to further explain or subdivide complex or long duration tasks, without affecting Time for Completion of the Works.

1.9. SHARED ACCESS AND SITE ACTIVATES

The Bidder/Contractor shall include in all programmes his work obligations towards shared access,



shared Site areas and other coincident or adjacent area to the Site.

1.10. THE ENGINEER'S APPROVAL

The Works Programme, and all more detailed or revised versions, shall be submitted to the Engineer for his consent.

2. METHODOLOGY

2.1. COMPUTERISED TECHNIQUES

The computerized Critical Path Method (CPM) network using the Precedence or Arrow Diagramming Method shall be employed by the Bidder in preparing their Bid submissions and by the Contractor in their Design and Construction Phase submissions.

2.2. DEVELOPMENT

Unless otherwise agreed by the Engineer, all programmes submitted by the Contractor shall be produced using computerized Critical Path Method (CPM) Networks developed implementing the accurate representation of the current status of the Works and of the work remaining to be accomplished; shall provide a sound basis for identifying problems, deviations from the planned works, and for making decisions; and shall enable timely preparation of the same for presentation to the Engineer.

3. PROGRAMME MANAGEMENT SOFTWARE

Project programming software to be used for the Bid Programme, the Works Programme and all subsequent programmes shall be MS project or better software with scaled logic network format. The Contractor shall provide copies of the agreed scheduling software together with all relevant instruction manuals, license. The Contractor shall provide training for user. The Employer may require training up to 6 personnel of the Employer.

4. BID PROGRAMME

See also Bidding Documents, Section IV [*Bidding Forms*], [*Construction Schedule*]

4.1. COMPLIANCE WITH KEY DATES

The Bidder shall with his bid submit a fully logic linked programme that covers all elements of this Contract. The programme shall comply with all Key Dates.

4.2. SEQUENCE AND DURATION

The Programme shall clearly indicate sequence in which the Bidder proposes to carry out the Works and include information regarding any External Interfacing Parties that may impact on the completion of the Works. The programme shall recognize realistic consideration/approval durations for both the Engineer and any external agency activities

4.3. PLANT /EQUIPMENT MOBILIZATION

The Programme shall be supported by information detailing major Plant/Equipment to be mobilized to the Project, temporary facilities the Bidder proposes to set up to support his activities, details of all long lead items and information regarding the numbers, skills and source of the labor he is proposing to deploy.

4.4. RELATED WORKS CONTRACTS

The Bid Programme will be used by the Engineer to refine the interfacing between the Related



4.5. APPROACH AND ASSUMPTIONS

A narrative that describes the Bidder's approach to the Project and lists any assumptions made during the preparation of the programme shall accompany the Bid Programme.

4.6. BASIC OF INITIAL WORKS PROGRAMME

Following the placing of the Contract, the Bid Programme together with any negotiated changes in Commencement Date, sequence or durations shall become the successful Initial Works Programme (See Clause 5.2 below) and should be prepared accordingly taking into account all aspects of Initial Works Programme and Works Programme as specified hereinafter.

5. POST CONTRACT AWARD

The Works Programme to be submitted under the Contract shall be developed from the Bid Programme submitted and developed during the Bidding Period. Similarly the Design Submission Programme, Mobilization Programme shall be developed from the Bidding Documents submitted and reviewed during the Bidding Period

5.1. MOBILISATION PROGRAMME

The Contractor shall within 28 days from the award of the Contract submit for the Engineer's consideration a Mobilization Programme that details all the work activities planned to take place during the first 90 days of the Project.

The programme shall clearly list all activities requiring the Engineer input and reflect any agreements regarding responses outside the standard 21 days response time.

The programme shall include but not be limited to mobilization of staff, procurement of facilities, Information required from the Engineer and deliverables to be submitted.

A narrative that clearly states any assumptions made by the Contractor, any items that the Contractor identifies as being at risk and any action required to be undertaken by the Engineer shall support the Mobilization Programme.

5.2. FAILURE BY THE CONTRACTOR TO SUBMIT WITHIN THE SPECIFIED TIMESCALES

1) If the Contractor fails to submit the Works Programme within the timescales nominated above the Employer may nominate the Bid Programme as the first issue of the Works Programme required under the Contract.

2) In the event that the Employer does nominate the Outline Works Programme as the first issue of the Works Programme under the Contract, the Engineer may include any amendments that he sees fit to change external constraining dates, duration of activities by parties other than the Contractor and subdivide the Contractor's own activities to provide additional detail and links to other activities but without altering the duration or sequencing of the activities shown on the Outline Works Programme.

3) The Works Programme resulting from a nomination by the Employer of the Outline Works Programme as amended shall be taken by the Contractor as his own work and any responsibility for further maintenance of the Works Programme as nominated shall remain with the Contractor.

6. CONTENT OF PROGRAMMES

6.1. WORKS PROGRAMME STRUCTURE

The Works Programme shall demonstrate by reference to its Sub-Programmes, supplementary Programmes and associated Management Plans, the sequence and duration of activities and any restraints thereto, that the Contractor shall adopt to achieve Key Dates and to fulfil all Contract obligations. The Works Programme shall become the Engineer's basis of administration of the time-related aspects of the Contract.



6.2. CONSTRAINTS ENTERED INTO WORKS PROGRAMME

The Contractor shall provide the Engineer with substantiation for each constraint whether target start, target finish or mandatory constraint entered by the Contractor into the Works Programme. The number of constraints shall be kept to an absolute minimum in order that the CPM networks developed can be freely analyzed.

6.3. LOGICAL INTERDEPENDENCIES AND STAGES

The Works Programme shall include activities for all the phases and stages of the Works, clearly showing all logical interdependencies and stages in the development of the Contractor's design, procurement, installation, commissioning and setting to work. As a minimum, it shall include:

- 1) all work comprising the Works;
- 2) preparation, submission and consideration of Design Documents showing all items where consideration by the Engineer is required;
- 3) preparation and submission for consideration of mock-ups and prototypes;
- 4) procurement of all major materials and items of Contractor's Equipment for the Works, including the dates orders are to be placed, manufacture period and the expected delivery date to the Site for each item, long lead items to be clearly identified.
- 5) any software development requirements and validation time frames;
- 6) all manufacture or prefabrication of materials or components;
- 7) all design and installation of major Temporary Works;
- 8) all activities associated with the securing of necessary permits and other statutory approvals for the Works;
- 9) access and availability dates for all Related Works Contractors;
- 10) all interfaces related to the Project that may affect the progress of the Works, will include all External Interfacing Parties reviews and approvals;
- 11) testing and commissioning activities which demonstrate an understanding of the interfaces and requirements of Related Works Contractors; and
- 12) Training and Skills Transfer.

6.4. SUB-PROGRAMME

The Works Programme shall be divided into Sub-Programmes of manageable sizes addressing in more specific detail. The Sub-Programmes shall be as follows:

- 1) Design Submission Programme;
- 2) Design, Procurement and Manufacturing Programme;
- 3) Construction Programme
- 4) Co-ordinated Fabrication programme;
- 5) Testing and Commissioning Programme; and
- 6) Training and Skills Transfer Programme

6.5. WORKS PROGRAMME

The submission of the detailed version of the Works Programme shall include the Design, Procurement and Manufacturing Programme, Construction Programme and a preliminary version of the Coordinated Fabrication programme and the Testing and Commissioning Programme identifying all major construction, installation, testing activities and associated Related Works Contractor interfaces.



6.6. SUB-PROGRAMME STRUCTURE

The Sub-Programmes shall be further substantiated by the following supplementary programmes:

- 1) Three Month Rolling Programme;
- 2) other programmes required by the Engineer.

6.7. COMPLIANCE

The Contractor's Works Programme shall comply with the following:

- 1) all programmes, except the Five Week Rolling Programme, shall be computerized Critical Path Method (CPM) networks developed using the Precedence or Arrow Diagramming Method, and submitted in both hard copy and electronic data format;
- 2) unless consent is otherwise obtained from the Engineer, all programmes shall be accompanied by a Programme Analysis Report as described in Clause 14 below
- 3) a standard Gregorian calendar shall be used for planning and execution of the Works. All programme submissions shall include details of the Contractor's allowance for Public Holidays and non-work periods. If a Key Date or Milestone falls on a Public Holiday or non-work day, it shall be effective the next working day;
- 4) the planning unit for the duration of all programme activities shall be the day. Any activity having a duration of more than thirty (30) days shall be divided into sub-activities that shall not exceed (30) days;
- 5) CPM programmes shall reflect status using remaining duration and percentage complete;
- 6) all programmes shall be fully resource loaded as appropriate or required by the Engineer covering all stages and aspects of the Contract and shall include, but not be limited to:
 - a) major manpower for both design and installation;
 - b) number of items of Contractor's Equipment;
 - c) number of drawings and other design deliverables ;
 - d) principle quantities of components or parts ;
 - e) principle quantities of bulk materials inclusive of Steel, Cement, Aggregate Sheeting, pavement, cabling, pipe, ductwork and equipment items, etc.

6.8. WORK BREAKDOWN STRUCTURE

All programmes constituting the Works Programme shall be organized in a logical work breakdown structure including work stages or phases. Each activity shall be coded to indicate, as a minimum, the work group or entity responsible for the activity, the area, facility or location and the Cost Centre in which the activity is included, from information provided in the Pricing Document. Key Dates and Milestones shall be coded so as to be separately identifiable. The Contractor may be required to assign additional activity codes as required by the Engineer.

7. DESIGN, PROCUREMENT AND MANUFACTURING PROGRAMME**7.1. SUBMISSION**

Within 28 days after the Commencement Date, the Contractor shall submit for approval of the Engineer a Design, Procurement and Manufacturing Programme that shall be an integrated part of the overall Works Programme.

7.2. INTERDEPENDENCY

The Design, Procurement and Manufacturing Programme shall show the interdependencies between the Engineering disciplines as well as between the Contractor and its Subcontractors and suppliers. This programme shall demonstrate compliance with the requirements of the Design Submissions Programme in the Employer's Requirements - Design.



8. CO-ORDINATED FABRICATION PROGRAMME

8.1. SUBMISSION

The coordinated Construction/Fabrication programme shall be submitted not less than 3 months before the start of construction/installation activities or as directed by the Engineer.

8.2. ACTIVITIES

The Construction/Fabrication programme shall include detailed activities describing all aspects of the installation of the Works, to meet all Milestones and Key Dates given in the Contract. It shall be clearly linked to the Design, Procurement and Manufacturing Programme and Testing and Commissioning Programme to form an integrated part of the Works Programme.

8.3. ACCESS AREAS

The Construction/Fabrication programme shall indicate the physical areas to which the Contractor requires access, access date, duration required and the required degree of completion for civil prior to the access date.

8.4. PORT, DELIVERY, STORAGE AND PRESERVATION

The Construction/Fabrication programme shall take into account the requirements for arrival at port, delivery, storage, preservation and positioning of large items of Contractor's Equipment and Works and shall set out the Contractor's proposed delivery route for such items to the Site.

8.5. FABRICATION TEST

Installation Tests shall be clearly shown in the Fabrication programme and shall include those interface tests required to be carried out by others to establish a timetable for these tests.

8.6. OVERTIME, ADDITIONAL SHIFTS

Activities that may be expedited by the use of overtime, additional shifts or by any other means shall be identified and explained.

8.7. NOTES

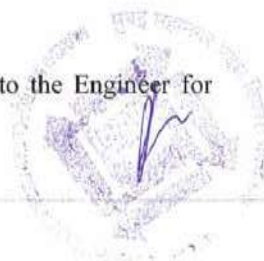
In preparing the Fabrication programme, the Contractor should note that the following conditions shall apply:

- 1) the Contractor shall not have exclusive access to any part of the Site except by the specific consent of the Engineer;
- 2) the Contractor shall take note that concurrent time allocations for certain areas may be given to more than one Contractor. The Contractor shall co-ordinate his Works in such areas with the Related Works Contractors through Employer's Requirements;
- 3) the absence of a programme date or installation period for the Contractor in a specific area shall not prejudice the right of the Engineer to establish a reasonable programme date or installation period for that area;
- 4) the Contractor shall comply with the identified Key Dates and Milestone dates identified in the Schedule of Milestones; and
- 5) the Contractor shall deliver all Contractor's Equipment and Works for stations and ventilation shafts by road and via temporary access openings unless otherwise consideration by the Engineer.

9. THREE MONTH ROLLING PROGRAMME

9.1. SUBMISSION

Within 28 days after the Commencement Date, the Contractor shall submit to the Engineer for



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consent his initial Three Month Rolling Programme. The Initial submission shall show in detail all activities that have commenced or are due to start within the first three calendar month period to meet Key Dates and Milestones and any other dates set out in the Contract. Thereafter, the Contractor shall submit a new Three Month Rolling Programme every month as part of the Monthly Progress Report.

9.2. REQUIREMENTS

The Three Month Rolling Programme shall after the initial submittal:

- 5) provide details of all activities that are in progress, or are due to start, within the forthcoming two month period and the previous one month period shall also be shown;
- 6) be updated every month and be submitted concurrent with the Monthly Progress Report;
- 7) highlight all required dates for transmittal or receipt of information to or from the Engineer, Subcontractors or Related Works Contractors; and
- 8) consist of a three-month time window extracted from the Works Programme.

10. PROGRAMME REVIEW

10.1. RE-SUBMISSION

The Engineer shall, within 21 days of receipt of the initial submission of any programme for consent, either give a Notice of No Objection or provide specific details as to why a Notice of No Objection is not given. If the Contractor is advised that the programme is not given a Notice of No Objection of no objection, the Contractor shall amend the programme taking into account the Engineer's comments and/or requirements and resubmit the programme within 14 days.

10.2. FURTHER RE-SUBMISSION

In the case of further re-submittals, the resubmission time shall also be 14 days.

11. WORKS PROGRAMME REVISIONS

11.1. CONTRACTOR'S NOTIFICATION

The Contractor shall immediately notify the Engineer in writing of the need for any change in the Works Programme, whether due to a change of intention or circumstances or for any other reason. Where such a proposed change affects the timely completion of the Works or any Section or Stage; the Contractor shall within 14 days of the date of notifying the Engineer submit for the Engineer's consideration his proposed revised Works Programme and accompanying Programme Analysis Report. The proposed revised Works Programme shall show the sequence of operations of any and all work related to the change and the impact of changed work or changed conditions on the Works and Related Works Contractors.

11.2. THE ENGINEER'S NOTIFICATION

If at any time the Engineer considers the actual or anticipated progress of the Works reflects a significant deviation from the Works Programme, he may request the Contractor to submit a proposed revised Works Programme. Upon receipt of such a request the Contractor shall submit within 14 days a revised Works Programme, together with an accompanying Programme Analysis Report and Narrative Statement that shall demonstrate the means by which the Contractor intends to eliminate the deviation.

11.3. PROGRESS MONITORING

The Contractor shall monitor the progress and his Subcontractors' performance and against programmes to ensure its compliance with its obligations under the Contract. Monitoring of the Works shall include direct, daily monitoring of the progress of the Works and the preparation of written and computerized reports to be submitted to the Engineer. The reports shall include all necessary supporting data to apprise the Engineer of the status of the completion of the Works. The



Contractor shall prepare the Monthly Progress Reports covering all aspects of the execution of the Works as specified in Appendix 7.

12. MONTHLY PROGRESS (EARNED VALUE) REPORT

12.1. GENERAL

The Contractor shall prepare and submit monthly, a Monthly progress report based on earned value techniques. The Contractor's proposal for the Monthly progress report and basis for measuring progress shall be prepared in accordance with the requirements listed below and shall be submitted to the Engineer within 45 days after the Commencement Date.

12.2. SELECTION OF WORK ACTIVITIES

- 1) Earned value progress reporting requires that the Contractor's activities be broken down into discrete measurable units that are time phased (0% to 100% complete) in accordance with the Contractor's programme and maximum limit. These discrete measurable units shall be based on the physical deliverables and are weighted by the value of the items in Indian Rupee (IDR) in order to summarize the activities into a planned percentage complete curve. The format for presenting the earned value progress measurement information in a Monthly progress report is to be considered by the Engineer.
- 2) Key work activities for reporting progress shall be determined by the Engineer in consultation with the Contractor.
- 3) To the maximum extent possible, activities shall be chosen which can be measured quantitatively rather than subjectively as the work progresses. In the event it is necessary to use activities that can only be measured subjectively, intermediate activities or Milestones shall be identified on the programme that will establish a predetermined intermediate percentage complete for the activity at attainment of each intermediate milestone. Such Milestones shall be no more than one month apart.

12.3. ACTIVITY WEIGHTING

In order to summarize the key individual activities into an overall planned or actual percentage complete, activities must be weighted. Various methods for determining the appropriate weighting can be used. The Contractor may propose an existing methodology comparable to the intent of the earned value concept. The Engineer will assess and, if appropriate, consider the method proposed by the Contractor. The sum of the weighting for all activities shall equal one hundred percentile (100%).

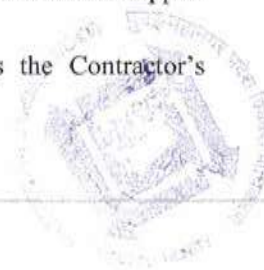
12.4. REVISIONS TO MONTHLY PROGRESS REPORT

Once the weightings have been established they shall not be changed unless there is a variation that significantly impacts on the programme and the weightings. If, after consideration, it is decided by the Engineer to incorporate a major variation, the weightings shall be adjusted for the impact of the variation and both the plan and actual curves revised. The curves shall be recalculated by inserting the variation activity percentage complete plan (0 to 100%) in the time frame it will occur and applying the revised weightings. This recalculation shall be submitted to the Engineer for consideration prior to its use in the Monthly Progress Reports. The other time-phased planned activities shall remain unchanged during this process in order to maintain the integrity of the baseline plan.

12.5. MEASUREMENT OF ACTIVITY PROGRESS

The actual percentage of the Works completed shall be calculated on a monthly basis as required to support the preparation of the Monthly progress report and the Project status reviews. The Contractor shall ensure that sufficient reliable quantitative backup documentation exists to support these calculations for each activity within the Monthly progress report.

Periodic detailed considerations may be made by the Engineer to assess the Contractor's



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calculations.

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13. PROGRESS MEETINGS

13.1. DATE AND TIME

The Engineer will chair progress meetings every month with the Contractor. These meetings will be held at dates and times to be advised by the Engineer. Progress meetings shall not be later than 10 days after the issue of the Contractor's Monthly Progress Report.

13.2. NOTIFICATION

The Engineer may convene at his discretion, at any time upon reasonable notice to the Contractor, any meeting, either on or off the Site, to discuss and address any aspect of the Works or the Contract. The Contractor shall attend any such meetings convened by the Engineer.

13.3. MEETING PLACE

All meetings shall be convened in Mumbai or Navi Mumbai unless otherwise directed by the Engineer. Meetings shall be attended by senior personnel from the Contractor who shall arrive properly briefed for all aspects of the meeting and shall be empowered to make executive decisions in respect of the execution of the Works.

14. QUARTERLY REVIEW MEETINGS

14.1. NOTIFICATION

The Engineer may convene Quarterly Review Meetings in Mumbai or Navi Mumbai at approximately three monthly intervals. The Engineer will notify the Contractor the date of such Quarterly Review Meetings not less than 28 days before they are to be held.

14.2. HOLDING PERIOD AND ATTENDANCES

Quarterly Review Meetings shall be held over a period of up to 3 days in order to Review the overall progress of the Works in the context of the Project as a whole and to address and resolve any issues relevant to the execution and progress of the Works. Such Quarterly Review Meetings will be chaired by the Senior Director of the Employer or his delegate. The Contractor shall have in attendance one senior representative of Director level from each of the companies comprising the Contractor (together with the Managing Director of the company acting as leader or sponsor of the Contractor if it is a joint venture, consortium or partnership whenever necessary and required by the Engineer).

14.3. PROPOSED ATTENDANCE BY THE CONTRACTOR

The Contractor shall submit names of the persons who are proposed by the Contractor to attend each Quarterly Review Meeting to the Engineer for consideration not less than 7 days prior to each Quarterly Review Meeting.



APPENDIX 7 MONTHLY PROGRESS REPORT

1. GENERAL

The Contractor shall submit to the Engineer, a Monthly Progress Report. This Report shall be submitted monthly thereafter, each within seven (7) days after the last day of the period to which it relates. It shall be submitted in a format to which the Engineer shall have given his consent and shall contain sections/sub-sections for, but not be limited to, the topics listed below.

2. EXECUTIVE SUMMARY

The Contractor shall provide an executive summary covering the major achievements made during the reporting period, the activities planned for the next month and any issues that are effecting or may affect future Project progress. These items are to be dealt with fully in the body of the report.

3. FINANCIAL STATUS

The Financial Status shall include:

- 1) A narrative review of all significant financial matters and actions proposed or taken in respect to any outstanding matters.
- 2) A spreadsheet summarizing each Cost Centre, the budget, costs incurred during the period, costs to date, costs to go, cost forecast (total of costs to date and costs to go) and variance (difference between cost forecast and budget) cost.
- 3) A spreadsheet indicating the status of all payments due and made.
- 4) A report on of the status of any outstanding claims. The report shall in particular provide interim updated accounts of continuing claims.
- 5) A report on the status of the Contractor's claims and potential claim – variations / potential variations

4. DESIGN STATUS

A report detailing the design progress made during the reporting period together with a progressed copy of the Design Submission Programme.

5. PHYSICAL PROGRESS

It shall describe the status of work performed, significant accomplishments, including critical items and problem areas, corrective actions taken or planned and other pertinent activities, and shall, in particular, address interface issues, problems and resolutions.

It shall include a simplified representation of progress measured in percentage terms compared with percentage planned as derived from the Works Programme.

6. PROGRAMME UPDATE

6.1. PROGRAMME UPDATE STRUCTURE

The monthly Programme Update that shall be prepared by recording actual activity completion dates and percentage of activities completed up to the end of the month together with estimates of remaining duration and expected activity completion based on current progress. The Programme update shall be accompanied by an activity report and a Narrative Statement. The narrative statement shall explain the basis of the Contractor's submittal:

- 1) Early Work and baseline submittals – explains determination of activity duration and



describes the Contractor's approach for meeting required Key Dates as specified in the Contract.

- a) Updated Programme Submittals – state in narrative the Works actually completed and reflected along Critical Path in terms of days ahead or behind allowable dates. Specific requirements of narrative are:
- b) If the updated Work Programme indicates an actual or potential delay to Contract Completion Date or Key Dates, identify causes of delays and provide explanation of Work affected and proposed corrective action to meet Key Dates or mitigate potential delays. Identify deviation from previous month's critical path.
- c) Identify by activity number and description, activities in progress and activities scheduled to be completed.
- d) Discuss Variation Order Work Items, if any.

6.2. PROGRAMME STATUS

The Programme Status that shall:

- 1) show Works Programme status up to and including the current report period, display Cumulative progress to date and a forecast of remaining work.
- 2) be presented as a bar-chart size A3 or A4 and as a time-related logic network diagram on an A1 media, including activity listings;

6.3. ACTIVITY VARIANCE ANALYSIS

The activity variance analysis that shall analyze activities planned to start prior to or during the report period but not started at the end of the report period as well as activities started and/or completed in advance of the Works Programme.

7. MILESTONES STATUS

A report on the status of all Milestones due to have been achieved during the month and forecasts of achievement of any missed Milestones, and those due in the next month.

8. PLANNING AND CO-ORDINATION

The Contractor shall make a summary of all planning/co-ordination activities during the month and details of outstanding actions, and also make a schedule of all submissions and a list of consents/approvals obtained.

9. DESIGN DELIVERABLE SCHEDULE

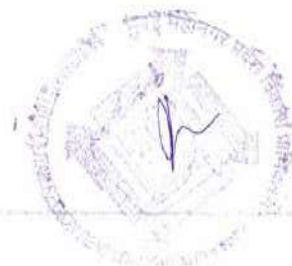
The Contractor shall make a progress version of deliverable schedule indicating actual achievement dates and forecast dates for outstanding items.

10. PROCUREMENT REPORT

The Contractor shall make a summary of all significant procurement activities during the month, including action taken to overcome problems.

This report of major items of plant and materials will be incorporated into the Works and shows the following activities as a minimum requirement:

- 1) Purchase order date - scheduled/actual,
- 2) Manufacturer/supplier and origin,
- 3) Letter of credit issued date,
- 4) Manufacturer/supplier ship date - scheduled/actual,



- 5) Method of shipment,
- 6) Arrival date in hanoi- scheduled/actual.

11. PRODUCTION AND TESTING

The Contractor shall review of all production and manufacturing activities during the month and a make summary of all production and manufacturing outputs during the month together with forecasts for the next month.

Review of all testing activities (either at Site or at the manufacture's premises) during the month.

12. SAFETY

The Contractor shall review of all safety aspects during the month including reports on all accidents and actions proposed to prevent further occurrence.

13. ENVIRONMENTAL

The Contractor shall review of all the environmental issues during the past month to include all monitoring reports, mitigation measures undertaken, and activities to control environmental impacts.

14. QUALITY ASSURANCE

The Contractor shall review of all quality assurance issues during the past month including all audits undertaken (internal and external) with a schedule detailing the status of outstanding actions.

15. HINDRANCES

The Contractor shall review of all hindrances during construction works including all monitoring reports and inform to the Engineer the reason of delay or obstruction concerning the progress of Works. After clarification of Hindrances the Contractor shall make an action plan considering with necessary additional machinery, material and manpower to catch up schedule of Works and make clear the result of progress achieved during passed one month. And continue this practice to be satisfied by the Engineer.



APPENDIX 8 DOCUMENT SUBMISSION AND RESPONSE PROCEDURE

1. SUBMISSIONS TO THE ENGINEER

The general requirements are as follows:

1.1. PROJECT MANAGEMENT INFORMATION SYSTEM

- 1) The Contractor shall provide a web-based information management system of transmittal for formal project correspondence, documents and information to ensure efficient information management on the Project. Where it is necessary to transmit original signed documents, these shall be acceptable forms of correspondence only when they have been issued via the system first.
- 2) The Contractor shall provide the Project-wide use of the system during the Design and Construction Phases and also the Defects Notification Periods.
- 3) The system shall be capable of issuing a list of outstanding responses from the Engineer 7 days before the due date of the response.

1.2. DRAWING AND SPECIFICATION REGISTER

The Contractor shall submit drawings and specifications register to the Engineer in electronic copy and hard copy with each submission of drawings and at an interval agreed by the Engineer. The drawings and specifications register shall be in a format submitted for review and agreed without objection by the Engineer and shall include each document reference number, version, date, title and data-file name.

2. RECORDS AND REPORTS

2.1. FORMAT

Reports and records are to be submitted via the system to the Engineer and shall be in a format agreed by the Engineer. Reports and records shall be signed prior to submission by the Contractor's agent or by a representative authorized by the Contractor.

2.2. PROJECT DOCUMENT CONTROL PROCEDURE

Within twenty-eight (28) days after Commencement Date, the Contractor shall submit via the system a Project document control procedure to the Engineer for review, which shall include but not be limited to the following:

- 1) a document approval system which shall specify the level of authority for approval of all documents and material before submission to the Engineer;
- 2) a system of issuing documents to ensure that pertinent documents are issued to all appropriate locations;
- 3) a document change or re-issue system to ensure that only the latest revision of a document can be used; and
- 4) a submission identification system that identifies each submission uniquely by the following:
 - a) contract number;
 - b) discipline;
 - c) submission number; and
 - d) revision indicator.



2.3. PROJECT RECORD

Project records will eventually be used by the Employer to manage, operate and maintain the Works after the completion of the Project under construction and for future reference.

2.4. ADEQUACY OF THE PROJECT RECORD

The Contractor shall submit the documents as required by the Engineer as Project records in full and on time. The Engineer shall determine the adequacy of the Project record.

3. SUBMISSION AND RESPONSE PROCEDURE

3.1. GENERAL

Except where specific procedures are given for certain items, all submissions shall be submitted and reviewed according to the procedure laid down in the following clauses.

3.2. PROPOSAL

Each submission shall be accompanied by a brief introduction to explain which sub-system, part or section of the Works to which the submission refers, listing the documents enclosed with the submission, and describing in outline how all relevant requirements of the Employer's Requirements are achieved by the proposals.

3.3. SUBMISSION RESPONSE REQUEST

For each stage of submittal, the Contractor shall prepare a Submission Response Request (SRR) carrying the date of submission, the submission reference number as defined in Clause 2.2 (4) above, the submission title, the stage of submission (e.g. Technical Design, etc.), and the authorized signature of the Contractor's responsible engineer to confirm that, in the opinion of the Contractor, the submission:

- 1) complies with all relevant requirements of the Employer's Requirements;
- 2) conforms to all interface requirements;
- 3) contains, or is based on auditable and proven or verified calculations or design criteria;
- 4) has been properly reviewed by the Contractor, according to the Contractor's Quality Assurance System, to confirm its completeness, accuracy, adequacy and validity; and
- 5) has taken account of all requirements for approval by statutory bodies or similar organizations, and that where required, such approvals have been granted.
- 6) contains 2 (two) properly signed copies of Independent Design Checker Certificate (Form IDCC) and 2 (two) properly signed copies of the Construction Design Pack Certificate (Form CDPC) as stated in Appendix 10)

3.4. THE ENGINEER'S RESPONSE

The Engineer's response to the submission from the Contractor will be made within 21 calendar days of receipt of the submission. If the submission is made later on the Design Submissions Programme, the Engineer may extend the review period depending on the amount of documentation accompanying the submission.

3.5. MONTHLY DESIGN REVIEW MEETINGS

Throughout the each Design Stage, the Contractor shall attend monthly design review meetings with the Engineer. At these Engineer's review meetings, the Contractor shall present information, drawings and other documents to the Engineer in respect of all submissions programmed to occur during the following five-week period. The Contractor's presentations shall be in sufficient depth to enable the Engineer to obtain a clear understanding of the Contractor's proposals and to discuss the methodology and process used in reaching the proposed design solutions.



3.6. THE ENGINEER'S OBSERVATIONS

The Contractor shall record all of the Engineer's observations and any agreed actions resulting from the Engineer's review meeting and shall address each of these fully before submission of the respective documents for formal review.

3.7. NOTIFICATION

If, in the Engineer's opinion, following receipt of a submission there is benefit to be gained from a meeting with the Contractor to clarify or discuss any of the contents of the submission, he will notify the Contractor accordingly with not less than 3 days advance notice, and the Contractor shall attend at the time and place appointed by the Engineer.

3.8. NOTICE OF NO OBJECTION

The Contractor in respect of the Works or any sub-system, part or section may make no submission thereof unless a Notice of No Objection of No Objection with Comments has been received for the previous stage of the same Works or any sub-system, part or section thereof.

4. RESPONDED PROCEDURE**4.1. RESPONDED PROCEDURES**

The Engineer will respond in one of the following three ways:

- 1) "Notice of Rejection" (with "A" Comments)
- 2) "Notice of No Objection"
- 3) "Notice of No Objection with Comments" (with "B" or/and "C" Comments)

4.2. RESPONSE DEFINITION

Definition of the Engineer's response:

1) "Notice of Rejection" (with "A" Comments) if following his review of the submission, the Engineer discovers major non-compliance, discrepancies or omissions etc that in his opinion are of a critical nature, the Engineer will issue a "Notice of Rejection" (NOR) with type "A" comments. The Contractor shall revise and reissue the submission within 21 calendar days of receipt of "Notice of Rejection" from the Engineer addressing the Engineer's comments. Subsequently the Engineer shall respond within 21 calendar days of receipt of the resubmission. Following the issue of a NOR by the Engineer the Contractor is not entitled to proceed to the next programmed stage for that section of the work until all of the Engineer's comments have been fully addressed and a NONO issued.

2) "Notice of No Objection" if following his review of the submission the Engineer has not discovered any non-compliance with the contract the Engineer will issue to the Contractor a formal "Notice of No Objection (NONO). A NONO from the Engineer irrespective of with or without comments does not in any way imply the Engineer's consent of the submission nor does it remove any responsibility from the Contractor for complying with the Contract. Issue of a NONO from the Engineer entitles the Contractor to proceed to the next stage of the programmed work.

3) "Notice of No Objection" (With Comments) if following his review of the submission the Engineer discovers discrepancies or omissions etc. that in his opinion are not of a critical nature the Engineer may issue a "Notice of No Objection" with Comments, (NONOC) the comments will be of either type B or type C as defined below. The Contractor shall respond to the comments in accordance with the requirements of Clause 4.3. Following the issue of a NONOC by the Engineer the Contractor is entitled to proceed to the next stage of the programmed work subject to the inclusion of amendments necessary to address the comments.

The Contractor shall respond to Type B and C comments and get the Engineer agreement and closure prior to full inclusion in the Final Design.



4.3. THE ENGINEER'S COMMENTS

Definition of the Engineer's comments:

- 1) Type "A" Comments are of a critical nature that renders the submission non-compliant with the Contract, the submission shall be corrected and resubmitted.
- 2) Type "B" Comments are of an intermediate nature that shall be responded, agreed and incorporated.
- 3) Type "C" Comments are of a minor nature or may affect future submissions.

5. RECORDS

The Contractor shall establish and maintain a place for the storage and archiving of all the documents relating to the Works and are not required to be submitted to the Engineer under Clause 2.



APPENDIX 9. REQUIREMENTS FOR DOCUMENTS AND DRAWINGS**1. REQUIREMENTS ON DOCUMENTS****1.1. COVER FORMAT**

- 1) Heading and name of the Employer are on top, in capital, size 11.
- 2) Name of the Project is in bold letter, size 24.
- 3) Content of document is in bold capital, size 18.
- 4) Documents' reference number is in bold capital, size 14
- 5) Company name: capital, size 14.
- 6) Company's logo is in size 35x40 (WxH) mm.
- 7) Address of the company is in normal letter, size 11.

1.2. DOCUMENT FORMAT

- 1) General regulations:

Six (6) copies of all documents shall be submitted by the Contractor

- a) Height of letter: applied size 11.
- b) Paper size A4 (A3 is used for table.)
- c) Periods, semicolons, etc. should be put right after the letter.
- d) The space between paragraphs and headings is 1 line.
- e) Main headings: are placed in number's order and the period is right after the heading, then a space, written in bold capital and underline the letters.

For ex. **I. IN BOLD CAPITAL:**

- f) Other headings: are placed in number's order and the period is right after the heading, then a space, written in bold normal letters and underline the letters.

For ex **1. In bold normal letter:**

- 2) Note:
 - a) Notes of tables should be included in the table; in case if they are not able to be included, they should be noted clearly that they are notes for which table.
 - b) Notes are usually in italic letters.

- 3) Contents of the documents:

Following the Indian regulations, standards of technical process on survey, design, experiment, etc.

1.3. DOCUMENT NUMBERING SYSTEM

The Contractor shall prepare the document numbering system and describe it in the Quality Management System document.

1.4. CARE AND SUPPLY OF DOCUMENT

The Contractor shall keep on the site, a copy of Contract, publications such as Drawings, Correspondence Letter with the Employer and Engineer, Monthly, Weekly Report, Test date, Programmes and other necessary Contractor's Documents.

The Employer's personnel shall have the right of access to all these documents at all reasonable times.



2. REQUIREMENTS ON DRAWINGS

2.1. GENERAL

- 1) Two (2) soft copies and Five (5) hard copies of As-built Drawings shall be submitted by the Contractor for As-built drawings.
- 2) One (1) soft copy and Five (5) hard copies of Other Drawings shall be submitted by the Contractor.
- 3) The Contractor shall adopt a title block similar for all drawings prepared under the Contract.
- 4) Each drawing shall be uniquely referenced by a drawing number and shall define both the current status and revision of the drawing.
- 5) The current status of each design drawing shall be clearly defined by the use of a single letter code as follows;
 - I - Initial Design
 - T - Technical Design
 - C - Construction Technical Drawings
 - B - As-Built Drawings

2.2. DRAWING NUMBER SYSTEM

- 1) The drawing number shall comprise nine (9) letters/digits plus a revision letter in the following format:
 Drawing No.
 Revision/xx/xx/nnnn/xx
 (Note: This format permits the use of a full 10 - character computer reference, combining the Drawing No. and Revision.)

3. COMPUTER AIDED DESIGN & DRAUGHTING (CAD) STANDARDS

The main objectives of the CAD standards are as follows:

- 1) To ensure that the CAD data files produced for the Project are coordinated and referenced
- 2) To provide the information and procedures necessary for a CAD user from one discipline or external organization to access (and use as background reference), information from a CAD data file prepared by another discipline or external organization.
- 3) To standardize the information contained within CAD data files which may be common to more than one discipline such as drawing borders, title boxes, grid lines etc.
- 4) To establish procedures necessary for the management of CAD data files.
- 5) To ensure all contractors use „Model space“ and „Paper space“ in the production of their CAD files“.

3.1. CAD DATA CREATION, CONTENT & PRESENTATION

A consistent method of CAD data creation, together with content and presentation is essential. The method of CAD “Model Space and Paper Space” creation is as follows:

- 1) Model Space Files
 - a) Typically CAD “Model Space” files are required for general arrangement and location



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plans and will consist of a series of other "Model Space" referenced CAD files covering the total design extents at a defined building level (the number of referenced files should be kept to an absolute minimum). Data contained within a CAD "Model Space" files is drawn at full size (1:1) and located at the correct global position and orientation on the Project Grid / or defined reference points.

- b) Each CAD "Model Space" file will relate to an individual discipline. Drawing border / text, match / section lines or detailed notation shall NOT be included within a CAD "Model Space" file. Dimensions shall be included within a CAD "Model Space" but located on a dedicated layer. Elevations, Long Sections and Cross Sections shall also be presented in CAD "Model Space" as defined above, but do not need to be positioned and orientated on the Project Grid.
- 2) Paper Space CAD Files
 - a) Paper Space" CAD files are utilized to aid the process of plotting "Paper" drawings and are primarily a window of the CAD "Model Space" file. A "Paper Space" CAD file will typically contain drawing borders, text, match or section lines & detailed notation. Once these files are initially set up and positioned displaying different combinations of element layers and zymology contained within the "Paper Space" file and the referenced "Model Space" files efficiently and consistently generate the majority of "Paper Drawing" plots at various approved scales.
 - b) The purpose is to ensure that total co-ordination is achieved between the CAD "Model Space" file and the "Paper Drawing" output during the revision cycle of the design and production process. Duplicated data in "Model and Paper Space" files will not be acceptable unless an automatic update link exists between the two data sets. "Paper Space" files are not typically required as part of the CAD Media Receipt from contractors, unless specifically requested.

3.2. CAD QUALITY CONTROL CHECKS

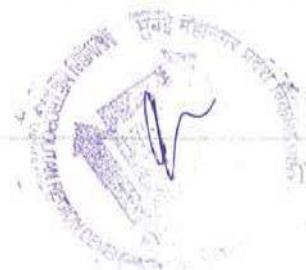
- 1) Random CAD Quality Control Audits will be carried out by Engineer on all CAD media received and transmitted.
- 2) These checks DO NOT verify the technical content of the CAD data received or transmitted (as this is the responsibility of the originating organization), however compliance with Project CAD.
- 3) In addition, all contractors who transmit and receive CAD data from the Project shall have CAD quality control procedures in place. A typical quality control procedure shall contain CAD data quality checking routines coupled with standards for CAD data transmittal and archiving.

3.3. REVISIONS

- 1) All „Revisions“, „In Abeyance“ and „Deletions“ shall be located on a common layer. This layer can be turned on or off for plotting purposes.
- 2) The following example text indicates the current CAD file revision, i.e. „Revision [A]“. This shall be allocated to a defined layer on all CAD "Model Space" files, in text of a size that will be readable when the CAD "Model Space" file is fitted to the screen, with all levels on.

3.4. BLOCK LIBRARIES, BLOCKS, & BLOCK NAMES

- 1) All Construction Industry symbols produced as CAD Cells shall typically conform to Indian regulation.
- 2) All Blocks created shall be Primitive (i.e. NOT Complex) and shall be placed Absolute (i.e. NOT Relative).
- 3) The Contractor's specific block libraries shall be transmitted to the Engineer together with an associated block library list containing the filename (max. 6 characters) and block description. The Contractor shall ensure that the library is regularly updated and circulated to all other users, together with the associated library listing.



- 4) All Blocks of a common type, symbols or details should initially be created within a CAD "Model Space File" specifically utilized for that purpose. These files will be made available upon the Engineer's request.
- 5) All Blocks created will typically be 2D unless 3D is specifically requested. In both instances they shall have an origin at a logical point located within the extents of each Block's masked area or volume.

3.5. CADDIMENSIONING

Automatic CAD Dimensioning will be used at all times. Any dimensional change must involve the necessary revision to the model space file. If the CAD Quality Control Checks find that the revisions have not been correctly carried out, the rejection of the entire CAD submission will result.

3.6. CAD LAYERING

All CAD elements shall be placed on the layers allocated for each different discipline. The layer naming convention to be adopted by the Contractor shall be submitted for acceptance and inclusion within these standards.

3.7. GLOBAL ORIGIN, LOCATION & ORIENTATION ON THE ALIGNMENT DRAWING

- 1) Location or Plan information in "Model Space" files shall coincide with the correct location and orientation on the Project grid for each specific contract.
- 2) Location plans shall have at least three setting out points shown on each CAD "Model Space" file. Each setting out point shall be indicated by a simple cross-hair together with related East and North co-ordinates. The Contractor will establish the three setting out co-ordinates for their respective works, which will then be used by all Related Works Contractors.

3.8. CAD UTILIZATION OF 2D & 3D FILES

Although the Project standard is 2D CAD files, certain disciplines may use 3D CAD files for specific applications or where the isolated use of 3D aids the design and visualization process (i.e. Architecture, Survey and Utilities). In these specific instances 3D CAD data will only be transmitted if all other users can use this data. If this is not the case, 3D to 2D translation shall be processed by the creator prior to issue.

3.9. CAD FILE NUMBERING

- 1) Contractors and Related Works Contractors' CAD File Numbering shall be described in 2.2 above.
- 2) Employer's CAD File Numbering: Unlike Contractor and/or Related Works Contractors the Employer will not be required to produce numerous CAD files. This will follow the numbering system except that the status of the drawing in 2.1(3) shall be "E".

3.10. CAD FILE NAMING CONVENTION -GENERAL

CAD "Model Space" files shall be named in accordance with general drawing conventions.

4. SUBMISSION, RECEIPT AND TRANSMITTAL OF DOCUMENTS AND DRAWINGS

4.1. SUBMISSION OF THE DOCUMENTS AND DRAWINGS

When the Contractor submits any documents and drawings to the Engineer for his review, checking and/or comment, the Contractor shall prepare five (5) sets of hard copies with one (1) set of CDs containing the PDF files of submitting documents and CAD data of submitting drawings.

4.2. DATA TRANSFER MEDIA AND FORMAT

When data is received & transmittal between Engineer and the Contractor, the media shall be as



Section VI-1. Employer's Requirements follows:

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- 1) Data Exchange Format
 - a) Document including tables and figures: PDF (.pdf)
 - b) Drawings: AutoCAD Vr. 2015 (.dwg)
- 2) Operating System - Windows XP/VISTA
- 3) Data Transfer Media: 12cm Compact Disc (650 MB) is highly preferred
- 4) All CDs or tapes must be labelled on the data shield with:
 - a) Name of Company
 - b) Project
 - c) Title Drawing Filenames
- 5) The Contractor must ensure the supplied media is free from virus.

4.3. CAD MEDIA RECEIPT & TRANSMITTAL

- 1) Transmittal (from the Contractor to Engineer) - this will consist of the following:
 - a) CAD Digital Media shall typically contain CAD "Model Space" and "Paper Space" files.
 - b) CAD data sheet
 - c) CAD issue / revision sheet
 - d) CAD Quality Checklist confirming compliance.
- 2) The above CAD media will be collectively known as "CAD Media Transmittal Set". The CAD data file transmittal format required by Employer' Representative from all contractors shall be in AutoCAD (version 2015)
- 3) All CAD media received from contractors will be retained by Engineer as an audit trail / archive of a specific contractor's design evolution.
- 4) CAD Media Receipt (from Engineer to the Contractor)
 - a) CAD media should normally be obtained from the respective interfacing contractor(s), but should Engineer issue CAD media it will consist of the following:
 - b) CAD Digital Media typically contain only CAD "Model Space" files.
 - c) CAD data sheet.
 - d) CAD issue / revision sheet
 - e) The above CAD media will be collectively known as the "CAD Media Receipt Set". The CAD data file transmittal format used by Engineer to all contractors will be in AutoCAD (version 2007)

Each CAD transmittal disk will be labelled with proper disk label as approved by the Engineer. Any CAD data transmitted without this label is assumed to be provisional information not to have been quality checked and therefore not formally issue



APPENDIX 10. REQUIREMENTS FOR DESIGN APPENDICES

1. CONTENTS OF DESIGN STAGE SUBMISSIONS

1.1. INITIAL DESIGN

1.1.1. DESCRIPTION

Based on the Bidder's Design and Technical Proposal the Contractor shall develop and provide an Initial Design Submission for review. This will be in sufficient detail to show the main elements of the design and the main documents required to allow subsequent preparation and development of the Technical Design and will include:

- 1) Design Quality Plan
- 2) Review of the Outline Drawing criteria
- 3) Initial submission of the design manual including the identification of design codes and standards (see 1.1.2 below)
- 4) Submission of proposed software
- 5) Initial equipment layouts and details
- 6) Initial off site testing recommendation
- 7) Submission of specifications proposed for the works
- 8) CAD and Document Control procedures
- 9) Initial design of Interface requirements
- 10) Alignment review
- 11) Initial construction methodology and Temporary Works requirement
- 12) Updated Design Submission Programme
- 13) Initial Traffic Management Plan
- 14) Proposed Site surveys and other field surveys including geotechnical surveys
- 15) Review of permanent land requirements
- 16) Initial ground treatment and building protection proposals
- 17) Initial reinstatement drawings
- 18) Initial construction utilization plan including segment casting yard details

1.1.2. DESIGN MANUAL

The Design Manual shall incorporate all design requirements including standards, codes, loading cases, permissible movements and deflections, limit states, design stresses and strains, material properties and all other documents or matters which are relevant to and govern the design. The Design Manual shall refer to all materials, codes and standards used, making clear their specific applications. The Design Manual shall be produced so that it can be used by those involved in the preparation or review of the design of the Works as a comprehensive reference text and efficient working document. The Design Manual shall be further developed and submitted in the Technical Design.



1.2. TECHNICAL DESIGN**1.2.1. DESCRIPTION**

Submission of the Technical Design shall be a coherent and complete set of documents, properly consolidated and indexed and shall fully describe the proposed Technical Design. In particular, and where appropriate, it shall define:

- 1) the dimensions of all major features, structural elements and members;
- 2) all materials;
- 3) potential forces and movements due to all possible loadings and actions on the structures, and their accommodation;
- 4) all second order effects;
- 5) the layout and typical details of reinforcement in structural concrete members / the layout and typical details of pre-stressing in pre-stressed concrete members;
- 6) standard details;
- 7) location, geometry and setting-out of all main elements and features;
- 8) electrical and mechanical services and equipment and their interaction with the structures;
- 9) provisions and proposals for construction interfacing with the Related Works Contractors;
- 10) utilities to be diverted /supported;
- 11) the stages of road diversion including any decking required
- 12) traffic or other civic service affected
- 13) Utility Diversion Plan
- 14) Site Safety Plan

1.2.2. TECHNICAL DESIGN CONTENT

The Technical Design will be developed from the Initial Design submission and provide a full submission of the Technical Design for review. This will be in sufficient detail to show all main elements of the design and the main documents required to enable the design to be fully reviewed although further Working Drawings would still be needed for ease of construction and installation.

1.2.3. SUBMISSION OF TECHNICAL DESIGN

Submission of the Technical Design shall be accompanied by the following documents, which will be considered by the Engineer in his review of the Technical Design. Where relevant or required, these documents shall be accompanied by a design note stating clearly how information has been used in the design of the Works.

1.2.4. TECHNICAL DESIGN REPORT

The report shall be a narrative report describing the Design Submission including its extent and relationship with other submissions. It shall include, a guide to all relevant technical data used and outline the design approach, standards used etc.

1.2.5. WORKS SPECIFICATION

The Specification included in the Bidder's Technical Proposals together with the Outline specifications shall be amplified so as comprehensively to specify the design and construction of the Works.

1.2.6. TOPOGRAPHIC SURVEY REPORT

The Contractor shall make topographic survey report at technical design stage.

1.2.7. HYDROLOGIC REPORT

Hydrologic report shall contain such information, as temperature, weather, rainfall, wind directions,



water level, geographic location, socioeconomic, etc.

1.2.8. ELECTRICAL AND MECHANICAL DOCUMENTS

Electrical and Mechanical documents shall contain designs, performance specifications, calculations and drawings and all technical requirements relating to the Works, for all electrical and mechanical equipment comprised in the Works.

1.2.9. INTERFACE REPORT ON RELATED WORKS CONTRACTORS

Interface report on related works Contractors shall show details of the design and construction of the Works adjacent to other Related Works Contracts. Details of provisions for the Related Works Contractors, indicating arrangements for accesses, fixings, casting-in, openings, supports, decks, manholes, trenches and the like; updated interface management plan relating to design integration and co-ordination.

1.2.10. TESTING REPORT

Details of proposals for testing procedures for all relevant elements contained in the Works.

1.2.11. GEOTECHNICAL INTERPRETATIVE REPORT

Geotechnical Interpretative report shall contain site investigation results and covering the geotechnical interpretation of Site investigation work including that undertaken by the Contractor in sufficient detail to confirm and justify parameters used in geotechnical designs. The report shall include the full logs and descriptions of confirmatory boreholes drilled by the Contractor.

1.2.12. SURVEY REPORT

Survey report shall contain on all survey works undertaken by the Contractor, including checks on mapping, survey stations, co-ordinates and setting-out. Updated topographical and survey drawings shall also be included.

1.2.13. UTILITIES REPORT

Utilities report shall indicate details of arrangements and working methods in respect of the existing utilities, including protection measures, diversions, reinstatements and programme allowances.

1.2.14. TEMPORARY WORKS DESIGN REPORT

Temporary works design report shall indicate sufficient information on the design of the Temporary Works to allow the Engineer's personnel to assess their effects on the Works and to enable these to be taken into account in the review of the Technical Design.

1.2.15. CONSTRUCTION/INSTALLATION ANALYSIS REPORT

Construction/Installation analysis report shall contain a stage-by-stage construction/ installation sequence for all structures / equipment.

1.2.16. CONSTRUCTION METHOD STATEMENT

The Contractor shall make report which provides sufficient information on the methods of construction and Contractor's Equipment to allow the Engineer to assess their effects on the Works and to enable these to be taken into account in the review of the Technical Design.

Construction Method Statement shall include the safety assessment.

1.2.17. WORKS PROGRAMME

Works Programme shall indicate as stipulated in the Clause 6.5 of Appendix 6

1.2.18. REPORT ON THE USE OF WORKS AREAS

A report updating the proposals from those contained in the Contractor's Technical Proposals for the use of Site and their reinstatement, detailing the station accesses and access facilities.



1.2.19. TECHNICAL DESIGN DRAWINGS

Submission of the Technical Design shall include, where appropriate and without limitation, the following Design Drawings which will fully describe the Works to be built:

- 1) general arrangement;
- 2) architectural details including signage, elevations, perspectives and landscaping;
- 3) plans, layouts and details of all structural elements including reinforcement details;
- 4) all temporary works details;
- 5) earthworks;
- 6) structural and surface drainage;
- 7) access roads and temporary road works;
- 8) existing and proposed utilities;
- 9) road works and works related to traffic management including decking; and
- 10) embedded items drawings.

1.2.20. INDEPENDENT DESIGN CHECKER

The Contractor shall employ the Independent Design Checker who shall undertake the design assurance of the Permanent Works and Temporary Works. Design Data shall be prepared by or under the supervision of the Independent Design Checker. The Independent Design Checker shall satisfy himself that the Design Data, in the case of submissions up to and including the proposed Design, comply with the Employer's Requirements and is in accordance with, and incorporates the Contractor's Technical Proposals. Design Submittal for the types of Design stipulated in the Employer's Requirements shall be accompanied by an Independent Design Checker Certificate (IDCC) signed by the Independent Design Checker and Contractor's Certificate signed by the Contractor. Independent Design Checker Certificate (IDCC), Valid Form IDCC as stated in this Appendix shall be issued.

1.3. CONSTRUCTION DESIGN**1.3.1. REQUIREMENTS**

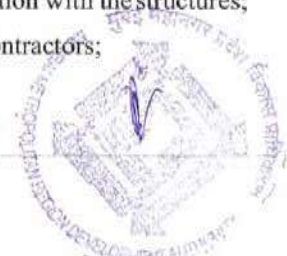
The Construction Design shall be the latest revisions of the documents comprised in the Technical Design, taking account of agreed responses to any comments in the schedules appended to Notices of No Objection.

1.3.2. CONTENT OF CONSTRUCTION DESIGN

Submission of the Construction Design shall be a coherent and complete set of documents, compiled by the Designer from the approved Technical Design incorporating any comments made during review in addition to any working drawings to supplement the design and show further details for construction.

In particular, and where appropriate, it shall be defined:

- 1) all calculations showing actual forces and movements due to all loading and actions on both the permanent structures and temporary works,
- 2) all predictions of effect on structures and the protective measures to limit the effects to an acceptable degree (refer to the Outline Drawing Criteria);
- 3) dimensions, location, geometry and setting-out of all elements;
- 4) the layout and details of reinforcement in structural concrete members;
- 5) all materials and standard details;
- 6) detailed construction methods;
- 7) electrical and mechanical services and equipment and their interaction with the structures;
- 8) clarification of construction interfacing with the Related Works Contractors;



- 9) utilities to be diverted /supported;
- 10) traffic diversions or other civic service affected;

1.3.3. INDEPENDENT DESIGN CHECKER

The whole of the Construction Design Pack shall be certified by the Independent Design Checker and then endorsed by the Contractor. Valid Forms IDCC and Construction Design Pack Certificate, Form CDPC as stated in this Appendix shall be respectively issued and included in the Construction Design Pack.

1.3.4. THE CONTENTS OF THE CONSTRUCTION DESIGN PACK PRODUCED BY THE CONTRACTOR

- 1) Specifications
- 2) Construction Design Drawings: means latest approved Technical Design Drawings described as the above Clause 1.2.19 of this Appendix.
- 3) Working Drawings: these are comprise the Manufacture and Installation and other drawings and documents as are necessary to amplify the Manufacture and Installation purposes and endorsed as required by the Engineer
- 4) Shop Drawings: these are supplementary detail drawings that expand and explain the information shown on the Construction Technical Drawings.
- 5) Fabrication Drawings: These are supplementary drawings of specific elements of the works shown on the Construction Technical Drawings and Shop Drawings for the purpose of manufacture or fabrication of those elements.
- 6) Temporary Work Drawings including utilities, traffic and erection drawings.
- 7) Bar Bending Schedule
- 8) All other drawings as deemed necessary by the Contractor for the accurate and safe construction of the Works in accordance with the Contract.
- 9) Other construction related documents
 - a) Detailed Construction Method Statement
 - b) Safety Risk Assessment: means as described in the Clause 5 of this Appendix.
 - c) Erection Sequence Statement
 - d) All other documents deemed necessary by the Contractor for the accurate and safe construction of the Works in accordance with this Contract.

1.4. AS-BUILT DOCUMENTS

1.4.1. SCOPE

The As-Built Documents shall contain the As-Built Drawings, and all other records included in the list below.

1.4.2. AS-BUILT DOCUMENTS CONTENT

As-Built Drawings showing all changes from the Construction Technical Drawings of the Works. The As-Built information shall include, but not be limited to the following:

- 1) Changes to dimension and detail from the Construction Technical Drawings;
- 2) Components left in place, including temporary support systems, concrete outside of neat lines of permanent structures, and other such matters;
- 3) Depths of all elements of foundations in relation to survey datum;
- 4) Horizontal and vertical locations of utilities related to the Works, including diverted



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utilities and utilities left in-place;

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- 5) Location of appurtenances and utilities concealed within a structure; and
- 6) Changes due to Variation Orders.
- 7) All As-Built Drawings shall be signed off by the Contractor's Construction Supervisor and the Contractor's Representative.
- 8) Records data, as-built records, Project photographs, damage or settlement surveys, property surveys and similar final record information;
- 9) Geotechnical data and records;
- 10) As-Built survey data and drawings as specified;
- 11) Official letters regarding the design change acceptance;
- 12) Certificates of acceptance among the Contractors, between the Contractors and the Engineer personnel;
- 13) Construction diary;
- 14) Internal certificates of acceptance.

2. FORM OF INDEPENDENT DESIGN CHECKER CERTIFICATE

Refer to following pages, Form IDCC.

3. FORM OF CONSTRUCTION DESIGN PACK CERTIFICATE

Refer to following pages, Form CDPC.



FORM IDCC (Page 1 of 2)

INDEPENDENT DESIGN CHECKER CERTIFICATE

This Independent Design Checker Certificate refers to Submission No.

Design Stage: Technical Design / Construction Design / As-Built Documents
in respect of:

[description of the Works to which the submission refers] The

contents of this submission are listed in Section A below.

Documents for which a Notice of No Objection has previously been issued and which are of
relevance to this Submission are listed in Section B below.

INDEPENDENT DESIGN CHECKER'S STATEMENT

We certify that the design of the Works, as shown and described in the drawings and documents
listed in Section A below,

- a) has been independently checked and verified by us and complies with the Employer's
Requirements and all other requirements of the Prime Contract;
- b) includes all necessary and required approvals relating to the design;
- c) all effects of the design comprising the submission on, or from, the design of adjacent or
other parts of the Works and Related Works Contracts have been fully taken into account
in the design.

Signed by „Authorized Representative“ (for Independent Design Checker)

Name

Date

Position/ Designation



FORM IDCC (Page2 of 2)**CONTRACTOR'S CERTIFICATION**

This certifies that the Independent Design Checker Certificate of this design has been performed utilizing the skill and care to be expected of a professionally qualified and competent designer, experienced in work of similar nature and scope. This further certifies that all works relating to the Independent Design Checker Certificate has been verified by us.

Signed by Authorized Representative (for the Contractor)

Name

Date

Position/Designation

Section A

Submission no. comprises the following :

Drawings : *(Title, drawing number and revision)*

Documents : *(Title, reference number and revision)*

Others :

Section B

Documents for which a Notice of No Objection has previously been issued and which are of relevance to this Submission :

Document : *(Title, reference number and revision)*

submitted with Submission No.....

(Contractor to provide sufficient details to uniquely identify the relevant document)



FORM CDPC (Page 1 of 2)**CONSTRUCTION DESIGN PACK CERTIFICATE**

This Construction Design Pack Certificate refers to Construction Design Pack No.
in respect of:

[description of the Works to which the submission refers]

The contents of this Construction Design Pack are scheduled in Section A below.

Documents for which a Construction Design Pack Certificate has previously been issued and which are of relevance to this Construction Pack are listed in Section B below.

CONTRACTOR'S STATEMENT

We certify that the this Construction Design Pack is "Good for Construction" and that its contents, as listed in Section A below,

- (a) has been checked by us and complies with the Employer's Requirements and all other requirements of the Contract;
- (b) Includes all necessary, relevant and valid Independent Design Checker Certificates
- (b) has been confirmed as a complete, adequate and valid Construction Design Pack through an in-house design and QA check;
- (d) includes all necessary and required approvals (e.g. from Local Authorities or agencies etc.) and copies of such approvals are annexed in Section C below;
- (e) all effects of the design and construction compiled in this Construction Design Pack on, or from, the adjacent or other parts of the Works and Related Works Contracts have been fully taken into account in the composition of this Construction Design Pack.

Signed by „Authorized Representative“ (for Contractor)

Name

Date

Position/ Designation



FORM CDPC – Page 2 of 2**SECTION A**

Construction Design Pack No. comprises the following :

Drawings : *(Title, drawing number and revision)*

Documents : *(Title, reference number and revision)*

Others :

SECTION B

Documents for which a Construction Design Pack Certificate has previously been issued and which are of relevance to this Submission :

Document : *(Title, reference number and revision)*

submitted with Construction Design Pack No.....

(Contractor to provide sufficient details to uniquely identify the relevant document)

SECTION C

[Contractor to attach copies of necessary and required approvals]



APPENDIX 11 . REQUIREMENTS FOR CONSTRUCTION

1. THE SITE

1.1. USE OF THE SITE

- 1) The Site designated for Contractor's Equipment shall not be used by the Contractor for any purposes other than for carrying out the Works, except that, with the consent in writing of the Engineer, the Site or Contractor's Equipment such as batching and mixing plants for concrete and bituminous materials may be used for the Works in connection with other Related Works Contracts under the Employer.
- 2) The location and size of each stockpile of materials, including excavated materials, within the Site shall be as permitted by the Engineer. Stockpiles shall be maintained at all times in a stable condition.
- 3) Entry to and exit from the Site shall be controlled and shall be only available at the locations for which the Engineer has given his consent.

1.2. ACCESS TO THE SITE

- 1) The Contractor shall select routes, choose as per prevailing local traffic regulation and use vehicles so that movement of Contractor's Equipment, Plant and Materials from and to the Site is limited so that traffic is not delayed and damage to highways and bridges is prevented. Should any delay or damage or injury occur, the cost of rectification or reconstruction of highways or bridges shall be borne by the Contractor and he shall indemnify the Employer from any claim so arising.
- 2) If during the execution of the Works the Contractor shall receive any claim arising out of the execution of the Works in respect of damage to highways or bridges, he shall immediately report the facts to the Engineer. The Contractor shall negotiate a settlement in respect of such claims and indemnify the Employer in respect of all claims, proceedings, damages, costs, charges and expenses in relation thereto.
- 3) In addition, the Contractor shall ensure that access to every portion of the Site is continually available to the Employer and the Engineer.

1.3. SURVEY OF THE SITE

A survey shall be carried out of the Site to establish its precise boundaries and the existing ground levels within it. This survey shall include a photographic survey sufficient to provide a full record of the state of the Site before commencing the Work with particular attention paid to those areas where reinstatement will be carried out later on. The survey shall be carried out before the Site clearance wherever possible and in any case prior to the commencement of work in any Works Area. The survey shall be carried out by the Contractor and agreed with the Engineer.

1.4. FENCING AND SIGNBOARDS

- 1) The Contractor shall erect hoardings, fences and gates around its areas of operations to prevent entry by unauthorized persons to his Works Areas. The Contractor shall submit its proposals for fencing of his Works Areas to the Engineer. No work shall be commenced in any Works Area until the Engineer has been satisfied that the fencing installed by the Contractor is sufficient to prevent, within reason, unauthorized entry.
- 2) Project signboards shall be erected at construction Site not more than four (4) weeks, or such other period as the Engineer has given his consent, after the Commencement Date of the Works. The types, sizes and locations of Project signboards, which are described in English, Hindi and Marathi, shall be agreed with the Engineer before manufacture and erection. Other advertising signs shall not be erected on the Site.
- 3) The consent of the Engineer shall be obtained before hoarding, fences, gates or signs are removed. Hoardings, fences, gates and signs that are to be left in positions after the completion of



the Works shall be repaired and repainted as instructed by the Engineer.

- 4) Hoardings, fences, gates and signs shall be maintained in good order by the Contractor until the completion of the Works, whether such hoardings, fences, gates and signs have been installed by the Contractor or by others and transferred to the Contractor during the period of the Works.
- 5) All hoardings, fences, gates and signs installed by the Contractor shall be removed by the Contractor upon the completion of the Works, unless otherwise directed by the Engineer.
- 6) Hoarding/fencing can be reused after removing from one place to other locations / sites provided they are in good condition and consented by the Engineer.
- 7) Damage/worn-out fencing/hoarding shall be replaced by Contractor within 24 hours. The Engineer's decision regarding need for replacement shall be final and binding and if no action is taken by Contractor the cost of any repairs will be deducted by the Engineer from any payment due to the Contractor.

1.5. CLEARANCE OF THE SITE

All Temporary Works which are not to remain on the Site after the completion of the Works shall be removed prior to completion of the Works or at other times as instructed by the Engineer. The Site shall be cleared and reinstated to the lines and levels and to the same condition as existed before the Works were started except as otherwise stated in the Contract.

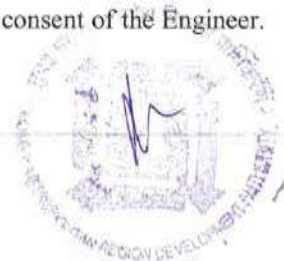
2. SURVEY

- 1) The Contractor shall relate the construction of the Works to the Site Grid. To facilitate this, survey reference points have been established and the Engineer will provide benchmarks in the vicinity of the Site.
- 2) Before the Contractor commences the setting out of the Works, the Engineer will provide a drawing showing the position of each survey reference point and bench mark, together with the coordinates and/or level assigned to each point. The Contractor shall satisfy itself that there are no conflicts between the data given and shall establish and provide all subsidiary setting out points, monuments, towers and the like which may be necessary for the proper and accurate setting out and checking of the Works.
- 3) The Contractor shall carefully protect all the survey reference points, bench marks, setting out points, monuments, towers and the like from any damages and shall maintain them and promptly repair or replace any points damaged due to any causes whatsoever. The Contractor shall regularly recheck the position of all setting out points, benchmarks and the like to the satisfaction of the Engineer.
- 4) Upon handover to the Contractor, the survey reference points will become the responsibility of the Contractor. The Contractor shall, by annual or more frequent review, ensure that these survey points continue to remain consistent with the benchmarks.

3. CARE OF THE WORKS

3.1. GENERAL

- 1) Unless otherwise permitted by the Engineer all works shall be carried out in dry conditions.
- 2) The Works, including materials for use in the Works, shall be protected from damage due to water. Water on the Site and water entering the Site shall be promptly removed by temporary drainage or pumping system or by other methods capable of keeping the Works free of water. Silt and debris shall be removed by traps before the water is discharged and shall be disposed of at a location or locations to which the Engineer has given his consent.
- 3) The discharge points of the temporary systems shall be as per the consent of the Engineer.



The Contractor shall make all arrangements with and obtain the necessary approval from the relevant authorities for discharging water to drains and watercourses etc. The relevant work shall not be commenced until the consented arrangements for disposal of the water have been implemented.

- 4) The methods used for keeping the Works free of water shall be such that settlement of, or damage to, new and existing structures does not occur.

3.2. PROTECTION OF THE WORKS FROM WEATHER

- 1) Work shall not be carried out in weather conditions that may adversely affect the Works unless proper protection is provided to the satisfaction of the Engineer.
- 2) Works, including materials for such Works, shall be protected from exposures of weather conditions that may adversely affect such Works or materials.
- 3) During construction of the Works, storm restraint systems shall be provided where appropriate. These systems shall ensure the security of the partially completed and ongoing stages of construction in all weather conditions. Such storm restraint systems shall be installed as soon as practicable and shall be compatible with the right of way, or other access around or through- out the Site.
- 4) The Contractor shall at all time programme and carry out the Works duly ensuring protective arrangements such that the Works can be made safe in the event of storms.

3.3. PROTECTION OF THE FINISHED WORK

The finished Works shall be protected from any damage that could arise from any activities on the adjacent Site/ works.

4. DAMAGE AND INTERFERENCE

4.1. UTILITIES AND PIPELINES AND OTHER SERVICES

- 1) The Contractor shall make his own enquiries and investigations, including excavating trial holes, to ascertain the existence, nature, location and size of utilities. The Contractor will prepare a schedule of utility diversions and utilities that are to remain. The schedule will list out utilities that:
- have been diverted by the Employer prior to the commencement of the Work,
 - will be diverted by the Contractor during the course of the Work, and
 - will remain in place and subsequently require the use of specific construction methods to complete the underground structures around and below the utilities including support of the utilities during construction.
- 2) Temporary supports and protection by methods proposed by the Contractor and agreed by the utility owner shall be provided to the utilities; permanent supports and protection shall be provided if wherever required for the safety and security of the utility service.
- 3) The Contractor shall immediately inform the Engineer and the utility agencies of:
- damage to utilities;
 - leakage of utilities; and
 - discovery of utilities not previously identified.
- 4) The Contractor shall inform the Engineer of the programme of all works of utility diversions and shall take all steps to enable the utility diversions to proceed in accordance with the programme. The Contractor shall maintain close liaison with the utility undertakings.
- 5) Records of the existing utilities encountered shall be kept by the Contractor on the Site and a copy provided for the Engineer. The records shall contain the following details:



- a) location of utility;
- b) date on which the utilities were encountered;
- c) nature and sizes of the utilities;
- d) condition of utility;
- e) temporary or permanent supports provided; and
- f) diversions made –temporary or permanent

The Contractor shall include the details (plan, location, ownership, size and material) of all such utilities on the As-built Drawings.

4.2. STRUCTURES, ROADS AND OTHER PROPERTIES

The Contractor shall immediately inform the Engineer of any damage to structures, roads or other properties.

4.3. ACCESS

Alternative access shall be provided to all premises if interference with the existing access, public or private is necessary to enable the Works to be carried out. The arrangements for the alternative access shall be as agreed by the Engineer and the concerned agency. Unless agreed otherwise, the permanent access shall be reinstated as soon as practicable after the Work is complete and the alternative access shall be removed immediately it is no longer required, and the ground surfaces reinstated to the satisfaction of the Engineer. Proper signage and guidance shall be provided for the traffic / users regarding diversions.

4.4. TREE

Materials, including excavated materials, shall not be banked around trees. Trees shall be protected from damages at all times by the methods consented to by the Engineer. Unless consent to by the Engineer, trees shall not be trimmed or cut.

4.5. REMOVAL OF TREES, GRAVES AND OTHER OBSTRUCTIONS

If any trees, graves and other obstructions are required to be removed in order to execute the Works and such removal has not already been arranged for, the Contractor shall draw the Engineer's attention to them in good time to make necessary arrangement for authorizations for such removal. The Contractor shall not itself remove them unless the Engineer has given consent. Removal of mangrove trees is mandatory required the permission from the relevant authority detailed in Appendix 4 of the Engineers Requirements- General.

4.6. PROTECTION OF THE ADJACENT STRUCTURES AND WORKS

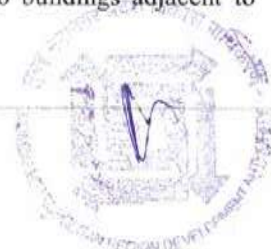
The Contractor shall take all necessary precautions to protect the structures or works being carried out by others adjacent to and, for the time being, within the Site from the effects of vibrations, undermining and any other earth movements or the diversion of water flow arising from its work.

5. WORK ON ROAD

5.1. USE OF ROADS AND FOOTPATHS

- 1) Public roads and footpaths on the Site in which the Work is not being carried out shall be maintained in a clean and passable condition.
- 2) Measures shall be taken to prevent the excavated materials, silt or debris from entering gullies on roads and footpaths; entry of water to the gullies shall not be obstructed.
- 3) Surfaced roads on the Site and leading to the Site shall not be used by tracked vehicles unless protection against damage is provided.

The Contractor should allow reasonable pedestrian access at all times to buildings adjacent to



Underground Stations.

5.2. REINSTATEMENT OF PUBLIC ROADS AND FOOTPATHS

Temporary diversions, pedestrian access and lighting, signage, guarding and traffic control equipment shall be removed immediately when they are no longer required. Roads, footpaths and other items affected by temporary traffic arrangements and control shall be reinstated, immediately after the relevant work is complete, to the same condition as existed before the work was started or as permitted by the Engineer.

6. SITE ESTABLISHMENT

6.1. THE EMPLOYER'S PERSONNEL ACCOMMODATION FOR OFF SITE WORK

1) Where any portion of the Works is prepared or fabricated off-Site or at any fabrication facilities away from the Site, whether by the Contractor or by one of his Subcontractors or suppliers, the Contractor shall provide and maintain office accommodation, furnishings, equipment and transport facilities for the use of the Employer's personnel including the Engineer and its staff at each such location for the duration of such work.

2) The accommodation, furnishings and equipment shall be suitable and sufficient for the purposes of the Employer's personnel including the Engineer and shall be consented-to by the Engineer. The Employer's personnel including the Engineer shall, in all cases, be provided with a telephone with an exclusive line at the location of the off-Site work and with such transport facilities as may, in the opinion of the Engineer, be necessary for the execution of his duties.

3) Where the off-Site work requires the presence of the Employer's personnel including the Engineer and/or any of its staff at any off-Site location for a period exceeding three (3) calendar months, the Contractor shall provide and maintain office accommodation, furnishings, equipment and transport facilities for the Employer.

6.2. CONTRACTOR'S SITE ACCOMMODATION

The Contractor shall provide and maintain its own Site accommodation at locations consented to by the Engineer. Offices, sheds, stores, mess rooms, garages, workshops, latrines and other accommodation on the Site shall be maintained in a clean, stable and secure condition.

The Contractor shall obtain all necessary permissions from competent authorities for establishment of site office, accommodation, Casting yard and Labour camp etc before construction.

6.3. LATRINES AND WASH PLACES

1) The Contractor shall provide latrines and wash places for the use of its personnel and all persons who will be on the Site. The size and disposition of latrines and wash places shall accord with the numbers and dispositions of persons entitled to be on the Site. There shall be separate facilities for males and females.

The capacities and layout shall be subject to approval of the Engineer. The Contractor shall arrange regular disposal of effluent and sludge in a manner that shall be in accordance with local laws/regulations.

2) The Contractor shall be responsible for maintaining all latrines and wash places on the Site in a clean and sanitary condition and for ensuring that they do not pose a nuisance or a health threat. The Contractor shall also take such steps and make such provisions as may be necessary or directed by the Engineer to ensure that vermin, mosquito breeding etc. are at all times controlled.

6.4. SITE UTILITIES AND ACCESS

1) The Contractor shall be responsible for providing water, electricity, telephone, sewerage and drainage facilities and all such services that are necessary for satisfactory performance of the Works for all Site accommodation, structures and buildings. The Contractor shall make all



arrangements with and obtain the necessary approval from the relevant civil and utility authorities for the facilities.

2) Access roads and parking areas shall be provided within the Site as required and shall be maintained in a clean, acceptable and stable condition. For lengths of roadway longer than 100 m and where vehicle movements exceed one hundred (100) movements/day and heavy commercial vehicle are to ply the Contractor shall provide paved surfacing of adequate thickness and quality to the satisfaction of the Engineer.

6.5. CONTRACTOR'S OPERATION ON SITE

The Contractor, after obtaining any necessary permission from any relevant authority, shall submit to the Engineer proposals showing the layout of pedestrian routes, lighting, signs, and guarding any road opening or traffic diversion which may be required in connection with the execution of the Works and which the Contractor intends to construct.

Any consent given by the Engineer to such proposals shall not relieve the Contractor of any obligation under the Contract or absolve the Contractor from any liability for or arising from such proposals or the implementation thereof. The Contractor shall also consult with the relevant authorities and shall take all reasonable and proper steps for protecting, securing, lighting and watching all places on or about the Works and the Site which may be dangerous to workers or any other person whomsoever.

All lights provided by the Contractor shall be so placed or screened as not to interfere with signs, signals or lights. The Contractor shall not in any way obscure or affect signs, signals or lights, in use by any relevant authority. In the event that the Contractor does so, the Contractor shall pay all costs associated with the re-siting, re-instating or provision of alternatives for any sign, signal or light, obscured or affected.

6.6. SUBMISSION OF PARTICULARS

1) The following particulars shall be submitted to the Engineer for his consent within twenty eight (28) days after the Commencement Date:

- a) drawings showing the formation works and the layout within the Site of the Employer's, the Engineer's and the Contractor's offices, Project signboards, principal access and other major facilities required early in the Contract, together with all service utilities;
 - b) drawings showing the layout and the construction details of the Contractor's office and accommodation; and
 - c) drawings showing the details to be included on the Project signboards and diversion boards.
- 2) Drawings showing locations of stores, storage areas, concrete batching plants and other major facilities as well as the access roads/paths shall be submitted to the Engineer for his consent as early as possible but in any case at least twenty eight (28) days prior to the date when such facilities are intended to be constructed on the Site.

7. SECURITY

7.1. GENERAL REQUIREMENT

1) The Contractor shall be responsible for the security of the Site for the full time the Site is in its possession except after the handover. The Contractor shall set up and operate a system whereby only those persons entitled to be on the Site could enter the Site. To this end, the Contractor shall with the consent of the Engineer provide the specific points only at which entry through the security fence can be effected, and shall provide gates and barriers at such points of entry and maintain a twenty four (24) hours security guard. The Contractor shall also arrange for such other security personnel and patrols elsewhere as may be necessary to maintain security.

2) The Contractor shall maintain all Site boundary fences in first class condition, and shall so arrange Site boundary fences and security measures that the drainage arrangement is not affected. Notices shall be displayed at intervals around the Site to warn the public of the dangers of entering the Site.



3) During the progress of the Works the Contractor shall maintain such additional security patrols over the areas of the Works as may be necessary to protect its own and its sub-Contractor's work and equipment. The Contractor shall co-ordinate and plans the security of both the Contract Work under this Contract and the works of others engaged in adjacent and Related Works Contractors and requiring access to the Site.

In order to operate such a security system it will be necessary to institute the issue of unique passes to personnel and vehicles entitled to be on the Site, system of separately identifiable according to the shifts being worked on the Site. The Contractor shall at the outset determine, together with the Engineer, a system including the design of passes to suit the requirements of the foregoing and to suit the methods of work to be adopted by the Contractor. The Contractor shall at all times ensure that the Engineer has an up to date list of all persons entitled to be on the Site at any time. The Contractor shall also introduce a system for issue of passes to any outsider or person/vehicles belonging to agencies other than the Employer / Engineer who may have to visit the Site in connection with the Work.

4) The Contractor shall liaise with the Related Works Contractors to ensure that coordinated security procedures are operated, in particular in respect of vehicles permitted to pass through the Site and/or the adjacent sites.

5) Security and checking arrangements, as felt necessary shall be provided with advice and help of the Police.

7.2. THREAT ASSESSMENT

7.2.1. TERRORISM

There is a high threat for terrorism throughout India with several incidents occurring over recent years. No evidence has been found to suggest that bridge structures are being targeted in recent terrorist attacks in India. International examples suggest that bridge structures are targeted for reasons of symbolism, disruption and significant impact to the local economy, whilst creating the opportunity a disproportionate number of casualties.

7.2.2. CRIME

Following criminal threats likely to generate the highest levels of risk are indicated.

- 1) Criminal Damage, such as Graffiti/Petty vandalism and arson
- 2) Sabotage
- 3) Theft
- 4) Violence against the person
- 5) Anti-social/Nuisance issues, such as Trespass/Drug/Vagrancy/Prostitution/suicide
- 6) Civil disruption

7.2.3. CIVIL DISRUPTION

There have been a number of cases of protests and civil unrest in India, though none have been identified that specifically target bridge structures. Nevertheless civil disruption like Grandstanding and Demonstration are possible.

7.3. SECURITY PLAN

7.3.1. OVERVIEW

The security plan has been developed to mitigate the threats and risks identified in the Threat Assessment in order to define and coordinate the individual mitigation measures identified in the latter. The plan consists of five elements:

- 1) Access management
- 2) Surveillance
- 3) Target hardening
- 4) Active security
- 5) Command & control

The combination of these elements will deter, detect and delay intrusions and attacks and provide



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verified alarms in order to initiate a security force and/or police response.

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7.3.2. ACCESS MANAGEMENT

Access management will be achieved by a combination of the following elements:

1) Zoning of the site

*Zone 1 Public areas

Public accessible area on foot or vehicle where no or minimal measures are taken to control access

*Zone 1a Pedestrian Public areas

Public accessible area on foot where physical measures are taken to control vehicle access

*Zone 2 Semi Public areas

Open areas not normally on public rights of way and enclosed escape routes considered normally private with controlled access that may be breached by the public in case of emergency.

*Zone 3 Private areas

Private areas where visitors are permitted access only with permission and which will normally be occupied by maintenance staff.

2) Access control

Access control shall be achieved by a combination of physical and electrical measures to manage both pedestrian and vehicular access.

3) Physical security measures

Physical measures shall be used to establish controlled perimeters and layers of security that relate to the security zones. Physical standards of doors, shutters and access hatches have been chosen to deter and delay unauthorized entry to secure areas. With associated fencing around compounds, the physical systems provide the necessary barriers to prevent uncontrolled entry, with the electric systems providing verified intrusion alarms via appropriate sequential sensor technology or visual verification of breaches in those barriers such that a police response may be initiated. The physical measures include the following.

*Key locking

*Doors

*Physical construction of buildings

*Backfilling of trenches to prevent access to cables/control equipment

*Shutters

*Barsets

*Access hatches

*Fences

*Rising blockers and static bollards

7.4. CONTRACTUAL SECURITY REQUIREMENTS

7.4.1. ENTRY TO DECK

Access hatches from roadway level into the deck interior shall be lockable hinged/sliding access points of steel construction and shall satisfy LPS 1175 SR3 or equivalent with an equivalent BS EN 12320 padlock standard for forced entry from deck level.

7.4.2. VEHICLE ACCESS TO ABUTMENT ENVIRONS

Vehicle access to abutment environs shall be designed to ensure that unauthorized vehicles cannot approach within 10 meters of the abutment structure and within 15 meters of the bridge bearings. This shall be achieved by use of landscaping, retaining walls, ditches, berms etc.

Operable impact rated vehicle barriers shall be provided on the relevant access road at the authorized vehicle approach limits. These shall take the form of hydraulically operated bollards that can be lowered so as to be flush with the adjacent road surface. The barriers shall incorporate a secure lockable access control system.

Operable and static barriers shall be provided. The design impact rating shall be determined by evaluating the speeds at which a range of potential hostile vehicles could approach the abutments taking account of road geometry and local topography.



Impact rated barriers for hostile vehicle mitigations measures shall ensure no clear gap of more than 1.2 meters.

7.4.3. GENERAL LOCKING REQUIREMENTS

All doors, gates and hatches throughout the Main crossing shall have, as a minimum requirement, padlocks to BS EN 12320 with a grade to suit application with coordinated key suiting and key locking to be to BS3621, also with coordinated key suiting. This includes internal doors to the Main crossing deck. Access doors from the deck box to piers only require an opening and closing handle from both inside and outside.

7.4.4. VEHICLE ACCESS BELOW MAIN CROSSING

Access by unauthorized vehicles below the deck shall be prevented by the use of landscaping, retaining walls, ditches, berms, security fencing etc.

Similar measures shall be used to prevent unauthorized vehicle access within 10 meters of the base of on land piers.

Impact rated barriers for hostile vehicles mitigation measures shall ensure no clear gap of more than 1.2 meters.

8. TESTING OF CIVIL WORKS AND ARCHITECTURAL WORKS

8.1. SCHEDULE FOR TESTS

The Contractor shall, no later than Twenty one (21) days prior to the likely completion of MTHL, notify the Engineer and the Employer of its intent to subject the MTHL to Tests, and no later than 7 (seven) days prior to the actual date of Tests, furnish to the Engineer and the Employer detailed inventory and particulars of all works and equipment forming part of the MTHL.

The Contractor shall notify the Engineer of its readiness to subject the MTHL to Tests at any time after 7 (seven) days from the date of such notice, and upon receipt of such notice, the Engineer shall, in consultation with the Contractor, determine the date and time for each Test and notify the same to the Employer who may designate its representative to witness the Tests. The Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Clause 9 of the Conditions of Contract.

8.2. TESTS

Visual and physical Test: The Engineer shall conduct a visual and physical check of the MTHL to determine that all works and equipment forming part thereof conform to the provisions of this Agreement.

Test drive: The Engineer shall undertake a test drive of the MTHL by a Car and by a fully loaded Truck to determine that the quality of service conforms.

Riding quality Test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator.

Pavement Composition Test: The thickness and composition of the pavement structure shall be checked on a sample basis by digging pits to determine conformity of such pavement structure with Specifications and Standards. The sample shall consist of one pit in each direction of travel to be chosen at random in each stretch of 5 (five) kilometers of the MTHL. The first pit for the sample shall be selected by the Engineer through an open draw of lots and every fifth kilometer from such first pit shall form part of the sample for this pavement quality Test.

Cross-section Test: The cross-sections of the MTHL shall be checked on a sample basis through physical measurement of their dimensions for determining the conformity thereof with Specifications and Standards. For the road portion, the sample shall consist of one spot to be selected at random in each stretch of 1 (one) kilometer of the MTHL. The first spot for the sample shall be selected by the Engineer through an open draw of lots and the spots located at every one kilometer from such first spot shall form part of the sample. For the bridge portion, one spot shall



be selected at random by the Engineer in each span of the bridge.

Structural Test for bridges: All major and minor bridges constructed by the Contractor shall be subjected to the Rebound Hammer and Ultrasonic Pulse Velocity tests, to be conducted in accordance with the procedure described in Special Report No. 17: 1996 of the IRC Highway Research Board on Non- destructive Testing Techniques, at two spots in every span, to be chosen at random by the Engineer. Bridges with a span of 15 (fifteen) meters or more shall also be subjected to load testing.

Other Tests: The Engineer may require the Contractor at his expense to carry out or cause to be carried additional Tests, in accordance with Good Industry Practice, for determining the compliance of the MTHL with Specifications and Standards.

Environmental audit: The Engineer shall carry out a check to determine conformity of the MTHL with the environmental requirements set forth in Applicable Laws and Applicable Permits.

Safety review: Safety audit of the MTHL shall have been undertaken by Safety Consultant and on the basis of such audit, the Engineer shall determine conformity of the MTHL with the provisions of the Contract.

8.3. AGENCY FOR CONDUCTING TESTS

All Tests set forth in this clause shall be conducted by the Engineer or such other agency or person as it may specify in consultation with the Employer.

8.4. COMPLETION/PROVISIONAL CERTIFICATE

Upon successful completion of Tests, the Engineer shall issue the Completion Certificate or the Provisional Certificate.

9. RECORDS

9.1. DRAWINGS PRODUCED BY THE CONTRACTOR

Drawings produced by the Contractor including drawings of Site layouts, Temporary Works, etc. for submission to the Engineer shall generally be to ISO A4 size. They shall display a title block with the information as detailed in Appendix 9 to these Employer's Requirements - Design. The number of copies to be submitted to the Engineer shall be as stated in the Contract, or as required by the Engineer.

9.2. PROGRESS PHOTOGRAPHS AND VIDEO RECORDS

- 1) The Contractor shall provide monthly progress photographs, which have been properly recorded to show the progress of the works to the Engineer. The photographs shall be taken on locations agreed with the Engineer to record the exact progress of the Works. Two sets of photographs shall be provided on CD-ROM format with two sets of color prints of 175 mm x 125 mm size. The Contractor shall, unless otherwise agreed in writing by the Engineer, arrange for six (6) of progress photographs to be aerial photographs taken at an agreed height with frequency of every quarter.
- 2) The Contractor shall mount each set of each month's progress photographs in a separate album of a type to which the Engineer has given his consent, and shall provide for each photograph two typed self-adhesive labels, one of which shall be mounted immediately below the photograph and one on the back of the photograph. Each label shall record the location, a brief description of the progress recorded and the date on which the photograph was taken.
- 3) All photographs shall be taken by a skilled person and processing shall be carried out by a competent processing firm to the satisfaction of the Engineer.
- 4) The Contractor shall ensure that no photography is permitted on the Site without the consent of the Engineer.
- 5) The Contractor shall take videos and supply two (2) No. copies of VCD of approx.30 minute's duration with suitable recorded commentary/subtitles taken by an approved experienced



video camera operator before the start of the Works and at monthly intervals thereafter to depict all the major construction activities, all to the direction of the Engineer.

9.3. RECORDS OF WAGE RATES

The Contractor shall keep monthly records of the average, high and low wage rates for each trade/tradesman employed on the Site and records shall be made available to the Engineer during inspection.

10. MATERIALS

10.1. GENERAL

- 1) Materials and goods for inclusion in the Works shall be new unless otherwise the Engineer has consented. Preference shall be given to local materials where available.
- 2) Certificates of tests by manufacturers, which are to be submitted to the Engineer, shall be current and shall relate to the batch of material delivered to the Site. Certified true copies of certificates may be submitted if the original certificates could not be obtained from the manufacturer.
- 3) Parts of materials, which are to be assembled on the Site, shall be marked to identify the different parts.
- 4) Materials that are specified by means of trade or proprietary names may be substituted by materials from a different manufacturer that has received the consent of the Engineer provided that the materials are of the same or better quality and comply with the specified requirements.
- 5) Samples of materials submitted to the Engineer for information or consent shall be kept on the Site and shall not be returned to the Contractor or used in the Works unless permitted by the Engineer. The samples shall be used as a mean of comparison, which the Engineer shall use to determine the quality of the materials subsequently, delivered. Materials delivered to the Site for use in the Works shall be of the same or better quality as the samples, which have received consent.

10.2. PROVISION AND DISPOSAL OF EARTHWORKS MATERIAL

- 1) The Contractor shall be responsible for the provision of all classes of earthworks material required for the Works, whether sourced from the excavations within the Contract or obtained from any other source located outside the Site, for which the Engineer has given the consent.
- 2) The Contractor shall be responsible for the disposal, in a manner and at a location consented by the Engineer, which consent should not unreasonably be withheld, of all unsuitable or surplus excavated material.



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