



ORISSA WATER SUPPLY AND SEWERAGE BOARD

(A Government of Orissa Undertaking)

Mahanadi Vihar, Naya Bazar, Cuttack, Cuttack, Odisha PIN 753004, India

Phone: +91-671-2444511, Fax: +91-671-2441616

**JICA ASSISTED ODISHA INTEGRATED SANITATION
IMPROVEMENT PROJECT (ID-P252)**

BIDDING DOCUMENTS

FOR

**CONSTRUCTION OF BOX DRAINS WITH ROAD BETWEEN CHAINAGE
3300 – 5150 OF MAIN DRAIN – 1, CUTTACK, DESIGN BUILD
(PACKAGE NO. JICA/OWSSB/OISIP/04 – II / LOT 1)**

ON

INTERNATIONAL COMPETITIVE BIDDING

VOLUME - 1

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December 2020

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Invitation for Bids

Date: [04/12/2020]

Loan Agreement No: ID-P252

IFB No: 1/2020

Reference Identification No: JICA/OWSSB/OISIP/04 – II / LOT 1

1. The Government of India has received a loan from Japan International Cooperation Agency (JICA) towards the cost of Odisha Integrated Sanitation Improvement Project (II). It is intended that part of the proceeds of this loan will be applied to eligible payments under the Contract for Construction of Box Drains with Road between Chainage 3300 – 5150 of Main Drain - 1, Cuttack, Design Build (Package No. JICA/OWSSB/OISIP/04 – II / LOT 1).
2. Bidding will be conducted through procedures in accordance with the applicable Guidelines for Procurement under Japanese ODA Loans, and is open to all Bidders from eligible source countries, as defined in the Loan Agreement and Section V of this Bid Document.
3. The Orissa Water Supply and Sewerage Board (OWSSB) now invites sealed Bids from eligible Bidders for the design, execution and completion of Construction of total length 1,850 m Box Drain and Road between Chainage 3300 – 5150, in the Main Drain 1 under the rehabilitation of Main Storm Water Channel 1 (MD 1) of Cuttack, on the Design Build base (“the Works”). International Competitive Bidding will be conducted in accordance with Single Stage -Two Envelope Bidding Procedure.

Lot No.1: Chainage from 3300 to 5150 (JICA/OWSSB/OISIP/04 – II / LOT 1)

4. Interested eligible Bidders may obtain further information from and inspect the Bidding Documents at the office of

The Engineer -in- Chief, OISIP, JICA
Orissa Water Supply & Sewerage Board (OWSSB)
Mahanadivihar, Nayabazar, Cuttack – 753004.
Phone: +91-671-2444511
Fax: +91-671-2441616
e-mail: ce_jica@owssb.in

5. The complete set of the Bidding Document may be purchased and inspected by interested Bidders on the submission of a written application to the address above and upon payment of a non-refundable fee of INR 10,000 (Indian National Rupee Ten Thousand Only) in the shape of Bank Draft issued by any Scheduled Bank of India approved by RBI or any scheduled foreign bank with business in India.

The Bidding Document can also be obtained by post / courier upon a written request accompanied by the cost of Bidding Document. An additional sum of INR 7,000 (Indian National Rupee Seven Thousand Only) for postage & handling charges should be sent along with the request. The Orissa Water Supply & Sewerage Board will promptly

dispatch the documents by registered mail, but under no circumstances will it be held responsible for late delivery or loss of the documents so mailed. The non-refundable fees for Bidding documents as well as additional fee for postal delivery (if requested), shall be paid in shape of Bank Draft issued by any Scheduled Bank of India approved by RBI or any scheduled foreign bank with business in India.

6. The non-refundable Bank Draft(s) shall be in favour of Engineer -in- Chief, OISIP, JICA, Orissa Water Supply & Sewerage Board and payable at Cuttack.
7. The downloaded copy is available on Government of Odisha Web site, shall be used for information only but not for submission of Bid. Bid Document purchased from the office of the Engineer -in- Chief, OISIP, JICA, OWSSB, Cuttack in hard copy has stamp and initials of the Employer, shall be used for submission along with Bid. In the event of any discrepancy between the downloaded copy, photo copy and the original purchased, the original shall prevail.
8. A Bidder may be a Firm (single entity) or a Joint Venture (JV) of several entities. In case of JV, any member of the JV who have purchased the Bidding document would be sufficient to submit the Bid on behalf of the JV.
9. Bids must be delivered to the address above on or before 3:00 PM on 25/01/2021 and must be accompanied by a Bid Security (same as that stated in Clause 21.1 of the Bid Data Sheet (BDS)).

The amount and currency of the Bid Security for LOT 1 shall be : INR 32,000,000.

10. Bids will be opened in the presence of Bidders' representatives who choose to attend at 3:30 PM on 25/01/2021 at the office of:

Place: At Conference Room
1st Floor, OISIP, JICA, OWSSB
Mahanadivihar, Nayabazar, Cuttack – 753004.

In charge officer: The Engineer -in- Chief, OISIP, JICA
Orissa Water Supply & Sewerage Board (OWSSB)
Mahanadivihar, Nayabazar, Cuttack, - 753004.
Phone: +91-671-2444511
Fax: +91-671-2441616
e-mail: ce_jica@owssb.in

11. The Bid shall remain valid for the period of 120 days after the last date of submission of bids. Any further corrigendum/addendum/clarification, if any, will be uploaded on Government of Odisha Web site: www.odisha.gov.in/tender only.

Engineer -in- Chief, OISIP, JICA
Odisha Water Supply & Sewerage Board
Mahanadivihar, Nayabazar, Cuttack – 753004



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INTERNATIONAL COMPETITIVE BIDDING

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Part - 1

BIDDING PROCEDURES

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Section I. Instructions to Bidders

The Instructions to Bidders governing this bidding process are the “Instructions to Bidders included in **Option A**, Single-Stage Two-Envelope Bidding, Section I,” of the Standard Bidding Documents for Procurement of Plant Design, Supply and Installation (Trial Version) published by JICA in July 2015. Those Instructions to Bidders are available on the JICA’s web site shown below:

https://www.jica.go.jp/english/our_work/types_of_assistance/oda_loans/oda_op_info/guide/tender/c8h0vm0000aoesst-att/design.pdf

A copy of the Instructions to Bidders is not attached to these Bidding Documents.

Section II. Bid Data Sheet

The Bid Data Sheet (BDS) contains information and provisions that are specific to a particular bidding process. To facilitate the preparation of the BDS, its clauses are numbered with the same numbers as those of the corresponding ITB clauses.

Bid Data Sheet

A. General	
ITB 1.1	The number of the Invitation for Bids is : 01/2020
ITB 1.1	The Employer is: Orissa Water Supply and Sewage Board (OWSSB)
ITB 1.1	The name, identification and number of the lot(s) (contract(s)) comprising this ICB is: Construction of Box Drains with Road between Chainage 3300 – 5150 of Main Drain - 1, Cuttack, Design Build, Lot No.1: Chainage from 3300 to 5150 (Package No. JICA/OWSSB/OISIP/04 – II / LOT 1)
ITB 2.1	The Borrower is: The President of India
ITB 2.1	The number of the Loan Agreement is: ID-P252 The amount of a Japanese ODA Loan is: 25,796,000,000 Japanese Yen. The signed date of the Loan Agreement is: 30/03/2016
ITB 2.1	The name of the Project is: Odisha Integrated Sanitation Improvement Project (II).
ITB 2.2	The applicable Guidelines for Procurement under Japanese ODA Loans are those published in: October 1999.
ITB 3.1(c)	A list of debarred firms and individuals is available at the World Bank's website: www.worldbank.org/debarr
ITB 4.5	This bidding is not subject to prequalification.
B. Bidding Documents	
ITB 6.4	<i>the provision is an addition after end of ITB 6.4:</i> “In the event of any discrepancy between the downloaded copy and the original purchased, the original shall prevail.”
ITB 7.1	For <u>clarification purposes</u> only, the Employer's address is: Attention: The Engineer -in- Chief, OISIP, JICA, Orissa Water Supply & Sewerage Board (OWSSB)

	Street Address: Mahanadivihar, Nayabazar City: Cuttack ZIP Code: 753004 Country: India Telephone: +91 671-2444511 Facsimile number: +91 671-2441616 Electronic mail address: e-mail: ce_jica@owssb.in
ITA 7.1	Responses to any request for clarification, if any, will be published on the Employer's web page indicated below. Web page: www.odisha.gov.in/tender
ITB 7.4	A pre-bid meeting will take place at the following date, time and place: Date: <u>22/12/2020</u> Time: <u>11:00 AM</u> Place: <u>Conference Hall, Office of the Engineer -in- Chief, OISIP, JICA, OWSSB, Mahanadivihar, Nayabazar, Cuttack - 753004</u> A site visit will not be conducted by the Employer. However, the Employer will assist for a site visit if bidder requests.
ITB 8.2	Addenda, if any, will be published on the Employer's web page.
C. Preparation of Bids	
ITB 10.1	The language of the Bid is: English
ITB 12.1	As a supplement to this Sub-Clause, If Bidder submits both Lots, the Letter of Technical Bid and the Letter of Price Bid shall be submitted Lot-wise.
ITB 13.1	Alternative Bids are not permitted.
ITB 16.1 (b)	The spare parts, special tools etc. shall not be required in the contract.
ITB 18.1	Bidders shall quote for the entire Works on a single responsibility basis.
ITB 18.5	The prices quoted by the Bidder shall be: fixed; consequently, the Bidder is not required to furnish the indices and weightings for the price adjustment formulae in the Schedule of Adjustment Data.
ITB 19.1	The currency(ies) of the Bid shall be as described below: The unit rates and prices shall be quoted by the Bidder in the Price

	Schedule separately in the following currencies: (i) for those inputs to the Works that the Bidder expects to supply from within the Employer's country, in Indian national Rupee, the name of the currency of the Employer's country, and further referred to as "the local currency"; and (ii) for those inputs to the Works that the Bidder expects to supply from outside the Employer's country (referred to as "the foreign currency requirements"), in Japanese Yen, US Dollar and/or Euro.
ITB 20.1	The Bid validity period shall be 120 days.
ITB 20.3 (a)	The Bid Price shall be adjusted following factor:. Not applicable.
ITB 20.3 (b)	The fixed portion of the Bid Price shall be adjusted by the following factor: (i) For Local Currency portion: "All Commodity in the All India Wholesale Price Index for all Commodities as published by Economic Advisor to Govt. of India, Ministry of Industry and Commerce", Index shall be used for the period of extension. (ii) For Foreign Currency portion: the official source of index of the country of the currency, shall be used for the period of extension."
ITB 21.1	The amount and currency of the Bid Security(ies) shall be: Lot No.1: INR 32,000,000 (Thirty-Two Million Indian National Rupees). If the bidder submits both Lots No.1 and Lot No.2, the bid securities shall be submitted Lot-wise.
ITB 21.2 (d)	Other types of acceptable securities: National Savings Certificate (NSC)/Demand Draft/Fixed Deposit in favor of the Employer from Scheduled Bank in India. or scheduled foreign bank with business in India.
ITB 22.1	In addition to the original of the Bid, the number of copies is: Four (4) copies.
ITB 22.2	The written confirmation of authorization to sign on behalf of the Bidder shall consist of: A written Power of Attorney authorizing the signatory of the bid to commit for the bidder, signed by their legally authorized representatives.
ITB 23.1	As a supplement to this Sub-Clause, If Bidder submits both Lots, the original and the copy of the Technical Bid and of the Price Bid for each Lot, shall be sealed in the appropriate separate envelopes by the lot, in the

	same manner specified in this Sub-Clause.
D. Submission and Opening of Bids	
ITB 24.1	For <u>Bid submission purposes</u> only, the Employer's address is: Attention: The Engineer -in- Chief, OISIP, JICA, Orissa Water Supply & Sewerage Board (OWSSB) Street Address: Mahanadivihar, Nayabazar City: Cuttack ZIP Code: 753004 Country: India The deadline for Bid submission is: Date: 25/01/2021 Time: 15:00 hrs
ITB 27.1	The Technical Bid opening shall take place at: Street Address: Mahanadivihar, Nayabazar Floor/Room number: Conference Room (1F) City: Cuttack Country: India Date: 25.01.2021 (same date of deadline) Time: 15:30 hrs
E. Evaluation, and Comparison of Bids	
ITB 37.1	The currency that shall be used for Bid evaluation and comparison purposes to convert all Bid Prices expressed in various currencies into a single currency is: U.S Dollar (USD) The source of exchange rate shall be: Reserve Bank of India The date for the exchange rate shall be: 28 days prior to the date of Bids submission.

Section III. Evaluation and Qualification Criteria (Without Prequalification)

Evaluation and Qualification Criteria (Without Prequalification)

1 Evaluation

1.1 Technical Evaluation

Assessment of adequacy of Technical Proposal with Requirements

The Technical Proposal will be evaluated as Responsive / Non-Responsive, for all bidding forms required in the Technical Proposal in Section IV, Bid Forms (for Technical Bid). A Proposal may be considered “Non Responsive” at this stage if it does not respond to all aspects of the technical requirements of the Bid documents, particularly the Section VI Employer’s Requirements, or if it fails in any items specified in ITB 11.2 including each of the Forms of Technical Proposal in Section IV. Nonconformity to technical requirement, which are justifiable grounds for rejection of a Bid are as follows;

- (a) Failure to comply with complete requirement in this section (item 1.1.1 to 1.1.3 below);
- (b) Inadequate contents in the Forms (e.g., failure to bid for the required scope of work, failure to quote for major items, failure to meet major technical requirements and presentation of absolutely unrealistic and inadequate implementation Plans and schedules regarding performance); and
- (c) Failure to provide evidence (s) including certificate (s) if required in the Form, will be determined as “Non Responsive” for the Form.

In addition to the criteria listed in ITB 35.1 (a) – (b) the following factors shall apply:

1.1.1 Personnel

The Bidder must demonstrate that it has the personnel for the key positions that meet the following requirements:

No.	Position	Minimum Desirable Qualification	Total Work Experience (years)	Experience in Similar Works and Position (years)
1	Project Manager ^{(1),(2)}	Graduate in Civil Engineering	15	10
2	Project Engineer	Graduate in Civil Engineering	15	10

3	Design Engineer	Post graduate in Civil / Structural Engineering	10	5
4	Quality Control Engineer	Graduate in Civil Engineering	10	5
5	Health & Safety (Accident Prevention) Officer ⁽²⁾	Graduate in Engineering	5	3

Note:

- (1) If the bidder desires to be considered eligible for both Lot No. 1 and Lot No. 2, the proposed personnel for the different positions shall be different for each lot. Same person cannot be proposed for both lots.
- (2) Project manager should be responsible for timely execution of work and he should have an authority of work in administrative and financial deals / decisions for the project. To be Contractor's Representative under GC 4.3.
- (3) Health & Safety (Accident Prevention) Officer shall submit a diploma in safety course, a certificate of completion of safety training of one year or more, or similar evidence.
- (4) The listed staff and number are the minimum to be available at site during execution of contract. The successful bidder shall deploy additional qualified staff in sufficient numbers, as required at site for successful completion of the contract.

The Bidder shall provide details of the proposed personnel and their experience records in Forms PER-1 and PER-2 in Section IV, Bidding Forms.

1.1.2 Equipment

The Bidder must demonstrate that it has the key construction equipment and facilities listed hereafter:

No.	Equipment Type and Characteristics	Minimum Number required for each lot
1	Sheet piling equipment for Non-Vibrating and Non-Hammering method (e.g. Press-inn, or others)	1
2	Pumping System for Water Diversion: 200LPS	14
3	Sludge /Mud pumps	3
4	Excavators	4
5	10 ton truck / tipper	3
6	Cranes adequate capacity/type	2

Notes: -

- a) In case, the bidder desires to be considered eligible for both LOTs, The Bidder must demonstrate that it has at least two times of the equipment and facilities of each type listed as above table.
- b) All equipment/ machinery/plant are to be in good working condition. Sheet piling equipment/ machinery in Sl. No. 1, shall be able to driving (installation/extracting) the sheet pile for hot rolled steel sheet piles AU-25 (Steel Grade as S 430 GP).
- c) The above is a partial list and quantity of equipment/machinery/plant specified and is the minimum number required for qualification.
- d) The number and capacity of the equipment/machinery/plant to be engaged in the work are to be compatible with the nature and magnitude of works so as to complete the work on schedule.
- e) All the equipment/machinery/plant operators shall be skilled and experienced in using the equipment/machinery/plant to deliver the necessary output.
- f) The Plant/equipment listed in the above schedules is the minimum suggested major plant/equipment required, in the opinion of the OWSSB Engineer, to attain the completion of works within the prescribed construction period. However, the applicants should undertake their own assessment of the work to be executed and furnish with their proposal, construction planning and methodology supported with necessary documents and calculation, to allow the employer to assess their proposal.

The Bidder shall provide further details of proposed items of equipment using Form EQU in Section IV, Bidding Forms.

1.1.3 Time Schedule

In case, the Bidder proposes time schedule exceeding from the date of the Time for Completion (refer to the Section VII and VIII), the bid will be rejected.

1.2 Evaluation of Price Bid

Any adjustments in price that result from the procedures outlined below shall be added, for purposes of comparative evaluation only, to arrive at an “Evaluated Bid Price.” Bid Prices quoted by Bidders shall remain unaltered.

In addition to the criteria listed in ITB 38.2 (a) – (c) the following criteria shall apply.

1.2.1 Quantifiable nonmaterial nonconformities

Pursuant to ITB 34.3 and ITB 38.2 (d), the cost of all quantifiable nonmaterial nonconformities or omissions shall be evaluated. The Employer will make its own assessment of the cost of any nonmaterial nonconformities and omissions for the purpose of ensuring fair comparison of Bids.

An item not listed in the Price Schedule and/or determined by Evaluation of Technical Bid shall be assumed to be not included in the Bid, and provided that the Bid is determined substantially responsive notwithstanding this omission, the average price of the item quoted by substantially responsive Bidders will be added to the Bid Price and the equivalent total cost of the Bid so determined will be used for price comparison.

1.2.2 Award Criteria for Combined Lots No. 1 and 2 (ITB 38.4)

- (i) Bidders meeting the eligibility criteria specified for single LOT will have the option to bid for any one lot or both lots. However, Bidders desired to be considered for award of both lots must qualify in the technical evaluation criteria required for both bids.
- (ii) Bids will be evaluated lot-wise and Bidder qualified for award of one Lot OR Both LOTS shall be finalized.
- (iii) Conditional offers shall be rejected.

2 Qualification

In accordance with ITB 32, the evaluation shall be carried out on “Pass”/ “Fail” criteria, set out in the requirements/criteria prescribed in this clause.

(i) Exchange Rate for Qualification Criteria

Wherever a Form in Section IV, Bidding Forms, requires a Bidder to state a monetary amount, Bidders should indicate the USD equivalent using the rate of exchange determined as follows:

- (a) For turnover or financial data required for each year - Exchange rate prevailing on the last day of the respective Financial year.
- (b) Value of single Contract - Exchange rate prevailing on the date of the Contract.

Exchange rates shall be taken from the publicly available source **identified in BDS 37.1** or, in case such rates are not available in the source identified above,

any other publicly available source acceptable to the Employer. Any error in determining the exchange rates may be corrected by the Employer.

(ii) Qualification Criteria for both Lots No.1 and 2

The criteria for qualification shall be the aggregate of minimum qualification requirements for each lot, or any other reasonable requirements set forth by the Employer, for the respective lots as specified under Financial Situation and Experience, Sub-Factors 2.3.2, 2.3.3 (i), 2.3.3 (ii), 2.4.2 (a) and 2.4.2 (b) below.

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.1 Eligibility							
2.1.1	Nationality	Nationality in accordance with ITB 4.3.	Must meet requirement	N/A	Must meet requirement	N/A	Form ELI –1.1 and 1.2, with attachments
2.1.2	Conflict of Interest	No conflicts of interests as described in ITB 4.2.	Must meet requirement	N/A	Must meet requirement	N/A	Letter of Bid
2.1.3	JICA Ineligibility	Not having been declared ineligible by JICA as described in ITB 4.4.	Must meet requirement	N/A	Must meet requirement	N/A	Letter of Bid Form ACK
2.2 Historical Contract Non-Performance							
2.2.1	History of non-performing Contracts	Non-performance of a Contract ⁽ⁱ⁾ did not occur as a result of Contractor’s default since 1 st January 2019.	Must meet requirement ⁽ⁱⁱ⁾	N/A	Must meet requirement ⁽ⁱⁱ⁾	N/A	Form CON
2.2.2	Pending Litigation	All pending litigation shall in total not represent more than fifty percent (50 %) of the Bidder’s net worth and shall be treated as resolved against the Bidder.	Must meet requirement ⁽ⁱⁱ⁾	N/A	Must meet requirement ⁽ⁱⁱ⁾	N/A	Form CON

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.2.3	Litigation History	No consistent history of court/arbitral award decisions against the Bidder ⁽ⁱⁱⁱ⁾ since 1 st January 2015	Must meet requirement ⁽ⁱⁱ⁾	N/A	Must meet requirement ⁽ⁱⁱ⁾	N/A	Form CON
<u>Notes for the Bidder</u> (i) Non-performance, as decided by the Employer, shall include all Contracts: (a) where non-performance was not challenged by the Contractor, including through referral to the dispute resolution mechanism under the respective Contract, and (b) that were so challenged but fully settled against the Contractor. Non-performance shall not include Contracts where Employers decision was overruled by the dispute resolution mechanism. Non-performance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective Contract and where all appeal instances available to the Applicant have been exhausted. (ii) This requirement also applies to Contracts executed by the Bidder as a JV member. (iii) The Bidder shall provide accurate information on the related Bidding Form about any litigation or arbitration resulting from Contracts completed or ongoing under its execution over the last five (5) years. A consistent history of awards against the Bidder or any member of a joint venture may result in rejection of the Bid.							

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.3 Financial Situation							
2.3.1	Financial Performance	The audited balance sheets or, if not required by the law of the Bidder’s country, other financial statements acceptable to the Employer, for the last five (5) years shall be submitted and must demonstrate the current soundness of the Bidder’s financial position and its prospective long-term profitability. As the minimum requirement, a Bidder’s net worth calculated as the difference between total assets and total liabilities should be positive.	Must meet requirement	N/A	Must meet requirement	N/A	Form FIN – 1 with attachments

Section III.
Evaluation and
Qualification Criteria

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.3.2	Average Annual Construction Turnover	Minimum average annual construction turnover of USD 22 million, calculated as total certified payments received for Contracts in progress and/or completed, within the last 5 years divided by 5 years. If the bidder submits bids for both lots, the requirements shall be minimum of two times of minimum average annual construction turnover requirements i.e. USD 44 million	Must meet requirement	Must meet requirement	Must meet Twenty Five percent (25%) of the requirement	Must meet Forty percent (40%) of the requirement	Form FIN – 2

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.3.3	Financial Resources	(i) The Bidder shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the cash flow requirements estimated as USD 4.9 million for the subject Contract(s) net of the Bidder's other commitments. If the bidder submits bids for both lots, requirements shall be minimum of two times of the cash flow requirements i.e. USD 9.8 million.	Must meet requirement	Must meet requirement	Must meet Twenty Five percent (25%) of the requirement	Must meet Forty percent (40%) of the requirement	Form FIR - 1
		(ii) The Bidder shall also demonstrate, to the satisfaction of the Employer, that it has adequate sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.	Must meet requirement	Must meet requirement	N/A	N/A	Form FIR – 1 and Form FIR - 2

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.3.4	Financial Restructuring	The Bidder shall not be currently in the process of financial restructuring under Corporate Debt Restructuring Act	Must meet requirement	N/A	Must meet requirement	N/A	Self-declaration
2.4 Experience							
2.4.1	General Experience	Experience under contracts in the role of prime contractor (single entity or JV member), or management contractor ⁽ⁱ⁾ for at least the last 5 years starting 1 st January 2015.	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP - 1 ^(vii)

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.4.2 (a)	Specific Experience	A minimum number of one (1) similar ⁽ⁱⁱ⁾ contract, that have been satisfactorily and substantially ⁽ⁱⁱⁱ⁾ completed as a prime contractor (single entity or JV member) ^(iv) between 1st January 2015 and the Bid submission deadline. Minimum contract value of at least USD 14 million. If the bidder submits bids for both lots, one or more similar ⁽ⁱⁱ⁾ contracts must meet the overall requirements for both Lot 1 and 2.	Must meet requirement	Must meet requirements ^(v)	N/A	N/A	Form EXP - 2(a) ^(vii)
2.4.2 (b)	Specific Experience	For the above or other contracts completed and under implementation as prime contractor (single entity or JV member), management contractor or Subcontractor ^(vi) between 1 st January 2015 and the Bid submission deadline, a minimum experience in the following key activities successfully completed:	-	-	-	-	

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
	(i)	Construction works for Box Drain/Box Culvert/Covered rectangular culvert, minimum inner area 9 sq. mtrs, total length at least 750 mtrs or more, in one or more contract(s). If the bidder submits bids for both lots, experience requirements shall be minimum length 1,500 mtrs of length.	Must meet requirements (can be a specialist Subcontractor) ^(viii)	Must meet requirements (can be a specialist Subcontractor) ^(viii)	N/A	N/A	Form EXP - 2(b) ^(vii)
	(ii)	Shoring using sheet piling, concrete piling or other soil/structure prevention retaining wall by Non-vibrating & Non-hammering method for at least 5,000 Sqm. The same method shall be proposed in the Technical Proposal. If the bidder submits bids for both lots, one or more contracts must meet the two times of the cash requirements i.e. 10,000 Sqm.	Must meet requirements (can be a specialist Subcontractor) ^(viii)	Must meet requirements (can be a specialist Subcontractor) ^(viii)	N/A	N/A	Form EXP - 2(b) ^(vii)

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
	(iii)	At least one contract having the design of Box Drain/Box Culvert/Covered Rectangular Culvert for Drainage / Irrigation / other the infrastructure project, Design, Design Build, EPC, Turn-Key or DBO. Minimum Project value of at least USD 14 million. If the bidder submits bids for both lots, one or more contracts must meet the two times of the cash requirements i.e. Project value USD28 million.	Must meet requirements (can be a specialist Subcontractor) ^(viii)	Must meet requirements (can be a specialist Subcontractor) ^(viii)	N/A	N/A	Form EXP - 2(b) ^(vii)

Notes for the Bidder

- (i) A management contractor is a firm which takes on the role of contract management as a “general” contractor of sort could do. It does not normally perform directly the work(s) associated with the Contract. Rather, it manages the work of other (sub) contractors while bearing full responsibility and risk for price, quality, and timely performance of the contract.
- (ii) The similarity shall be based on the physical size, complexity, methods/technology and/or other characteristics described in Section VI, Employer’s Requirements. But not limited to the Box drain for Drainage / Irrigation and may consider similar Box drain/Box Culvert/Covered Rectangular Culvert for the infrastructure projects (such as road, subway, railway, power).
- (iii) Substantial completion shall be based on 80% or more works completed under the Contract.

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
(iv) For contracts under which the Bidder participated as a JV member, only the Bidder’s share, by value of contract, physical size, complexity, methods/technology and/or other characteristics, shall be considered to meet this requirement. (v) In case of a JV, the value of Contracts completed by its members shall not be aggregated to determine whether the requirement of the minimum value of a single Contract has been met. Instead, each Contract performed by each member shall satisfy the minimum value of a single Contract as required for single entity. In determining whether the JV meets the requirement of total number of Contracts, only the number of Contracts completed by all members each of value equal or more than the minimum value required shall be aggregated. (vi) For Contracts under which the Bidder participated as a JV member or Subcontractor, only the Bidder’s share shall be counted to meet this requirement. (vii) The Bidder shall furnish the certificate for the component certified by employer (end user), detail shall be specified in the required information against each Factor/sub-Factor in this clause. If no certificate (or certificate without detail) is furnished in the Bid, the Employer shall not be considered. In case of any foreign experience being claimed by the Bidder, the Bidder shall submit copies of such Experience Certificates issued by the client (authorized signatory of the client) with self-certification by declaration on affidavit. In case the Experience Certificate issued by the authorized signatory of Client is in a language other than English, the Bidder shall also submit the translation of such Experience Certificate from other languages to English with self-certification. The Bidder shall also submit the Email ID and Telephone Nos. of the concerned client. (viii) “(can be a specialist subcontractor)”: specialist subcontractor’s experience in similar capacity elsewhere will be considered and the same can complement to the experience of the main bidder.							

Section IV. Bidding Forms **(for Technical Bid)**

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Single-Stage Bidding

Letter of Technical Bid

Date: *[insert date of Bid submission]*

Loan Agreement No.: ID-P252

IFB No.: 01/2020

To: *[insert full name of Employer],*

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB 8): *[insert the number and issuing date of each Addendum]*;
- (b) We, including any Subcontractors/ manufacturers, for any part of the Contract, meet the eligibility requirements in accordance with ITB 4 and ITB 5;
- (c) We, including any Subcontractors/ manufacturers, for any part of the Contract, have no conflict of interest in accordance with ITB 4;
- (d) We offer to design, construction, test, recommission and commission , in conformity with the Bidding Documents, the following Works: the Construction of Box Drains with Road between Chainage 3300 – 5150 of Main Drain - 1, Cuttack, Design Build, *[insert “LOT 1: Chainage from 3300 to 5150 (JICA/OWSSB/OISIP/04-II / LOT 1)”*.
- (e) Our Bid shall be valid for a period of *[specify the number of calendar days]* days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (f) We are not participating, as a Bidder or as a Subcontractor/ manufacturers, in more than one Bid in this bidding process in accordance with ITB 4.2 (c), other than alternative Bids submitted in accordance with ITB 13; and
- (g) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption.

Name of the Bidder***[insert complete name of the Bidder]*

Name of the person duly authorized to sign the Bid on behalf of the Bidder*** *[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid [*insert complete title of the person signing the Bid*]

Signature of the person named above [*insert signature of person whose name and capacity are shown above*]

Date signed [*insert date of signing*] day of [*insert month*], [*insert year*]

****:** In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder

*****:** Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid.

Technical Proposal

To establish its Technical Proposal to perform the contract in accordance with Section III, Evaluation and Qualification Criteria, the Bidder shall provide the information requested in the corresponding Forms included hereunder:

Table of Technical Proposal Forms:

- Technical Particulars for Lot No.1

For single Lot submitting, the Bidder shall fill out and submit this Form only for respective Lot.

- Site Organization
- Method Statement
- Mobilization Schedule
- Construction Schedule
- Preliminary Design
- Safety Plan
- Schedule of Guarantee
- Personnel
- Contractor's Equipment

PREAMBLE

- Particulars called for in this Schedule shall be fully completed by the Contractor at the time of tendering.

The Schedule (Technical Proposal Forms) shall use the same forms in the bidding of Lot No.1 and Lot No.2. The Form: Technical Particulars has Lot No.1 and Lot No.2, the Bidder shall select either proper Form for the bidding Lot.

- Manufacturer's literature shall be submitted with the Tender, giving full specifications of equipment offered. Where further details of the Contractor's proposals are submitted in any document accompanying the Tender, such details shall comply with the Specification.
- Particulars entered by the Contractor in the Schedules shall form a binding part of the Contract and shall not be altered without the approval of the Engineer.
- Entries shall be deemed to refer to the specified Works unless explicitly stated otherwise. Any particulars covering other options or alternative proposals shall be entered in similar details either in the places provided in the Schedules or on a clearly labelled separate sheet(s) of paper appended to the Schedules.
- Inadequate contents of each Form may result in “Non-Responsive Bid” at Technical Evaluation.

Form: Technical Particulars for Lot No.1

SL. No.	Description of Items	Employer's Requirements	Bidder's Proposed
1	Shoring – Respond for each method used		
1.1.1	Quality standard of Sheet Piles	Hot rolled steel sheet piles AU-25 in 15m Length, Steel Grade as S 430 GP	
1.1.2	Sheet pile driving method	Non vibrating	
1.1.3	Reuse factor of Sheet pile in project	5 times	
1.2	Other shoring method*	To be provided by Bidder	
2	Water Diversion		
2.1	Chainage 3300-4150 peak flow	745 lps	
2.2	Chainage 4150-5150 peak flow	1040 lps	
4	Box Drain		
4.1	Quality standard of Concrete	M-30 (in situ) / M-35 (Precast)	
4.2	Quality standard of reinforcement bars.	Fe-500 (BIS)	
5	Road		
5.1	Design standard to be applied	MORTH	
6	Safety Plan		
6.1	Material of barricading for isolation of public and construction site.	GI steel, other rigid materials	

*Note * If Bidder considers other than sheet piling (or its combination with sheet piling), describe method in Sl. No.1.2, and identical standard, size or name inserts in Sl.No.1.1.1 to 1.1.3. Its details shall be described in the Form of Method of Statements.*

Form: Site Organization

The bidder shall describe the Site Organization, it may contain:

- 1. Brief description of the organization structure.*
- 2. Site Organization Chart (should include all key position)*

Form: Method Statement

The bidder shall describe the contents of the method statement, it may contain:

- 1. Method of schedule control (CPM/PERT, S-curve etc.) and proposed software (MS Project, Primavera etc.):*
- 2. Approach and methodology of Design: (including location of Design, sequence of Design to be proposed, etc.)*
- 3. Safeguarding existing facilities:*
- 4. Traffic control and Precautions for passing automobile, pedestrian, etc. (by Site Condition A, B, C)*
- 5. Completion for Partially completed Box Drain facilities:*
- 6. Shoring method, Sheet piling or others:*
- 7. Bidder's assessment of the working spaces. (by Site Condition A, B, C)*
- 8. Quality Control*
- 9. Emergency procedures, i.e communication network and major equipment (if any):*
- 10. Others:*

Form: Method Statement - Construction of Road

The bidder shall describe the contents (may include layout, sketch etc) of the method of Statement for construction of Road.

Form: Mobilization Schedule

The bidder shall describe the contents (may include table, bar-chart etc) of the mobilization schedule for the Works.

Form: Construction Schedule

The Bidder shall submit the detailed schedule (Bar chart), including Design stage, procurement equipment & Plant, execution, commissioning etc. to achieve all scope of work and breakdown work items as per requirements described in the Bidding Documents.

Form: Preliminary Design

The bidder shall describe any comments on referenced drawings or submit preliminary design, to achieve the requirements in Section VI Employer's Requirements, if any.

Form: Safety Plan

The bidder shall describe the contents of the Safety Plan during execution of the Works.

Form: Personnel

The bidder shall describe responsibility of Key positions, the contractor's personnel (teaming including Staffs and Labours) and work shift etc. are considered in the proposal.

Form: Contractor's Equipment

The bidder shall describe the contractor's equipment is considered in the proposal.

Form PER -1: Proposed Personnel

Date: *[insert day, month, year]*

Bidder's Legal Name: *[insert full name]*

Joint Venture Party Legal Name: *[insert full name]*

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[The Bidder shall provide the names of suitably qualified personnel to meet the specified requirements stated in Section III, Evaluation and Qualification Criteria, Clause 1.1.1 for Single-Stage Bidding or Clause 1.1 for Two-Stage Bidding.]

1.	Title of position*
	Name
2.	Title of position*
	Name
3.	Title of position*
	Name
4.	Title of position*
	Name

*As listed in Section III.

Form PER -2: Resume of Proposed Personnel

Date: [insert day, month, year]

Bidder's Legal Name: [insert full name]

Joint Venture Party Legal Name: [insert full name]

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[The Bidder shall provide the data on the experience of the personnel indicated in Form PER-1, in the form below.]

Name of Bidder

Position		
Personnel information	Name	Date of birth
	Professional qualifications	
Present employment	Name of employer	
	Address of employer	
	Telephone	Contact (manager / personnel officer)
	Fax	E-mail
	Job title	Years with present employer

[Summarize professional experience over the last 20 years, in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.]

From	To	Company / Project / Position / Relevant technical and management experience

Form EQU: Equipment

Date: [insert day, month, year]

Bidder's Legal Name: [insert full name]

Joint Venture Party Legal Name: [insert full name]

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[The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section III, Evaluation and Qualification Criteria, Clause 1.1.2 for Single-Stage Bidding or Clause 1.2 for Two-Stage Bidding. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.]

Item of equipment		
Equipment information	Name of manufacturer	Model and power rating
	Capacity	Year of manufacture
Current status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment ☐ Owned ☐ Rented ☐ Leased ☐ Specially manufactured	

Omit the following information for equipment owned by the Bidder.

Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

Attached are copies of Product catalog of the respective equipment/ machine to be used.

Bidder's Qualification

To establish its qualification to perform the Contract in accordance with Section III, Evaluation and Qualification Criteria, the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder:

Table of Qualification Forms:

- Form ELI - 1: Bidder Information
- Form ELI - 2: Bidder's Party Information
- Form CON: Historical Contract Non-Performance
- Form FIN - 1: Financial Situation
- Form FIN - 2: Average Annual Construction Turnover
- Form FIR - 1: Financial Resources
- Form FIR - 2: Current Contract Commitments
- Form EXP - 1: General Experience
- Form EXP - 2(a): Specific Experience
- Form EXP - 2(b): Experience in Key Activities
- Form LOI-SS: Sample Letter of Intent for Specialist Subcontractor
- Form ACK: Acknowledgement of Compliance with Guidelines for Procurement under Japanese ODA Loans
- SELF DECLARATION

Form ELI - 1: Bidder Information

Date: [insert day, month, year]

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[The Bidder shall provide the following information.]

1. Bidder's legal name:[insert full name]
2. In case of JV, legal name of the representative member and of each member: [insert full name of each member in the JV and specify the representative member]
3. Bidder's actual or intended country of registration: [insert country of registration]
4. Bidder's actual or intended year of incorporation: [insert year of incorporation]
5. Bidder's legal address in country of registration: [insert street/number/town or city/country]
6. Bidder's authorized representative information Name: [insert full name] Address: [inset street/number/town or city/country] Telephone/Fax numbers: [insert telephone/fax numbers, including country and city codes] Email Address: [insert E-mail address]
7. Attached are copies of original documents of: ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of legal entity named above, in accordance with ITB 4.3. ☐ Form Affidavit, for Non-Bankruptcy and non-Insolvency of Bidder or member of JV, in accordance with the ITB 4.7. ☐ In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1. ☐ In case of Specialist Subcontractor, MOU / Agreement or letter of intent to form Specialist Subcontractor. (refer sample Letter of Intents is Form LOI-SS)
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Form ELI - 2: Bidder's Party Information

Date: [insert day, month, year]

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[The following form is additional to Form ELI-1, and shall be completed to provide information relating to each JV member (in case the Bidder is a JV) as well as any specialist Subcontractor proposed to be used by the Bidder for any part of the Contract resulting from this process.]

1. Bidder's legal name: [insert full name]
2. Bidder's Party legal name: [insert full name of Bidder's Party]
3. Bidder's Party country of registration: [insert country of registration]
4. Bidder's Party year of incorporation: [insert year of incorporation]
5. Bidder's Party legal address in country of registration: [insert street/number/town or city/country]
6. Bidder's Party authorized representative information Name: [insert full name] Address: [insert street/number/town or city/country] Telephone/Fax numbers: [insert telephone/fax numbers, including country and city codes] E-mail address: [insert E-mail address]
7. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITB 4.3. ☐ Form Affidavit, for Non-Bankruptcy and non-Insolvency of Bidder or member of JV, in accordance with the ITB 4.7.
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Form CON: Historical Contract Non-Performance

[The following table shall be filled in for the Bidder and for each member of a JV.]

Date: [insert day, month, year]

Bidder's Legal Name: [insert full name]

Joint Venture Party Legal Name: [insert full name]

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1. History of Non-Performing Contracts

Non-Performing Contracts			
☐ Contract non-performance did not occur since 1 st January [insert year], in accordance with the Prequalification criteria, or Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.1, as appropriate.			
☐ Contract(s) not performed since 1 st January [insert year], in accordance with the Prequalification criteria, or Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.1, as appropriate, is(are) indicated below:			
Year	Non- performed portion of Contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and USD equivalent)
[insert year]	[insert amount and percentage]	- Contract Identification: [indicate complete Contract name, number, and any other identification] - Name of Employer: [insert full name] - Address of Employer: [insert street/city/country] - Reason(s) for non performance: [indicate main reason(s)]	[insert amount]

2. Pending Litigation

Pending Litigation				
☐ No pending litigation in accordance with the Prequalification criteria, or Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.2, as appropriate.				
☐ Pending litigation in accordance with the Prequalification criteria, or Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.2, as appropriate, is indicated below:				
Year of dispute	Amount in dispute (currency)	Outcome as Percentage of Net Worth	Contract Identification	Total Contract Amount (current value, currency, exchange rate and USD equivalent)
[insert year]	[insert amount]	[insert percentage]	- Contract Identification: [indicate complete Contract name, number, and any other identification] - Name of Employer: [insert full name] - Address of Employer: [insert street/ city/ country] - Matter in dispute: [indicate main issues in dispute] - Status of dispute: [indicate if it is being treated by the Adjudicator, under Arbitration or being dealt with by the Judiciary]	[insert amount]

3. Litigation History

Litigation History		
☐ No court/arbitral award decisions against the Bidder since 1 st January [insert year], in accordance with the Prequalification criteria, or Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.3, as appropriate.		
☐ Court/arbitral award decisions against the Bidder since 1 st January [insert year], in accordance with the Prequalification criteria, or Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.3, as appropriate, are indicated below:		
Year of award	Contract Identification	Total Contract Amount (current value, currency, exchange rate and USD equivalent)
[insert year]	- Contract Identification: [indicate complete Contract name, number, and any other identification] - Name of Employer: [insert full name] - Address of Employer: [insert street/city/country] - Matter in dispute: [indicate main issues in dispute] - Party who initiated the dispute: [indicate “Employer” or “Contractor”] - Status of dispute: [indicate if it is being treated by the Adjudicator, under Arbitration or being dealt with by the Judiciary]	[insert amount]

Form FIN - 1: Financial Situation

[The following table shall be filled in for the Bidder and for each member of a JV.]

Date: [insert day, month, year]

Bidder's Legal Name: [insert full name]

Joint Venture Party Legal Name: [insert full name]

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1. Financial data

Type of Financial information in (currency)	Historic information for previous [insert number] years (amount, currency, exchange rate, USD equivalent)				
	Year 1	Year 2	Year 3	Year 4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Profits After Taxes (PAT)					

2. Financial documents

The Bidder and its Parties shall provide copies of the financial statements for [*number of years*] years pursuant to the Prequalification Criteria or Section III, Evaluation and Qualifications Criteria, Sub-factor 2.3.1. The financial statements shall:

- (a) reflect the financial situation of the Bidder or in case of JV member, of each member, and not an affiliated entity (such as parent company or group member).
 - (b) be independently audited or certified in accordance with local legislation.
 - (c) be complete, including all notes to the financial statements.
 - (d) correspond to accounting periods already completed and audited.
- ☐ Attached are copies of financial statements¹ for the [*number of years*] years required above; and complying with the requirements.

¹ If the most recent set of financial statements is for a period earlier than 12 months from the date of Bid, the reason for this should be justified.

Form FIN - 2: Average Annual Construction Turnover

[The following table shall be filled in for the Bidder and for each member of a JV.]

Date: *[insert day, month, year]*

Bidder's Legal Name: *[insert full name]*

Joint Venture Party Legal Name: *[insert full name]*

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Annual Construction Turnover Data (Construction only)			
Year	Amount and Currency	Exchange rate	USD equivalent
<i>[indicate year]</i>	<i>[insert amount and indicate currency]</i>	<i>[insert applicable exchange rate]</i>	<i>[insert amount in USD equivalent]</i>
Average Annual Construction Turnover *			

* Total USD equivalent for all years divided by the total number of years, in accordance with the Prequalification criteria, or Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3.2, as appropriate.

Form FIR - 1: Financial Resources

[The following table shall be filled in for the Bidder and for each member of a JV.]

Date: [insert day, month, year]

Bidder's Legal Name: [insert full name]

Joint Venture Party Legal Name: [insert full name]

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[Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject Contract or Contracts as indicated in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2 (Following Prequalification), or Sub-Factor 2.3.3 (Without Prequalification), as appropriate.]

Financial Resources		
No.	Source of financing	Amount (USD equivalent)
1		
2		
3		

Form FIR - 2: Current Contract Commitments

[The following table shall be filled in for the Bidder and for each member of a JV.]

Date: *[insert day, month, year]*

Bidder's Legal Name: *[insert full name]*

Joint Venture Party Legal Name: *[insert full name]*

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[Bidders and each member of a JV should provide information on their current commitments on all Contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for Contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued, in accordance with Section III, Evaluation and Qualification Criteria, Clause 2.2 (Following Prequalification), or Sub-Factor 2.3.3 (Without Prequalification), as appropriate.]

Current Contract Commitments					
No.	Name of Contract	Employer's Contact Address, Tel, Fax	Value of Outstanding Work [Current USD Equivalent]	Estimated Completion Date	Average Monthly Invoicing Over Last Six Months [USD/month]
1					
2					
3					
4					
5					

Form EXP - 1: General Experience

[The following table shall be filled in for the Bidder and for each member of a JV.]

Date: [insert day, month, year]

Bidder's Legal Name: [insert full name]

Joint Venture Party Legal Name: [insert full name]

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[Identify Contracts that demonstrate continuous work over the past [number] years pursuant to Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4.1. List Contracts chronologically, according to their commencement (starting) dates.]

General Experience			
Starting Year	Ending Year	Contract Identification	Role of Bidder
[indicate year]	[indicate year]	- Contract name: [insert full name] - Brief description of the works performed by the Bidder: [describe works performed briefly] - Amount of Contract: [insert amount, currency, exchange rate and USD equivalent] - Name of Employer: [indicate full name] - Address: [indicate street/number/town or city/country]	[insert "Prime Contractor" (Single entity or JV member) or "Management Contractor"]

Note: The form shall be enclosed to the certificate for the component certified by employer in accordance with Note for the Bidder (vii), detail shall be specified in the required information against requirement of Sub-Factor 2.4.1 in the EQC 4.1.

Form EXP - 2(a): Specific Experience

[The following table shall be filled in for Contracts performed by the Bidder and by each member of a JV.]

Date: *[insert day, month, year]*

Bidder's Legal Name: *[insert full name]*

Joint Venture Party Legal Name: *[insert full name]*

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[Fill out one (1) form per Contract, in accordance with Section III, Evaluation and Qualification Criteria (Without Prequalification), Sub-Factor 2.4.2(a).]

Similar Contract No. <i>[insert number] of [insert number of similar Contracts required]</i>	Information		
Contract Identification	<i>[insert Contract name and reference identification number, if applicable]</i>		
Award date	<i>[insert day, month, year, e.g., 15 June, 2015]</i>		
Completion date	<i>[insert day, month, year, e.g., 03 October, 2017]</i>		
Role in Contract	Prime Contractor Only		
Total Contract Amount	<i>[insert Contract amount(s) and currency(ies)]</i>	USD <i>[insert exchange rate and total Contract amount in USD equivalent]</i>	
If member in a JV, specify participation in total Contract amount	<i>[insert percentage of participation]</i>	<i>[insert amount(s) and currency(ies) of participation]</i>	USD <i>[insert exchange rate and amount of participation in USD equivalent]</i>
Employer's Name	<i>[insert full name]</i>		
Address	<i>[indicate street/number/town or city/country]</i>		
Telephone/fax number	<i>[insert telephone/fax numbers, including country and city area codes]</i>		
E-mail	<i>[insert E-mail address, if available]</i>		

Similar Contract No. <i>[insert number of similar Contracts required]</i>	Information
Description of the similarity in accordance with Sub-Factor 2.4.2(a) of Section III:	
1. Physical size of required works items	<i>[insert physical size of items]</i>
2. Complexity	<i>[insert description of complexity]</i>
3. Methods/Technology	<i>[insert specific aspects of the methods/technology involved in the Contract]</i>
4. Other Characteristics	<i>[insert other characteristics as described in Section VI, Employer's Requirements]</i>

Note: The form shall be enclosed to the certificate for the component certified by employer in accordance with Note for the Bidder (vii), detail shall be specified in the required information against requirement of Sub-Factor 2.4.2(a) in the EQC 4.1.

Form EXP - 2(b): Experience in Key Activities

[The following table shall be filled in for Contracts performed by the Bidder and by each member of a JV.]

Date: [insert day, month, year]

Bidder's Legal Name: [insert full name]

Joint Venture Party Legal Name: [insert full name]

Subcontractor's Legal Name: [insert full name]

IFB No.: 01/2020

Page [insert page number] of [insert total number] pages

[Fill out one (1) form per Contract, in accordance with Section III, Evaluation and Qualification Criteria (Without Prequalification), Sub-Factor 2.4.2(b).]

1. Key Activity No. (i): [insert brief description of the Activity, emphasizing its specificity]

Total Quantity of Activity under the Contract: _____

Contract with Similar Key Activities Information				
Item	Information			
Contract Identification	[insert Contract name and number, if applicable]			
Award date	[insert day, month, year, e.g., 15 June, 2015]			
Completion date	[insert day, month, year, e.g., 03 October, 2017]			
Role in Contract [check the appropriate box]	Prime Contractor		Management Contractor ☐	Sub-contractor ☐
	Single ☐	JV member ☐		
Total Contract Amount	[insert Contract amount(s) and currency(ies)]		USD [insert Exchange rate and total Contract amount in USD equivalent]	
Quantity (as applicable) performed under the Contract per year or part of the year [insert extent of participation indicating actual quantity of key activity successfully completed in the role performed]	Total quantity in the Contract (i)	Percentage participation (ii)	Actual Quantity Performed (i) x (ii)	
Year 1				

Year 2			
Year 3			
Year 4			
Employer's Name	[insert full name]		
Address	[indicate street / number / town or city / country]		
Telephone/fax number	[insert telephone/fax numbers, including country and city area codes]		
E-mail	[insert E-mail address, if available]		

Note: The form shall be enclosed to the certificate for the component certified by employer (end user) in accordance with Note for the Bidder (vii), detail shall be specified in the required information against each requirement under Sub-Factor 2.4.2(b) in the EQC 4.1.

2. Activity No. (ii) _____

3. Activity No. (iii) _____

.....

6. Activity No. (vi) _____

Form LOI-SS: Sample Letter of Intent to from Specialist Subcontractor

[The Bidder shall require the Specialist Subcontractor to fill in this Form in accordance with the instructions indicated. This letter of authorization should be signed by a person with the proper authority to sign documents that are binding on the Specialist Subcontractor.]

Date: [insert date (as day, month and year) of Bid Submission]

IFB No.: 01/2020

To: [insert complete name of the Bidder]

WHEREAS

We [insert complete name of Specialist Subcontractor], who are official [insert service provider / manufacturers] of [insert type of services and/or goods manufactured], having office at [insert full address of Specialist Subcontractor], do hereby authorize [insert complete name of Bidder] to submit a Bid the purpose of which is to provide the following [insert goods and/or services], carried out by us [insert name and/or brief description of the Activity], and to subsequently negotiate and sign the Contract.

Name: [insert complete name of authorized person of the Specialist subcontractor]

In the capacity of [insert legal capacity of person signing the bid]

Signed: [insert signature of person whose name and capacity are shown above]

Dated on _____ day of _____, _____ [insert date of signing]

Form ACK

Acknowledgement of Compliance with Guidelines for Procurement under Japanese ODA Loans

A) I, [insert name and position of authorized signatory], being duly authorized by [insert name of Bidder/members of joint venture (“JV”)] (hereinafter referred to as the “Bidder”) to execute this Acknowledgement of Compliance with Guidelines for Procurement under Japanese ODA Loans, hereby certify on behalf of the Bidder and myself that all information provided in the Bid submitted by the Bidder for ID-P252 Odisha Integrated Sanitation Improvement Project (II) is true, correct and accurate to the best of the Bidder’s and my knowledge and belief. I further certify, on behalf of the Bidder, that:

- (i) the Bid has been prepared and submitted in full compliance with the terms and conditions set forth in the Guidelines for Procurement under Japanese ODA Loans (hereinafter referred to as the “Guidelines”); and
- (ii) the Bidder has not, directly or indirectly, taken any action which is or constitutes a corrupt, fraudulent, collusive or coercive act or practice in violation of the Guidelines and is not subject to any conflict of interest as stipulated in the relevant section of the Guidelines.

<If debarment for more than one year by the World Bank Group is NOT imposed, use the following sentence B).>

B) I certify that the Bidder has NOT been debarred by the World Bank Group for more than one year since the date of issuance of Invitation for Bids.

<If debarment for more than one year by the World Bank Group has been imposed BUT three (3) years have passed since the date of such debarment decision, use the following sentence B’).>

B’) I certify that the Bidder has been debarred by the World Bank Group for a period more than one year BUT that on the date of issuance of Invitation for Bids at least three (3) years had passed since the date of such debarment decision. Details of the debarment are as follows:

name of the debarred firm	starting date of debarment	ending date of debarment	reason for debarment

C) I certify that the Bidder will not enter into a subcontract with a firm which has been debarred by the World Bank Group for a period more than one year, unless on the date of the subcontract at least three (3) years have passed since the date of such debarment decision.

D) I certify, on behalf of the Bidder, that if selected to undertake services in connection with

the Contract, the Bidder shall carry out such services in continuing compliance with the terms and conditions of the Guidelines.

- E) I further certify, on behalf of the Bidder, that if the Bidder is requested, directly or indirectly, to engage in any corrupt or fraudulent action under any applicable law, such as the payment of a rebate, at any time during a process of public procurement, negotiations, execution or implementation of contract (including amendment thereof), the Bidder shall report all relevant facts regarding such request to the relevant section in JICA (details of which are specified below) in a timely manner.

JICA's information desk on fraud and corruption (A report can be made to either of the offices identified below.)

- (1) JICA Headquarters: Legal Affairs Division, General Affairs Department

URL: <https://www2.jica.go.jp/en/odainfo/index.php>

Tel: +81 (0)3 5226 8850

- (2) JICA India Office: 16th Floor, Hindustan Times House, 18-20,

Kasturba Gandhi Marg, New Delhi - 110-001, INDIA.

Tel: (91-11) 4909-7000 Fax: (91-11) 4909-7001/7002/7003/7004

URL: <https://www.jica.go.jp/india/english/office/>

The Bidder acknowledges and agrees that the reporting obligation stated above shall NOT in any way affect the Bidder's responsibilities, obligations or rights, under relevant laws, regulations, contracts, guidelines or otherwise, to disclose or report such request or other information to any other person(s) or to take any other action, required to or allowed to, be taken by the Bidder. The Bidder further acknowledges and agrees that JICA is not involved in or responsible for the procurement process in any way.

- F) If any of the statements made herein is subsequently proven to be untrue or incorrect based on facts subsequently determined, or if any of the warranties or covenants made herein is not complied with, the Bidder will accept, comply with, and not object to any remedies taken by the Employer and any sanctions imposed by or actions taken by JICA.

Authorized Signatory

[Insert name of signatory; title]

For and on behalf of [Insert name of the Bidder]

Date:

SELF DECLARATION

[This Form Self Declaration shall be submitted by the Bidder and for each Bidder's Party of a JV.]

Date: *[insert day, month, year]*
Bidder's Legal Name: *[insert full name]*
IFB No.: 01/2020

To: *[insert full name of Employer],*

Dear Sir

1. I/We am/are not currently in a financial restricting process such as Corporate Debt Restructuring, Strategic Debt Restructuring, facing recovery proceedings from financial institutions or facing winding of proceedings under the Board for Industrial and Financial Reconstruction (BIFR) or similar mechanism.. In case of any such event is found during bids evaluation and award of contract, I/ We have no objection if my /our tender is rejected.
2. In case of any information or documents furnished is found to be false or incorrect, I/We have no objection if my /our Bid is rejected.

Authorised Signature

Name of Bidder / *Bidder's Party of JV*

(This format should be certified by the Statutory Auditor of Bidder, and each Bidder's Party of JV)

Form of Bid Security (Bank Guarantee)

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: [Employer to insert its name and address]

IFB No.: 01/2020

Date: [insert date of issue]

BID GUARANTEE No.: [insert guarantee reference number]

Guarantor: [insert name and address of place of issue, unless indicated in the letterhead]

We have been informed that [insert name of the Bidder, which in the case of a joint venture shall be the name of the joint venture (whether legally constituted or prospective) or the names of all members thereof] (hereinafter called “the Applicant”) has submitted or will submit to the Beneficiary its Bid (hereinafter called “the Bid”) for the execution of [insert description of Contract] under Loan Agreement No. [insert Loan Agreement Number].

Furthermore, we understand that, according to the Beneficiary’s conditions, Bids must be supported by a bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of [insert amount in words, (insert amount in figures)] upon receipt by us of the Beneficiary’s complying demand, supported by the Beneficiary’s statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

- (a) has withdrawn its Bid during the period of Bid validity set forth in the Applicant’s Letter of Bid (hereinafter called “the Bid Validity Period”), or any extension thereto provided by the Applicant; or
- (b) having been notified of the acceptance of its Bid by the Beneficiary during the Bid Validity Period or any extension thereto provided by the Applicant, (i) fails to execute the Contract Agreement, or (ii) fails to furnish the Performance Security, in accordance with the Instructions to Bidders of the Beneficiary’s Bidding Documents.

This guarantee will expire and shall be returned to the Applicant: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Applicant and the Performance Security issued to the Beneficiary in relation to such Contract Agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary’s notification to the Applicant of the results of the bidding process; or (ii) twenty-eight (28) days after the end of the Bid Validity Period.

Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458.

[signature(s)]

[Note: All italicized text is for use in preparing this form and shall be deleted from the final product.]

Form of Bid Security (Bond)

BOND NO. [insert Bond No.]

BY THIS BOND [insert name of Bidder] as Principal (hereinafter called “the Principal”), and [insert name, legal title, and address of surety], authorized to transact business in [insert name of country of Employer], as Surety (hereinafter called “the Surety”), are held and firmly bound unto [insert name of Employer] as Obligee (hereinafter called “the Employer”) in the sum of [insert amount of Bond in words and figures]¹, for the payment of which sum, well and truly to be made, we, the said Principal and Surety, bind ourselves, our successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has submitted a written Bid to the Employer dated the [insert day] day of [insert month], 20 [insert year], for the construction of [insert name of Contract] (hereinafter called the “Bid”).

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal:

- (a) withdraws its Bid during the period of Bid validity specified in the Form of Bid, or any extension thereto provided by the Applicant; or
- (b) having been notified of the acceptance of its Bid by the Employer during the period of Bid validity; (i) fails or refuses to execute the Contract Form, if required; or (ii) fails or refuses to furnish the Performance Security in accordance with the Instructions to Bidders;

then the Surety undertakes to immediately pay to the Employer up to the above amount upon receipt of the Employer’s first written demand, without the Employer having to substantiate its demand, provided that in its demand the Employer shall state that the demand arises from the occurrence of any of the above events, specifying which event(s) has occurred.

The Surety hereby agrees that its obligation will remain in full force and effect up to and including the date twenty-eight (28) days after the date of expiration of the Bid validity as stated in the Invitation for Bid or extended by the Employer at any time prior to this date, notice of which extension(s) to the Surety being hereby waived.

IN TESTIMONY WHEREOF, the Principal and the Surety have caused these presents to be executed in their respective names this [insert day] day of [insert month] 20 [insert year].

Principal: _____

Surety: _____

Corporate Seal (where appropriate)

(Signature)

(Signature)

(Printed name and title)

(Printed name and title)

¹ The amount of the Bond shall be denominated in the currency of the Employer’s country or the equivalent amount in a freely convertible currency.

Section IV. Bidding Forms **(for Price Bid)**

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Letter of Price Bid

Date: *[insert date of Bid submission]*

Loan Agreement No.: ID-P252

IFB No.: 01/2020

To: The Engineer -in- Chief, OISIP, JICA
Orissa Water Supply & Sewerage Board (OWSSB)
Mahanadivihar, Nayabazar, Cuttack
Odisha PIN No.753004.

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB 8): *[insert the number and issuing date of each Addendum]*;
- (b) We offer to design, construction, test, recommission and commission, in conformity with the Bidding Documents, the following Works: the Construction of Box Drains with Road between Chainage 3300 – 5150 of Main Drain - 1, Cuttack, Design Build, *[insert “LOT 1: Chainage from 3300 to 5150 (JICA/OWSSB/OISIP/04-II / LOT 1)”]*.
- (c) The total price of our Bid, excluding any discounts offered in item (d) below is:
Total price of the Bid *[insert the total price of the Bid in words and figures, indicating the various amounts and the respective currencies]*;
- (d) The discounts offered and the methodology for their application are:

The discounts offered are: *[specify in detail each discount offered]*

The exact method of calculations to determine the net price after application of discounts is shown below: *[specify in detail the method that shall be used to apply the discounts]*;

- (e) Our Bid shall be valid for a period of *[specify the number of calendar days]* days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

- (f) If our Bid is accepted, we commit to obtain a Performance Security in accordance with the Bidding Documents;
- (g) We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding Contract between us, until a formal Contract is prepared and executed; and
- (h) We understand that you are not bound to accept the lowest evaluated Bid or any other Bid that you may receive.

Name of the Bidder***[insert complete name of the Bidder]*

Name of the person duly authorized to sign the Bid on behalf of the Bidder*** *[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid *[insert complete title of the person signing the Bid]*

Signature of the person named above *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* day of *[insert month]*, *[insert year]*

*: *In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder*

**: *Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid.*

Price Schedules

Sample Price Schedules

Preamble

1. The Price Schedules shall be read in conjunction with the Instructions to Bidders, General and Particular Conditions of Contract and the Employer's Requirement.

In general, the Contract is generally carried out a lump-sum price basis on which payment to the Contractor will be according to achieved milestones unless otherwise specified in Specific Provisions.

The Schedules may not generally give a full description of the works to be performed and the plant or equipment to be supplied under each item. Bidders shall be deemed to have read the Employer's Requirements and other sections of the Bidding Documents and reviewed the Drawings to ascertain the full scope of the requirements included in each item to filling the rates and prices.

2. **Bidders must complete and submit the form provided in this Section IV Bid Form (Price Bid), complied with the Bidding Documents. If the bidder submits both lot No.1 and lot No.2, the Letter of Price Bid and the schedule below shall be prepared and submitted for each lot separately.**
3. A rate or price shall be entered against each item in the priced Price Schedules, whether quantities are stated or not. The cost of Items against which the Bidder has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Price Schedules.
4. The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Price Schedules, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.
5. The Summary of Provisional Sums an amount equivalent to one-half of the Employer's estimate of the cost of the Dispute Board (DB) would incur in making payments to the Contractor of the Employer's share of the payments to the DB member(s).

The Contractor's overhead, profit, etc., shall not be included in the provisional sums for the cost of the DB. If the bid awarded to the foreign contractor (or if the lead partner is a foreign contractor, in case of JV), if he requested before signing of contract, the cost of DB may subject to the approval of the Employer be adjusted to

reasonable amount and currency.

6. With the exception of the provisional sum of the cost of the DB (which requires no prior instruction from the Engineer), the Provisional Sums included and so designated in the Price Schedules shall be expended in whole or in part at the direction and discretion of the Engineer, pursuant to Sub-Clause 13.5 of the General Conditions. A Provisional Sum is used for Works about which there is, at the time of the contract is entered into uncertainty to be carried out or supplied at the time of entering the Contract.
7. The Schedule of Rate and Price, the bidder's quote shall include all things necessary for the proper design, execution and completion of the Work and the remedying of any defects. Pursuant to the ITB 18, include the following prices.
 - (a) Performance Security cost required by Sub-clause 4.2 in the Conditions Contract
 - (b) Insurances required by Clause 18 in the Conditions Contract
 - (c) Provide safety measures
 - (d) Establishment, operation and maintenance and removal Offices and the Plant (e.g. Precast Box Drain, other Contractor's equipment)
 - (e) Provide and maintenance diversion of roads and traffic control.
 - (f) Any price for the Temporary Works
 - (g) Provide cleanup site.
 - (h) Taxes
8. Any arithmetical errors that appear in the computation or summation shall be corrected by the Employer as follows:
 - (a) in the event of a discrepancy between amounts in figures and in words, the amount in words will govern; and
 - (b) in the event of a discrepancy between the unit rate and the total amount derived by multiplying the unit price by the quantity, the unit rate as quoted shall prevail; provided, however, that if, in the opinion of the Employer, there has obviously been a gross misplacement of the decimal point in the unit price, the total amount as quoted shall prevail and the unit rate shall be corrected.

Bidders who are unclear or uncertain as to the scope of any item shall seek clarification in accordance with ITB 7 prior to submitting their bid.

Schedules of Rates and Prices

Schedule No. 1: Design and Construction of Box Drain (for Lot No.1)

Item no.	Description	Unit	Quantity	Rate		Amount	
				Local	Foreign	Local	Foreign
101	Procure sheet pile: including supply, transportation, loading, unloading in site etc complete in all respects. (5 times re-use, subject to the site condition)	MT	1,894.61				
102	Sheet piling by Non-Vibrating and Non-Hammering method:						
	a) Installation	Sqm	45,849.00				
	b) Extraction	Sqm	33,437.00				
103	Soil Stabilization (Sand pile: in total depth)	Mts (depth)	277276.50				
104	The Works, other than above Sl.No.101 to 103						
105							
Total for Schedule No. 1 (carried forward to Grand Summary)						—	—

Reference Rate:

Item no.	Description	Unit	Rate	
			Local	Foreign
I	Soil Stabilization (Sand Piling: 300 mm dia., details as per the Employer's Requirements.) where necessary as per approved Design.	Mts (depth) /piling	575.00	
ii	Sheet piling by Non-Vibrating and Non-Hammering method: (excluding			

	Procurement sheet piles)			
	a) Installation	Sqm.	2,118.26	
	b) Extraction	Sqm.	1,166.06	

Note:

- 1) Important for the SI No. 101 to 103 and Reference Rate:
 - (a) If no Amount provided in each, Price Bid is evaluated in accordance with the Bidding Documents, and Reference Rate will be used for payment adjustment.
 - (b) In case the Bidder proposed other method, replace Description to the similar item of work by proposed method and provide Unit, Quantity, Rate and Amount at the Bidder's own risk. The amount will not be changed, even if proposed method was not approved by the Design.
 - (c) "Reference Rates" are quoted for compliance with contractual provisions and are provided for reference to bidders. Bidders are free to use the reference rate or their own proposed method and rate to quote price bids at their own risk.
 - (d) The quantities are provisional quantities, the payment will be adjusted based on the actual quantity executed at the time of payment, as per GC 14.4.
- 2) The Employer may require the Bidder to produce detailed price analyses for any item of the Price Schedules, to demonstrate the internal consistency of those prices with the methods and the Price Schedules proposed. If the lowest evaluated Bid Price's rates and amounts are found to be disproportionate, the rates and amounts are adjusted within the Price Schedule, and mutual agreed prior to issue the Letter of Acceptance. The total amount of the Price Schedule will be unchanged.

Schedule No. 2: Design and Construction of Road

Item no.	Description	Unit	Quantity	Rate		Amount	
				Local	Foreign	Local	Foreign
201							
Total for Schedule No. 2 (carried forward to Grand Summary)						—	—

Note:

- 1) The Employer may require the Bidder to produce detailed price analyses for any item of the Price Schedules, to demonstrate the internal consistency of those prices with the methods and the Price Schedules proposed. If the lowest evaluated Bid Price's rates and amounts are found to be disproportionate, the rates and amounts are adjusted within the Price Schedule, and mutual agreed prior to issue the Letter of Acceptance. The total amount of the Price Schedule will be unchanged.

Schedule No. 3: Summary of Specified Provisional Sums

<i>Bill No.</i>	<i>Description</i>	<i>Amount</i>	
		<i>Local</i>	<i>Foreign</i>
301	Cost of Dispute Board (DB)	17,00,000 ^a	
Total for Specified Provisional Sums (carried forward to Grand Summary)		17,00,000	
Provisional Sums included and so designated in the Price Schedules shall be expended in whole or in part at the direction of the Engineer, except for the provisional sum for the cost of the DB, which requires no prior instruction of the Engineer, in accordance with Sub-Clause 13.5 of the General Conditions.			

- a. One-half of the Employer's cost estimate of the Disputes Board shall be included in the Provisional Sums. Contractor's overheads and profits shall not be included in this amount.*

Grand Summary

Contract Name:

Contract No.:

General Summary	Page	Amount	
		Local	Foreign
Schedule 1: Design and Construction of Box Drain Works			
Schedule 2: Design and Construction of Road Work			
Subtotal	(A)		
Schedule 3: Summary of Specified Provisional Sums	(B)	17,00,000	
Subtotal of Bills (A + B)	(C)		
GST (C x 12%)	(D)		
Bid Price (C + D) (Carried forward to Form of Price Bid)	(E)		
In word			

Section V. Eligible Source Countries of Japanese ODA Loans

The Eligible Source Country (ies) for procurement of all goods and services to be financed out of the proceeds of the Loan are all countries and area.



ORISSA WATER SUPPLY AND SEWERAGE BOARD

(A Government of Orissa Undertaking)

Mahanadi Vihar, Naya Bazar, Cuttack, Odisha PIN 753004, India

Phone: +91-671-2444511, Fax: +91-671-2441616

JICA ASSISTED ODISHA INTEGRATED SANITATION IMPROVEMENT PROJECT (ID-P252)

BIDDING DOCUMENTS

FOR

**CONSTRUCTION OF BOX DRAINS WITH ROAD BETWEEN CHAINAGE
3300 – 5150 OF MAIN DRAIN – 1, CUTTACK, DESIGN BUILD
(PACKAGE NO. JICA/OWSSB/OISIP/04 – II / LOT 1)**

ON

INTERNATIONAL COMPETITIVE BIDDING

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Part - 2

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Part 3 - CONDITIONS OF CONTRACT AND CONTRACT FORMS

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December 2020

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1. SCOPE OF WORK

1.1 Introduction

Storm water flow in Cuttack is managed mainly by two principal drains, Main Drain 1 and Main Drain 2. The drains flow from northwest to southeast, reaching the Kathajori river through sluice gates. At present this drain is carrying storm water mixed with sewage water, which is flowing mostly sewage water in dry season, and mostly storm water in rainy season.

In this tender a portion of the Main Drain 1 is to be converted to closed drain (“Box Drain”).

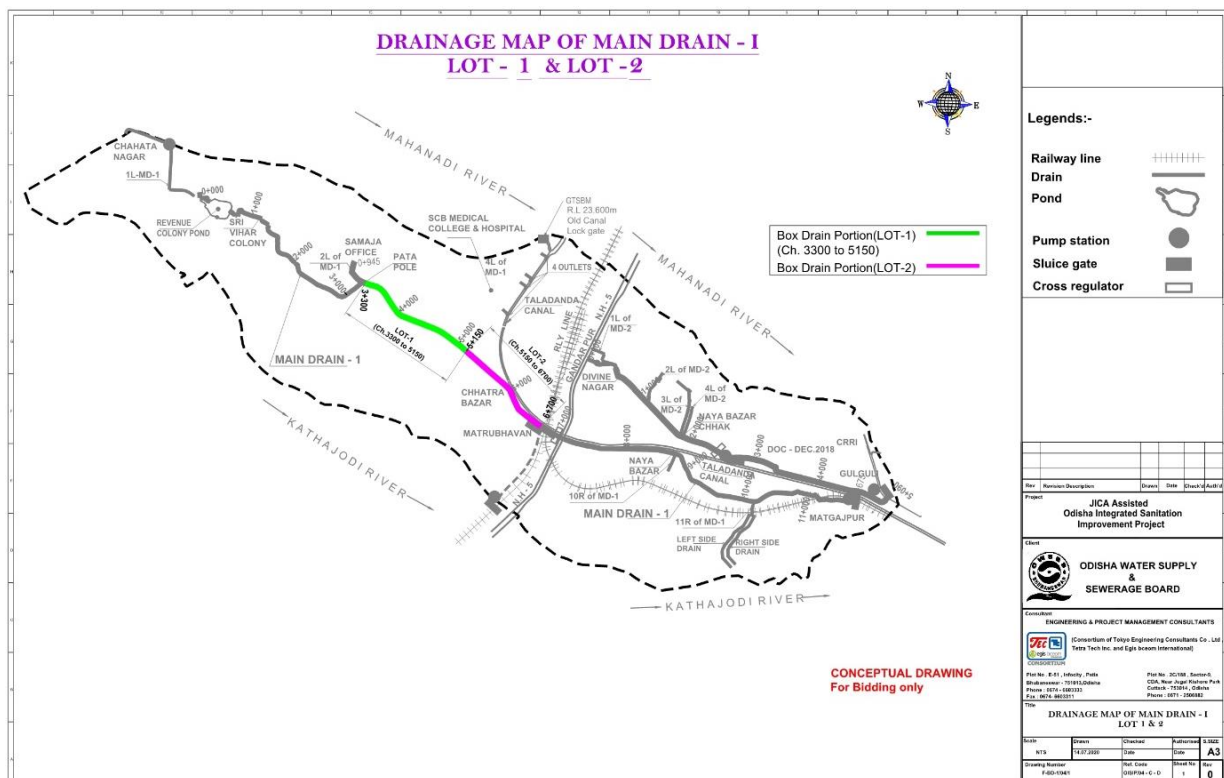
1.1.1 Project Objective

The project aims to improve the drainage system for flood mitigation in the city, sanitary environment by constructing a box drain in the main drain 1 and to contribute to improving traffic conditions and safety by constructing the road above the box drain, for the congested area located between Drainage Chainage 3300 (Potapole) and Chainage 6700 (Mathrubhavan).

1.1.2 Location

The Box Drain is a 3400 m portion of the Main Drain 1, from Chainage 3300 (Potapole) to 6700 (Mathrubhavan). Out of which 1850 m length of Box drain from chainage 3300-5150, is considered under the scope of LOT-1 (Package No. JICA/OWSSB/OISIP/04 – II / LOT 1).

Drainage system including MD-1 box drain



Approximately 333 meters have been completed at different location along the length in different segmental lengths, and 33 additional meters partially completed by the Package 4 Contractor under the JICA Assisted Odisha Integrated Sanitation Improvement Project (OISIP).

1.2 Site Conditions.

The Main Drain 1 is an urban drain which in core area of city. The portion designated for box drain is mainly situated in habited and market area where movement of heavy machinery will not be allowed in day time. Access to the work site and space availability for machinery and equipment and to perform the work differ from site to site. In addition, water diversion equipment must be accommodated in every case. In generally, there are categorized following site conditions in the route:

Site Condition A. There are roads on both sides of the drain and the homes or boundary walls are about 6 meters from the drain wall. Access to the sites in this condition is generally from side streets of varying width. In order to secure the safety of the traffic, pedestrian and minimizing interference to inconvenience of the public on entire both side roads, to secure a sufficient working space and the environmental concerns, Contractor must care and secure access to site and provide for separation of public and work space positively for safety purposes, and selecting the suitable method of the construction.

Site Condition B. One side of the drain has an access road and the other is adjacent to the residential or boundary walls. The distance from walls to drain on the road side is about 5 m. The Contractor must secure the safety of the traffic and pedestrians on entire one side roads and minimizing interference of residents, keeping a sufficient working space and the environmental concerns. The contractor may consider the effective use of on the existing drainage such as to fill it with soil/sand with the drainage flow diversion, etc. And the Contractor shall take all precautions of third-party property Protection on the side for adjacent to the residential or boundary walls.

Site Condition C. The drain wall is within one to three meters of the residential or boundary walls. There is a side road available in partial stretches of the drain. Further access can be obtained from the drain ends and open space/using private lands beside the drain on temporary basis, but less disturbance of work by the traffic control and management as required for the condition A and B. The Contractor must secure the safety of the traffic and pedestrians at access points of the roads and minimize interference of residents with keeping a sufficient working space. The contractor may consider the effective use of the existing drainage such as to fill it with soil/sand with the drainage flow diversion, etc. And the Contractor shall take all precautions of third-party property Protection on the side for adjacent to the residential or boundary walls. The Contractor may arrange their own access and workspace. The Employer and Local authority will facilitate it.

The types of condition are distributed along the drain and are not always sequential. Length of section and distance from drain to walls varies and must be independently confirmed by Contractor. The table below shows the accessibility condition prevalent by chainage. Contractor is to evaluate the various sites and ascertain the condition assessment and methodology to accomplish the work.

Table 1: Existing Details of Box Drain Site (3300-6700)

Sl. No.	Chainage		Site Condition in “m”			Remarks
	From	To	A	B	C	
1	3300	3400			100	
2	3400	4330		930		
3	4330	5450	1120			
4	5450	5850		400		
5	5850	6120			270	
6	6120	6225		105		Narrow Road on RHS (Aprox 2m)
7	6225	6700			475	
Total Length			1,120	1,435	845	
			Total A, B and C: 3,400			

Detailed Chainage wise present situation refers to the Figures in Sub-Clause 1.5.8 and Table 4.1 and 4.2 for summarized scheme of Box Drain Works.

1.3 The Contract Lots

The entire Works is divided and carried out by the following Contract Lots.

1.3.1 LOT No.1 (No. JICA/OWSSB/OISIP/4-II/ LOT 1):

The works from Drainage Chainage 3300 (Potapole) to Chainage 5150, (Half portion of first segment Near to Bajrajbati Culvert.

This stretch is mainly situated in residential area. Number of cross bridges of smaller width provide access to residents for pedestrian movement and some are being used for movement of one two wheeler vehicle at a time. The portion designated for box drain is mainly situated in habited and some market area where movement of heavy machinery will not be allowed in day time. Access to the work site and space availability for machinery and equipment and to perform the work differ from site to site. In addition, water diversion equipment must be accommodated in every case.

Table 2: Summary of Box Drain for Contract Lot No.1

Sl.No.	Completion of Box Drain	Approximately Length by Site Conditions (m)				Remarks
		A	B	C	Total	
1	Total Length	820	930	100	1,850	
2	Completed	28	69	49	146	4 Locations
3	Partially Completed	0	2	8	10	2 locations, 2nd lift walls completed

Detailed Chainage wise present situation and the works refers to the Table No. 4-1 of Chapter 1. “Scheme of Box Drain Works: Lot No.1 - Chainage from 3300 to 5150 “given at Page No. 31.

Above length of section and distance from drain to walls varies and must be independently confirmed by Contractor. Contractor is to evaluate the various sites and ascertain the condition assessment and methodology to accomplish the work.

1.4 Scope of Work

The works will be executed as a Design Build mode for each Contract lot. The successful bidder will be responsible for pre-design, design, construction and the defect notification period (DNP), to achieve the Project Objective. Mode of payment will be lump sum with mutually agreed billing milestones.

Present scope of works include construction of Box Drain for 1850 mts (in Lot-1) including completion of 33 mts (10 in Lot-1 and 23 in Lot-2) for partially completed stretches and associated works, completion of balance activities like construction of roads, ventilation arrangement, street light, construction of cycle track with foot path made with paver block, construction of catch water drain and connecting it to main drain etc, for already constructed and partially constructed portion also.

Making through connectivity for the entire 1850 meters by joining already constructed segments of box drain for smooth flow of storm water mixed with sewage water and movement of traffic, including design and construction of junctions for smooth movement of traffic with proper street lighting and fixing of traffic signals as and where required.

All construction methodology and execution including making access for, construction activity, water diversion, movement of traffic, safety for movement of pedestrian and vehicular traffic, environmental concerns, during construction period shall be responsibility of Contractor.

The work includes the construction of the box drain, connection of secondary and tertiary drains, construction of bar screen and silt traps for secondary drains and territory drains, provision of access ports for cleaning the box drain with machinery, interconnection to the Main Drain 1 open drain at both ends of the box drain, and the construction of a concrete road on top of the drain, Laying of bituminous surface, matching the elevations of intersecting roads and providing foot paths as required, design and implementation of road junctions, installation of traffic signals at junctions of Roads along the alignment of drains, providing and fixing of street light as per relevant standards.

The main challenges for this project are:

1. **Collapsible soils:** Cuttack is situated between two rivers, soil conditions are very poor, ground water table is at very high level, bed level of drain is having huge amount of sludge and silt.
2. **Properties are very close to drain:** The drain is flowing through core area of city. Residential and commercial properties are situated very close to existing drain wall, such properties may get damage during construction activity.
3. **Live Drain:** The drain is running with sewage water in dry season and in rainy season sewage mixed with storm water also. Water diversion for construction activity will require a proper engineering solution.
4. **Restricted access to site, and work space:** Box-drain construction has to be done in core area of city, access to work place is not available at all reaches of site, Contractor has to select construction methodology suiting to available access and space.
5. **Limited seasonal and daily work time:** Cuttack is flood effected city, From 15th June to 15th October, Local administration is not allowing any construction in drain because no alternate drainage is available to drain out surface runoff during rains. Construction activity will be allowed in remaining year. Construction has to be done in market area,

heavy machinery movement will not be allowed in day time, construction activity will be allowed in day and in night also.

6. **Making connections to exiting segments of box drain:** The Box drain already constructed at different chainage as shown in Table Scheme of Box Drain Works should have to be connected with proposed construction to have smooth flow of water and movement of traffic.
7. Coordination with utility departments for removal or relocation of service utilities

Contractor has to visit the site of work of each location to get accustomed with site conditions, accessibility etc. Soil investigation data provided in bid document is for general idea only to about soil strata conditions and OWSSB shall not be held responsible for this soil investigation report if it does not matches with soil test which will be conducted by the bidder in subsequent stages. It is suggested to get soil investigation done by the bidder before bidding to have a proper Techno Financial Proposal during bidding. There will be no separate payment for such pre bid investigations.

1.5 Key Design and Construction Criteria

The work includes the construction of the RCC box drain (Pre Cast/Cast in Situ), making connection of secondary and tertiary drains, construction of silt traps at secondary and tertiary drain before joining to main drain and fixing bar screen with cleaning arrangement for bar screen and silt trap, provision of access ports for cleaning the box drain with machinery, making interconnection to the open drain portions of Main Drain 1 at both ends of the box drain, construction of a concrete cement road with Bitumen surfacing as per technical specifications on top of the drain, matching the elevations of intersecting roads and providing cycle track, foot paths as required. Catch water drains has to be constructed along the length on both side of main drain and arrangements has to be made for entry of surface runoff to main drain from catch water drain. Street light arrangements shall be done as per technical specifications and relevant IS Code.

During Construction, drain has to be cleaned for smooth operations. After construction and handing over of drain (facility developed including segments already constructed), cleaning of drain shall be done by Contractor from Chainage 3300 to Chainage 6700). Maintenance of drain will not be in scope of present Contract, but Contractor has to provide operation and maintenance manual for this complete stretch. It will be mandatory to have mechanical cleaning arrangement for drain constructed for which special care shall be taken during design and construction of box drain. Presently this drain is carrying storm water mixed with sewage hence proper care should be taken from safety and hygiene for its cleaning and operation and maintenance.

Many household and secondary drains join the Main Drain 1 along the route. Contractor's design responsibility under this project includes creating temporary and permanent solutions to each and every drain regardless of size. Water, sewer lines and other service utilities which may cross the drain at multiple locations, shifting of such utilities shall be responsibility of Contractor and cost of such shifting with supervision charges, fees, payable to authorities shall be included in price bid. Any type of security deposits in any required to be paid to concern authorities shall be paid by the contractor and reimbursed by Employer. The Contractor shall make provision for such utility shifting in his design and coordinate with appropriate authorities for such issues.

1.5.1 Safety.

Safety is of the utmost importance and the goal for this project is ZERO accidents. Contractor shall employ all means necessary to isolate the area population from the work area. Solid barricades has to be provided to isolate work space from public movement area. Under no circumstances will work be allowed if this condition is not met.

1.5.2 Impact to local traffic.

The local traffic will be managed by deploying sufficient number of traffic marshals and directional signages to facilitate the maximum fluidity in the local traffic. As conditions necessitate the Contractor has to coordinate with Police Department for temporary street closure. Contractor may have to create his own working space off road to maintain local traffic.

1.5.3 Access and Work Space.

Contractor is responsible for access routes to the site and for creating working space for his machinery, equipment and materials.

1.5.4 Third Party Property Protection.

Structures in close proximity to the drain wall may have shallow foundation, soil in Cuttack is collapsible and drain bed may have more depth of silt and slushy soil. Installation of shoring before start and during construction may cause damage to structures situated along the length of drain, hence the Contractor has to use methods and machinery that will minimize or eliminate the possibility of structural damage. After taking all precautions during construction if any property got damaged, it is responsibility of Contractor to make his property in good usable condition with no extra cost to employer.

Contractor is required to indemnify and hold harmless the Employer on this type of damage and the Contractor will be expected to use his own resources or insurance to mitigate any problems caused by construction activities.

1.5.5 Live Flow Management.

The drain carries storm water mixed with sewage in rainy season and mostly municipal sewage flow in dry season. Contractor will have to develop a solution or mix of solutions to address any and all discharge conditions in the drain for construction of box drain. Under no circumstances overflows caused by Contractor's operations will be permitted.

The discharge of water in the box drain varies according to the chainage described under Sub-clause "4.12.7 water diversion" which is only indicative and informative, the flow carries an extremely large amount of floating debris, consisting mainly of residential garbage. It is Contractors responsibility to reconfirm discharge characteristics in terms of quantity and quality while make arrangements for water diversion system. Contractor has to manage this condition by removing garbage from the drain as and when required to maintain water diversion system in operation and in good form.

1.5.6 Traffic restrictions.

The municipal authorities in Cuttack prohibit the circulation of heavy machinery and trucks during the daytime hours. Plying the Cuttack roads with said machinery is restricted to the hours of between 8.00AM to 10.00PM

1.5.7 Limited working time.

By official order of the Cuttack Municipality the Main Drain 1 work will cease on 15-Jun and resume on or about 15-Oct every year, to facilitate free drainage of monsoon rains. The Contractor will be expected to complete removal of machinery, equipment and materials from the drain by 15-June, with no exceptions. This means that any temporary works erected to facilitate the construction of permanent works will have to be removed.

1.5.8 Work plan consistent with removal of utilities.

The Contractor will be required to provide a detailed work plan for each section of work that takes into consideration, the time required for removal of utilities, if any. Utilities in potential conflict with the project as of November 2018 are shown below. The intent of the early work plan is to allow the concerned entities to plan and execute the removal of utilities in an orderly manner.

Figure 1.



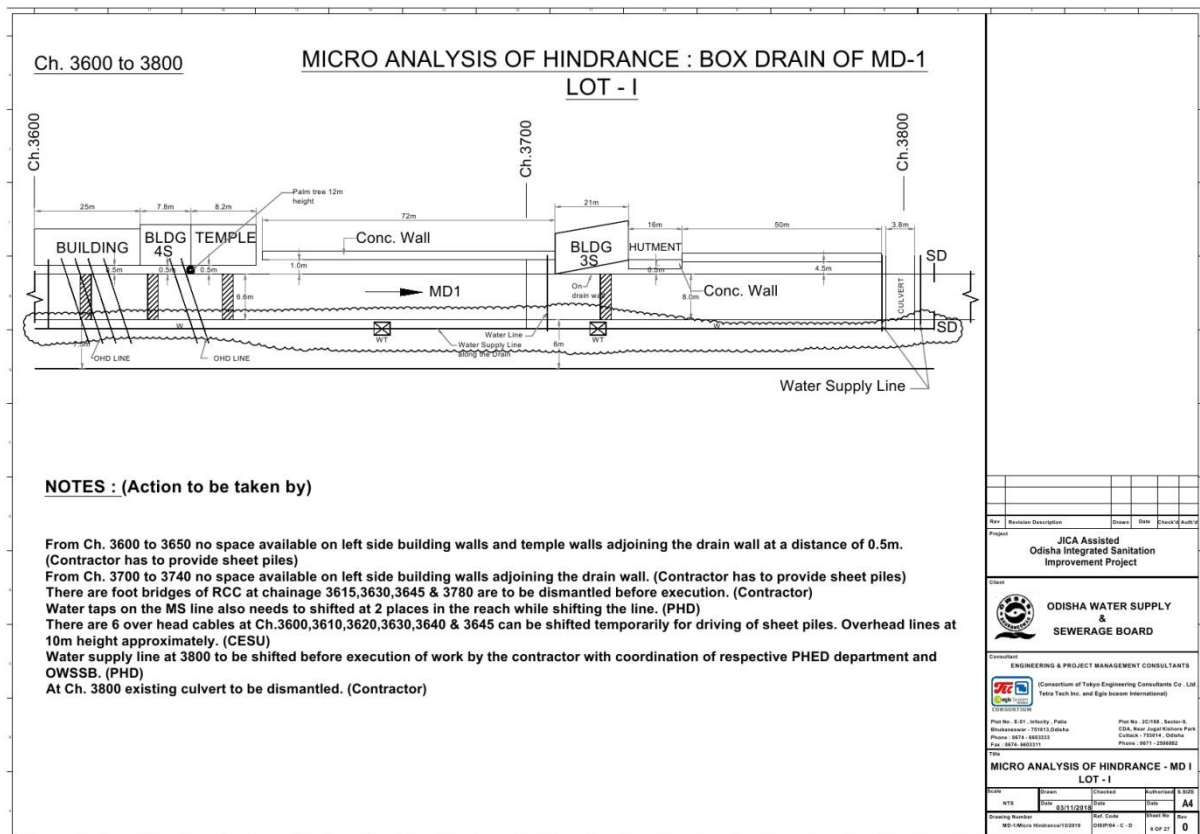
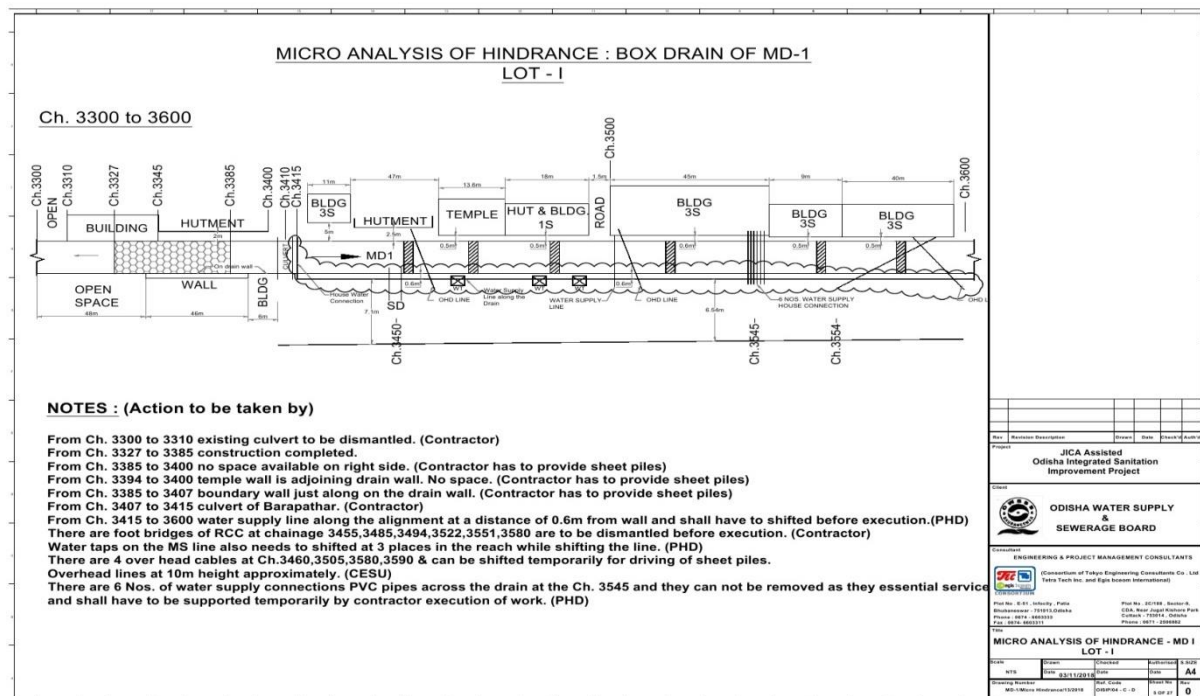


Figure 2.



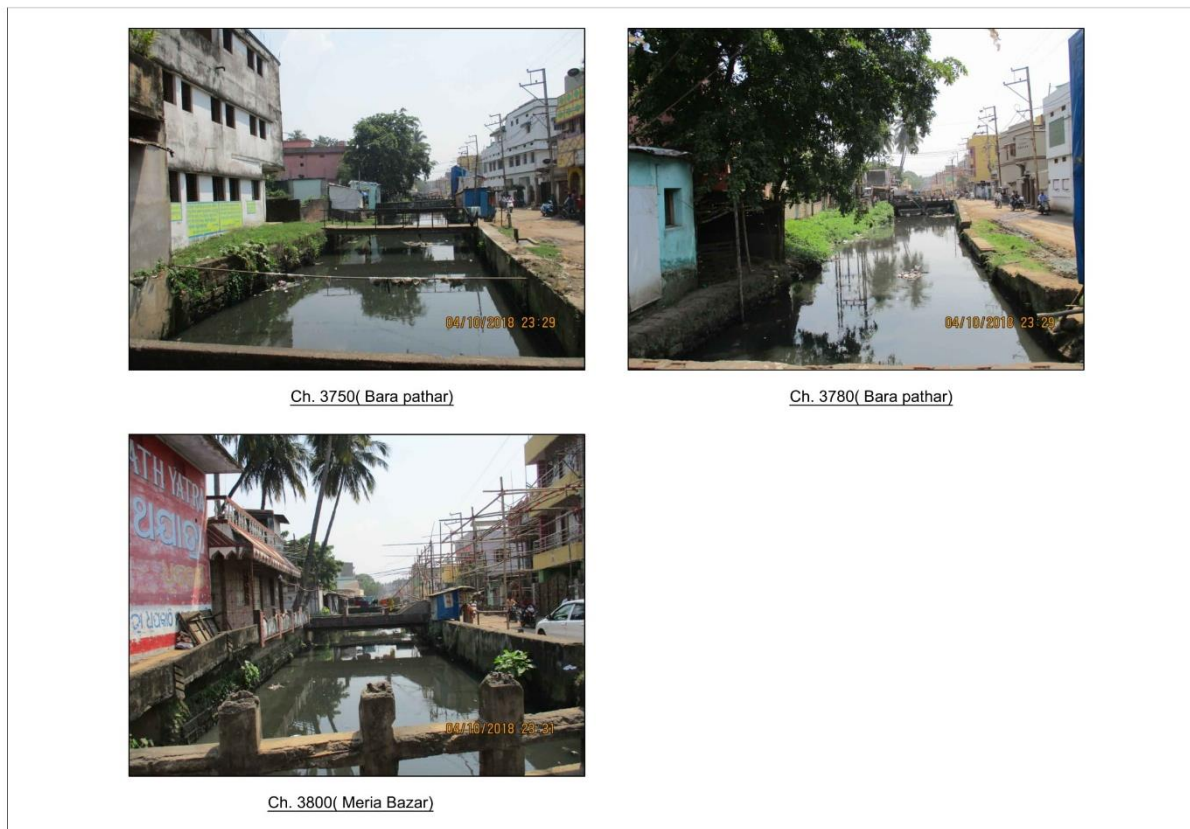


Figure 3.

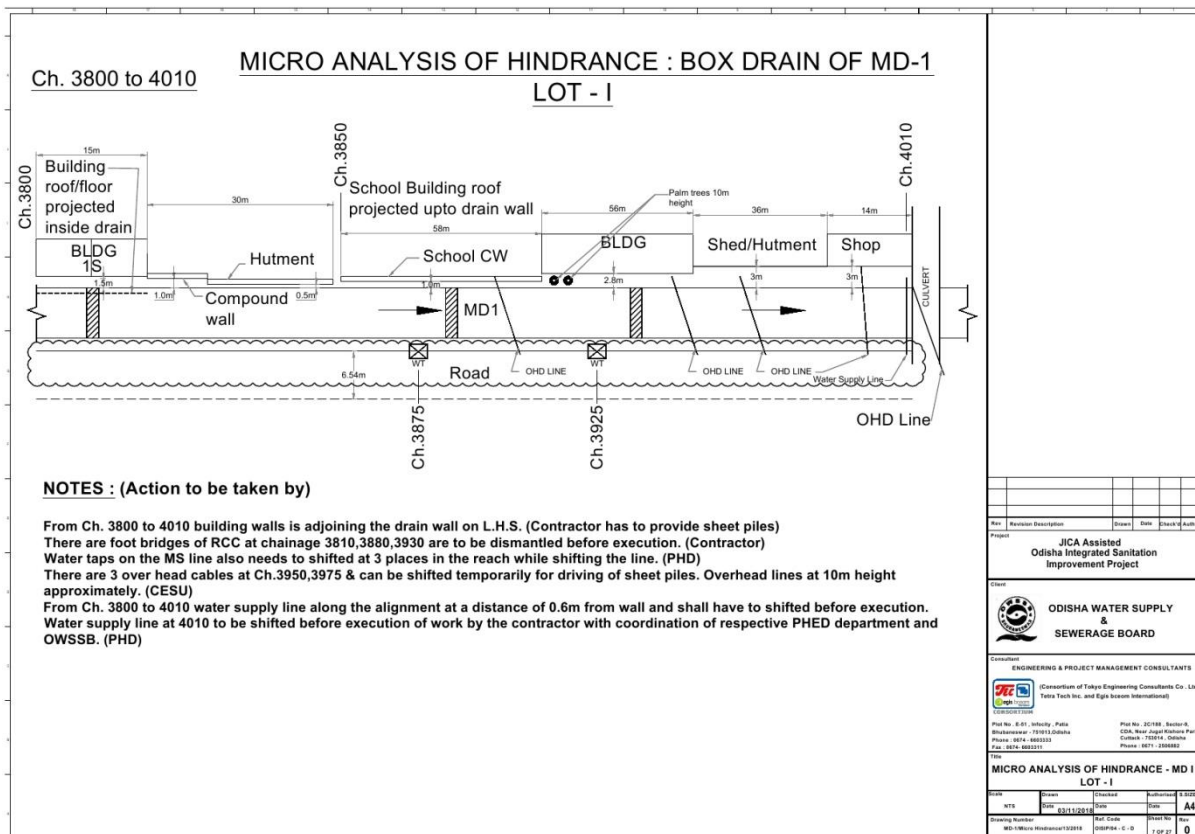


Figure 4.

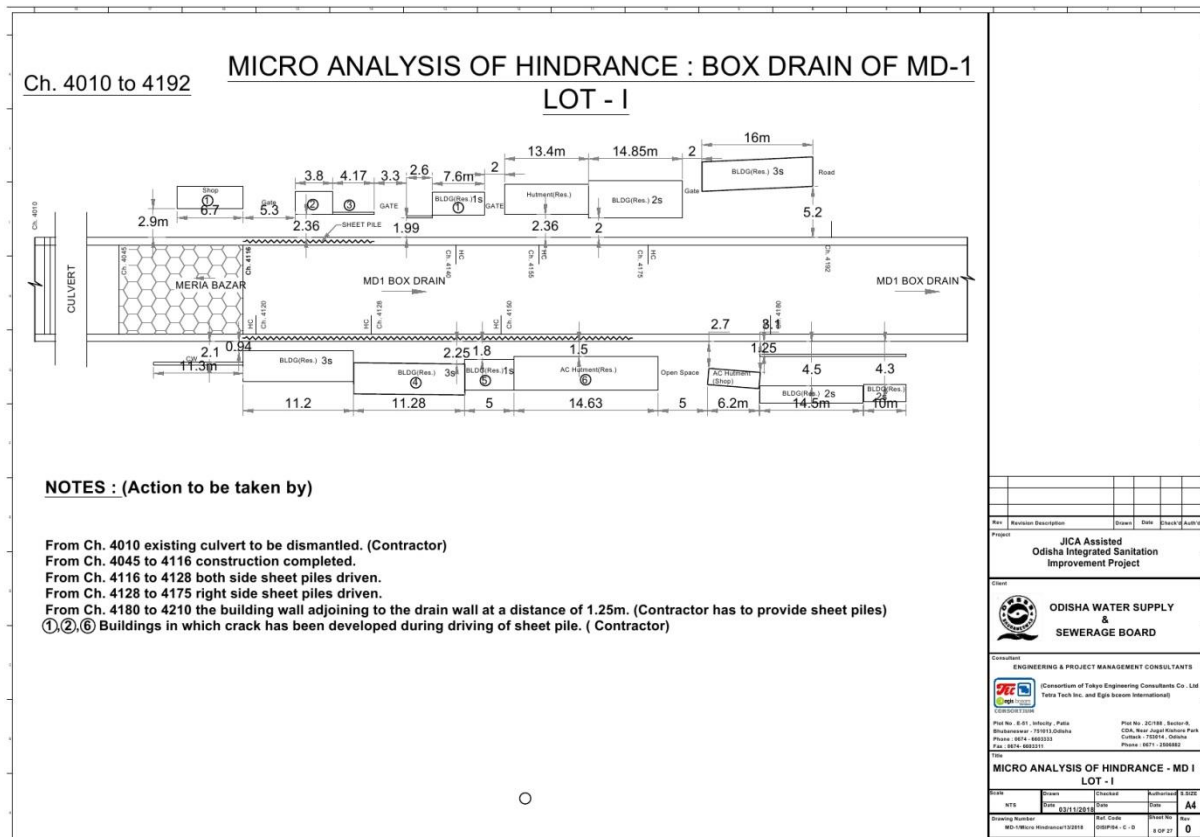


Figure 5.

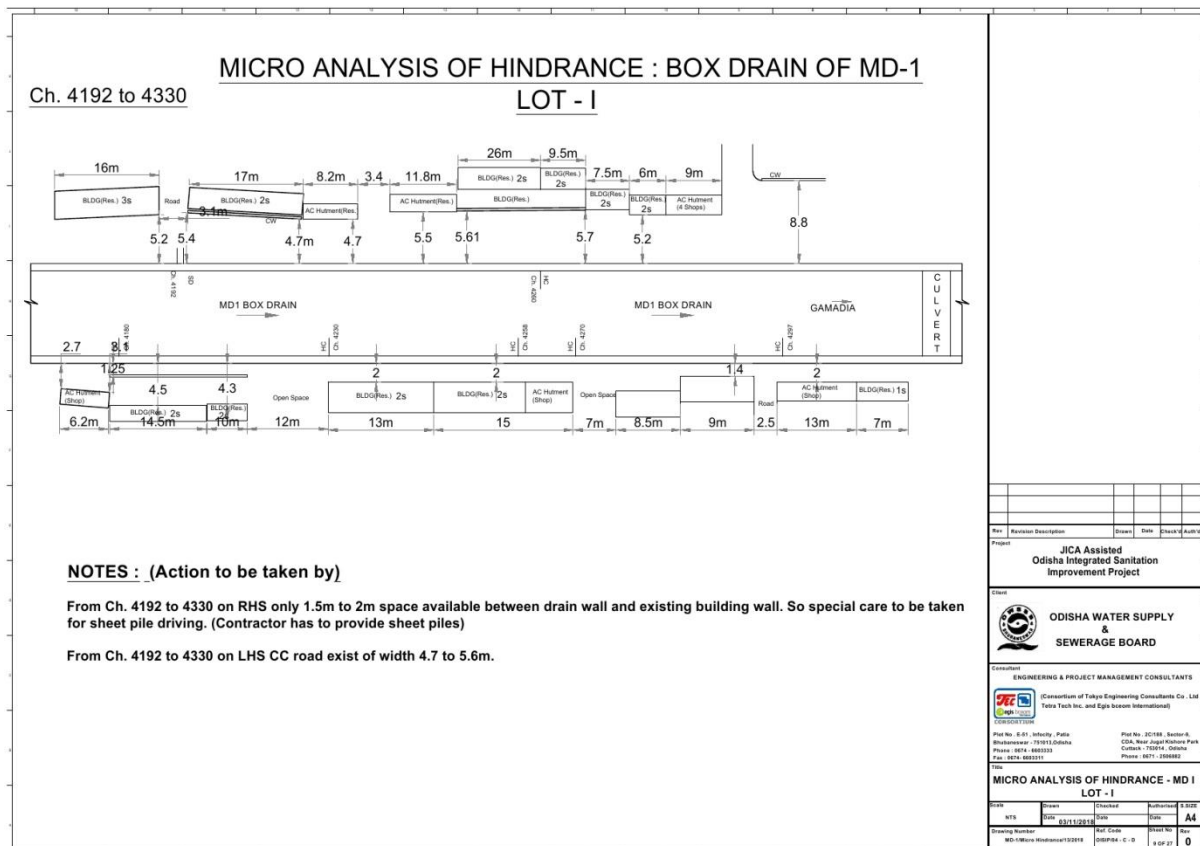
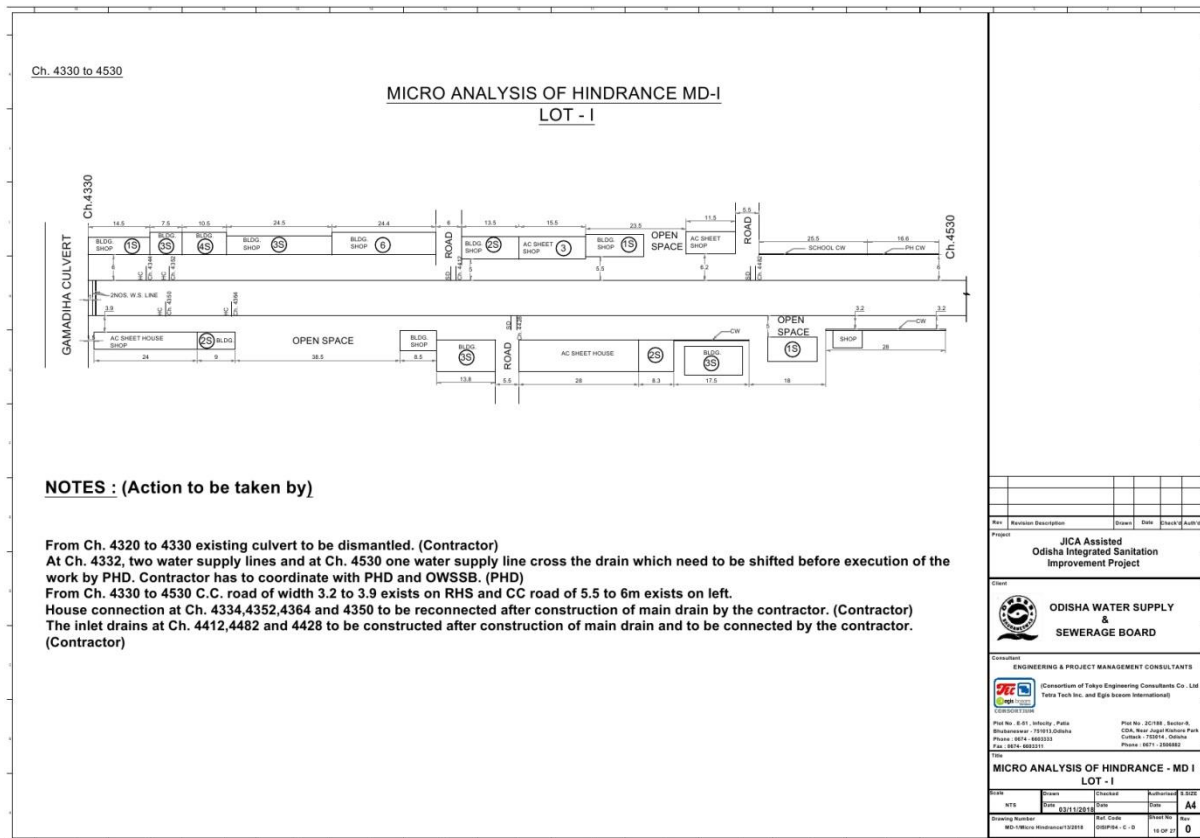
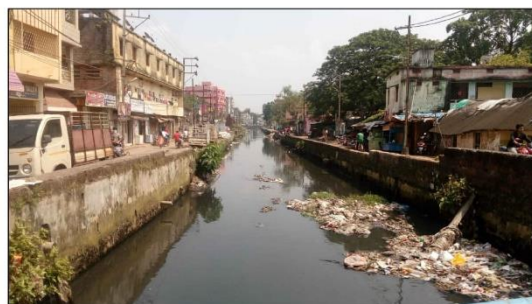


Figure 6.



Ch. 4330(Gamadia)



Ch. 4400(Gamadia)

Figure 7.

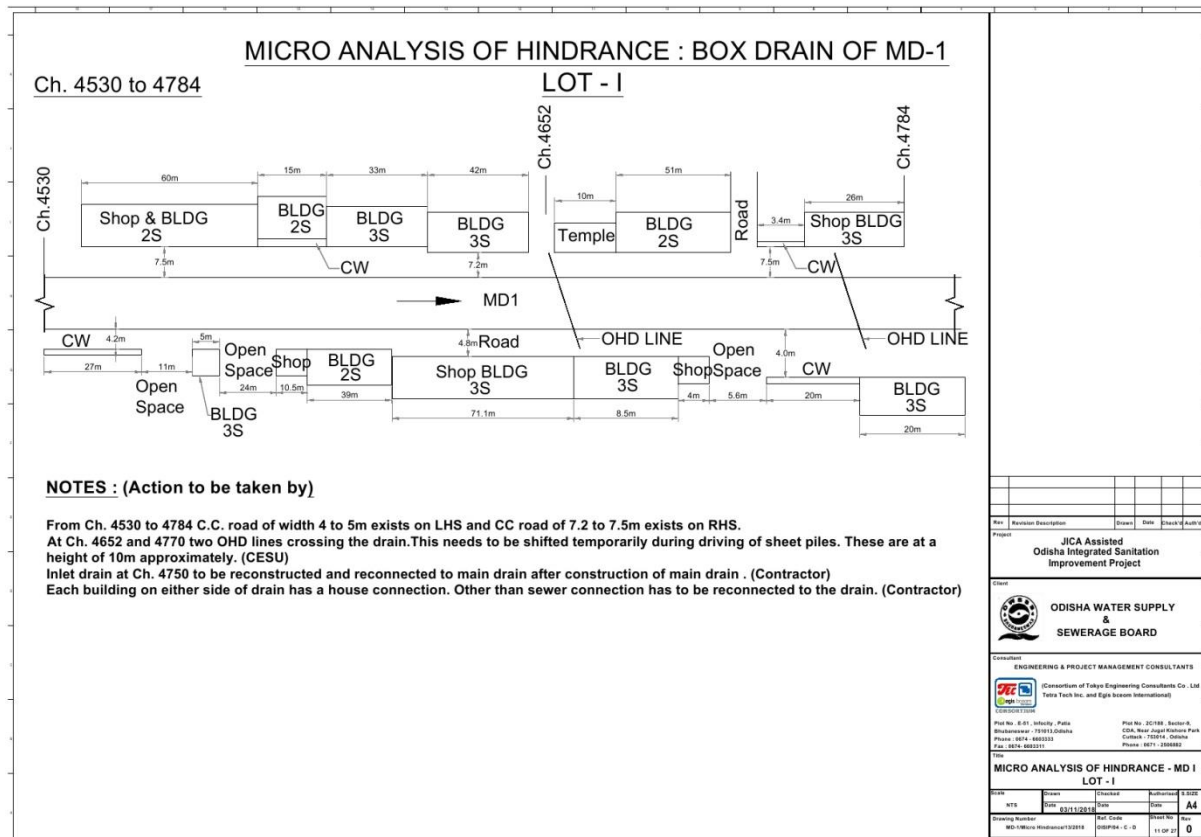
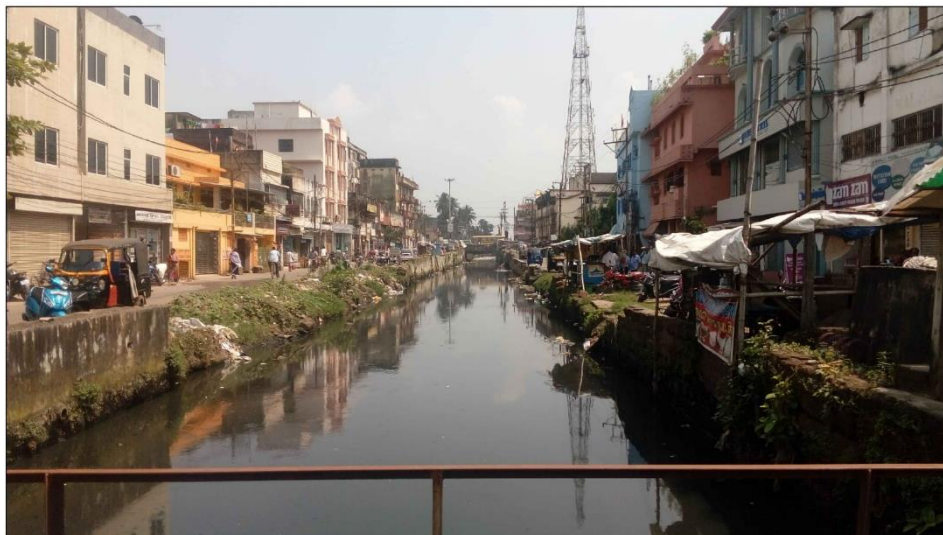
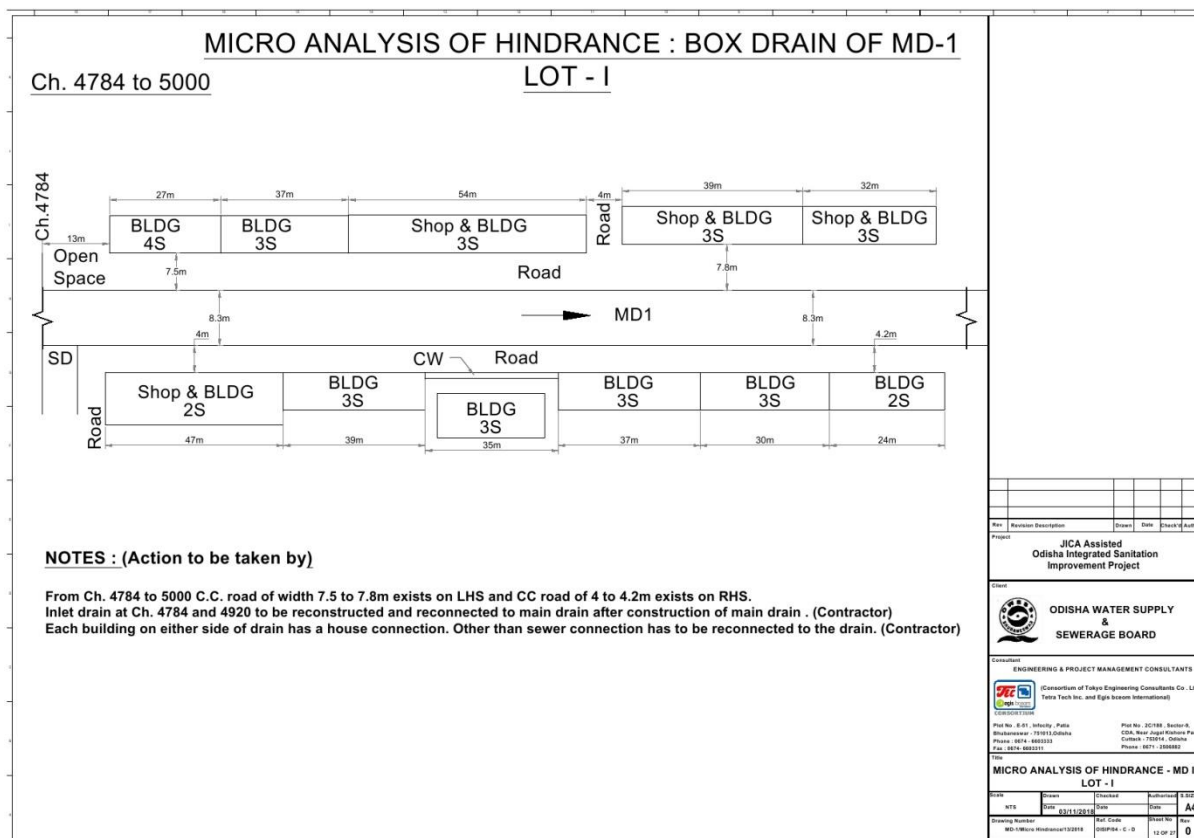


Figure 8



Ch. 4800(B.K.Canal Road)

Figure 9.

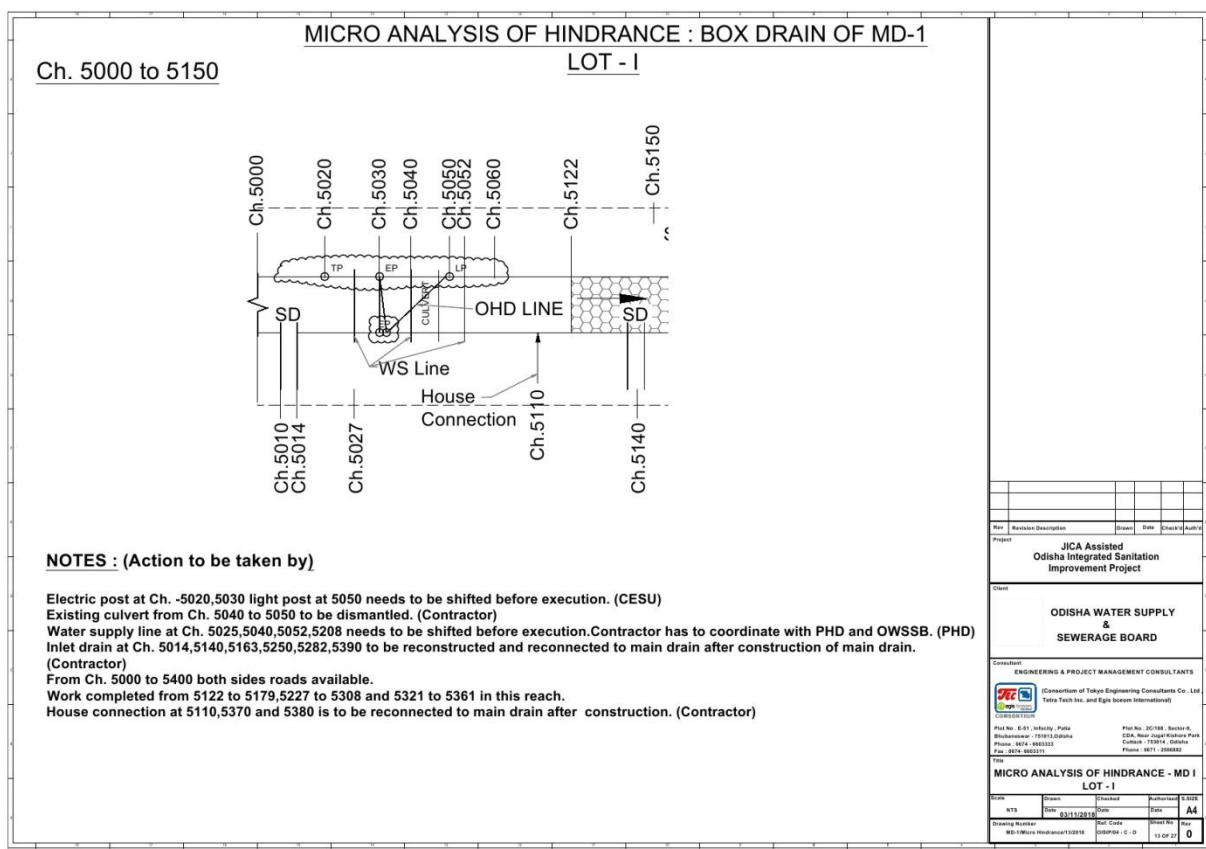


Figure 10.

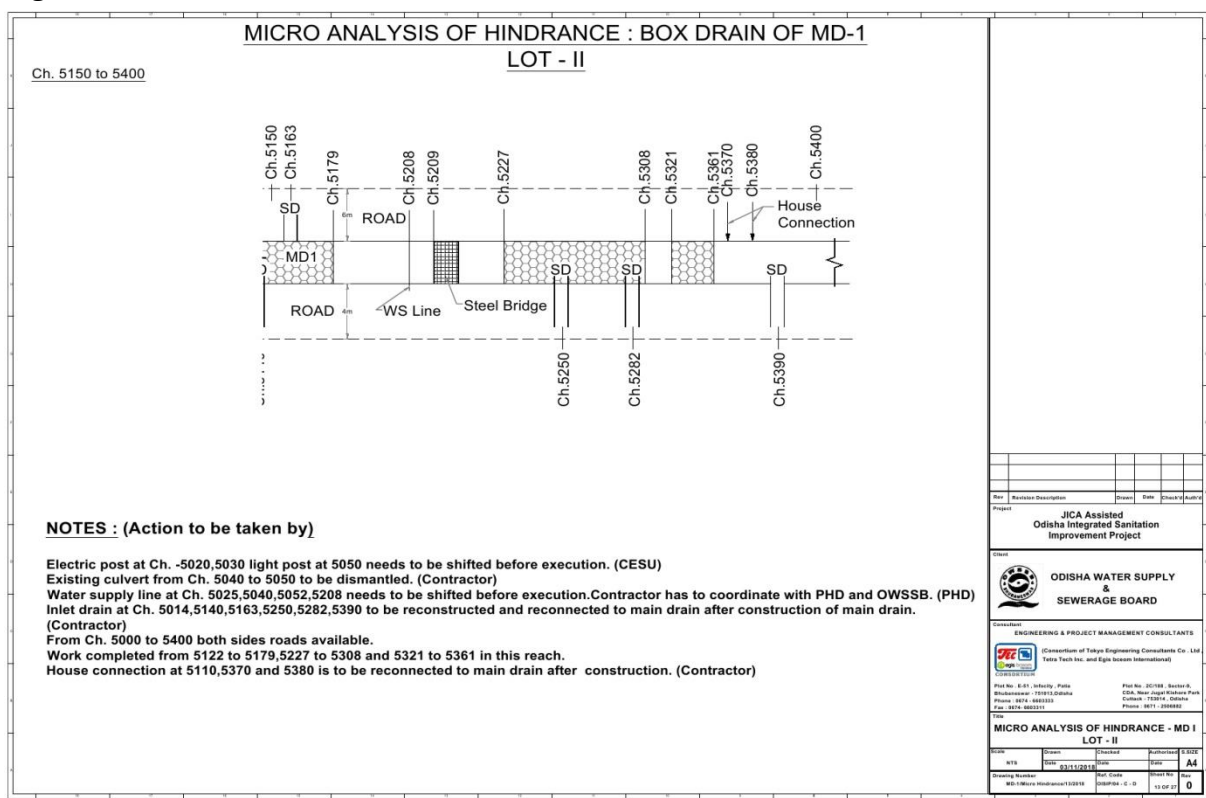
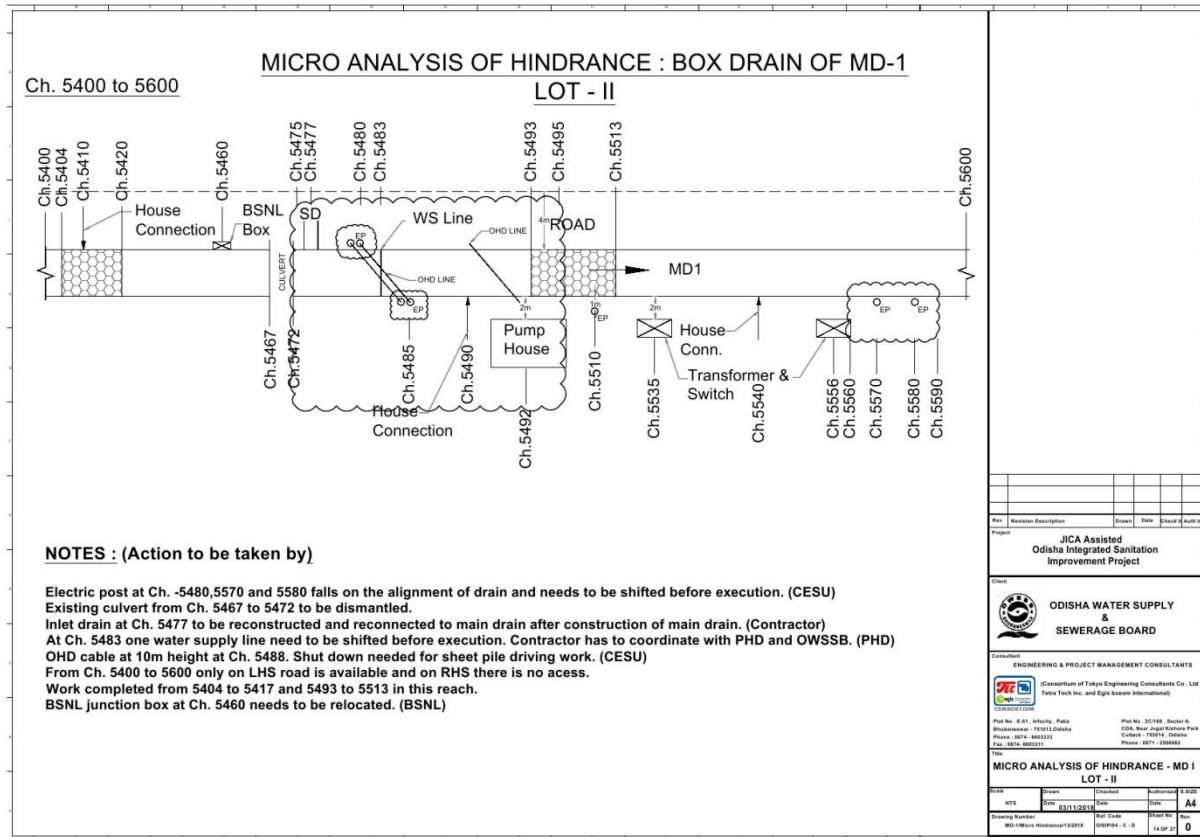


Figure 11.

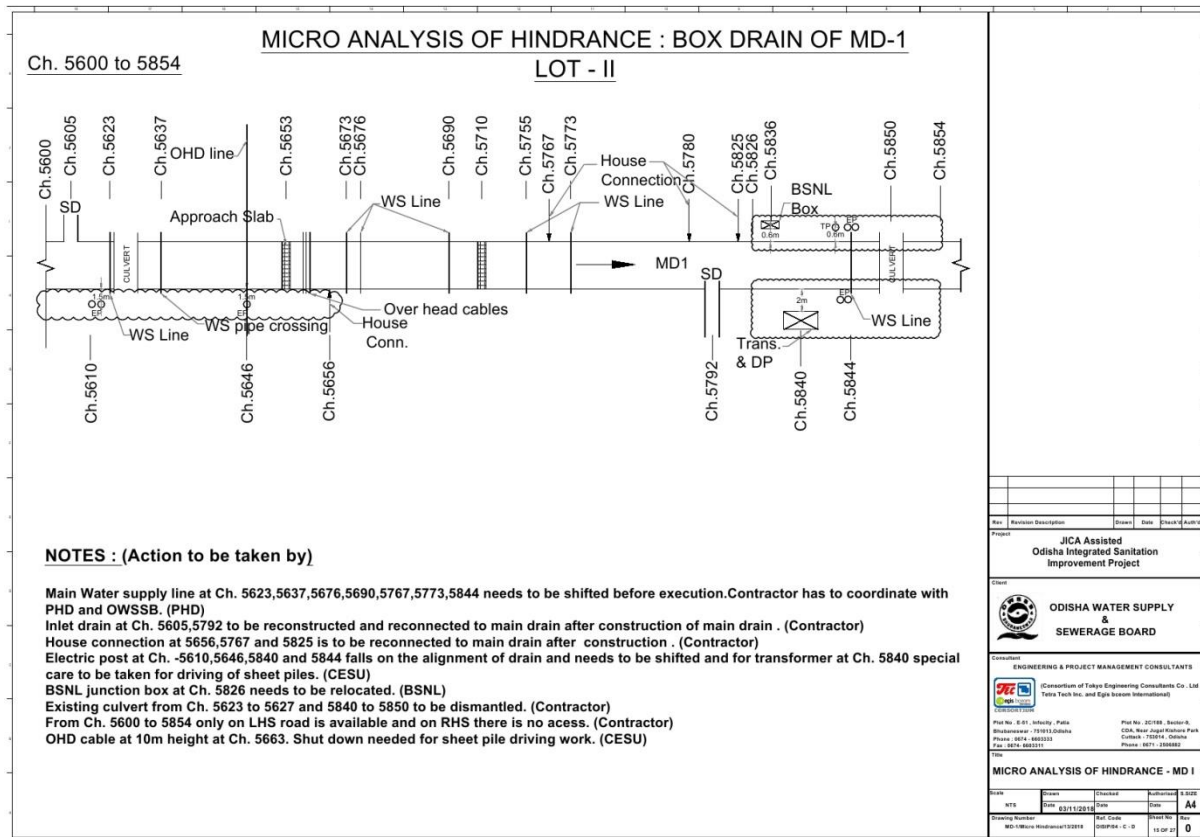


Ch. 5500(Professor pada)

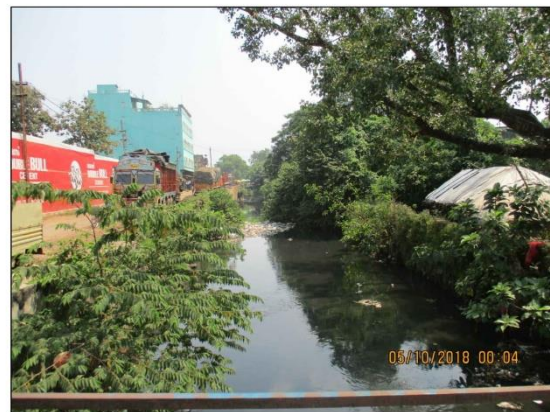


Ch. 5600(Professor pada)

Figure 12.



Ch. 5700(Professor pada)

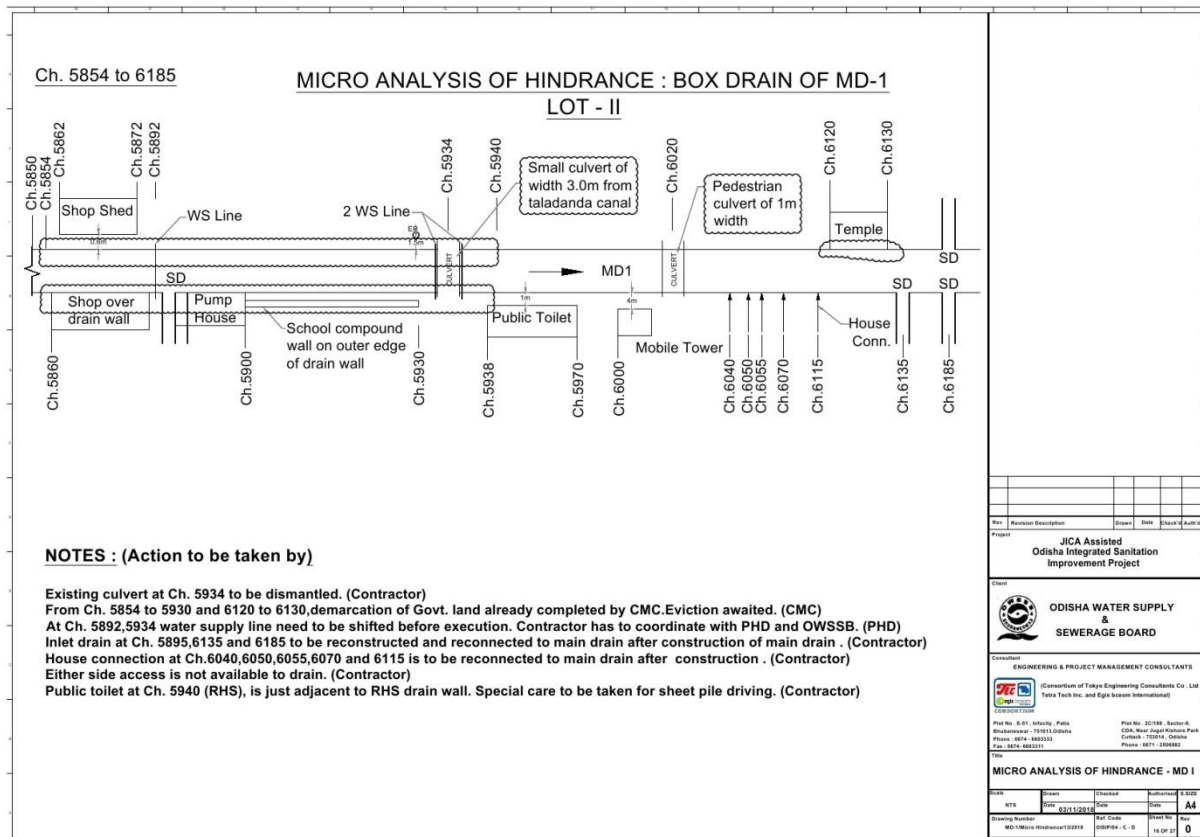


Ch. 5800(Professor pada)

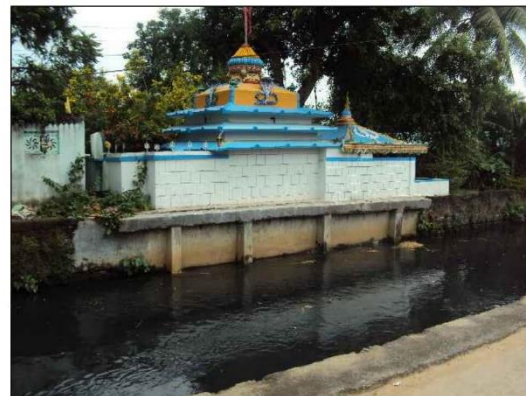


Ch. 5750(Professor pada)

Figure 13.



Ch. 5862(Chatra Bazar)

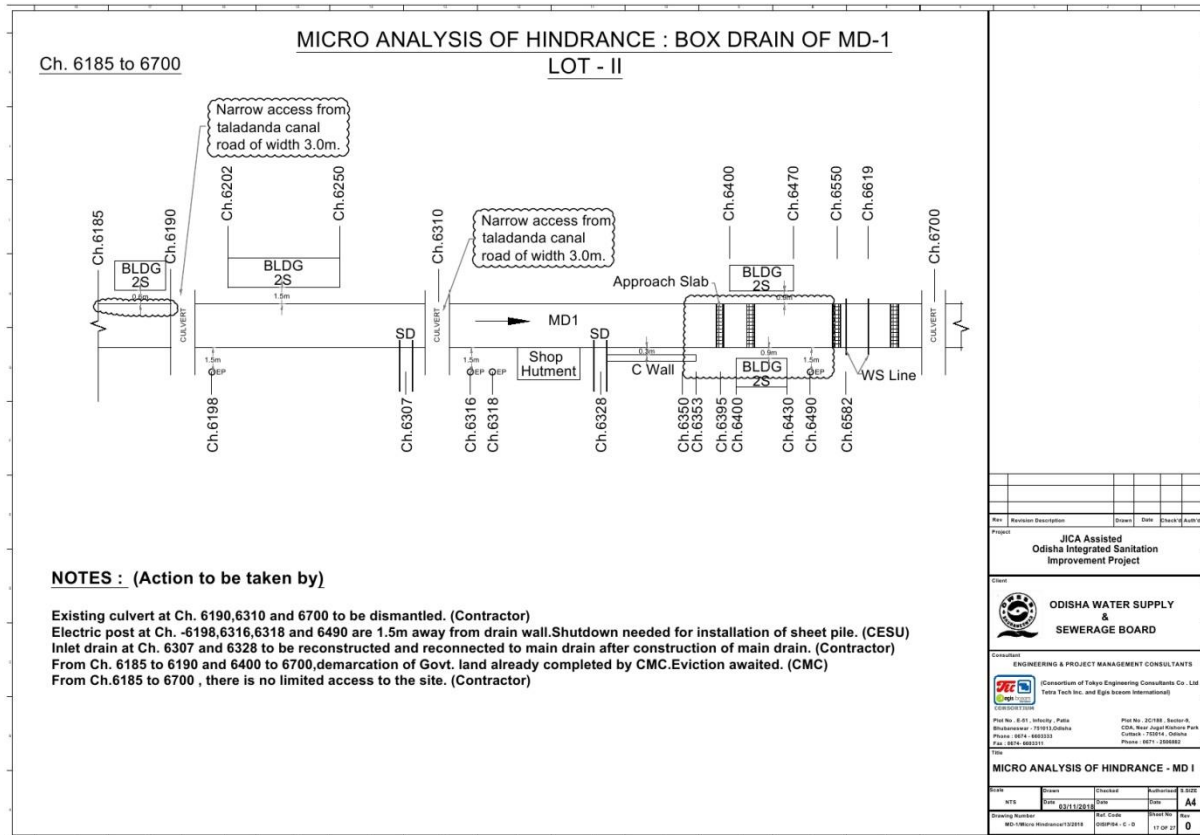


Ch. 6120(Chatra Bazar)



Ch. 6010(Chatra Bazar)

Figure 14.



Ch. 6350(Sankarpur)



Ch. 6600(Matrubhaban)



Ch. 6700(Matrubhaban)

1.6 Mode of the Contract

The project will be delivered on a Design Build basis. The Contractor is responsible for all phases of the project including but not limited to pre-Design, Design, planning and construction, Commissioning and one year of Defect Notification Period.

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.

1.7 Salient Features

The main features of this project are listed below. For details on each item consult the proper specification section:

1.7.1 Design Build mode.

The project will be delivered under a design build mode. The hydraulic design has already been done in relation to the entire 11 km length of Main Drain 1, therefore the invert elevations are fixed. A base design is furnished for reference only and Contractor shall be responsible to modify it to meet the intent of the project. Adopting the base design with no changes is not acceptable.

Pre-design data beyond that furnished in these specifications shall be obtained by the Contractor at his cost. The data furnished is for reference only and Contractor shall adopt it at his own risk. Contractor is responsible for all design, including but not limited to civil, structural and mechanical. Means and methods are the responsibility of the Contractor. The Employer shall not be under any obligation to resolve design methodology issues.

1.7.2 Box drain.

The box drain is a 3400-meter reach of the Main Drain 1. Approximately 333 meters have been completed at different location along the length of different segmental lengths, and 33 additional meters partially completed. The Contractor will complete construction work for 1850 mts under LOT-1, including partially completed works, completed drain construction segments, completion of balance activities like construction of roads, ventilation arrangement and street light, Construction of Cycle track and footpath, construction of catch water drain etc, and making through connectivity for the entire 1850mts meters by joining already constructed segments of box drain for smooth flow of storm water and movement of traffic, including design and construction of junctions for smooth movement of traffic with proper street lighting and fixing of traffic signals as and where required.

The box drain consists of two vents, roughly 4m by 4m, for ease of maintenance. Each vent will have a water tight sluice stop log system at each vent at every 750 mts for isolation during maintenance. Access is required for lowering of cleaning equipment and extraction of silt, garbage etc., during cleaning operations. Manholes shall be installed at every 10-meter interval

in staggered manner to facilitate ventilation and can be used as access during cleaning operation.

The existing drain is made mostly of Laterite stone wall and in some places earthen and cement concrete, with earthen bed. The existing walls shall be dismantled. The drain is in running conditions from so many years and it may have varying depth of silt and slushy soil. For resting foundation on firm strata, it may require soil replacement and disposal of replaced soil as specified place by the Engineer (min distance to be considered 25kms). The methodology for increasing bearing capacity of soil at bed level of drain should be submitted and got approved from Engineer before start of construction work. Construction activity has already been done in upstream, downstream and at intermediate sections also, it is necessary to maintain invert levels of drains for smooth flow of sewage/storm water and top level of drain for smooth movement of traffic .

The MD1 Box Drain at Potapole, chainage 3300 is joined by a lateral drain also constructed as box drain, for which a suitable transition is to be provided for smooth flow of discharge and movement of traffic. A sluice gate, screen and silt trap has to be provided at all branch drains including all secondary and tertiary drains with cleaning arrangement.

1.7.3 Culverts.

12 no of culverts are in the box drain alignment. These culverts has to be dismantled and will be eliminated after construction of box drain. Traffic management during construction will be critical, as roads cannot be completely blocked off. Contractor may require to provide temporary access for movement of traffic at such junctions or divert traffic with proper traffic diversion plan and its implementation by coordinating with traffic authorities. For such permissions, liasioning has to be done by the Contractor and Contractor is expected to minimize the work duration by detailed planning, accurate logistics and securing all resources are in place before starting the work. The list and location of culverts can be found below.

Table 1. List of Culverts

Existing Culverts and their Top Levels under LOT-1			
SL No	Location	Chainage	Existing Top RL
1	Potapole	3300	22.360
2	Barapathar	3415	23.035
3	Meriabazar	3800	21.880
4	Roouspatna	4010	21.660
5	Gamadia	4330	22.050
6	Bajrakabati	5025	23.675
Existing Culverts and their Top Levels under LOT-2			
1	Proffessorpada	5475	22.665
2	Proffessorpada	5586	22.555
3	Chhatrabazar	5850	23.070
4	Shankarpur Canal Road	6174	21.855
5	Shankarpur Canal Road	6284	21.750
6	Bisinabar	6700	22.190

1.7.4 Junctions of Lateral Drains.

There are 53 nos. junctions of lateral drains. The lateral drains are to be connected in a manner consistent with the specifications. A list of lateral junctions is shown below.

Table 2. List of lateral drain junctions

Junction of Lateral Drains and other Inlets with the Box Drain (Main Drain 1)-LOT-1							
Sl. No.	Chainage (m)	Lateral Drain Inlet / Lateral other type of Inlets				Proposed Main Drain	
		Width (m)	Invert Level (m)	Drain Top (m)	Depth	Invert Level (m)	Drain Top (m)
1	3400.00	0.400	20.520	20.920	0.400	18.581	22.126
2	3411.22	0.539	20.429	22.709	2.280	18.576	22.122
3	3450.00	1.583	20.251	21.786	1.535	18.556	22.108
4	3455.00	1.500	20.251	21.786	1.535	18.551	22.105
5	3500.00	0.304	20.679	21.623	0.944	18.532	22.091
6	3570.00	0.200	20.685	20.885	0.200	18.497	22.067
7	3580.00	0.200	20.696	20.896	0.200	18.492	22.063
8	3625.00	0.417	20.701	21.501	0.800	18.472	22.050
9	3635.00	0.400	20.700	21.650	0.950	18.463	22.043
10	3687.72	0.271	20.699	21.839	1.140	18.443	22.029
11	3775.00	0.546	20.136	21.533	1.397	18.399	21.998
12	3790.00	1.250	20.120	21.855	1.735	18.389	21.991
13	3800.00	0.900	19.946	22.190	2.244	18.384	21.988
14	3800.00	0.600	20.196	21.316	1.120	18.384	21.988
15	3830.00	0.300	20.350	20.650	0.300	18.369	21.977
16	3850.00	0.300	20.490	20.790	0.300	18.359	21.970
17	3850.00	0.548	20.681	21.147	0.466	18.359	21.970
18	4000.00	0.677	20.280	21.256	0.976	18.285	21.919
19	4040.00	5.300	19.940	21.905	1.965	18.276	21.905
20	4162.86	0.487	20.552	21.362	0.810	18.207	21.863
21	4175.00	0.825	21.520	21.787	0.267	18.202	21.860
22	4210.95	0.300	20.299	20.586	0.287	18.182	21.846
23	4220.80	0.302	20.361	20.703	0.342	18.177	21.843
24	4325.00	0.982	20.585	21.612	1.027	18.125	22.090
25	4325.00	0.900	20.251	21.509	1.258	18.125	22.090
26	4350.00	0.384	20.215	20.441	0.226	18.113	21.798
27	4411.62	0.450	20.382	22.369	1.987	18.084	21.777
28	4470.20	0.326	20.332	20.840	0.508	18.054	21.756
29	4475.00	1.010	20.392	22.553	2.161	18.049	21.753
30	4550.00	0.450	20.760	21.362	0.602	18.015	21.729
31	4560.00	0.400	20.682	21.295	0.613	18.010	21.725

Junction of Lateral Drains and other Inlets with the Box Drain (Main Drain 1)-LOT-1							
Sl. No.	Chainage (m)	Lateral Drain Inlet / Lateral other type of Inlets				Proposed Main Drain	
		Width (m)	Invert Level (m)	Drain Top (m)	Depth	Invert Level (m)	Drain Top (m)
32	4590.00	0.300	20.540	20.570	0.030	17.995	21.715
33	4650.00	0.300	20.220	20.520	0.300	17.965	21.746
34	4750.00	2.061	19.571	21.987	2.416	17.916	21.816
35	5000.00	4.721	19.828	23.788	3.960	17.793	21.990
36	5010.00	0.200	19.963	20.163	0.200	17.788	21.997
37	5050.00	0.202	19.983	20.183	0.200	17.769	22.025
38	5050.00	1.250	22.009	22.719	0.710	17.769	22.025
39	5075.00	0.400	21.225	22.944	1.719	17.759	22.039
Junction of Lateral Drains and other Inlets with the Box Drain (Main Drain 1)-LOT-2							
1	5158.66	0.624	19.548	21.709	2.161	17.714	22.101
2	5200.00	2.530	20.042	21.805	1.763	17.695	22.129
3	5250.00	0.500	19.807	21.626	1.819	17.670	22.111
4	5282.00	0.619	20.489	21.329	0.840	17.655	22.099
5	5390.00	0.581	20.186	21.735	1.549	17.601	22.059
6	5477.00	1.200	20.129	21.840	1.711	17.557	22.025
7	5600.00	0.600	20.042	23.058	3.016	17.498	22.618
8	5675.00	3.559	20.065	22.084	2.019	17.458	22.618
9	5850.00	1.096	21.300	22.935	1.635	17.385	22.818
10	5900.00	0.266	20.762	20.962	0.200	17.365	23.018
11	6135.00	0.266	20.379	20.748	0.369	17.272	21.757
12	6185.00	0.245	20.632	21.448	0.816	17.256	21.718
13	6307.00	1.500	19.968	20.754	0.786	17.205	21.592
14	6328.00	0.485	20.014	21.213	1.199	17.197	21.572

1.7.5 Junction of Existing Sluice Gate Inlets.

There are five locations where secondary drains meet the Main Drain 1 that shall be connected to the box drain by making small portion of branch drain to box drain. The Contractor is responsible for dismantling the existing sluice gate, civil construction required for fixing of sluice gates and mechanical components inclusive, and replace with a brand-new sluice gate.; the locations are given in the table below.

Table 3. List of sluice gates

Junction of Sluice Gate with Box Drain (Main Drain 1) LOT-1								
Sl. No.	Chainage (m)	Existing Sluice Gated Inlets			HGL of Main Drain (m)	Proposed R.L. Top of Sluice Gate (m)	Sluice Gate Size	
		Width (m)	R.L. of Invert Level (m)	R.L. of Drain Top (m)			Height	Width
1	4325.00	0.631	20.307	22.308	21.180	22.308	2.001	0.631
2	4411.62	0.450	20.382	22.369	21.165	22.369	1.987	0.450
3	4475.00	1.010	20.392	22.553	21.150	22.553	2.161	1.010
4	4550.00	0.782	20.581	22.510	21.140	22.510	1.929	0.782
Junction of Sluice Gate with Box Drain (Main Drain 1) LOT-2								
5	5200.00	2.530	20.042	21.805	20.950	21.939	1.763	2.530

1.7.6 Approach foot bridges.

All foot bridges shall be dismantled during construction and temporary access to those served by the foot bridge shall be provided by the Contractor at no extra cost to the project.

1.7.7 Silt Trap and Bar screens.

Silt traps has to be constructed at upstream side of branch drain with fixing of bar screens at every junction of secondary or tertiary drains to the box drain with all necessary civil construction works required for fixing bar screen, with cleaning arrangement of silt trap and bar screen as per relevant IS code.

1.7.8 Maintenance access.

The box drain consists of two vents, roughly 4m by 4m. for ease of maintenance. Each vent will have a water tight sluice stop log system at each vent at every 750 mts for isolation during maintenance. Access is required for lowering of cleaning equipment and extraction of silt, garbage etc. during cleaning operations. The box drain will be cleaned periodically by mechanical means. Removable access ports shall be designed at every 750 m intervals to allow for ingress and egress of machinery and equipment.

Ventilation ports shall be provided at every 20mts on both side of drain in the form of manway ports constructed in proximity to the side wall to allow long-term, continuous ventilation.

Manholes with removable covers has to provide at every 10mts in staggered manner (without disrupting movement of traffic) for extraction of mud, silt, trash.

A separate report on the intended maintenance strategy and the use of the design features is to be prepared and got approved separately before completion commissioning and start of Defect Notification Period.

1.7.9 Roads and drains.

The road design will take into consideration the plinth elevation of the structures along the road. Conflicts with these structures are to be highlighted and specific solutions has to be provided to avoid inundation of the houses by road run-off.

The top of box drains and adjacent roads will be converted to a concrete road with Bituminous Top, with footpaths, rain inlets and Catch water drains on both sides with provision of entry of storm water to main drain with fixing of CI/SS 304 grating at each entry point to Main Drain.

The access points on Main Drain will include openings at strategic locations for ingress and egress of mini front loaders, extraction of materials and ventilation. Additionally, the road will feature tabletop whose function is to house the water lines that cross the drain. Coordination will be required with the utility departments during design.

Street light arrangements shall be done as per technical specifications and relevant IS Code.

1.7.10 Utility relocation.

The project will require permanent or temporary relocation of utilities and services including but not limited to electricity, telephone, water, sewer, cables of other services, etc. and drains.

Relocation of utilities for construction purposes is the responsibility of the Contractor, who must program the work with enough advance notice to allow the government department or utility company enough time to respond. Liasioning for such issues shall be done by the Contractor and Employer will provide necessary request letters to concern authority. Any shifting charges, fees etc. required by concern department shall be deposited by the by the Employer.

Any damages occurred during shifting of utilities will be responsibility of Contractor and should be rectified with no extra cost to the Employer.

The work program specification establishes parameters regarding the orderly programming of utility relocations.

1.7.11 Water mains crossing drain.

There is no room in the drain freeboard to place the water lines under the top slab thus they will remain over the surface of the top slab, inside a casing, protected by a reinforced concrete hump, designed for traffic loads and smooth movement of traffic. Contractor is to design these humps only after consultation with the Public Health Department and the Engineer, to address their present needs and for future plans.

1.7.12 Water diversion and Dewatering

The drain is designed to handle storm flows; however, the drain carries upto 45 MLD of sewage on a daily average basis. During the peak periods this flow can increase to 100 MLD for short periods. The discharge figures given here is indicative only, it is Contractors responsibility to reconfirm discharge characteristics while make arrangements for water diversion system. Contractor will have to develop a solution or mix of solutions to address any and all discharge

conditions in the drain. Under no circumstance's sewage overflows caused by Contractor's operations will be permitted. Dewatering means lowering of water level by pumping in construction zone and keep surrounding area dry for construction activity. The cost of water diversion and dewatering shall be included in the lump sum price. No separate payment will be made for these activities. Contractor has to include all cost related to this operation in his bid price, including but not limited to any ancillary civil, mechanical or electrical work done; permits, fees, licenses, installation cost by third parties, and all other cost associated with this activity.

1.7.13 Shoring

The nature of soils and depth of excavation will decide the type and arrangement and methodology for shoring shuttering to be used. Soil investigation data given is indicative only and it will be only Contractor's responsibility to get soil investigation data by his own resources before finalizing the type and methodology of shuttering and shoring to be used at particular reach. Contractor shall be responsible to develop a shuttering shoring method such that it will not effect the safety and stability of adjacent, surrounding and nearby structures. Contractor is advised that the responsibility for prevention, avoidance and mitigation of structural damages is his only. The Employer is to be indemnified and held harmless in accordance with the General Conditions.

1.7.14 Traffic Control requirements

The work shall be carried out in a manner that causes least interruption to the traffic. The road/street may be closed only after obtaining necessary permissions from relevant authorities such as Police, Local Urban Body etc. Where it is necessary suitable foot crossings shall be provided to cross open trenches. Necessary traffic de-touring, safety signs shall be used for safe and smooth traffic movement.

The Contractor shall provide efficient lighting and safety signs on temporary roads during construction and shall adopt and implement adequate traffic regulation.

The Contractor shall take effective safety and warning measures to reduce accidents and provide suitable temporary crossings to facilitate normal life and business.

1.7.15 Safety Measures

Contractor shall implement and enforce national safety standards in the work site. The public is to positively be isolated from the work site and equipment maneuvering areas by physical barriers as detailed in the specifications. Bamboo stakes, rails or safety tape will not be acceptable. Contractor's employees and all subcontractors are to be trained in safety and provided Personal Protection Equipment. The Contractor shall not allow any worker (his or his subcontractors' employees) to be in the work area without PPE.

Safety training is to be coordinated with the Engineer and properly documented. Daily review of potential safety issues in each work site is mandatory. Accident information is expected to be shared with the Engineer immediately upon learning about it. Near-accidents and first aid incidents are to be documented and provided to the Engineer.

1.7.16 Coordination with other contractors and battery limits

Contractor shall coordinate work with other contractors working in the area. They include contractors installing sewer lines in Cuttack, relocating or installing water lines on behalf of PHEO; and contractors working on the open drain. Facilitation of mutual work is expected from all contractors.

1.7.17 Testing and Commissioning

Contractor shall clean the drains and provide CCTV documentation of the final state of the drain. Sluice gates and other mechanical elements shall be tested for proper functioning. As-Built drawings and O&M Manuals shall be provided and got approved before Taking Over Certificate is issued.

1.7.18 Work plan requirements

The Contractor will prepare a general project plan at the onset of the project. The plan will list the initial sequence of work, duration of intended activities, list of resources and expected monthly billing. Upon commencement of work, the Contractor will prepare a three-month microplanning schedule, which will be updated every month. This document will be the basis for Engineer's authorization of new work fronts.

1.7.19 Design Documents

The Contractor shall carry out the Design in accordance with GC 5 [Design], with meeting all requirements stipulated in the Employer's Requirements of Section VI. The base design provided with the tender documents is for illustration purposes only. The Contractor is to submit his own design if his intended product varies in materials, products or methodology. Design of the preparatory activities of shoring and water diversion must be submitted to the Engineer for approval.

Approval by Engineer of Contractor Drawings and design shall not relieve the Contractor of his responsibilities under the Contract. The Engineer will not permit construction to start on a part or section of the Works unless Construction Documents for that part or section have been approved.

1.7.20 Quality Control / Quality Assurance

In accordance with the Conditions of Contract, the Contractor shall apply the formal requirements of Quality Control/Quality Assurance to the design, supply, construction and maintenance of the requirements of BS: 5750 or an equivalent International Standard. Positive commitment to Quality Control/Quality Assurance shall be expressed in a formal policy statement given in the Contractor's Quality Manual.

Table 4.1 - Scheme of Box Drain Works: Lot No.1 - Chainage from 3300 to 5150

Summary of Site Conditions						Schematic Map				Box Drain Work				Sheet Piling							
Chainage (Ch.)			Site Conditions			Remarks	Box Drain				Executed	Partially Completed		To be Completed	Driven		To be Driven				
from	to	length	Length				Property	Sheet Pile	Box Drain	Sheet Pile		Property	1st Lift Wall complete		2nd Lift Wall completed	Left side	Right side	Left side		Right side	
			A	B	C												w/Lifting	Parmanet	w/Lifting	Parmanet	
3300	3315	15				Road crossing at Ch 3300 to 3310								15				15		15	
3315	3327	12				BD Width 2@2750								12	12	12					
3327	3345	18										18			18						
3345	3376	31			100							31			31						
3376	3378	2											2	2	2					Not Required	
3378	3384	6											6	6	6						
3384	3388	4											4	4	4						
3388	3390	2											2	2	2						
3390	3400	10											10	10	10			10		10	
3400	3457	57				Road crossing at Ch 3407 to 3415								57			57			57	
3457	3570	113												113			113			113	
3570	3750	180				BD Width 2@3000								180			180			180	
3750	3800	50				Road crossing at Ch 3800								50			50			50	
3800	3925	125		930										125			125			125	
3925	3975	50				BD Width 2@3250								50			50			50	
3975	4010	35				BD Width 2@3500								35			35			35	
4010	4041	31				Road crossing at Ch 4010								31			31	31			
4041	4043	2											2	2	2		2				
4043	4045	2																			
4045	4108	63										63									
4108	4110	2											2	2	2					Not Required	
4110	4112	2																			
4112	4114	2																			
4114	4116	2																			
4116	4125	9				BD Width 2@3750								9	9	9					
4125	4162	37												37	37	37					
4162	4168	6												6	6						
4168	4175	7																			
4175	4330	155												155			155			155	
4330	4422	92				Road crossing at Ch 4320 to 4330								92			92			92	
4422	4463	41												41	41				41		
4463	4465	2												2	2		2				
4465	4469	4																			
4469	4476	7																			
4476	4478	2																			
4478	4497	19												19	19				19		
4497	4530	33												33			33			33	
4530	5045	515		820										515			515			515	
5045	5110	65				Road crossing at Ch 5045								65			65			65	
5110	5114	4												4	4	4				4	
5114	5122	8												8	8						
5122	5150	28										28									
Total		1,850	820	930	100							146	2	8	1,704 **	208	83	1,323	220	983	636
Total (by Executed, and To be Executed)												146	Partially Compt'ed: 10		1,704 **	291		w/Lifting		2,306	
Combined Total												1,850				3,453				856	

Construction Conditions

A Roads on both sides of the drain and the Properties are about 6 meters from the drain wall.

B One side of the drain has an access road and the other is adjacent to the Properties.

C The drain wall is within one meter of the Properties

Legend:

Properties (House, Boundary wall, etc)

Sheet Piles Driven

Box Drain - Completed

Box Drain - To Be Completed (Pending Works)

Box Drain - To Be Completed

Note:

1 References:

* Box Drain to be completed (Partially Completed portion.)

** Box Drain to be completed (including Partially Completed portion).

2 Lengths are approxmetly at present. Final length will be determinrd by the design with consideration of site conditons

Chapter-2: SITE REQUIREMENTS

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2. SITE REQUIREMENTS

2.1 Space for Contractor

Contractor to build a Temporary Site Office / Camp office and for construction of a godown for storing some Construction Material prior to physical start of work.

2.2 Maintenance of the Site

The Contractor shall maintain the site equipment and related services until expiry of the Contract period or aforementioned facilities are to be maintained until the instruction of the Engineer.

2.3 Project office

The Contractor shall provide a suitable Project Site Office of 90 Square meter area for his own staff, records etc as per his requirement. In addition, the Contractor shall provide fully furnished Site Office for the sole use of Engineer and Project Management Consultancy, PMC Staff during construction and shall have Engineering Room and Conference Room with Air Conditioner and attached Toilet, Office, Computer Room, Record Room, Toilet with Wash Basin and Pantry as per approved Drawing by the Engineer. The contractor shall be responsible for maintenance of office, provide office stationery maintenance of printers including providing ink and papers for printers as and when required.

The equipment, furniture and furnishings shall include:

1. Once conference table 10'-0" x 5'-0" with 12 chairs
2. 6 Nos of 5' x 3' table with (3 on both side) & (3 on one side) drawers
3. 2 Nos of 3' x 2' table with single side three drawers
4. 2 Nos of steel cupboards (Storewell type or approved equipment)
5. One No. Drawing Cabinet, 3 Nos. of 6 Drawers filing cabinet
6. Computer and chair – 3 Nos
7. Chair – 8 Nos
8. One No. pantry table with 3 Nos Drawers.

The Contractor shall furnish the rooms as per Engineer's requirement and the equipment, furniture, furnishings and fittings to be supplied shall be new items and also of approved make.

2.4 Office Equipment:

The Contractor shall provide 3 Nos Laptops with 8 GB RAM, I-5 Processor and 1 TB Hard Disk. Along with 2 Nos laser jet MFP M436 SERIES Printers for One for A4 & Other for A4 & A3. Along with 5 Nos of Smart Phones of reputed Brand as decided by the Engineer.

The Contractor shall provide for Engineer and his Staff, Consultants and their Staff protective Clothing, Safety Helmets, Gas Mask, Safety Boots and like as may be reasonably required by them.

The Contractor shall also provide:

1. Water Cooler with Dispenser,
2. Coffee / Tea Dispenser,
3. 200 Ltr Refrigerator,
4. Dining Set for 4 Persons,
5. Tea Set for 10 Persons,
6. Water Glasses 20 Pcs,
7. Gas Stove with Cylinder,
8. Helmets 10 Nos,
9. Inverter 1 No,
10. 5 No Portable Fire Extinguisher of 4.5 Kg of Reputed Make.

2.5 Vehicles:

The Contractor shall provide 1 Nos New Vehicle. The Vehicles shall be kept at all the times for duration of construction and Operation & Maintenance. The Contractor shall submit for approval the detail of Vehicles proposed. Contractor shall be solely responsible for running and maintenance of the Vehicles including Taxes, Insurances, Licenses, Fuel, Oil and Lubricants, Repair and Maintenance. Also provide competent Driver for Running of Vehicle as required by the Engineer. The Contractor shall provide at his own cost survey Equipment, measuring Instruments of approved make of every kind necessary for execution of work including total station survey unit as approved by the Engineer.

The Contractor shall be solely responsible for all such instruments, equipment IT Equipments and shall ensure that they are all the good repair and adjustment and shall make good any loss or damage howsoever caused.

2.6 Space for Contractor:

Employer will allocate space to the contractor to build a site office, construction of godown and setting up of plant if available on lease for construction period and any lease fee or any other charges levied by government shall be borne by the contractor, and shall have to hand over the space in original condition to allotter, otherwise the contractor has to arrange above facilities on rent in Cuttack and nearest possible to site only.

2.7 Areas outside the Site

In the event of the Contractor making use of any special or temporary wayleave or accommodation acquired by him or any pit for the disposal of surplus materials, or any borrow pit or quarry, he shall obtain the written consent of the owner, occupier or authority having charge of the land in which such way leave, accommodation or pit is situated, and shall make a record, agreed by the owner, occupier or authority as aforesaid, of the condition of the surface of that land before entering thereon.

The Contractor shall permit the Employer and the Engineer and any person authorized by the Employer, access for the purposes of the Contract to any such special or temporary way leave or additional accommodation.

In the event of the Contractor making use of any special or temporary way leave or additional accommodation made available to him by the Employer for the purpose of the Contract, the land in which such way leave or accommodation is situated shall be deemed to be part of the Site. On Completion of the work at site, the Contractor shall reinstate the area to its original condition to the requirement of the Engineer.

For the purposes of this clause, 'accommodation' shall be deemed to include housing, Offices, workshops, warehouses and storage areas.

2.8 Maintenance of Temporary Access Roads

The Contractor shall prepare and maintain temporary access roads. The Contractor shall be solely responsible for the maintenance of the existing site access roads. This responsibility shall continue until the completion of the Defects Notification Period, or until such earlier date as the Engineer may advise the Contractor in writing. Such maintenance work shall include general upkeep and any necessary repairs to damaged road surfaces, pavement, drainage, associated slopes, etc to a standard at least equal to their original condition. While carrying out such maintenance work, the Contractor shall make arrangements to maintain through passage for the Employer and Engineer vehicles and also those of other contractors over these access roads, which may comprise temporary diversions all to the approval and requirement of the Engineer.

2.9 Clearance of the Site

The Contractor shall clear the Site to the extent required by the Engineer for checking the setting-out.

Clearance of the Site shall also include demolition and removal of all articles, objects and obstructions which are expressly required to be cleared.

The Contractor shall ensure that the parts of the Site to be occupied by the proposed Permanent Works are clear, and shall maintain the remainder of the Site as may be required for access and temporary works areas required for rehabilitation of the existing works.

The Contractor shall remove the material arising from such clearance and dispose of it in a manner and at a location, to the approval of the Engineer.

The Contractor shall fill and make good with appropriate materials those cavities and losses of soil which result from clearing the parts of the Site not subsequently to be occupied by the Works.

The Contractor shall not clear the Site of any existing structure without the prior written instruction of the Engineer.

2.10 Clearance and Reinstatement of the Site on Completion

On completion of the Works, the Contractor shall clear any temporary works areas and temporary access roads and reinstate the areas to their original condition and to the requirement of the Engineer.

2.11 Access for the Employer and Engineer

The Contractor shall permit the Employer and the Engineer and any person authorized by the Employer or the Engineer including workmen of the Employer, other contractors or utility undertakings access for the purposes of the Contract to all areas of the Site and to any additional accommodation or temporary way leave for the duration of the Contract period.

2.12 Water Supply at Site

The Contractor shall make his own arrangements for water supply during construction at each site and he shall ensure the quality of the water remains suitable for the purpose for which it is intended. The Contractor shall also conduct weekly/bi-weekly test for water quality and comply with the quality requirements, as directed by the Engineer.

2.13 Latrines, Washing Facilities and Wastewater Disposal at Site

Throughout the period of construction of the Works the Contractor shall provide, maintain and cleanse suitable and sufficient latrines and washing facilities for use by his employees. He shall ensure that his employees do not foul the Site but make proper use of the latrines. Where practicable, the latrines shall be connected to the nearest sewer, or if this is not practical the Contractor shall provide an adequately sized septic tank and soak-pit.

The Contractor shall also provide separate latrines to the above requirements for the entire Engineer's staff.

After completion, the latrines and washing facilities shall be removed, all ground disinfected and the surface reinstated to the requirement of the Engineer.

2.14 Electricity for Contractor's Use on Site

The Contractor shall be responsible for provision and distribution of an electrical supply for the purpose of constructing the Works.

The installation shall comply with all the relevant regulations, Indian Standards and Codes of Practice, and Health and Safety requirements, etc. The Contractor must take every possible precaution to ensure that his installation is safe and injury to personnel or damage to plant and buildings is avoided. The Contractor shall be fully responsible for all safety aspects.

The Contractor shall test the temporary site distribution system every 3 months for compliance with the relevant standards.

2.15 Camp Facilities

The Contractor shall construct and maintain to the Engineer's requirement a camp to provide living accommodation for all Contractor staff and operatives who have no other local accommodation. The Contractor's camp shall be located close to but not on the Site itself and at a location approved by the Engineer.

Responsibility for providing all services to the living quarters and compliance with all sanitary laws and other laws and regulations shall be borne by the Contractor. Security and the fencing of these areas shall be the responsibility of the Contractor.

2.16 Compressed Air Use on Site

The Contractor shall provide the necessary compressed air plant and equipment required for construction of the Works.

Electrically driven compressors connected to the site electricity supply shall not be used. Diesel engine driven compressors shall not be sited within buildings or in a location that may cause a health hazard to personnel owing to exhaust fumes or noise.

2.17 Refuse Disposal on Site

Refuse and rubbish of every kind shall be removed from the Site and disposed off by the Contractor at his own expense, frequently and regularly so as to keep the Site in an approved wholesome, hygienic and tidy condition to the requirement of the Engineer.

2.18 Safety and Security on Site

2.18.1 General

The Contractor shall at all times maintain a safe system of working and working environment and shall comply with all enactments, regulations and working rules relating to safety, security, health and welfare of all persons who may be affected by his work.

In particular, he shall ensure that only persons who are properly trained for their duties are employed, and that the correct tools and procedures are used.

Nothing which has been written into or omitted from this Employer's Requirements shall be taken to relieve the Contractor from his obligations under this clause. No clause in this Employer's Requirements shall prevent the Contractor from drawing the attention of the Engineer to any feature of the Works which is not consistent with normal safety practices

nor prevent him from putting forward proposals at any time which would increase the safety of the installations.

Not later than four weeks before work commences on the Site, the Contractor shall submit to the Engineer his comprehensive proposals relating to the safety, health and welfare of all his personnel on the Site.

The Contractor shall appoint a suitably qualified representative as Safety Officer who shall be responsible for the implementation of site procedures which shall include but not be limited to:

1. Safety;
2. Working in hazardous areas;
3. Permit to work;
4. Fire and smoking regulations
5. First aid;
6. Warning signs;
7. Trenching scaffolding and other construction structures;
8. Safety barriers;
9. Protective clothing and equipment;
10. Safety training;
11. Safety meetings and inspections;
12. Health and welfare.

The proposals shall be appropriate for all grades of labour and personnel who will work on or visit the Site on behalf of the Employer, Engineer or Contractor. The Engineer shall have the power to stop any activity or work in any area where there is a breach of the published site safety rules such that health or life is put at risk. The Contractor shall ensure that all other contractors working on the Site are not working in an unsafe manner so as to endanger themselves, the Contractors personnel, other personnel or the Plant and pumping stations. The Contractor shall bring any violation of Site safety rules by others to the attention of the Engineer in writing.

2.18.2 First Aid and Life-saving Apparatus on Site

The Contractor shall provide on the Site such life-saving apparatus as may be appropriate and an adequate and easily accessible first aid outfit or such outfits as may be required by any government ordinances, factories acts, etc, published and subsequently amended from time to time. These outfits shall be suitably labelled for identification. In addition, an adequate number of persons permanently on the Site shall be instructed in their use, and the persons so designated shall be made known to all employees by the posting of their names and designations in a prominent position on Site.

2.18.3 Electrical Safety on Site (by electrical person)

The Contractor shall be responsible for the electrical safety of all Plant and pumping station supplied and installed materials and equipment. Whilst any equipment is being installed or tested, the Contractor shall ensure that all necessary precautions are taken to safeguard personnel working on site. If necessary, this shall include fencing off areas which are considered to pose a risk, and erecting warning notices.

The Contractor shall be responsible for ensuring that the electrical installation is carried out by suitably trained competent personnel and that the work is carried out in a safe manner.

The Contractor shall be responsible for the operation on the Site of a permit to work system during the period of electrical equipment installation and testing. This system shall regulate the installation, the energization and the use of electrical equipment installed and the method of work adopted.

2.18.4 Noise

The Contractor shall minimize noise on site to the extent practical. Operations entailed in the construction of the Works shall be limited only to operation of machinery within the working hours approved for weekdays, weekends and holidays. The noise level shall not exceed the limits prescribed by the governing regulatory authorities for daily construction activities.

2.18.5 Warning and Safety Signs

During construction of the Works, statutory safety signs shall be adequately provided throughout the Works, both indoors and outdoors. These safety signs shall cover mandatory, prohibition, warning, emergency, fire-fighting and general notices. All signs shall be positioned around the Works at highly visible points with fluorescent colours where necessary. Provision of signs, and the positions of signs shall be subject to the Engineers approval. Special attention shall be given to areas designated hazardous. Warning signs shall be in Odia, Hindi and English.

2.18.6 Site Working Hours

The Contractor shall have working hours 24 x 7 and work shall be executed in three shifts round the clock.

2.18.7 Delivery to Site

The Contractor shall be responsible for the transporting, handling and bringing to site of all the materials and equipment etc. as required and directed by Engineer.

2.18.8 Protection from Weather and Storage

An area and/or building on the Site for use by the Contractor for storage of cement, steel etc. and equipment prior to erection will be subject to the approval of the Engineer.

2.19 Survey Details and Benchmarks

The existing ground levels and the reference benchmarks shown on the Drawings (attached). However, contractor shall conduct his own topographic and geo-technical survey, for verification of data attached with the bid document and work accordingly. Any claim by contractor, on account of change in data mentioned in bid-document, shall not be entertained.

2.20 Project Signboards

The Contractor shall supply and erect project signboards at locations to be specified by the Engineer. The layout and dimensions of the signboards and their construction shall be to the approval of the Engineer and the lettering in English, Hindi and Odia shall be black on a white background.

2.21 Advertising

The Contractor shall not use any part of the Site for any form of advertising without the prior written approval of the Engineer.

2.22 Working Space.

The site conditions vary along the 3400 meter route of the project, mainly in the amount of work space available, adjacent to the road and access points. The space availability gives rise to three conditions:

- Condition A: Sites with a road on both sides of the drain. Road is generally up to 6 meters wide and aggregate length of this drain exhibiting this condition is 1,120 meters.
- Condition B: Sites with one side road only and structures immediately adjacent to the drain wall on the other. Road width up to 5 meters and aggregate length is 1,435 meters.
- Condition C: Sites with no roads next to drain and structures immediately adjacent to drain, within one meter.

The distribution of the different conditions in the project is given below:

Chainage	Length (m)	Condition Type	Typical Cross-Section No.
3300 - 3400	100	C	Cross-section Refer Drawing No:F-BD-1/04/11
3400 - 4330	930	B	
4330 - 5450	1120	A	
5450 - 5850	400	B	
5850 - 6120	270	C	
6120 - 6225	105	B	
6225 - 6700	475	C	

Contractor shall be responsible for creating the working space required to implement his design.

2.22.1 Access to Site

Access to site varies from side streets to main roads, except for the cases where the condition C, access is only from the ends of the reach as from drain alignment. The Contractor is responsible for obtaining the access routes to the various work fronts and to develop the means to carry out the work where access is restricted.

The Employer will be deemed to have been giving the Contractor access to the site when the authorization to carry out the work is given. Under no circumstance will the Employer be liable for providing physical access to the site, as contractor has to develop methodology for access on the alignment of drain

2.22.2 Impact to Local Traffic

The Contractor will maintain sufficient number of traffic marshals, directional signs, and road by-passes to facilitate the movement of local traffic. In the event the traffic is to be restricted for safety or for unavoidable work purposes, the Engineer shall be notified least seven days in advance and subsequently the area residents by posting informational signs with the intended restriction start date and likely duration.

Chapter-3: HEALTH & SAFETY MEASURES

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3. HEALTH AND SAFETY MEASURES

3.1 General

The Contractor shall at all times maintain a safe system of working and working environment. The Contractor is responsible for health and safety of all workers, regardless of rank, company affiliation or position, including all subcontractors, casual laborers and day laborers. Health and safety conditions at the job sites shall comply with all applicable rules and laws of the Odisha State and the Government of India and as per relevant Indian standard safety codes. These rules and laws shall apply and the Contractor shall prepare a Health & Safety plan for review and approval by the Engineer in accordance with these rules and laws and as per guide lines in Indian Safety Codes. Also the contractor has to follow the Guidance for the Management of Safety for Construction Work in Japanese ODA Project.

The Contractor shall appoint a suitable qualified and trained person as safety officer who shall be responsible for the implementation of rules, regulations and procedures which shall include but not limited to;

1. Safety
2. Working in hazardous areas
3. Permit to work
4. Fire & smoking regulations
5. First Aid
6. Warning signs
7. Trenching, scaffolding and other constructions or structures etc.
8. Safety barriers
9. Protective clothing and Equipment
10. Safety training
11. Safety meeting and impaction
12. Health and welfare

Access to work sites shall be restricted to authorized personnel for the duration of work at any site, without exceptions and without consideration of time of day or day of the week. Only authorized persons shall be allowed in and/or on any work site. All persons within the work site shall be provided with safety equipment appropriate for their work, to the satisfaction of the Engineer.

Should at any time and for any reason the Engineer observes any person on or in a work site without safety equipment or breach of published site safety rules at the site the Engineer may

stop any activity of work and may direct that the person be removed from the work site immediately.

Additional protective measures and/or equipment shall be available and used for work of known hazards including, but not limited to, work in trenches, sheet piling work, work near/over water, Confined space entry, work on ladders, elevated work, and welding, grinding, cutting, work with extremely hot items, work with cranes or lifting equipments.

On all sites and at all times the public shall be excluded from the work area. The Contractor shall take all precautions necessary and to the satisfaction of the Engineer to ensure that only authorized person are allowed access to work sites.

As needed the Contractor shall erect and maintain fences, barricades and other physical barriers. The Contractor shall also erect and maintain caution and warning signs at all work sites. The Contractor shall also post and empower guards as needed. The Contractor shall also provide lights for area illumination, lighted caution/warning signs including power generation as needed during night hours.

In all matters relating to safety including barriers, guards, signs, lights and police interaction the Contractor shall keep the Engineer fully informed and the above shall be to the full and complete satisfaction of the Engineer.

The contractor shall bring any violation of site safety rules by other contractors to the attention of the Engineer in writing. Safety measures to be taken for storage of different materials and during excavation work briefly described.

3.2 Safety Measures during excavation

The IS: 3764:1992 has laid down the standard of the requirement or carrying out safely in excavation works, such as trenches test pits, cellars, borrow pits, cuttings for the railway NH, Canals and road formation. The size and spacing of sheathing, walls and struts under the showering and timbering for different depth of the trench shall be followed as laid down in Is:3764-1992 which is given below.

SI. No.	Table No.	Purpose
1	1	For different depth of trench
2	2	For soil which may crack or crumble
3	3	For loose, sandy or soft soil which may be previously excavated
4	4	For soil under hydrostatic pressure

3.3 Inspection

No person shall work in any excavation, shaft or earthwork, unless all timbering and plant used there in are inspected by a competent person before work is started. When open excavation with steep side slopes are carried out by means of blasting, after every blasting operation, side slopes

of excavation shall be carefully excavated by a competent person to prevent rock falls. Inspection shall be carried out after heavy rain or storm to ensure safe working condition.

3.4 Plant and Machinery

Heavy equipment such as excavating machinery and road traffic shall be kept back from excavated side at a distance not less than the depth of trench or at least 6m for trench dipper than 6 mtr.

The use of trucks or wagons, in and about the trenches shall be under the control of an experienced foreman or supervisor. The vehicle shall not be permitted to be driven near the lip of the excavation and for this reason, care shall be exercised in locating roads leading to or from it. The foremen or supervisor shall see that in spotting of the vehicles for loading, they are not backed in to the wall of the pit and that when loading vehicle by hands, a constant watch is kept for slides or boulder rolling down the slope.

3.5 Means of Access and Escape

a. Pathways

Pathways shall be non-slippery and shall be of adequate width not less than 75cm. They shall be strong enough to withstand the intended use.

b. Gangways

Gangways shall be of proper construction and adequate width. If planks are used, they shall be laid parallel to the length of gangway and fastened together against displacement. Planks shall be uniform in thickness and shall be provided with cleats to ensure safe walking.

c. Ladders

Excavation shall have at least one ladder per 15 m. of length or fraction thereof in case of hazardous work and per 30m of length or fraction thereof in case of relatively less hazardous work. Ladders shall extend at least 1m above the top of the cut to provide a hand hold when stepping on or off the ladder. Ladder shall be constructed, used, maintained and inspected in accordance with the requirements laid down in IS 3696(PART-

d. Caution Provisions

(i) Provision of Fences, Guards & Barricading.

Contractor shall provide hard barricade with Metal sheets anchored properly to the steel pipes supports as approved by the engineer. Minimum barricading height will be 1.5 metre and stable, such that no public access to the construction area.

(ii) Provision of lighting and warning signals

Contractor shall provide and use adequate lighting and warning signals apart from using safety ropes at construction sites.

3.6 Safety against Common Hazards in Excavation

As per IS: 3764:1992 the contractor shall familiarize himself with the nature of the materials to be excavated and factors that has to be specially looked for, and guard against the following;

- a. Quicksand
- b. Water content or degree of saturation
- c. Effect of freezing and thawing
- d. Vibration from nearby sources
- e. Adjacent loose fills
- f. Surcharge load from adjacent building

3.7 Safety measures for Storage, Stacking and Handling of construction materials: -

Storage, stacking and handling of construction material to be used in the Project form essential operations till their final use. Handling of such material has to be mostly multistage, but their storage too may become multistage when the materials are first received in a central depot or where the first unloading site is far from the work site or the storage site has to be shifted for any reason, unloading, stacking lifting, loading and conveying operation involved are at present, mostly performed manually but, gradually, more and more mechanical aids and are being brought into use. The risk involved to workman employed in handling in storage operation increases when quantity of material increases. Hence safety measures are to be applied as per IS: 7969:1978.

Stacking, storage and handling of materials to be used in construction works shall be as per standards laid down in IS: 7969. Materials shall be segregated as to kind and length, and placed in orderly piles that are safe against falling. If the piles are high they shall be stepped back at suitable intervals in height. Piles of materials are to be arranged so as to allow a passage way of not less than 1m width in between piles or stack for inspection and removal.

Materials shall be stacked on well drained, firm and unyielding surface. Materials shall not be stacked so as to impose any undue stress on walls or other structures. Materials shall be stacked in such a manner as not to constitute a hazard to passerby. At such places, the stacks shall have suitable warning signs in day time and red lights on and around them at night.

3.7.1 Manually Lifting

When materials have to be handled manually each workman shall be instructed by the contractor through his workman or supervisor to adopt proper method of lifting heavy object. Workman shall be provided with suitable equipment for his personal safety as necessary. Supervisor shall also take care to assign enough men to each lifting job, the weight carried by each man shall be determined by the distance to be moved, difficulty of movement presented, time required etc. Whenever any stock exceeds 1.5m in height,

suitable and safe means of access shall be provided for the use of workers and such means of access shall not disturb the stability of the stack.

3.7.2 Stacking & Handling Timber

Timber shall be stacked on unyielding and drained surface. Cross strips or cross piling shall be used where the piles are more than 1m high.

3.7.3 Storage and Handling of cement

Stacks shall not be higher than 15 bags. If the stack has to be more than 8 bags high the bags shall be arranged in header and stretcher fashion, that is alternate layers length wise and crosswise, so as to tie piles together to lessen the danger of toppling over. Bags shall be removed uniformly from the top of the piles to avoid tipping of the stack.

Workmen handling baulk cement shall wear protective clothing, respirators, and goggles and shall be provided with hand cream, petroleum jelly, or similar preparation for protection of exposed skin.

3.7.4 Storage of materials near overhead power lines

In stacking and handling of construction materials and other conducting materials the following minimum safety distances shall be ensured from overhead power lines;

11 kv and below	- 1.40 m
Above 11kv and below 33 kv	- 3.60 m
Above 33 kv and below 132 kv	- 4.70 m
Above 132 kv and below 275 kv	- 5.70 m
Above 275 kv and below 400 kv	- 6.50 m

3.7.5 Handling, Stacking of Sand, Gravel and Crushed stone

Stack piles of these materials shall be so located as to provide easy access for withdrawal. When withdrawals are made from stock piles, no overhanging shall be permitted. Materials shall not be piled against walls that will be endangered by thrust nor along the sides of excavation or on the top of the embankment so as to cause slips.

3.7.6 Storage and handling of Bitumen, Bituminous, Emulsion and Road Tar

No stacks shall exceed hundred drums (180/200 ltr capacity drums). A safety distance of 6m minimum shall be kept between stack. Drum shall be kept stacked on their sides so that water shall not collect on them. Pyramid stacking shall always be used, and height of the stack shall not exceed three tiers. To facilitate rolling of drums of middle and top tier, in building up, or braking down the stack, suitable skids shall be temporarily laid on the tier over which rolling has to be done.

3.7.7 Safety measures for loading & unloading of materials

During loading and unloading of materials from Railway wagons & motor vehicles etc. The safety measures as per IS: 7969 shall be observed.

Appropriate warning signals shall be displayed while loading & unloading of materials of rail wagons or Trucks.

The motor vehicles shall be properly blocked while being loaded or unloaded, brakes alone shall not be dependent upon to hold them.

Loading and unloading of heavy items, shall as far as possible, be done with cranes and gantries. The workman shall stand clear of the materials being moved by mechanical equipment. The slings and the ropes used shall be of adequate load carrying capacity, so as not to give way and result in accident.

While heavy and long components are being manually loaded in to motor vehicle, wagon, trailer etc., either wooden sleepers or steel rails of sufficient length shall be put in a gently slope against the body of the wagon / vehicle at 3 to 4 places of loading.

These long items shall be dragged, one by one gently and uniformly along these supports by means of ropes, being pulled by men with feet properly anchored against firm surface.

3.7.8 Confined space entry

The contractor has to follow all safety guidelines, precautions and procedure for Confined space entry as directed by the Engineer. No workmen will be allowed to enter the confined space without entry permit.

3.7.9 Installation of Sheet Pile

To install sheet piles the contractor has to follow all safety procedure as per the direction of Engineer. The contractor has to use silent pilers and specialized auger method to eliminating noise and vibrations as per the direction of Engineer. Installation of Sheet pile has to done without harm or damage to the adjacent live and properties.

3.8 First Aid and Life-saving Apparatus on Site

The Contractor shall provide on the site such life-saving apparatus as may be appropriate and an adequate and easily accessible first aid outfit or such outfits as may be required by any government ordinances, factories acts, etc, published and subsequently amended from time to time. These outfits shall be suitably labelled for identification. In addition, an adequate number of persons permanently on the site shall be instructed in their use, and the persons so designated shall be made known to all employees by the posting of their names and designations in a prominent position on site.

3.9 Electrical Safety on Site (by electrical person)

The Contractor shall be responsible for the electrical safety of all Plant and pumping station supplied and installed materials and equipment. Whilst any equipment is being installed or tested, the Contractor shall ensure that all necessary precautions are taken to safeguard

personnel working on site. If necessary, this shall include fencing off areas which are considered to pose a risk, and erecting warning notices.

The Contractor shall be responsible for ensuring that the electrical installation is carried out by suitably trained competent personnel and that the work is carried out in a safe manner.

The Contractor shall be responsible for the operation on the site of a permit to work system during the period of electrical equipment installation and testing. This system shall regulate the installation, the energisation and the use of electrical equipment installed and the method of work adopted.

3.10 Noise

The Contractor shall minimize noise on site to the extent practical. Operations entailed in the construction of the works shall be limited only to operation of machinery within the working hours approved for weekdays, weekends and holidays. The noise level shall not exceed the limits prescribed by the governing regulatory authorities for daily construction activities.

3.11 Warning and Safety Signs

During construction of the works, statutory safety signs shall be adequately provided throughout the works, both indoors and outdoors. These safety signs shall cover mandatory, prohibition, warning, emergency, fire-fighting and general notices. All signs shall be positioned around the works at highly visible points with fluorescent colors where necessary. Provision of signs, and the positions of signs shall be subject to the Engineers approval. Special attention shall be given to areas designated hazardous. Warning signs shall be in Odia, Hindi and English.

3.12 Health and Safety Plan

The contractor should follow but not limited to the following HSP guidelines to avoid mishaps.

- a. All workers should wear appropriate personal protective equipment during all operations where exposure to hazardous conditions exists.
- b. Where there is a possibility that an injury could acquire during the performance of assigned duties, the workers is required to use suitable face shields or goggles.
- c. The worker shall wear high top leather work boots which provide the most protection. During summer times appropriate material for size should be chosen to make sure complete foot safety.
- d. All worker working or visiting locations designated by the Employer's representative as Head Project Areas (HPA) shall wear approved (IS specified-industrial standard) protective helmets. These helmets should be inspected on a regular basis and shall be replaced immediately if found to be defective. Helmets shall be worn while working underneath overpasses and at any other time the survey worker head drums it necessary.

- e. Worker must wear high-visibility safety vests of orange/ yellow color and orange rain coats, whenever working within the right of way, at any time when exposed to traffic such as driveways, parking lots, construction sites, etc and at any other time deemed necessary by the Employer's representative. In addition, during night (if permitted by the Employer's representative) operation the safety vests must be light reflecting. If raingear or other outer garment is being worn the reflecting vest must be worn above it.
- f. While working in any spot of water bodies, safety vests must be used.

3.13 Emergency Plan

3.13.1 Emergency Control

- a. First Aid- The worker must make sure that enough people have first aid training/knowledge, one first aid helper may be sufficient per survey location.
- b. The worker must have at least one complete first aid kit at their disposal on site. The contents of the kit must comply with the regulations of the local authorities.
- c. The first aid helpers must be recognizable by a visible mark on their hard hat.
- d. The worker head must inform the other working members who the first aid helpers are. The same must also be informed to the Employer's representative.

3.13.2 Emergency Contact Number

The safety officer / person in-charge of safety must always keep with him safety plan documents and must also have all emergency contact number including ambulance, police, doctor, hospital, and EPMC coordinator.

3.13.3 Safety Check List

The safety officer / person in charge of safety must comply with the following check list;

- a. carry first aid kit
- b. Carry emergency plan sheet
- c. Carry emergency contact details
- d. Carry PSPE as appropriate
- e. Inform Employer's representative before entering into confined space.
- f. Safety check list in JICA format

3.14 Safety Equipment

With reference to above mentioned safety measure the contractor shall provide following safety equipment, those are normally require in Box Drain maintenance work.

1. Gas mask

2. Oxygen breathing apparatus
3. Portable lighting equipment
4. Non sparking tools
5. Portable air blowers
6. Safety belt
7. Inhalators
8. Diver suit
9. Manila safety rope
10. Gas detector
11. Red colour flag
12. Lighting and warning signal
13. Combustible gas indicator
14. Carbon monoxide indicator
15. Polorimetris detector
16. Oxygen deficiency detector
17. Safety lamp
18. Gum boot
19. Insulation robber pad
20. Goggles
21. First Aid Box

3.15 Protection of the Environment

The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein, comply with all provisions in the Loan Agreement between the Bank and the Borrower with respect to the protection of the environment, which are as follows:

3.15.1 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 the Contractor's work.

The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein, comply with all provisions in the Loan Agreement between the Bank and the Borrower with respect to the protection of the environment, which are as follows:

The Contractor shall take adequate measures impacts during construction (e.g. noise, vibrations, turbid water, dust, exhaust gases, and wastes);

The Contractor shall take adequate measures to reduce impacts on natural environment;

The Contractor shall take adequate measures to reduce the impact on social environment;

The Contractor shall provide health and safety education to the project personnel including the construction workers.

The Contractor shall comply with the Environmental Protection Act (1986) and Water Act of the Government of India.

The Contractor shall comply with the stipulations of the Central and the State Pollution Control Boards.

3.15.2 Environmental Protection Work

The Contractor shall have to take the following measures during construction and commissioning of works for protection of environmental as under to avoid environmental impacts on air, water and land.

3.15.3 Site Clearance

The site clearance shall be done with minimum damage to existing structures flora and fauna, electricity and telephone lines and other infrastructure service

3.15.4 Earth Work and Excavation

The Contractor shall inform the local authority/ Government of any fossils, coins artefacts of value or antiquity, structures and other remains of geological or archaeological interests and excavation shall be stopped until identification of cultural relic by the authorized institution is completed.

The Contractor shall dispose of surplus/waste material at identified site approved by the Engineer. The Contractor shall ensure that there is minimum hindrance to normal activities and business. The Contractor shall avoid damage to permanent structures and shall avoid loss of standing crops along the road.

3.15.5 Re plantation

The Contractor shall carry out re plantation on areas/ on the periphery of construction sites to minimize visual impact and soil erosion. The Contractor shall pay special attention to the type of trees to be replanted to prevent fouling of water through falling leaves and bird dropping. A list showing the type of trees to be replanted will be approved before replanting any trees. Generally, the Contractor will avoid removing trees; and if removed, the Contractor will plant 3 trees for every one cut.

3.15.6 Soil Erosion and Water Quality

The Contractor shall ensure that earth and stone do not silt up existing irrigation/drainage system. The Contractor shall take suitable measure to prevent direct discharge of polluted water from construction activity into lakes/rivers/irrigation channels. The Contractor shall minimize exposure of soil type susceptible to wind and water erosion. The Contractor shall control run-off and erosion through proper drainage channels and structures.

3.15.7 Soil Compaction

The Contractor shall restrict traffic movements and use low ground pressure machines and shall preserve topsoil to be replaced after completion of construction activity. The Contractor shall avoid wet soils.

3.15.8 Social Disruption

The Contractor shall minimize interruptions to utility services through proper planning and scheduling of activities.

The Contractor shall provide temporary roads, bridges and diversions as may be necessary for smooth flow of the traffic. The Contractor shall preferably use local labour / skilled

persons during construction. Through negotiations with local shopkeepers compensate businesses for the lost income.

3.15.9 Dust/ Air Pollution

The Contractor shall provide effective dust control through sprinkling/ washing of construction sites and access roads and shall cover and/or water stockpiles and storage areas to prevent dust pollution. The Contractor shall cover trucks transporting construction materials to minimize spills and shall have a preventive maintenance program for construction equipment and vehicles to meet emission standards.

3.15.10 Noise Pollution

The Contractor has to adopt suitable noise control methods during such works. The Contractor shall avoid working on concrete road sections or maintain machines and trucks to keep them at low noise level..

3.15.11 Construction Camp

The Contractor shall take adequate measures such as provision of septic tank/pit latrines at construction site/ camps and shall provide crèches to working women labourer.

The Contractor shall provide drinking water, conforming to IS10500, for all labourers and shall provide garbage cans at suitable fixed place and have the garbage disposed off regularly.

3.15.12 Aesthetic Improvement

The Contractor shall through proper housekeeping enhance aesthetic appearance of construction sites. The Contractor shall dispose-off construction wastes at approved disposal sites.

3.15.13 Conservation of Ecological Resources

The Contractor shall not use arable farmland and forest belts as materials borrow sites. In case excavation in arable land is unavoidable, topsoil layer (30cms depth) shall be saved and returned after construction work is completed so as to minimize impacts on ecosystem, agriculture and animal husbandry. The Contractor shall educate construction workers to protect natural resources, wild plants and animals.

3.15.14 Risk of Accidents

The Contractor shall provide efficient lighting and safety signs on temporary roads during construction and shall adopt and implement adequate traffic regulation.

The Contractor shall take effective safety and warning measures to reduce accidents and provide suitable temporary crossings to facilitate normal life and business.

3.15.15 Responsibility For Accident, Damages Etc.

Except under the Force Majeure condition, the care of the whole permanent work until their completion and whole of the temporary work until their removal, shall remain with the Contractor, who shall be responsible for all accidents or damage from whatever cause

arising and chargeable for anything that may be stolen, removed, destroyed or damaged to whomsoever belonging and also for making good all defects and damages to the said works or to any property adjoining or any cause whatever, whether such damage or defects were occasioned by the negligence of the Contractor or not or may be or might have been discovered during the progress of the works or in consequence thereof or shall appear to be known after the completion thereof whether payment may wholly or partially have been made or the works approved as supposed to have been properly done, and no certificate or approval of any works by any officers or members of the Board shall effect.

3.15.16 Noise Monitoring

(i) Monitoring Frequency

During construction period: 12 times a year each time including day and night

During Commissioning period: 4 times ad hoc monitoring will be taken.

(ii) Monitoring points:

During construction period: near construction sites and sensitive area.

3.15.17 Fire Hazard (Naked Lights)

No naked light shall be used by the Contractor on or about the site otherwise than in the open air without the permission, in writing, of the Engineer. If, in the Engineer's opinion the use of naked light may cause a fire hazard, the Contractor shall at no extra cost to the Board, take such additional precaution and provide such additional firefighting equipment as the Engineer considers necessary. The term 'naked lighting' shall be deemed to include electric arcs and oxy-acetylene or other flames used in welding or in welding or in cutting metals, or open fires used for cooking. Compliance with the requirements of this Article shall not relieve the Contractor of any of this liabilities and obligation under the Contract.

Chapter-4: SCOPE & TECHNICAL SPECIFICATION OF CIVIL & STRUCTURAL REQUIREMENT FOR THE BOX DRAIN

Contents

SCOPE & TECHNICAL SPECIFICATION OF CIVIL & STRUCTURAL REQUIREMENT FOR THE BOX DRAIN 5

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SCOPE & TECHNICAL SPECIFICATION OF CIVIL & STRUCTURAL REQUIREMENT FOR THE BOX DRAIN

4.1. General

The clauses in this section are meant to provide general guidelines and compliance requirements to the Contractor. It does not however relieve the Contractor from taking every other steps and precautions as deemed necessary to complete the construction of box drain successfully within the specified contract period and the bid amount.

The following general requirements shall be followed by the Contractor:

- i. During construction all the conditions as per the Government of Orissa, CPWD / PWD Specification will be applicable.
- ii. Approvals from Railways, National Highway, Orissa PWD (R&B), Water Resources, Telecom Department, GRID Corporation of Orissa, CMC, Forest Department, wherever needed will be obtained by the OWSSB, but Contractor has to co-ordinate with OWSSB & these organization.
- iii. All the safety precautions will be taken by the Contractor to avoid any damage/incident. The Contractor will submit a Health and Safety Plan reviewed and approved by the Engineer.
- iv. Electric poles, telephone cables, water supply pipe lines, trees etc. should be protected as far as possible with due care.
- v. Suitable arrangement must be made for street drainage if required at site.
- vi. With reference to clause 17.1 of General Conditions of Contract, claims on account of damage to Private property, shall be borne by the Contractor.
- vii. The Employer's Requirements for all the items covered in this tender are included in this section of the bid documents. In case any item is not covered or is missing, Orissa PWD and PHD specifications, CPWD specification, MORTH specification and relevant IS code shall be followed, as per approval by the Engineer.
- viii. In case of discrepancy between specifications in this document, and Orissa PWD and CPWD/PHD specifications/ relevant IS code the decision of the Engineer shall be final.
- ix. The cleaning and removal of debris etc. shall be carried out side by side during the execution of work as well as on completion. All debris shall have to be removed by the Contractor and completed work to be handed over free of debris and allied structures created with the construction of work.
- x. The stacking of materials for construction work shall be done as per instructions of Engineer.
- xi. Watch and ward liability of construction/demolished materials during execution of work shall be by the Contractor.
- xii. Surplus earth from excavations & all dismantled materials shall be placed by the Contractor at places approved by the Engineer. No earth & other dismantled materials shall be sold by the Contractor to any private parties.

- xiii. No pits should be dug by the Contractor near the site of work taking out earth for use on the work. In case of default the pits so dug will be filled in by OWSSB at the risk & cost of the Contractor.
- xiv. The Contractor shall make his own arrangements for water required for construction purpose at his own cost.
- xv. Actual quantities of completed and accepted work by OWSSB will be paid for.
- xvi. The Contractor will arrange his own tools, plant and equipment required for work.

4.2. General Specifications, Standards and References

4.2.1. General Specifications and IS Codes to be referred for works

In general, all relevant IRC Codes & BIS Codes shall be followed for design, Construction, Operation and maintenance etc. As a guideline only, a few codes are mentioned below.

- IS: 456-2000: Indian Standard –Plain and Reinforced Concrete-Code of Practice, Fourth Revisions
- IS 3370 Code of practice for concrete structures for storage of liquids (Parts 1 to 4)
- IS 1786: 2008 Specification for high strength deformed steel bars and wires for concrete reinforcement.
- Standard Drawings for Box Cell Culverts published by IRC, Govt. of India, Ministry of surface Transport.
- IS 2314-1986 Specification for Steel piling sections.
- Piling hand book 9th edition ArcelorMittal ASTM C 1433, ASTM C 1577 standards for Precast Box Drain.
- All relevant I.S & IRC codes.

4.2.2. Concrete and Allied Works

IS: 12269	Specification for 53 Grade Ordinary Portland Cement.
IS: 8122	Specification for 43 Grade Ordinary Portland Cement.
IS: 8041	Specification for Rapid Hardening Portland Cement.
IS:383	Specification for coarse and fine aggregates from natural sources for concrete.
IS: 432	Specification for mild steel and medium (tensile steel bars and hard- drawn steel) wires for concrete reinforcement. (Part 1 and 2)
IS: 9103	Specification for admixtures for concrete.
IS: 2645	Specification for integral cement water- proofing compounds.
IS: 4990	Specification for plywood for concrete shuttering work.

4.2.3. Material Testing

- IS: 650 Specification for standard sand for testing of cement. IS: 2430
 Methods for sampling of aggregates for concrete.
- IS: 2386 Methods of test for aggregates for concrete (Parts 1 to 8)
- IS: 3025 Methods of sampling and test (physical and chemical) for water.

4.2.4. Material Storage

- IS: 4082 Recommendations on stacking and storing of construction materials at site.

4.2.5. Concrete Mix Design

- IS: 10262 Recommended guidelines for concrete mix design. SP: 23 (S&T) Handbook
 on Concrete Mixes

4.2.6. Equipment

- IS: 1791 Specification for batch type concrete mixers.
- IS: 2438 Specification for roller pan mixer.
- IS: 4925 Specification for concrete batching and mixing plant.
- IS: 5892 Specification for concrete transit mixer and agitator.
- IS: 7242 Specification for concrete spreaders.
- IS: 2505 General Requirements for concrete vibrators: Immersion type.
- IS: 2506 General Requirements for screed board concrete vibrators.
- IS: 2514 Specification for concrete vibrating tables. IS: 3366 Specification for pan
 vibrators.
- IS: 4656 Specification for form vibrators for concrete.
- IS: 11993 Code of practice for use of screed board concrete vibrators.
- IS: 7251 Specification for concrete finishers.
- IS: 2722 Specification for portable swing weigh batchers for concrete (single and
 double bucket type).
- IS: 2750 Specification for steel scaffoldings.

4.2.7. Concrete Testing

- IS: 1199 Method of sampling and analysis of concrete.
- IS: 516 Method of test for strength of concrete.
- IS: 9013 Method of making, curing and determining compressive strength of
 accelerated cured concrete test specimens.
- IS: 2770 Methods of testing bond in reinforced concrete
- IS: 456 Code of practice for plain and reinforced concrete.

IS: 457	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
IS: 3370	Code of practice for concrete structures for storage of liquids (Parts 1 to 4)
IS: 3935	Code of practice for composite construction.
IS: 2502	Code of practice for bending and fixing of bars for concrete reinforcement.
IS: 5525	Recommendation for detailing of reinforcement in reinforced concrete works.
IS: 2751	Code of practice for welding of mild steel plain and deformed bars used for reinforced concrete construction.
IS: 9417	Specification for welding cold worked bars for reinforced concrete construction.
IS: 3558	Code of practice for use of immersion vibrators for consolidating concrete.
IS: 3414	Code of practice for design and installation of joints in buildings.
IS: 4326	Code of practice for earthquake resistant design and construction of building.
IS: 4014	Code of practice for steel tubular scaffolding (Parts 1 & 2)
IS: 2571	Code of practice for laying in situ cement concrete flooring.
IS: 7861	Code of practice for extreme weather concreting: Part 1 Recommended practice for hot weather concreting.
IS: 875	Code of practice for design loads (other than earthquake) for building structures (Parts 1 to 5)
IS: 2502	Code of practice for bending and fixing of bars for concrete reinforcement
IS: 1893	Criteria for earthquake resistant design of structures
IS-12592	Precast Concrete Manhole Covers

4.2.8. For Construction of Roads

IRC:11-1962	Recommended Practice for the Design and Layout of Cycle Tracks
IRC:54-1974	Lateral and Verbal Clearances at Underpasses for Vehicular Traffic
IRC:65-1976	Recommended Practice for Traffic Rotaries
IRC:69-1977	Space Standards for Roads in Urban Areas
IRC:70-1977	Guidelines on Regulation and Control of Mixed Traffic in Urban Areas
IRC:86-1983	Geometric Design Standards for Urban Roads in Plains
IRC:92-1985	Guidelines for the Design of Interchanges in Urban Areas
IRC:98-1997	Guidelines on Accommodation of Underground Utility Services Along and Across (First Revision)
IRC:99-1988	Tentative Guidelines on the Provision of Speed Breakers for Control of Vehicular Speeds on Minor Roads
IRC:103-1988	Guidelines for Pedestrian Facilities

IRC:106-1990 Guidelines for Capacity of Urban Roads in Plain Areas

IRC:SP:12-1973 Tentative Recommendations on the Provision of Parking Spaces for Urban Areas

IRC:35-1997 Code of Practice for Road Markings (with Paints) (First Revision)

IRC:67-2001 Code of Practice for Road Signs (First Revision)

IRC:SP-31-1992 New Traffic Signs

IRC:80-1983 Geometric Design Standards for Urban Road

4.2.9. Construction Safety

IS: 3696 Safety code for scaffolds and ladders. (Parts 1 & 2)

IS: 7969 Safety code for handling and storage of building materials.

IS: 8989 Safety code for erection of concrete framed structures.

All other BIS codes, standards, Manuals and Codes, as are acceptable to OWSSB, may be used with prior approval.

4.2.10. Orissa Govt References

Detailed specification for works issued by PWD, Odisha incorporating the following parts shall be followed.

- Part I-Preliminary specifications dealing with general rules and procedure.
- Part-II-Specifications for materials.
- Part-III-Specifications for building and earth works.
- Part-IV-Specifications for Road works.

The various specifications, mode of measurements etc. shall be followed as specified above & in Public health Engineering works, wherever applicable. If the above specification are silent on any aspect of the work, the IRC Codes and MORTH specification for Road construction and other standards with the prior concurrence of the Engineer, shall be followed.

4.3. Work Programme

The Contractor shall provide comprehensive Work Programme in line with the Contract for review and approval.

4.3.1. Work Plan.

Within 30 days of the agreement execution, a work plan shall be submitted for review and approval by Engineer.

Work Plan will state the sequence of works the Contractor intends to pursue for timely completion of the work. The work plan will have basic information not limited to;

- Procurement of key equipment and supplies
- Preparation of Status report of adjoining properties before start of works.
- Submission Structural Design of Box Drain based on soil test report and expected soil bearing capacity to be achieved by soil improvement system proposed by Contractor and its approval by the Employer after review.
- Traffic Diversion plan submission and approval
- Shifting of utilities if required
- Installation of shoring
- Establishment of water diversion system
- Providing soil improvement system, determination of bearing capacity after soil improvement at every 250mts distance along the drain course inside the drain. Achieved SBC of soil through relevant / required soil test should be more than the value considered in submitted design drawings by the Contractor. If achieved bearing capacity lesser than bearing capacity in designs, Designs shall be revised and resubmitted for approval.
- Start of Construction of box drain and completion of construction activity with construction of catch water drain along the length of main drain.
- Making connection with branch drains, any previously constructed segment of Main Drain, including approach roads and culverts
- Fixing of Air Vents and installation of isolating system for each vent.
- Construction of Cycle track and Footpath
- Bitumen Top Coat and Fixing of Street Light
- Start of Traffic of Completed Stretch.

The plan will describe the number of work fronts to be open simultaneously and list the resources to be utilized to achieve the work. A financial program will be prepared that reflects the planned activities and resources.

After approval of work plan, micro planning shall have to be submitted.

4.3.2. Micro-planning

Micro-planning shall comprise details of activities to be done in next three months and after its approval, authorization shall be given by the Employer to start activity based on approved micro plan :

- **Number of work fronts.** The micro-plan will confirm the number of new work fronts to be opened in the three months with resource mobilization schedule
- **Utility removal schedule.** The micro plan will identify the specific utilities to be removed in initial three 3-months.
- **Detailed data to be provided.** For every work front, expected start and end dates for activities shall be clearly defined.

4.3.3. Catch up plan for delayed work.

Any delay as per micro plan observed in due course of execution shall have to be achieved in consecutive month for which catch up plan with additional resource mobilization schedule has to be submitted.

4.4. Requirement for Critical Methodology and Key Resources

The Contractor shall provide comprehensive methodologies which are critical for the work, including methodologies for Shoring System, Water Diversion, Access to site and other important features.

4.4.1. Shoring System:

Presently sheet piles have been installed at different stretches (details are given for LOT-1 and LOT-2 in Scheme of Box Drain Works- Table 4.1 and 4.2 of Chapter 1). The Contractor can utilize already installed sheet piles make strengthening if any required. Disposal of existing installed sheet piles shall be done after getting approval from Engineer as per site conditions to the specified location.

Within 30 days from the date of commencement, Contractor shall submit the proposed methodology to install the shoring system to work areas for approval. The methodology shall contain:

- a) Description of the method to install the shoring system to avoid/minimize vibrations disturbing installation. The Engineer has the right to refuse any system that does not assures minimization of vibrations during installation.
- b) The method will also describe the contingency measures the Contractor intends to take to mitigate problems arising from the installation of the shoring system, such as claims by adjacent property owners because of damages to property.
- c) Detailed photographic record of the properties, adjacent to the drain including boundary walls as base data, against which future claims can be assessed. Contractor is responsible for contacting owners and obtaining their permission to photograph the desired areas.
- d) A list of resources to be used for installation of the shoring system, including materials, machinery and equipment and details of subcontractors shall be submitted. The list shall contain the resources to be used to achieve the desired work program targets. Productivity target, clearly stated and in agreement with the Time for Completion.

4.4.2. Water Diversion:

Within 30 days of commencement date Contractor shall submit the water diversion methodology for approval by Engineer for LOT-1 from Chainage 3300 to Chainage 5150 and for LOT-2 from Chainage 5150 to Chainage 6700. The methodology shall contain:

- a) Description of the method of water diversion, with expected flow to be handled by gravity and by pumping, as the case maybe.

- b) Length of work front to be developed under this methodology.
- c) List of equipment to be used in each work front including pumps, screens, power generators, suction and delivery pipes, and anything considered for diversion of water around work front.
- d) Pump characteristic curve and delivery line head loss calculation for the varying flow conditions in the 24 hour cycle.
- e) Discussion of redundant capacity provided and contingency plans.

4.4.3. Access to Site:

Within 30 days from commencement date, the Contractor shall provide the methodology for accessing and working on the site, for each of the Conditions described in the scope of work. The methodology shall describe:

- a) Safety measures to isolate public from work area.
- b) How local pedestrian, motorcycle or car traffic will move in each Conditions A, B and C of Scope of Work (Accessibility Conditions)
- c) Actions required to create the required working space and its impact on movement of public, if any.
- d) Describe the challenges to effective movement of materials and equipment for each reach and how they will be overcome, specifically, by type of Condition.

4.4.4. Time is of Essence

The methodologies must be complete in all regards and turned in within the specified time. Approval of these three methodologies by Engineer is compulsory before Contractor is allowed to begin operations on site.

4.4.5. Change in Methodology:

If at any time the Contractor decides to change the methodology for his convenience, the proposed methodology shall comply with all provision of this section and be submitted to the Engineer 15 days before the intended implementation date. **There will be no additional payment for any change in the proposed working methodology.**

At any time, the Engineer deems pertinent to better coordinate the project activities.

4.5. Work Scope

4.5.1. Topographical Survey & Soil Investigation

Topographic survey of the project area has been conducted, taking the Reduced Level (RL) of GTS Bench Mark established inside the premises of Mahanadi South Division of Water Resources Department near Mahanadi Barrage at Jobra. The Contractor shall check RLs of these Bench mark for confirmation and establish more number of Bench Marks as required for reference during construction. A permanent baseline along the drain and bench marks shall be established by the Contractor to serve as reference before construction is begun.

Fresh Survey is to be conducted for Topographical and Geological Assessment with cross sections at every 25mtrs intervals plotted. G.T.S. values are to be considered as shown in Drawing No. F-BD/LOT 1/04/1. The Contractor shall assist the Engineer in checking all such survey works as and where required by Engineer including provision of necessary instruments and personnel. The Contractor's Supervisors, all Foremen and all Leadsman shall be suitably qualified commensurate with the size and complexity of the work. They should speak and understand the Hindi and the English languages.

Contractor has to visit the site of work of each location to get accustomed with site conditions, accessibility etc. Soil investigation data provided in bid document is for give to general idea only about soil strata conditions and OWSSB shall not be held responsible for this soil investigation report, if it does not match with soil test, which will be conducted by the bidder in subsequent stages. It is suggested to get soil investigation done by the bidder before bidding to have a proper Techno Financial Proposal during bidding. There will be no separate payment for such pre bid investigations.

4.5.2. Soil Improvement

Sub soil profile of Cuttack in general is poor as appears. The sub soil profile along existing dilapidated drain course below drain bed seems to be poor than that because of erosion and sedimentation in rotation. The soil investigation report provided in tender document by Department is meant to generate a general idea on sub soil condition along the drain system.

It is mandatory to adopt the following sequence of activities for providing soil improvement system to achieve improved bearing capacity required as per design.

- To Conduct required types of soil tests (like bore log with SPT and collecting UDS & DS samples for lab tests , vane shear test, tri-axial tests and other types of tests as required regards to actual field requirement).
- Based on the designed load & sub soil condition revealed from said soil test , the contractor has to propose Soil improvement system and implement it after getting approval from the Engineer.
- Perform plate load soil test / other required soil tests at each location at every 250 m gap distance along the drain length at founding level (at bottom of PCC of foundation) to confirm the SBC considered in design, after implementation of soil improvement.

Suggested Sub-Soil Improvement System

It is suggested to provide and execute a general Sub-Soil Improvement System comprising of Sand Piling (as Soil Stabilization), then granite boulder soling interstices filled with sand and then clean coarse sand filling duly compacted below foundation PCC of structural member. Minimum dia of sand pile shall be 300 mm and its depth below said boulder filling and the spacing of sand piling is to be finalized on the basis of results of sub soil investigation to be done by the contractor along the drain course inside drain at every 250 mts , loadings on account of structure and other design parameters etc . Granite boulder soling shall be done for a minimum thickness of 500 mm and size of boulder shall not be more than 300mm. On boulder soling, clean coarse sand filling has to be done for a minimum thickness of 900mm, duly compacted in layer by layer not exceeding 250mm in depth.

For afore said soil tests and soil improvement works, at each locations before preparation of design and drawings, the contractor has to make all necessary arrangements to execute all related items at his cost and risk required for dewatering, water diversion of drain, coffer dam, island, excavation, removal of excavated materials, shoring, shuttering, sheet piling, sand piling and all other soil improvement items.

Providing soil improvement system below PCC is mandatory, the bidder is free to adopt any other additional improved / latest technology / methodology for sub soil improvement at his cost and risk to achieve desired SBC of soil required for structural design purpose.

The structural design and drawings which will be submitted by the contractor for approval and execution has to fulfill the following stipulated technical requirements. While designing the contractor is to ensure that the below mentioned technical requirements are well fulfilled and has been adopted in design and drawings.

4.5.3. Design and Drawing of Box Drain (Pre-Cast and Cast in Situ-All types)

The Contractor shall carry out the Design in accordance with GC 5 [Design], with meeting all requirements stipulated in the Employer's Requirements of Section VI. The base design provided with the tender documents is for illustration purposes only. The Contractor is to submit his own design if his intended product varies in materials, products or methodology. Design of the preparatory activities of shoring and water diversion must be submitted to the Engineer for approval.

The Contractor is responsible and submit all design documents of the project in accordance with GC 5.2 [Contractor's documents], including follows:

- (a) **Topographic Survey Report:** 4 copies, within 15 day after the commencement date.
- (b) **Geotechnical Investigation Report including recommendations:** 4 copies, within one months after the commencement date.
- (c) **Design Report including drawings:** 4copies within 45days after the commencement date.
- (d) **Construction Drawings and required documents during execution of work:** 6 copies, 2 weeks prior start construction segment.
- (e) **As-build Documents:** 2 copies of As-Build Documents (all record) prior to commence the Test on Completion, and 6 copies of final As-Build Drawings (Prior to the issue of any Taking-Over Certificate) in accordance with GC 5.6.
- (f) **O&M Manual:** 4 copies of provisional operation and maintenance manual (draft O&M Manual), and 6 copies of final O&M manual (Prior to the issue of any Taking-Over Certificate), in accordance with GC 5.7.

The draft O&M manual shall be subject to the review and consent of the Engineer who shall have all rights to make any changes and revisions to the O&M Manual as it may deem appropriate. The Contractor shall revise such draft O&M Manual prior to submit the final O&M Manual.

Other all kind of Technical Reports: 4 copies, when instructed by the Engineer or the contractor considers necessary.

4.5.3.1. Design Documents

Three (3) copies/ sets of each set of documents, manuals and designs and drawings etc. shall be submitted by the Contractor to the Department for preliminary check and approval. Based on the requirement, the contractor has to depute his design engineer / Geotech expert etc. for clarifications and compliance. If required observations shall be communicated by the Authority to the contractor for compliance and re submission. After preliminary approval, one set of documents shall be returned back to the contractor.

Six (6) copies / sets of each set of documents, manuals and designs and drawings etc. incorporating the corrections made in that of preliminary approval shall be submitted by the Contractor to the Department for final approval and distribution. The Engineer will return two (2) approved copies to the Contractor and retain eight (4) for the Engineer's office, field use and for the record etc. The Engineer will signify his approval or disapproval of the Preliminary Design (include drawings) within 30 calendar days of submission. Contractors Documents shall be submitted in accordance with the timetable set in the approved work plan.

Checking and Approval of Contractors Design and Drawings by the Client / department / representative of Department/ Authority shall not relieve the Contractor from it's responsibility towards structural safety and stability and shall not relieve the contractor of it's responsibilities under the Contract. The Engineer will not permit construction to start on a part or section of the Works unless Construction Documents for that part or section have been approved.

4.5.3.2. Construction Documents and Construction Activities

The Construction Documents are certified drawings and design submitted by the Contractor to the Engineer for review and approval during the course of the execution of work. If an approved drawing is revised, the revised copies shall be submitted as Design Change Request (DCR) for approval and after approval earlier copy of the drawings shall be marked 'superseded'. No revised drawing shall be used in the Contract until it has been approved in place of the earlier issued drawing.

Six (6) copies of each set of documents, manuals and drawings shall be submitted by the Contractor to the Engineer for distribution and approval. The Engineer will return two (2) approved copies to the Contractor and retain eight (4) for the Engineer's office, field use and for the record etc. The Engineer will signify his approval or disapproval of the Preliminary Design (including drawings) within 30 calendar days of submission. Contractors Documents shall be submitted in accordance with the timetable set in the Programmed.

Sequence of Construction Activities

- Installation of Sheet Piles
- Making arrangement of Water Diversion
- Removal of Slush and disposal at place identified by Engineer
- Providing Soil Stabilization as per approved methodology
- Performing confirmative soil test for achieved bearing capacity
- Laying of PCC

- Placing of Reinforcement steel for base raft and Concreting
- Raising of Wall and Casting of Roof Slab as per approved drawings
- Construction of Catch Water Drain as per approved drawing
- Finishing activities, & making ventilation arrangement
- Fixing of Manhole covers
- Fixing of Stop log gates
- Construction of Cycle Track and Walkway
- Making connection with secondary and tertiary drains
- Fixing of Light Pole with cabling works

Checking and Approval of Contractors Design and Drawings by the Client / department / representative of Department/ Authority shall not relieve the Contractor from it's responsibility towards structural safety and stability and shall not relieve the contractor of it's responsibilities under the Contract. The Engineer will not permit construction to start on a part or section of the Works unless Construction Documents for that part or section have been approved.

4.5.4. Cleaning and Grubbing of Land

The site is to be cleaned of Shrubs and cutting of trees if coming in the alignment.

4.5.5. Shifting of Utilities

After conducting the topographic survey, the utilities like water supply pipeline, sewer, electric poles and transformers are to be reallocated and shifted as directed by the Engineer, however the Engineer will write to the respective Department for the shifting but execution and coordination is sole responsibility of the Contractor. The fee and deposit if any required shall be paid by the Employer.

4.5.6. Demolition of Existing Drain / Culverts

- a) The existing drain laterite lining is to be demolished wherever coming in alignment.
- b) Existing 12 culvert are also to be demolished coming in the alignment along with private foot bridges across the MD-1, Usable dismantled material is to be carted to stores and stacked and unserviceable materials shall be disposed of within 5. Km as per directions of Engineer.

4.5.7. Shoring System

Contractor shall propose an appropriate shoring/sheet pile system for supporting the sides of excavation, to avoid any collapse of sides, based on geo-technical investigation done by the contractor, site conditions, ensuring safety of nearby buildings/structures, ensuring safety of workers and traffic/people moving on the adjoining roads, and in line with the construction methodology proposed by the contractor. The contractor shall submit the necessary design

calculations of the shoring/sheet pile proposed and take approval from the Engineer on the same.

The sheet piles required for installation shall be procured by contractor for construction of drain. The Sheet Piles shall be shifted to site, driven, reused for temporary installation for at least 4 times and then finally driven for permanent installation. Contractor should use pile caps for temporary installation so that edge of sheet pile is not damaged for reuse. All precautions shall be taken by the contractor, so that no damage occurs to the adjoining buildings while driving or extracting the sheet piles. Cross bracing/anchoring shall be done to piles to avoid tilting of sheet piles.

4.5.7.1. Shoring Design Submittal Requirement.

Contractor shall submit a shoring design duly certified by a competent Structural Engineer for each work front, for approval by the Engineer. The structural design shall be submitted 15 days before the intended start date of each work front. Work will not be authorized prior to shoring design approval.

The submittal will include work front start and end chainage, loading calculations on the intended shoring materials, cross bracing recommendations specific to the site and drawings/diagrams as needed.

4.5.7.2. Driving of Sheet Piles

Contractor has to use any of suitable pile driving machine and techniques which is suitable as per contractor. Certain machines are listed like Non-Vibrating and Non-hammering (Silent) Piling Machines as Vibration Less Sheet Pile Pressing, Hydraulically Pressing, Resonance Free Vibratory Hammer, Silent Pressing and High Frequency Vibrating Combined the DCP Power Push contractor can think of as per requirement of the Site Conditions. As use of vibro hammer for driving of sheet piles has damaged buildings even 20 meters away from driving site. So vibro hammer shall not be used for pile driving at box drain site.

Under certain conditions, pile driving, pressing of Piles can be made easier with the help of jetting. The process deliver water to the toe of Pile where it loosens the Soil causing the toe resistance of Pile to reduce, depending on the Soil conditions causes a reduction of Skin and interlock friction as it flows back to the ground surface along with faces of the Pile.

At Site where dense and cohesion strata is encountered usually pre augured on the Pile Line to loosen the Soil before pressing can be attempted. Easier pressing can be achieved by pre-auguring.

Previously as use of vibro hammer for driving of sheet piles has damaged some buildings even 20 meters away from driving site, so it is suggested to access conditions of existing properties before selection of method for fixing of sheet files. Any damages to existing properties due to impact of driving of sheet piles shall be rectified and repaired by the Contractor and no separate payment shall be made for such repairs.

4.5.7.3. Sheet Pile (Steel Waling and Strutting)

Typical specifications shall comprise of hot rolled Steel Sheet Piles AU25 in 15 m length, Steel Grade – S430 GP etc, having following properties:

- Width of single pile 750mm

- Unit weight of single pile 110.40kg/m
- Unit weight of wall 147 kg/m²
- Elastic section modulus 2500 cm³/m

Steel waling & Strutting of Sheet Piles are to be designed on the bearing capacity report of soil at that level.

1. Contractor should arrange Pile driving Equipment of suitable capacity and suitable type to drive/extract.
2. Equipment used for Piling should not have excessive vibration which shall cause damage the adjoining structures.
3. Top two meters Soil / Earth must be excavated by Excavator to achieve surface free from any material like Bricks / Stones / Boulders which may affect the smooth driving.
4. Contractor is to use pitch and drive method which requires equipment to control verticality of pile during installation so that Piles can be pitched and driven one by one.
5. Certain difficult conditions of driving of piles can be made easier with the help of jetting. The process delivers water to the toe of pile where it loosens the soil resistance or by pre-auguring.
6. **Stacking of Sheet Piles:** It is essential that Piles are stacked safely on firm ground before handling and installation to minimize damage .
7. Loading and unloading of Piles / should be done using telescopic ladder rigs.
8. Greater risk of injury to piling personal occurs during Pile pitching. So, it is important to develop a safety plan and methodology and got approval from Engineer and work accordingly.
9. **Driving tolerance:** General tolerances for a straight and plump sheet pile wall should be in accordance with the following figures
 - a) Deviation in plan normal to the wall line at the top of the pile $\pm 50\text{mm}$ ($\pm 75\text{mm}$ for silent pressing)
 - b) Finishing level deviation from nominal level of top pile $\pm 20\text{mm}$
 - c) Deviation of verticality for panel driving – all directions 1 in 100
 - d) Deviation of verticality along line of piles for pitch & drive 1 in 75
10. **Extracting:** When Piling is to extracted for reuse by means of suitable extractor by vibrating or jacking type of suitable capacity and while extracting no damage should occur to the new structures, Box Drain and adjoining structures.

4.5.8. Water Diversion

This specification applies to the water discharge present in the Main Drain 1 that has to be managed in order to create the proper working conditions for construction activities of the box drain. The water is a mixture of sewage and street run off, with a considerable quantity of floating debris. This discharge is continuously present in the drain and it follows minimum and maximum flows just like those observed in a sewer system. Peak flow is

expected to be a short period in the morning and evening; at night minimum flow may be only a fraction of the average flow.

Diversion of flow means providing and making arrangements for diversion of drain water from construction zone, from upstream of upstream cofferdam to downstream of downstream cofferdam, for a length of minimum 250m. The Contractor is responsible for managing the entire quantum of flow at all times. Overflows are absolutely not allowed under any circumstance. The Contractor shall provide sufficient equipment and redundancy to ensure uninterrupted operation throughout the working period of the work front.

The contractor shall access the flow in the drain and propose scheme for diversion of the same safely to downstream side. The contractor shall make sufficient arrangements for diversion of sewage mixed surface water and ground water flowing in drain/side drains, by gravity/pumping, by open channel/pipe line/pipe lines, safely to downstream side of drain, away from construction zone, to obtain dry working conditions for construction of box drain. Contractor should also have arrangements for cleaning /removal of garbage/floating material without creating any inconvenience. During diversion of flow it is to be ensured regarding unsafe conditions for buildings, structures, people or traffic moving on the adjoining road and creating dry working conditions till completion of construction of box drain up to ground level. Contractor shall take approval from the Engineer on the same.

4.5.8.1. Submittal Requirements

Prior to ordering or mobilizing equipment Contractor shall submit the water diversion methodology for review and approval of the Engineer. Review by Engineer shall be prompt and avoid unnecessary delays. Minimum items to be presented are:

1. Methodology for dealing with floating debris.
2. For each stretch, hydraulic design of gravity, pump or combined solutions.
3. Pump manufacturer, model and type of drive.
4. Delivery pipe hydraulic design including pump characteristic curve for each type proposed.
5. Redundancy preparations
6. Operating strategy for maintaining 24/7 conveyance

Pump efficiency and maximum velocity in delivery pipe to be clearly demonstrated.

Water diversion will not be paid separately. Contractor has to include all cost related to this operation in his bid price, including but not limited to any ancillary civil, mechanical or electrical work done; permits, fees, licenses, installation cost by third parties, and all other cost associated with this activity

4.5.8.2. Methodology

Contractor shall propose a water diversion methodology suitable for his purposes. Full diversion by Gravity conveyance, full pumping, or a combination of both can be utilized provided that the freeboard requirements specified above is maintained at all times. The method chosen shall take into consideration the complications expected from the floating debris and shall explicitly describe how that will be addressed.

4.5.8.3. Quantity of water

The discharge of water in the box drain varies according to the reach. The discharge has been estimated as follows: These figures are indicative only and contractor has

to confirm water flow to be diverted for construction activity. The department will not be responsible for any change in water diversion quantity and no additional payment shall be considered due to change in water diversion quantity.

Chainage	Daily Average Flow	Peak Flow	
	MLD	MLD	lps
LOT-1			
3300-4150	28.6	64.4	745
4150-5000	35.8	80.6	933
5000-5150	39.9	89.8	1,040
LOT-2			
5150-5850	39.9	89.8	1,040
5850-6700	41.5	93.4	1,081

4.5.8.4. Minimum Freeboard

Contractor shall be responsible to maintain the water level in the drain within its bounds in Main Drain 1 upstream of the work front at all times, no exceptions, with a minimum freeboard of 600mm. Specific attention to be given to the designated locations at chainage 4010 in Rouspatna and 5080 in Bajrakabati.

4.5.8.5. Equipment

The type of pumps to be used is to be decided by the Contractor, however, the pumps shall have minimum design efficiency of 50%. Equipment shall be no more than one year old. For individual delivery pipes the maximum velocity when the pump is working at full speed shall not exceed 2 meters per second. Contractor is free to aggregate the discharge of multiple pumps into a single delivery pipe, however, the maximum velocity of the water at full aggregate capacity shall not exceed 3 meters per second. For electrical driven pumps aggregated in a single delivery pipe, a valve is to be fitted in the discharge to reduce the risk of cavitation when operating singly.

4.5.8.6. Redundancy

Contractor is to ensure proper, uninterrupted operation of the pumping system and have enough redundancy to absorb equipment maintenance periods. The pumping set shall have enough pumps to provide flexibility of operation and pump the entire peak flow when working together. The number of redundant pumps will be one (1) with a capacity equal to the largest pump in the set. In the event electrical pumps are used, redundant power sources will be provided. If a Diesel power generator set is used, the set shall have one (1) redundant unit equivalent to the largest unit in the set. Single power generator with no standby unit is not acceptable.

4.5.8.7. Floating debris

The quantity of floating debris is considerable and has not been quantified. Contractor shall install a bar screen with openings commensurate to the equivalent object size that can be handled by the pumping equipment, i.e. 60mm. Contractor is responsible for removal of debris affecting his operation and the cost is to be included in the bid price. No separate payment shall be made on this account.

4.5.9. Dewatering

Dewatering means lowering of water level by pumping sub-soil water from excavation to make it dry and workable. The Contractor shall study the sub-soil conditions carefully and shall conduct any tests necessary at the site with the approval of the Engineer to test the permeability and drainage conditions of the sub-soil for excavation, concreting etc., below ground level. Dewatering or bailing out of surface water, ground water and accumulated water due to all causes including lowering of ground water table by means of pumps or well-point system etc. The Contractor shall verify the site conditions and whenever such dewatering is required it is considered that the rates quoted are inclusive of dewatering of surface and sub-surface water for the works coming under this turnkey tender.

4.5.9.1. Methodology

Methodology submitted by Contractor shall be reviewed and approved by the Engineer. The Contractor shall ensure that the excavation area and structures are free from water submergence during construction and shall take all necessary precautions and measures to exclude ground/rain water so as to enable the works to be carried out in reasonably dry conditions. Sumps made for dewatering must be kept clear of the excavations/trenches required for further work. The pumping arrangement shall be such that there shall be no movement of subsoil or blowing due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction. The Contractor shall be responsible for making fool-proof dewatering arrangement which will continue to run without any distribution or interruptions and make sure that any sub soil water found during construction shall be lowered by continue pumping and ensure that the pits, trenches, tanks, etc. are kept dry until satisfactory completion of installation of all structures and materials. The arrangement for the disposal for the water pumped out from the trenches and pits up to nearby nalla/drain shall be the responsibility of the Contractor.

The Contractor shall suitably discharge the water obtained from dewatering from such areas of site where a buildup of water in the opinion of the Engineer obstructs the progress of the work, leads to insanitary conditions by stagnation, retards the speed of construction and is detrimental to the safety of men, materials, structures and equipment. The dewatering shall be continued for at least (7) seven days after the last pour of the concrete. The Contractor shall, however, ensure that no damage to the structure results upon stopping the dewatering operation.

When there is a continuous inflow of water and the quantum of water to be handled is considered in the opinion of Engineer, to be large, a well point system- single stage or multistage, shall be adopted. The Contractor shall submit to the Engineer, details of his well point system including the stages, the spacing, number and diameter of well points, headers, etc. and the number, capacity and location of pumps for general acceptance.

Dewatering will not be paid separately. Contractor has to include all cost related to this operation in his bid price, including but not limited to any ancillary civil, mechanical or electrical work done; permits, fees, licenses, installation cost by third parties, and all other cost associated with this activity.

4.5.10. Earthwork

The contractor shall do the excavation in correct profile and side slopes, up to full depth as per design including dewatering if required. Any excess excavation shall be filled with lean concrete. If at design depth slush is encountered, the contractor shall excavate till firm bed is met. The excess excavation shall be filled with well compacted sand to maintain the foundation level and achieving the stability of foundation. Contractor shall prepare the excavation drawings and take approval of client for the same.

4.5.11. Sand Filling

Sand filling in foundation compacting and dressing to correct grade.

4.5.12. Laying of PCC

PCC M20 for foundation of drain will be laid as per approved Designed thickness.

4.5.13. Construction of Box Drain

Construction work of drain shall be started preferably from Downstream to upstream side. Box drain construction includes making through connectivity of total length including joining already constructed sections to have a continuous smooth flow of storm water/sewage water inside drain and movement of traffic on top of completed box drain portion will be part of scope of this work.

All branch drains before meeting at Main Drain-1 should be provided a silt trap, manually cleaned bar screen and sluice gate with proper arrangement of maintenance, access to these units.

Soil Stabilization has to be done and after confirming safe bearing capacity of soil with approved design and drawings construction activities shall be done as per work plan and detailed construction program.

4.5.14. Back Filling

After extraction of Piles, excavated portion shall be filled by good earth (blending of sand with cohesive soil shall be permitted) with blending of sand and compacted to achieve dry density 95% of standard proctor density.

4.5.15. Road Work

Providing 100 mm thick with nominal reinforcement cement concrete wearing coat of M30 grade concrete reinforcement is to be provided. Bituminous coat shall be provided on top of road surface as per drawings. Side drains with pre cast covers along both side of main drain are to be provided with a connection to main drain at spacing specified as in drawing F-BD/LOT 1/04/6. Walk way (Footpath) and bicycle track of paver blocks of width as specified in drawings shall be provided on both side of Main Drain. Footpaths are to be discontinued at entrances of adjoining houses. At certain places the median is to be provide as specified in the drawing no. F-BD/LOT 1/04/10. Medians shall be constructed on top of

Box drain (Road). The road will be illuminated with decorative poles fixed in the median as scope and specification specified in the Technical Specification.

Manhole Covers: Providing and fixing RCC EHD35 Manhole Cover and frame in the wearing coat after as shown in Drawing No. F-BD/LOT 1/04/7 RCC manhole cover and frame shall be BIS marked .

Expansion Joints: Construction and expansion joint are to be provided as per relevant IRC Code.

4.5.16. Miscellaneous Work

Any other allied work not mentioned above, but as directed by Engineer in-Charge.

4.6. Design Criteria

The structural design and drawings which will be submitted by the contractor for approval, has to fulfill the following stipulated technical requirements. While designing the contractor is to ensure that the below mentioned technical requirements are well fulfilled and has been adopted in design and drawings.

- 4.6.1.** The box drain will be suitable for vehicular movement from one end to other as well as from all cross roads coming to box drain junctions.
- 4.6.2.** The contractor has to visit the site of each location to get accustomed with site condition, accessibility etc.
- 4.6.3.** Gradient of Box Drain to be maintained as per L-Section in Drawing No F-BD/LOT 1/04/2.
- 4.6.4.** Class of loading for Box drain design to be considered: IRC -Class A and Class AA (both for tracked and wheeled vehicles) loading as per IRC-6 playing along direction of drain flow and opposite (across) to the direction of drain flow. Minimum 40 % (forty percentage) of respective live loads and imposed loads shall be considered in design of box drains towards impact / dynamic action loading apart from other loadings both for precast and cast in situ box drains while designing structural members and while checking base pressure on soil.
- 4.6.5.** All allied latest I. S code of practices, IRC codes and books of reputed authors of national and international standards shall have to be considered in design and drawings apart from the I.S codes, IRC codes etc. referred in the tender documents. But in all cases, it is to be ensured that the technical requirements asked at various sections of tender documents and at above mentioned paragraphs / points are fulfilled.
- 4.6.6.** Since there is scarcity of construction land adjacent to drain walls at both sides, maximum projection of base slab to outside beyond outer face of outer wall may be limited to 500mm maximum at each side.
- 4.6.7.** Wherever the designed top roof level of box drain is lower than top levels of existing road crossing at old culverts, the top shall be filled up with road materials like, sand, metal, binding material, carpeting etc. as per standards and two sides of

junction of cross roads shall be finished with road materials & finished properly so that existing culvert top level is maintained for smooth movement of vehicles. Wherever roof level of drain is at higher level than the existing road level, filling is to be on existing road to achieve same finish level of cycle track and footpath.

- 4.6.8.** For crossing of utilities like water supply, cable lines gap shall be provided inside or above the roof slab to accommodate pipe from one side to other side, R.C.C M-30slab shall be provided so that no load comes directly on pipe conduits. adjacent to some existing culvert locations, shall be provided with ducts, as shown in reference Drawing No F-BD/LOT 1/04/8.
- 4.6.9.** For maintenance & cleaning & access inside box drain, opening with heavy duty MS cover shall be provided at regular intervals as shown in Drawing No F-BD/LOT 1/04/14.
- 4.6.10.** The existing tertiary drains & sub drains which connect the existing drain shall be reconstructed as per required sizes & invert levels and shall be provided with Stainless Steel Grade 304/316 bar screens as shown in reference drawings. Similarly roadside drains also shall be connected with box drain as per reference Drawing No F-BD/LOT 1/04/5.
- 4.6.11.** The box drains on each location has to be designed based on :-
 - (a) Geo technical investigation conducted by Contractor
 - (b) All relevant is I.S codes, IRC codes & other acceptable standards.
 - (c) Minimum class A and AA loading as per IRC codes & other dead load, live load, impact load etc.
 - (d) Grade of cement concrete: Minimum RCC – M-30 for cast in situ construction, Minimum RCC – M-35 for pre cast construction, PCC- shall of grade M-20 for both i.e. precast and cast in situ construction. This supersedes grade of concrete if mentioned elsewhere in tender documents
 - (e) Reinforcement: Fe 500 HYSD bars minimum confirming to relevant I.S Code and make of steel shall be of SAIL/ TATA/VIZAG only.
- 4.6.12.** Clear cover to reinforcement: base slab - 60mm, wall -60mm, roof slab -50mm, column -50mm, Pile: sides -50mm, bottom -100mm, others- 40 mm.
- 4.6.13.** All RCC structural members are to be designed as un-cracked section as per I.S-3370 limiting the maximum crack width within 0.15mm (Zero point fifteen millimeters.). Stresses in concrete, steel etc. shall be in conformity with I.S-3370.
- 4.6.14.** Minimum reinforcement in sections in each direction shall be in-conformity with the requirement of I.S code-3370. The permissible stresses in concrete and steel shall be in conformity with that laid down in I.S code -3370 also for water retaining structures.
- 4.6.15.** No age factor shall be considered in design.
- 4.6.16.** Walls to be designed for both conditions:
 - (a) Water inside and no earth, water & surcharge etc. outside.
 - (b) Inside empty with surrounding soil, water and surcharge loading etc. at outside.

- 4.6.17.** Maximum angle of repose of backfilling material on outer wall is to be considered to be 15 degree in design.
- 4.6.18.** In case of pre cast box drains/ open drains, handling stresses of minimum 15 % of structural weight shall be considered (because of placing of pre cast box sections and aligning them in to correct position) while checking maximum pressure on soil with that of SBC of soil at founding level.
- 4.6.19.** Minimum thickness of RCC Members irrespective of design requirement. The thickness of respective members in design and drawings for execution shall not be less than the stipulated thickness (as mentioned below) for respective members. But if the design & analysis of structural members requires more thickness over the stipulated thickness of respective members, the thickness of members shall be as per design requirement. In all cases the developed/calculated crack width and stresses in reinforcement and concrete has to confirm the afore said stipulation already made in that respect regards to relevant I.S codes.
- Minimum thickness of members are as follows;
- For Box drain:**
- Raft base slab 500mm, all walls 450 mm (uniform thickness), roof slab 450 mm.
- For laterals / tertiary drains etc connecting Main drains:**
- Base slab 250mm, walls 250 mm at bottom and 200 at top, roof slab if any 200 mm.
- For Connecting chambers:**
- Base slab 250mm, walls 250 mm at bottom and 200 at top, roof slab if any 200mm
- 4.6.20.** For all types of drains, Horizontal haunch of minimum 200 x 200 at junction of wall with base, and wall with roof slab shall be provided in addition to thickness required from bending moment and shear force consideration and to be provided with required reinforcement as per standard industrial practice.
- 4.6.21.** An earth cushion of height 0.60 m is to be considered in design on roof slab looking at future development & practical site requirement. A surcharge loading on account of 1.2m height earth at outside wall to be considered in design. Along with vehicular load, impact loading, pressure on account of: earth, water, surcharge, all live load, Dead loads, imposed loads, earth cushion of 0.6m on roof slab for future expansion/ site requirement etc. is to be considered in design apart from other loadings.
- 4.6.22.** For safety, Weep holes of minimum 75mm dia surrounded by graded granite metal is to be provided in outer walls in two layers laterally @ 2.5m c/c for release of water pressure during short flow. But in structural design walls to be designed both for pressure on account of surrounding soil and water/submerged water.
- 4.6.23.** PCC / Lean concrete shall be of minimum 150mm thick for all RCC members in contact with soil in foundation. Back filling outside the wall shall be done with clean coarse sand thoroughly mixed with cohesive soil(each approx. 50 %).
- 4.6.24.** Screed concrete of 75mm to be considered on top of base slab and wearing coat of RCC-M 30 of 100mm thick to be considered on roof slab ..

- 4.6.25.** Ventilating shaft at both sides of drain on wall surface of Box drain shall be provided at regular intervals for general ventilation of box drain. Ventilation shaft shall not be less than 250 mm dia Stainless steel of SS -304 grade with minimum 2.5m height having a bend at top with SS grating at end. Shafts shall be placed with a spacing not more than 20 meters apart at both side of drain apart from openable man holes which are to be provided at regular intervals on roof slab for operation and maintenance requirements. Equivalent or improved methodology if any for ventilation shall also be accepted without extra cost to Employer.
- 4.6.26.** Expansion joints are to be provided in drain at intervals confirming to relevant IS Code using two layers of PVC water stoppers at joint. Construction joints may be provided at each 200meters of drains. The joints are to be filled with hot bitumen to make it water tight as far as possible.
- 4.6.27.** On two parallel sides of box drain, road surface drains shall be provided for quick disposal of rain water, for draining storm water from roads road gullies are provided at every 20 meter in both lanes as in Drawing No F-BD/LOT 1/04/6.
- 4.6.28.** C.I. steps or plastic encapsulated step are to be provided confirming to relevant IS Code 5455 with latest revision and as fixed as per Drawing No F-BD/LOT 1/04/7.
- 4.6.29.** Road Gullies: Road Gullies are to be provided at every 20m or as per standards CD-526. for Road drainage as per IS Code 7440-1985 Construction and maintenance of Road Gullies and Road Gullies are connected to the main drain with the hume pipe of minimum 225id NP3 Pipes.

Above design requirements / criteria also hold good and is applicable for box culverts, likely similar structures and all other allied secondary structures in the contract.

4.7. Execution Sequencing:

4.7.1. Approvals needed before start of construction

After handing over the site, the Contractor has to start confirmative survey and recheck Ground levels with respect to GTS Bench Mark provided in bid document. Confirmative survey shall be submitted for approval to Engineer and approval, following approvals are needed to start of construction works;

1. Design and Drawing for Engineers Office
2. Quality Assurance Plan
3. Safety Health and Environment Plan
4. Methodology of sheet piling
5. Methodology for Water Diversion
6. Methodology of Sub-Soil Improvement system includes Soil Stabilization
7. Construction Program
8. Billing Breakup
9. Micro Plan for first three month
10. Quarries of material

11. Cement and Steel Make
12. After approvals, setting out of construction zone with marking of grid line pillars has to be done.

4.7.2. Pre Construction Activities

1. Construction of Engineers Office.
2. Installation of RMC Plant and certification by Engineer
3. Establishing and approval of Quality Control Laboratory
4. Design Mix

4.7.3. Construction Activities:

After approvals, setting out of construction zone with marking of grid line pillars has to be done.

1. Installation of Sheet piles as per approved methodology.
2. Installation of Water Diversion system.
3. Identifying Construction Zone.
4. Dismantling of Existing wall and stacking of serviceable material and disposal of unserviceable material as per instruction of Engineer.
5. Removal of slush and its disposal as per instruction of Engineer.
6. Making arrangement for Construction zone dewatering
7. Providing Sub-Soil Improvement System (including soil stabilization system) as per approved methodology.
8. Performing Bearing Capacity test at founding level in construction zone at every 250mts which ever is less, along the length of Main Drain-1 and verifying it with approved designs. If SBC achieved is less than SBC considered in design then structural designs has to be revised accordingly and got approved.
9. Providing and Laying PCC
10. Providing and laying reinforcement and Shuttering as per approved drawings
11. Applying pre construction checks
12. Concreting as per approved methodology and specifications
13. Curing and applying post construction check
14. Removal of shuttering and defect rectifications if any needed.
15. Construction of catch water drain
16. Construction of Cycle track and Footpath
17. Fixing of Stoplog system at identified locations
18. Construction of silt trap, fixing of bar screen and sluice gate at junction of branch drains.

19. Fixing of Ventilation system
 20. Construction of BT Road, road signage marking as per relevant IRC standards
 21. Fixing of decorative electric poles, laying cables and fixing light fixtures
 22. Fixing of traffic signals as and where required.
 23. Start of Traffic on completed stretch.
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- 4.7.4.** The dismantling work of existing drain and other existing construction will be carried out with utmost care and precision so that there is no damage to other existing properties and installations.
 - 4.7.5.** The existing laterite lining shall be dismantled with utmost precision so that substantial quantity can be reused. The contractor shall stack the materials as per direction of the Engineer. The dismantling materials shall be kept and stacked in places to shown by the Engineer. The un-used dismantled materials shall be disposed or shall be taken care of, as will be directed by the Engineer.
 - 4.7.6.** The Engineer can modify, change any portion of the drawings and designs and the contractor has to comply with such modification without extra claim.
 - 4.7.7.** The contractor shall arrange for Total Station survey instrument at site for all duration of the project and fix up the necessary bench marks along the alignment of the drains exhibiting the Reduced level (R.L) co-relating with the G.T.S levels as well as levels to be instructed by the Engineer. After preparation of the site and excavation of the earth, the R.L to be maintain at drain invert, foundation bottom, proposed drain top level etc. shall be maintained co-relating with the hydraulic levels specified in the profile and cross-sections of the drains and sub-drains etc. To avoid mistake the contractor shall fix up concrete blocks along bed of drains, throughout, the top levels of which should be flushed with drain bed invert levels as per profile drawing.
 - 4.7.8.** All required construction materials like sand, earth, aggregates, cement, steel reinforcements, centering, shuttering and shoring materials, bricks, cross bracing steel, pump sets including suction delivery, electrical accessories, MS-flats, MS-angles etc, required for construction purpose, shall be brought to the site and got approved for quality and specification by the Engineer in charge before using in the works. The material shall be properly stored and stacked so that these are not damaged by weathering and other effects. Special care shall be taken for storage of cement, reinforcement steel, sheet piles, sand, aggregate etc. for the safe storage before use.
 - 4.7.9.** All Tools and Plants, Equipment, dewatering pumps Mechanical Mixer machine, vibrator, Welding sets etc whatever will be required for smooth and efficient construction work shall be arranged by the contractor at his own cost and risk and shall be got approved by the Engineer before use in the works.
 - 4.7.10.** The work of Box Drain shall be carried out strictly as per approved drawings maintaining the required size of the drain i.e depth, width, invert levels, hydraulic gradient level, top of the Box Drain level etc. and also as per direction of the Engineer.

- 4.7.11.** The contractor will engage proper Tools and Plants, Equipment's, vehicles, skilled and non-skilled personnel in such a manner that the work of box drain can be done smoothly and efficiently to have maximum output possible, within given time span.
- 4.7.12.** Time of completion and quality of works and workmanship etc are the essences of the Contract. The contractor shall ensure timely completion of the works if required by working in 2 shifts. Similarly, the specification and the quality of the materials and workmanship etc, shall be followed & done in such a manner that so that there is no compromise about quality, failing which the Engineer shall be at liberty to take the action against the contractor. It is expected the contractor will deploy the latest technology & technique, in construction works.
- 4.7.13.** The Cement to be used for RCC M 35 & M 30 work shall be of Grade 53 as per IS 12269. The cement shall be of latest manufacture not more than 1 to 2 months old. Clumping in cement will not be allowed. The cement bags must bear the authorized BIS Certification marks with date of manufacture. The copy of BIS license of the manufacturer shall be submitted to the Engineer with due authenticated signature of the contractor. Similarly, certificate of the manufacturer that the cement conforms to BIS codes for Gr 53 shall be submitted to the Engineer in charge. The quality of cement & other requirements shall conform to IS 12269- 1987 & IS 8112-1989, respectively, as the case may be. The contractor shall, therefore, get approval of cement make from the Engineer and shall use same brand of cement for whole projects.
- 4.7.14.** The stone aggregate shall be washed graded as per specification for respective nominal gauge. The contractor shall get the quality strength of stone aggregate (Coarse Aggregate) tested in a testing laboratory. The contractor, therefore, shall use only specified quality.
- 4.7.15.** The steel reinforcement for RCC shall be High Yield Strength Deformed bars (HYSD) of minimum Fe500 grade as per BIS code IS 1786-2008. The proof stress, tensile strength, yield strength, nominal size, mass per meter, cross section etc. shall confirm to relevant BIS code. The name of the manufacturer & BIS certification marks shall be got embossed on steel rods, from the manufacturer. The valid BIS license of manufacturer will be submitted under signature of Manufacturer to the Engineer. If the Engineer so feels, he may inspect the factory of Manufacturer to satisfy himself about various testing & analysis. The Engineer may also get random samples tested for quality & strength in any testing laboratory & the contractor shall have to arrange such testing. The contractor shall use steel of only manufacturer, approved by the Engineer.
- 4.7.16.** The quality of the sand from specified lot will be collected jointly with the Engineer and shall be got tested in laboratory as will be specified by the Engineer and test results shall be submitted to the Engineer.
- 4.7.17.** The backfill material for trenches shall have values $C=0$ and Angle of cohesion as 20 degree in case of sand and 8 to 10 degree in case of earth having cohesion.
- 4.7.18.** The levels at foundation bottom, top of sand filling, top of PCC, R.C.C bottom slab, drain top etc. shall be got checked by the engineer or its representative at each location before proceeding work. If there is any defect in any level at any chainage along drains, sub-drains, the work shall be rejected by the Engineer and got redone at contractor's own risk and cost.

- 4.7.19.** The concrete work by hand mixing will not be allowed. Mixing shall be done by specified capacity of mixture machine with weigh batcher for concrete quantity less than 2.5 Cum and concreting quantity more than 2.5 Cum at one location, it will be only allowed from ready mix plant only.
- 4.7.20.** The underground water which percolates & come inside will be bailed out continuously as already stated earlier. Concreting & RCC work will not be allowed under water.
- 4.7.21.** The contractor shall arrange for collection of the sample of the concrete to be used in CC & RCC works in metallic cube moulds as per specifications and corresponding IS Codes and same after proper curing shall be got tested for compressive strength etc. in the testing laboratory specified by the Engineer.
- 4.7.22.** After cement concrete and R.C.C are laid & compacted, these will be allowed to harden at least 24 hours after casting, there shall not be any ingress of water because of failure of dewatering or water diversion system.
- 4.7.23.** Providing Centering & shuttering, Stripping period and curing shall be strictly followed as per specifications.
- 4.7.24.** The contractor shall co-ordinate with Traffic department for diversion of Traffic vehicles etc away from construction zone.
- 4.7.25.** The contractor will erect sign boards in construction zone for general appraisal & also every precaution/arrangement to protect general public, supervisory engineers & staff, contractor's own labourers & staff etc so that accidents do not occur & safety of life is not endangered. If any such accident occurs the contractor shall be responsible for liabilities & consequences.
- 4.7.26.** The site should be barricaded with steel barricaded of height 2.00 mts, made out of steel plates and angles with having adequate rigidity to sustain against impact of two wheeler vehicles.
- 4.7.27.** The roadside drains and all sub drains and tertiary drains and various outlets shall be connected with Box Drain as per specified levels, sizes, etc. as well as with protection arrangement with CI/SS-bar screens etc.
- 4.7.28.** The contractor shall maintain its own office in Cuttack city as well as site offices at suitable locations. The copies of the approved drawings, designs, specifications, etc. shall be maintained for inspection and verification by the Engineer and his representatives.
- 4.7.29.** The contractor shall keep close co-ordination with the Engineer and with other concerned departments representatives of stake holders for expeditious execution of works.
- 4.7.30.** The contractor shall maintain Hindrance register cum progress register in which day to day work, hindrance (if any) shall be recorded and got verified by the Engineer.
- 4.7.31.** The contractor shall maintain liaison and co-ordination with various departments and organization like Traffic Police, Power department (Central Electricity Supply utility of Odisha), Water Supply (PHED), BSNL, PWD, Water Resources

Department, Cuttack Municipal Corporation, Police department etc., for smooth execution of the works.

4.7.32. The contractor shall maintain watch and word till completion and handing over the works.

4.7.33. The contractor shall pay all central and state taxes duties, royalties, etc, for the supplies and works.

4.8. Maintenance Access

Contractor shall design and provide access to Box Drain for maintenance by mechanical means:

1. Stop log gates has to be installed at every 750mts along the length of drain with lifting arrangement and platform of Cement Concrete to withstand load of 10MT has to be constructed for temporary storage of waste collected from drain cleaning.
2. Two opening with precast slab has to be provided at starting Chainage 3325 and Second one end point at Ch 6700 with construction of Ramp has to be done as per drawing No.F-BD/LOT 1/04/15.
3. No storm water is to be seen outside the Ramp and shall be covered with suitable arrangements. It should be protected by lock and key to prevent Public entry.
4. Access is provided in side wall. The entry ramp raft slab should withstand 10T load and shall be protected from Public entry with angle & weld mesh fencing around the ramp upto height of 2 meters and lockable Gate of angle and weld mesh at Entry. The top of Ramp should be covered with suitable steel section and chequered plate at ground level above the ramp fixed on the one side with hinges with Pin and Bronze Bushes for lubrication at least 1 in every meter. The shutters can be provided in 2 meters width. A manual winch derrick system is to be provided for lifting the shutters in vertical position and with latching arrangements to hold the shutter in that position.
5. Where ever access is provided it should have entry into both the ducts of box drain as it is twin ducts.
6. At Ch 3300 there will be junction of 2L of MD1 Box Drain, Open Drain MD1 and Box drain the access at Ch 3327 should also be ingress to open drain Culvert at 3300.
7. The access at 6700 should also be designed in such a way that cleaning machine can go down stream to Railway Crossing Box Culvert at Matrubhawan.
8. The contractor may suggest any cleaning methodology and providing access for cleaning, it may be allowed only after approval from Engineer.

4.9. Demolition of Existing Culverts & Reconstruction

4.9.1. Pre-construction Activity

A traffic diversion plan has to be submitted indicating alternate routes for smooth movement of traffic with start and expected date of completion of work, to OWSSB and it will be communicated respective traffic control authority by OWSSB for approval. After getting approval, traffic diversion shall be done as per approved schedule and traffic Marshall shall be made available as instructed by Engineer for smooth movement of traffic. In no case, traffic congestion shall be permitted because of any construction activity done by Contractor.

4.9.2. Dismantling

Dismantling all existing culverts and bridges within the alignment can be taken up with most precautions, no adjoining structures/properties should be damaged because of dismantling action done by Contractor, and if occurs then it will be responsibility of Contractor to get it rectified immediately with no extra cost to Employer. After dismantling, stacking of serviceable material and disposal of unserviceable material shall be done as instructed by Engineer.

It is suggested to make a detailed status report on condition of existing properties which may be helpful in identifying the damages occurred and in rectifying damages. Entire culver has to be dismantled including slab, walls, including, wing walls and excavation has to be as per approved drawing and after Sub-Soil Improvement construction activity can be started. Special care should be taken in planning and construction that smooth movement of traffic and liquid flow shall be maintained after completion of box drain portion in previous culvert sections. At junctions from side roads, proper traffic junction should be designed and constructed for smooth movement of traffic.

4.9.3. Backfilling

Backfilling of trenches developed because of Box drain construction is to be filled up with approved backfilling soil as specified in backfilling duly compacted and if any open space is available, it should be developed such that it will not be encroached in future.

4.9.4. Junctions of Sluice Gate Inlets

The following drains with sluice gates are connected with Box Drain at various locations as listed in 1.4.5 of under Scope of work.. At all junctions of branch drains, existing gates if any available shall be dismantled with proper care shall be handed over to OWSSB with proper documentation. New sluice gates with bar screen (shall be fixed so that here will be least human intervention shall be needed during operation and maintenance of sluice gates and bar screens.

4.10. Specifications of Sluice Gates:

4.10.1. Frame & Gate:

The frame and gate shall be fabricated by Carbon steel BS 4, 449, and 1449 provided the standard flat back or spigot frame with rectangular opening. Gate is design for minimum 5 times of safety factor again the structural failure. The reinforced with structural shapes welded to the plate to prevent bending. The gate and the seating surface having the good flatness for better performance.

Stems –Carbon Steel confirming to IS-2004 -1991. Code for forging for general engineering purposes.

4.10.2. Fasteners

All anchor bolts assembly bolts, screws, nuts, etc. shall be of ample section to safely withstand the forces created by operation of the gate.

Stainless Steel, ASTM F593, Grade 304 or 316

Rubber Seals –Neoprene, ASTM D2000

Guide Bars -Ultra High Molecular Weight Polyethylene, ASTM D4020

4.10.3. Guides

Guide shall be bolted to the frame and shall be machined on all bearing and contact faces. The length of guide shall be such that it should support the gate up to the horizontal line of stem nut pocket. Arrangement shall be made to prevent lateral movement of bolted on guides. They shall be capable of taking the entire thrust produced by water pressure and wedging action. Wedges or wedge facings shall be attached securely to the guides at points where, in the closed position, they will make full contact with the wedging surfaces on the slides.

4.10.4. Seals

Slide gates shall contain a flush-bottom seal attached to the frame invert member. The seal shall extend into the guide frames and provide complete sealing for the entire width of the disc. J-bulb type seals shall be mounted inside of the gate frame and be welded with stainless steel flat head screws and UHMW poly cover bars. J-bulb seals shall conform to IS-11855.

4.10.5. Seating faces:

Seating faces shall be made of full width, solid section, dove-tail strips of stainless steel. They shall be secured firmly by means of counter sunk fixings in finished dove-tail grooves in the frame and slide faces in such a way as to ensure that they will remain permanently in place, free from distortion and loosening during the life of the sluice gates. The faces shall be of ample section and finished smooth. The maximum clearance between the seating surfaces, with the slide in the closed position shall not exceed 0.10 mm.

4.10.6. Wedging devices:

Sluice gates shall be equipped with adjustable side, top and bottom wedging devices as required to provide contact between the slide and frame facing when the gate is in closed position. All faces shall be machined accurately to give maximum contact and wedging action. Wedges shall be fully adjustable with suitable adjusting screws and locknuts and so designed that they will remain in the fixed position after adjustment.

4.10.7. Gate slides

The slide shall be with strengthening ribs where required and a reinforced section to receive the seating faces. The slide shall have tongues on each side extending its full length, and the tongues shall be machined accurately on contact surfaces. Surfaces of the slide that come in

contact with the seat facing and edges shall be machined accurately. The maximum allowable clearances between the slide and the slide guide shall be 1.6 mm. An integrally cast stem nut pocket with reinforced ribs shall be provided above the horizontal center line of the slide. The stem nut pocket shall be provided with drain.

4.10.8. Stem nut and lift nut:

Gate shall be provided with a lower fixed stem nut for connecting the stem to the slide and a revolving lift nut located in the lifting mechanism in the headstock. They shall be of ample design to endure the thrust crank operated type and shall have a lift nut threaded to fit the operating stem. Crank shall be removable. Ball or roller thrust bearings shall be provided above and below the flange on the lift nut to take the load developed in opening and closing the gate with a torque of 14 kg. m on the crank. Fittings shall be provided to lubricate gears and bearing. The design of the lift mechanism of the hand operated gates shall be such that the slide can be operated with a torque of not more than 7 kg m on the operator after the slide is unseated from wedges based on the operating head. The maximum crank radius shall be 380 mm. All gears and bearings shall be enclosed in a cast iron housing with labyrinth seals. The lifting mechanism shall be with a cast iron pedestal, machined and drilled to receive the gear housing and suitable for bolting to the operating floor. The gates shall close with clock wise rotation of the crank. The direction of rotation to close the gate shall be indicated on the lift mechanism. A suitable means shall be provided for lubricating the stem threads directly adjacent to the lift nut. An inspection cover shall be provided to access the lift nut and gearing. Stem shall be provided with a GI pipe cover. The cover shall be fixed to the head stock.

4.10.9. Wall thimbles:

Wall thimbles shall be made of cast iron and shall be supplied along with the gate. The wall thimbles shall provide a rigid mounting, designed to prevent warping of the gate frame during installation. The cross section of the thimble shall have the shape of the letter 'F'. The front, or mounting flange, shall be machined and shall be drilled and tapped to the same template used for its particular gate frame. The frame shall be attached to the thimble with bolts or studs. The depth of the wall thimbles shall not be less than 300 mm. To permit entrapped air to escape as the thimble is being encased in concrete, holes not less than 35 mm dia. at not more than 600mm span, shall be cast or drilled in each entrapment zone formed by the reinforcing ribs or the flange and fluid stop.

4.10.10. Lifting lugs:

Lifting lugs shall be provided for gates.

4.10.11. Junctions of Inlets:

Dismantling of existing connection & reconstruction of junction points of all lateral inlets of open drains, Road side drains etc. with Box Drain, at various locations, as per sizes, invert levels, top levels etc. with MS bar screens, Sluiceways, as the case may be etc. including supply of all materials, labor etc. complete in all respects, as per direction of the Engineer. For location refer clause 4.4. of Scope.

4.11. Specifications of MS Bar Screens:

4.11.1. Bar Screens

Screening large debris at surface inlets may be very effective in minimizing the need for Bar Screen. It should be provided inside the at outlet of Lateral Drains. Usually the bar screens are inclined with bar spacing at approximately 50mm. Constructing the screens in modules facilitate removal during maintenance. If the grid is relatively small, an emergency bypass of the screens should be provided to protect against clogging and subsequent surcharging of the system. The existing tertiary drains with sluice gate inlets shall be reconstructed as per required sizes & invert levels and shall be provided with MS bar screens & replaces with new MS sluices, as shown in reference drawings.

4.11.2. Light Duty Manhole Cover:

The Manhole Cover is to be provided in the Slab of screening chamber to facilitate rodding of covered Lateral Drains in case of Choking. The LD Manhole cover and frame shall be square type of size 450/60 confirming to IS Code 1726-1991.

4.12. Project display signs

The Contractor shall provide for the construction and placement of signs of minimum dimensions as stated below.

The following types of signs shall be produced and used as noted:

- Project Information – providing names of government agencies, funding agencies, engineers and contractors (Minimum dimensions: 3 x 2 m).
- 1 number should be provided at Project field office
- Warning / Caution – providing statements of warning caution relative to the construction activities (Minimum dimensions: 1.5 x 1 m).
- Adequate number of Warning/Caution boards should be provided at work site, depending on site characteristics.

The Contractor shall maintain all signs in good condition for the duration of the job, including all extensions and all warranty and/or defects liability periods. The Contractor shall be responsible for removal and disposal of the signs at the end of said period and in accordance with directions of the Engineer.

4.13. Reference standards

Wherever, reference to various IS Codes has been made in the Employer's Requirements, it shall mean the latest edition of the relevant Code. In case of ambiguity between the specifications contained in various sections of the bid documents and Indian Standards, the Contractor shall notify the Engineer, who shall determine the prevailing code and his decision shall be final.

4.14. Carriage of Materials

The carriage and stacking of materials shall be done as directed by the Engineer. Any tools and plants, required for the work shall be arranged by the Contractor. The carriage of materials includes loading within a lead of 50 meters, unloading and stacking within a lead of 500 meters.

4.15. General Consideration for stacking and Storage

For any site, there should be proper planning of the layout for stacking and storage of different materials, components and equipment with proper access and proper maneuverability of the vehicles carrying the material. While planning the layout, the requirements of various materials, components and equipment at different stages of construction shall be considered. The storage & stacking should be as per IS- 4082.

Material shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.

4.16. Protection against atmospheric exigencies:

Materials stored at site, depending upon the individual characteristics, shall be protected from atmospheric actions, such as rain, sun, winds and moisture to avoid deterioration.

4.17. Stacking and Storage of Materials

4.17.1. Cement

- Cement shall be stored at the work site in a building or a shed which is dry, leak proof and as moisture proof as possible. The building or shed for storage should have minimum number of windows and closefitting doors and these should be kept closed as far as possible.
- Cement shall be stored and stacked in bags and shall be kept free from the possibility of any dampness or moisture coming in contact with them. Cement bags shall be stacked off the floor on wooden planks in such a way as to keep about 150 mm to 200 mm clear above the floor. The floor may comprise of lean cement concrete or two layers of dry bricks lay on well consolidated earth. A space of 600 mm minimum shall be left around between the exterior walls and the stacks.
- In the stacks the cement bags shall be kept close together to reduce circulation of air as much as possible. Owing to pressure on the bottom layer of bags sometimes 'warehouse pack' is developed in these bags. This can be removed easily by rolling the bags when the cement is taken out for use. Lumped bags, if any should be removed and disposed off.
- The height of stack shall not be more than 10 bags to prevent the possibility of lumping up under pressure. The width of the stack shall be not more than four bags length or 3 metres. In stacks more than 8 bags high, the cement bags shall be arranged alternately length-wise and cross-wise so as to tie the stacks together and minimize the danger of topping over. Cement bags shall be stacked in a manner to facilitate their removal and use in the order in which they are received; a label showing date of receipt of cement shall be put on each stack to know the age of cement.

- For extra safety during the monsoon, or when it is expected to store for an unusually long period, the stack shall be completely enclosed by a water proofing membrane such as polyethylene, which shall close on the top of the stack. Care shall be taken to see that the waterproofing membrane is not damaged any time during use.
- Cement in gunny bags, paper bags and polyethylene bags shall be stored separately.

In case cement is received in silos

The silos shall be placed near the concrete batching plant. Proper access shall be provided for the replacement of soils.

Different types of cements shall be stacked and stored separately.

4.17.2. Aggregates

- Aggregates shall be stored at site on a hard dry and level patch of ground. If such a surface is not available, a platform of planks or old corrugated iron sheets, or a floor of bricks, or a thin layer of lean concrete shall be made so as to prevent contamination with clay, dust, vegetable and other foreign matter.
- Stacks of fine and coarse aggregates shall be kept in separate stock piles sufficient distance from each other to prevent the material at the edges of the piles from getting intermixed. On a large job, it is desirable to construct dividing walls to give each type of aggregates its own compartment. Fine aggregates shall be stacked in a place where loss due to the effect of wind is minimum.
- Unless specified otherwise or necessitated by site conditions stacking of the aggregates should be carried out in regular stacks. The suggested sizes for stacks are as follows:

Sl.no	Material	Size of Stack (in M)		
		Length	Breadth	Height
(i)	Coarse Aggregates	2.0	2.0	0.5
		Or 5.0	5.0	1.0
		2.0	1.0	0.5
(ii)	Fine Aggregates	2.0	2.0	0.5
		Or 5.0	5.0	1.0
		2.0	1.0	0.5

4.17.3. Steel

- For each classification of steel, separate areas shall be earmarked. It is desirable that ends of bars and sections of each class be painted in distinct separate colours.
- Steel reinforcement shall ordinarily be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. It is desirable to coat reinforcement with cement wash before stacking to prevent scaling and rusting.
- Bars of different classification, sizes and lengths shall be stored separately to facilitate issues in such sizes and lengths so as to minimize wastage in cutting from standard lengths.

- Reinforcement bars shall be stacked above ground level by at least 150 mm. Also a coat of cement wash shall be given to prevent scaling and rusting.
- Structural steel of different classification, sizes and lengths shall be stored separately. It shall be stored above ground level by at least 150 mm upon platforms, skids or any other suitable supports to avoid distortion of sections. In coastal areas or in case of long storage suitable protective coating of primer paint shall be given to prevent scaling and rusting.

4.17.4. Water

Wherever water is to be stored for construction purposes this shall be done in proper storage tanks to prevent any organic impurities getting mixed up with it.

4.17.5. Other Materials

Small articles like nails, screws, nuts and bolts, door and window fittings, , protective clothing, spare parts of machinery, linings, packing, etc, shall be kept in suitable and properly protected store rooms.

4.18. Dismantling and Demolishing

a) Dismantling:

The term 'Dismantling' implies carefully separating the parts without damage and removing. This may consist of dismantling one parts of the building & Culverts, drains, compound wall etc as specified or shown on the drawings as directed by the Engineer.

b) Demolition:

The term 'Demolition' implies breaking up. This shall consist of demolishing whole or part of work including all relevant items as specified or shown on the drawings as directed by the Engineer.

4.18.1. Precautions

- a. All materials obtained from dismantling or demolition shall be the property of the Employer unless otherwise specified and shall be kept in safe custody until they are handed over to the Engineer.
- b. The demolition shall always be well planned before hand and shall generally be done in reverse order of the one in which the structure was constructed. The operations shall be got approved from the Engineer before starting the work. Due care shall be taken to maintain the safety measures prescribed in IS 4130 Safety Code for Demolishing of buildings.(Code of safety)
- c. Necessary propping, shoring and or under pinning shall be provided to ensure the safety of the adjoining work or property before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damage is caused to the adjoining work or property. Wherever specified, temporary enclosures or partitions and necessary scaffolding with suitable double scaffolding and proper cloth covering shall also be provided, as directed by the Engineer.

- d. Necessary precautions shall be taken to keep noise and dust nuisance to the minimum. All work needs to be done under the direction of Engineer. Helmets, goggle, safety belts etc. should be used whenever required and as directed by the Engineer. The demolition work shall be proceeded with in such a way that it causes the least damage and nuisance to the adjoining building and the public.
- e. Dismantling shall be done in a systematic manner. Chisels and cutters may be used carefully as directed by the Engineer.
- f. Any serviceable material, obtained during dismantling or demolition, shall be separated out and stacked properly as directed by the Engineer within a lead of 50 meters. All unserviceable materials, rubbish etc. shall be disposed off as directed by the Engineer.
- g. The contractor shall maintain/disconnect existing services, whether temporary or permanent, where required by the Engineer.
- h. No demolition work should be carried out at night especially when the building or structure to be demolished is in an inhabited area.
- i. First-aid equipment shall be kept at all demolition works of any magnitude.

4.18.2. Demolition of Special Types of Structures

4.18.2.1. In-situ Reinforced Concrete

- a) Before commencing demolition, the nature and condition of the concrete, the condition and position of reinforcement, and the possibility of lack of continuity of reinforcement should be ascertained.
- b) Attention should be paid to the principles of the structural design to determine which parts of the structure depend on each other to maintain overall stability.
- c) Where hard demolition methods are to be used, the following procedures should be used.

I. Reinforced Concrete Beams

For beams, a supporting rope should be attached to the beam. Then the concrete should be removed from both ends by pneumatic drill and the reinforcement exposed. The reinforcement should then be cut in such a way as to allow the beam to be lowered under control to the floor.

II. Reinforced Concrete Columns / Piers

For columns, the reinforcement should be exposed at the base after restraining wire guy ropes have been placed round the member at the top. The reinforcement should then be cut in such a way as to allow the column to be pulled down to the floor under control.

III. Reinforced Concrete Walls / Roof Slabs

Reinforced concrete walls / Roof Slabs should be cut into strips and demolished as for columns.

4.19. Specifications of Materials

4.19.1. Sand

- a. Sand shall consist of clean hard, strong, sharp and durable uncoated particles free from injurious amounts of clay, vegetable, matter, dust, mica, soft or particles, shall, alkaline material or other harmful substances. It shall be obtained from clean beds in rivers or pits. Sea sand or sand which has remained under saline water shall not ordinarily be used. Requirements differ slightly for various classes of works as noted below.
- b. Sand for reinforced or plain cement concrete - shall be clean, coarse and as well graded as possible but must not contain too much fine material. The coarser particles shall pass through a mesh with 3/16" square sides in the clear. It should be free from mica and clayey matter. Where all sand is micaceous it should be carefully selected from the coarsest deposits so as to eliminate the mica as far as possible. Sand shall be washed and cleaned if this is considered necessary by the Engineer. In case of any doubt, as to the quality of sand it shall be tested according to the methods prescribed by the I.R.C. specification and code of Practice for Road Bridges in India both for fineness and freedom from clay, salts or other harmful impurities.
- c. Sand for cement mortar - As for cement concrete.
- d. Sand for plinth filling - Any sand coarse or fine which is fairly clean and free from salts may be used without screening or further treatment.
- e. Sand for plastering - This will be finer than what is required for cement-concrete but not so fine as dust. All particles of sand should pass through 64 mesh screen.

4.19.2. Portland Cement

Cement shall be of two varieties as required

(1) Ordinary Portland Cement, (2) Rapid hardening cement.

- a. General only ordinary Portland cement will be used. Rapid hardening cement on setting attains the same strength in about seven days as the normal cements attains in twenty-eight days and is therefore useful for structures which have to be brought into use very quickly. Because of its greater liability to develop shrinkage cracks, it should be used with caution, greater attention being paid to curing. Normal and rapid hardening cement must never be mixed together.
- b. All cement (Ordinary Portland Cement) shall be obtained from reputed manufactures who guarantee their product as being fully up to the Indian Standard Specification for cement of Gr 43 as per IS : 8122. It must be fresh and unharmed by exposure to moisture. Cement which has been stored too long or has become lumpy shall not be used. Cement in which only a few small lumps-soft and easily crushable in the fingers have formed may be used with care after screening out all the lumps and subject to satisfactory tests for strength. Cement used for reinforced concrete shall be tested periodically to see that it is up to the specification as regards quality and strength and has not deteriorated. The shed in which the cement is stored should be water tight and bags should be stored on a floor raised above the ground level and packed as tightly as possible to prevent moisture getting at the cement. In proportioning ordinary concrete, the quantity in Cum. of cement should be determined, by weight, taking the volume of 1441.66 Kg. of ordinary cement or 1281.47 Kg. of rapid hardening cement as 1 Cum.

4.19.3. Cement mortar

Cement mortar shall consist of fresh cement and clean sand- see specification for cement and sand-mixed by volume in the proportions 1:2, 1:2 $\frac{1}{2}$, 1:3, 1:4, 1:5, 1:6, 1:8, 1:10, 1:12 as may be specified. Cement and sand shall first be thoroughly mixed by hand in the dry condition. Enough water is then at once to be added by means of a rose so as to produce a fairly still mortar and the whole to, be turned not less than three times. Mortar should be used at once after mixing and it should be finally laid and tamped in position within 20 minutes counting from the time when the cement is moistened, remembering that most sands are initially more or less moist and the so called dry mixing also usually results in moistening of the cement to some extent. To ensure this it is necessary to mix only small quantities at a time which can be quickly handled and placed in the work. The timing shall be strict and particularly rigid in case of mortars for reinforced brickwork. Once laid the mortar shall not be disturbed again when green or insufficiently hardened. The only exceptions in this respect are cement mortar plasters requiring a smooth surface finish for floors or walls. For these light trowelling of the surface is permissible up to the time that the cement is taking its initial set. This may take place 30 minutes or more after mixing.

- Note-(1) Strong 1:4 mortar is suitable for all kinds of masonry which has to be very strong but is not too heavily loaded also for a strong plaster where smooth finish is not required for example in window sills, jambs and ceilings. 1:5 mortar is fairly strong and generally used for ceiling plaster over brick or tile surfaces. 1:6 mortar is generally quite strong enough for all kinds of ordinary masonry in walls but not in slender pillars. It may also be used for rubble masonry and for wall plaster where a fair strength and matt finish is needed.
- NOTE - (2) When sand and cement are mixed for cement mortar 1:2 or poorer it is found that dry mixing results in a volume not sensible different from the volume of the sand mixed. On wet mixing there may be slight increase in volume due to bulking but the final wet mixed volume is about the same volume of the sand mixed. There may be an increase about 5 per cent or more if the sand is well graded.

4.20. Earth Work

DEFINITIONS

Lead: All distances shall be measured over the shortest practical route and not necessarily the route actually taken. Route other than shortest practical route may be considered in cases of unavoidable circumstances and approved by Engineer along with reasons in writing.

Carriage by manual labour shall be reckoned in units of 50 meters or part thereof.

Carriage by mechanical transport shall be reckoned in one km. unit. Distances of 0.5 km. or more shall be taken as 1 km. and distance of less than 0.5 km. shall be ignored. However, when the total lead is less than 0.5 km., it will not be ignored but paid for separately in successive stages of 50 meters subject to the condition that the rate worked on this basis does not exceed the rate for initial lead of 1 km. by mechanical transport.

Lift: The vertical distance for removal with reference to the ground level. The excavation up to 1.5 meters depth below the ground level and every successive lift of 1.5 meters up to designed depth and depositing the excavated materials up to above the ground level are included in the rate of earth work.

Safety rules: Safety rules as laid down by the statutory authority and as provided in National Building Code (NBC) shall be followed.

4.20.1. Classification of Soils

The earthwork shall be classified under the following categories and measured separately for each category:

- **All kind of soils:** Generally any strata, such as sand, gravel, loam, clay, mud, black cotton moorum, shingle, river or nallah bed boulders, siding of roads, paths etc. and hard core, macadam surface of any description (water bound, grouted tarmac etc.), lime concrete mud concrete and their mixtures which for excavation yields to application of picks, showels, jumper, sacrifiers, ripper and other manual digging implements.
- **Ordinary rock:** Generally any rock which can be excavated by splitting with crow bars or picks and does not require blasting, wedging or similar means for excavation such as lime stone, sand stone, hard laterite, hard conglomerate and un-reinforced cement concrete below ground level. If required light blasting may be resorted to for loosening the materials but this will not in any way entitle the material to be classified as 'Hard rock'.

4.20.2. Antiquities and Useful Materials

- Any finds of archaeological interest such as relics of antiquity, coins, fossils or other articles of value shall be delivered to the Engineer and shall be the property of the Government.
- Any material obtained from the excavation which in the opinion of the Engineer is useful shall be stacked separately in regular stacks as directed by the Engineer and shall be the property of the Government.

4.20.3. Protections

- Excavation where directed by the Engineer shall be securely barricaded and provided with proper caution signs, conspicuously displayed during the day and properly illuminated with red lights and/or written using fluorescent reflective paint as directed by engineer during the night to avoid accident.
- The Contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, sewerage pipes, manholes, drainage pipes and chambers, communication cables, power supply cables etc. met within the course of excavation shall be properly supported and adequately protected, so that these services remain functional. However, if any service is damaged during excavation shall be restored in reasonable time.
- Excavation shall not be carried out below the foundation level of the adjacent buildings until under pinning shoring , sheet piling etc. is done as per the directions of the Engineer
- Any damages done by the contractor to any existing work shall be made good by him at his own cost. Existing drains pipes, culverts, over head wires, water supply lines

and similar services encountered during the course of execution shall be protected against damage by the contractor. The contractor shall not store material or otherwise occupy any part of the site in manner likely to hinder the operations of such services.

4.20.4. Site Clearance

- Before the earth work is started, the area coming under cutting and filling shall be cleared of shrubs, rank vegetation, grass, brushwood, trees and saplings of girth up to 30cm measured at a height of one metre above ground level and rubbish removed up to a distance of 50 metres outside the periphery of the area under clearance. The roots of trees and saplings shall be removed to a depth of 60cm below ground level or 30 cm below formation level or 15 cm below sub grade level, whichever is lower, and the holes or hollows filled up with the earth, rammed and leveled.
- The trees of girth above 30 cm measured at a height of one metre above ground shall be cut only after permission of the Engineer is obtained in writing. The roots of trees shall also be removed as specified, payment for cutting such trees and removing the roots shall be made separately.
- Existing structures and services such as old buildings, culverts, fencing, water supply pipe lines, sewers, power cables, communication cables, drainage pipes etc. within or adjacent to the area if required to be diverted/removed, shall be diverted/dismantled as per directions of the Engineer and payment for such diversion/dismantling works shall be made separately.
- In case of archaeological monuments within or adjacent to the area, the contractor shall provide necessary fencing around such monuments as per the directions of the Engineer and protect the same properly during execution of works. Payment for providing fencing shall be made separately.
- Disposal of Earth shall be disposed off at the specified location or as decided by the Engineer. The contractor has to take written permission about place of disposal of earth before the earth is disposed off, from Engineer.

4.20.5. Setting out and Making Profiles

- A masonry pillar to serve as a bench mark will be erected at a suitable point in the area, which is visible from the largest area. This bench mark shall be constructed and connected with the standard bench mark as approved by the Engineer. Necessary profiles with strings stretched on pegs, bamboos or 'Burjis' shall be made to indicate the correct formation levels before the work is started. The contractor shall supply labour and material for constructing bench mark, setting out and making profiles and connecting bench mark with the standard bench mark at his own cost. The pegs, bamboos or 'Burjis' and the bench mark shall be maintained by the contractor at his own cost during the excavation to check the profiles.
- The ground levels shall be taken at 5 to 15 metres intervals (as directed by the Engineer) in uniformly sloping ground and at closer intervals where local mounds, pits or undulations are met with. The ground levels shall be recorded in field books and plotted on plans. The plans shall be drawn to a scale of 5 metres to one cm or any other suitable scale decided by the Engineer. North direction line and position of bench mark shall invariable be shown on the plans. These plans shall be signed by

the contractor and the Engineer or their authorized representatives before the earth work is started. The labour required for taking levels shall be supplied by the contractor at his own cost.

4.20.6. Excavation in all Kinds of Soils

- All excavation operations manually or by mechanical means shall include excavation and 'getting out' the excavated materials. In case of excavation for trenches, basements, water tanks etc. 'getting out' shall include throwing the excavated materials at a distance of at least one meter or half the depth of excavation, whichever is more, clear off the edge of excavation. In all other cases 'getting out' shall include depositing the excavated materials as specified. The subsequent disposal of the excavated material shall be either stated as a separate item or included with the items of excavation stating lead.
- During the excavation the natural drainage of the area shall be maintained. Excavation shall be done from top to bottom. Undermining or undercutting shall not be done.
- In firm soils, the sides of the trenches shall be kept vertical upto a depth of 2 meters from the bottom. For greater depths, the excavation profiles shall be widened by allowing steps of 50 cms on either side after every 2 meters from the bottom. Alternatively, the excavation can be done so as to give slope of 1:4 (1 horizontal : 4 vertical). Where the soil is soft, loose or slushy, the width of steps shall be suitably increased or sides sloped or the soil shored up as directed by the Engineer. It shall be the responsibility of the contractor to take complete instructions in writing from the Engineer regarding the stepping, sloping or shoring to be done for excavation deeper than 2 meters.
- The excavation shall be done true to levels, slope, shape and pattern indicated by the Engineer. Only the excavation shown on the drawings with additional allowances for centering and shuttering or as required by the Engineer shall be measured and recorded for payment.
- In case of excavation for foundation in trenches or over areas, the bed of excavation shall be to the correct level or slope and consolidated by watering and ramming. If the excavation for foundation is done to a depth greater than that shown in the drawings or as required by the Engineer, the excess depth shall be made good by the contractor at his own cost with the concrete of the mix used for leveling / bed concrete for foundations. Soft/defective spots at the bed of the foundations shall be dug out and filled with concrete as directed by the Engineer.
- In all other cases where the excavation is taken deeper by the contractor, it shall be brought to the required level by the contractor at his own cost by filling in with mainly sand & some extent earth duly watered, consolidated and rammed.
- In case the excavation is done wider than that shown on the drawings or as required by the Engineer, additional filling wherever required on the account shall be done by the contractor at his own cost.
- The excavation shall be done manually or by mechanical means as directed by Engineer considering feasibility, urgency of work, availability of labour /mechanical

equipment and other factors involved. Contractor shall ensure every safety measures for the workers. No extra payment will be made on this account.

4.20.7. Excavation in Ordinary/Hard Rock

- All excavation operations shall include excavation and 'getting out' the excavated matter. In case of excavation for trenches, basements, water tanks etc. 'getting out' shall include throwing the excavated materials at a distance of at least one metre or half the depth of excavation, whichever is more, clear off the edge or excavation. In all other cases 'getting out' shall include depositing the excavated materials as specified. The subsequent disposal of the excavated material shall be either stated as a separate item or included with the item of excavation stating lead.
- During the excavation, the natural drainage of the area shall be maintained. Excavation shall be done from top to bottom. Undermining or under cutting shall not be done.
- Where hard rock is met with and blasting operations are considered necessary, the contractor shall obtain the approval of the Engineer in writing for resorting to the blasting operations. Blasting operations shall be done as specified and chiseling shall be done to obtain correct levels, slopes, shape and pattern of excavation as per the drawings or as required by the Engineer and nothing extra shall be payable for chiseling.
- Where blasting operations are prohibited or are not practicable, excavation in hard rock shall be done by chiseling.
- If the excavation for foundations or drains is done to a depth greater than that shown in the drawings or as required by the Engineer. The excess depth shall be made good by the contractor at his own cost with the concrete of the mix used for levelling/ bed concrete for foundations. Soft/ defective spots at the bed of foundations shall be dug out and filled with concrete (to be paid separately) as directed by the Engineer.
- In case the excavation is done wider than that shown on the drawings or as required by the Engineer, filling wherever required on this account shall be done by the contractor at his own cost.
- Only the excavation shown on the drawings or as required by the Engineer shall be measured and recorded for payment except in case of hard rock, where blasting operations have been resorted to, excavation shall be measured to the actual levels, provided the Engineer is satisfied that the contractor has not gone deeper than what was unavoidable.
- The excavation shall be done manually or by mechanical means as desired by Engineer considering feasibility, urgency of work, availability of labour /mechanical equipment and other factors involved Contractor shall ensure every safety measures for the workers. Neither any deduction will be made nor any extra payment will be made on this account.

4.20.8. Earth Work By Mechanical Means

Earth work by mechanical means involves careful planning keeping in view site conditions i.e. type of soil, nature of excavation, distances through which excavated soil is to be

transported and working space available for employing these machines. The earth moving equipment should be accordingly selected. The earth moving equipment consists of excavating and transporting equipment. Excavating equipment may be further classified as excavators and tractor based equipment.

Excavators

Excavators generally used at site are as follows:

a. **Dipper–shovel:**

It is used for excavating against a face or bank consisting of open-top bucket or dipper with a bottom opening door, fixed to an arm or dipper stick which slides and pivots on the jib of the crane. It is suitable for excavating all clay chalk and friable materials and for handling rock and stone. However, it is not suitable for surface excavation for which a skimmer is used.

b. **Backhoe:**

It is similar to face shovel except that the dipper stick pivots on the end of the jib and the dipper or bucket works towards the chassis and normally has no bottom door but is emptied by swinging away from the chassis to invert the bucket. It may be designed to carry both a front –mounted bucket loading mechanism and a rear mounted backhoe. It is mainly used to excavate trenches and occasionally used for the excavation of open areas such as small basements. In the backhoe mode the bucket lifts, swings and discharges materials while the undercarriage is stationary. When used in the 'loader' mode, the machine loads or excavated through forward motion of the machine, and lifts, transports and discharges materials.

c. **Skimmer:**

This arrangement is similar to the face shovel except that in this case the bucket slides on rollers directly along the jib and thus has a more restricted movement. It is used for surface excavation and levelling in conjunction with transport to haul away the excavated material.

d. **Dragline:**

It is usually fitted with a long slender boom or jib and the bucket, which in operation faces towards the machine and has no door, is supported by cable only as on a crane. It works from the side of the excavation at normal ground level and is used for excavating large open excavations such as basements when the depth is beyond the limit of the boom of a backhoe. It is commonly used for open cast mining operations.

e. **Clamshell:**

It consists of two hinged half-buckets or jaws pivoted to a frame which is suspended by cable from a long jib of an excavation. The grab is used for deep excavations of limited area on all types of soil except rock. Crane and Grab is a variant of this type of equipment.

4.20.9. Tractor-based Equipment

It is a self-propelled crawler or wheeled machine used to exert a push or pull force through mounted equipment. It is designed either as attachments to normal tracked or wheeled tractors or as machines in which the earth moving attachments and the tractor are designed as a single integrated unit. A tractor, which is hydraulically operated, can be rigged as:

a. **Loaders:**

It is used for loading, light dozing, scraping and grabbing operations, lifting and transporting the materials (loose earth, rubble, sand, gravel aggregate etc) at various sites through forward motion of the machine.

b. **Tractor Shovel:**

This consists of a tipping bucket at the front attached by strong pivoted arms or booms to the frame of the machine. It is used for stripping top soil, excavating against a face, bulldozing and for loading spoil or loose materials. It is similar to crawler dipper-shovel.

c. **Trench Digger:**

It operates on the same principle as a backhoe excavator except that the bucket is controlled by hydraulic rams instead of cables and pulleys.

d. **Scraper:**

Scrapers provide unique capability to excavate, load, haul and dump materials. Scrapers are available in various capacities by a number of manufacturers with options such as self – loading with elevators, twin engines or push-pull capability. They are cost effective where the haul distance is too long for bulldozers, yet too short for trucks. This distance typically ranges from 120 m to 1200 m; however, the economics should be evaluated for each project. Scraper has an open bowl with a cutting edge positioned between the axles, which cuts, loads, transports, discharges and spreads through forward motion of the machine. Loading through forward motion of the machine can be assisted by a powered mechanism (elevator) fixed to the scraper bowl.

e. **Bulldozer and Angle-dozer:**

The most common equipment used for clearing and leveling activities is a bulldozer. The terms bulldozer is used to define a tractor mounted with a dozing blade. The bulldozer consists of a rectangular steel blade with renewable cutting edge set at right angles (capable of only tilting but not angling) to the direction of travel and attached by steel arms to the side frames of a crawler tractor. It may be used for excavating natural soil or for moving loose soil or debris, which is pushed forward as the tractor forces it ahead.

f. **Angle dozer** is capable of both tilting and angling.

4.20.10. Transporting Equipment

This implies horizontal movement primarily but it can involve some vertical movement too.

- a. **Dumpers:** These are self-propelled wheeled machines, having an open body. It is designed for the transport of excavated materials and consists of a shallow tipping hopper or skip mounted on a wheeled chassis, such as, power barrow, dumper, multi-

skip dumpers, high discharge dumpers, dump truck, etc. These can be rear dump, side dump or bottom dump.

- b. **Vibratory Roller** : It is a single Drum Vibratory Roller for compaction of embankments, etc. The smooth drum version is for compaction of granular and mixed soil. The sheepsfoot Roller consists of a hollow cylindrical steel drum or drums on which projecting feet are mounted. These feet penetrate into the fill as a roller moves forward and cause compaction. The geometry of the foot may be sheep, club pyramid, cone or cylinder foot. Such rollers are employed for compaction (densification) of cohesive and semi-cohesive soils.

4.20.11. Filling

- The earth used for filling shall be free from all roots, grass, shrubs, rank vegetation, brushwood, tress, sapling and rubbish.
- Filling with excavated earth shall be done in regular horizontal layers each not exceeding 20 cm in depth. All lumps and clods exceeding 8 cm in any direction shall be broken. Each layer shall be watered and consolidated with steel rammer or ½ tonne roller. Where specified, every third and top most layer shall also be consolidated with power roller of minimum 8 tonnes. Wherever depth of filling exceeds 1.5 metre vibratory power roller shall be used to consolidate the filing unless otherwise directed by Engineer. The top and sides of filling shall be neatly dressed. The contractor shall make good all subsidence and shrinkage in earth fillings, embankments, traverses etc. during execution and till the completion of work unless otherwise specified.

4.20.12. Rough Excavation and Filling

Excavation for earth from borrow pits, cutting hill side slope etc. shall be described as rough excavation and shall be done as specified.

Wherever filling is to be done, the earth from excavation shall be directly used for filling and no payment for double handling of earth shall be admissible. Filling of excavated earth shall be done as specified. In case of hill side cutting, where the excavated materials is thrown down the hill slopes, payment for filling excavated earth shall not be admissible.

4.20.13. Excavation in Water, Mud or Foul position

All water that may accumulate in excavations during the progress of the work from springs, tidal or river seepage, broken water mains or drains (not due to the negligence of the contractor), and seepage from subsoil aquifer shall be bailed, pumped out or otherwise removed. The contractor shall take adequate measures for bailing and/or pumping out water from excavations and/or pumping out water from excavations and construct diversion channels, bunds, sumps, coffer dams etc. as may be required. Pumping shall be done directly from the foundation trenches or from a sump out side the excavation in such a manner as to preclude the possibility of movement of water through any fresh concrete or masonry and washing away parts of concrete or mortar. During laying of concrete or masonry and for a period of at least 24 hours thereafter, pumping shall be done from a suitable sump separated from concrete or masonry by effective means.

Capacity and number of pumps, location at which the pumps are to be installed, pumping hours etc. shall be decided from time to time in consultation with the Engineer.

Pumping shall be done in such a way as not to cause damage to the work or adjoining property by subsidence etc. Disposal of water shall not cause inconvenience or nuisance in the area or cause damage to the property and structure nearby.

To prevent slipping of sides, planking and strutting may also be done with the approval of the Engineer.

- a. **Work in or under water and/or liquid mud:** Excavation, where water is met with from any of the sources shall fall in this category. Steady water level in the trial pits before the commencement of bailing or pumping operations shall be the sub-soil water level in that area.
- b. **Work in or under foul position:** Excavation, where sewage, sewage gases or foul conditions are met with from any source, shall fall in this category. Decision of the Engineer whether the work is in foul position or not shall be final.

4.20.14. Surface Dressing

Surface dressing shall include cutting and filling upto a depth of 15 cm and clearing of shrubs, rank vegetation, grass, brushwood, trees and saplings of girth upto 30 cm measured at a height of one metre above the ground level and removal of rubbish and other excavated material upto a distance of 50 metres outside the periphery of the area under surface dressing. High portions of the ground shall be cut down and hollows depression filled upto the required level with the excavated earth so as to give an even, neat and tidy look.

4.20.15. Jungle Clearance

Jungle clearance shall comprise uprooting of rank vegetation, grass, brushwood, shrubs, stumps, trees and saplings of girth upto 30 cm measured at a height of one metre above the ground level. Where only clearance of grass is involved it shall be measured and paid for separately.

4.20.16. Uprooting of Vegetations

The roots of trees and saplings shall be removed to a depth of 60 cm below ground level or 30 cm below formation level or 15 cm below sub-grade level, whichever is lower. All holes or hollows formed due to removal of roots shall be filled up with earth rammed and levelled. Trees, shrubs, poles, fences, signs, monuments, pipe lines, cable etc., within or adjacent to the area which are not required to be disturbed during jungle clearance shall be properly protected by the contractor at his own cost and nothing extra shall be payable.

4.20.17. Stacking and Disposal

All useful materials obtained from clearing and grubbing operation shall be stacked in the manner as directed by the Engineer. Trunks and branches of trees shall be cleared of limbs and tops and stacked neatly at places indicated by the Engineer. The materials shall be the property of the Government. All unserviceable materials which in the opinion of the Engineer cannot be used or auctioned shall be removed up to a distance of 50 m outside the

periphery of the area under clearance. It shall be ensured by the contractor that unserviceable materials are disposed off in such a manner that there is no likelihood of getting mixed up with the materials meant for construction.

4.20.18. Clearance of Grass

Clearing and grubbing operation involving only the clearance of grass shall be measured and paid for separately and shall include removal of rubbish upto a distance of 50 m outside the periphery of the area under clearance.

4.20.19. Felling of Trees

Felling

While clearing jungle, growth trees above 30 cm girth (measured at a height of one metre above ground level) to be cut, shall be approved by the Engineer and then marked at site. Felling trees shall include taking out roots upto 60 cm below ground level or 30 cm below formation level or 15 cm below sub-grade level, whichever is lower.

All excavation below general ground level arising out of the removal of trees, stumps etc. shall be filled with suitable material in 20 cm layers and compacted thoroughly so that the surfaces at these points conform to the surrounding area. The trunks and branches of trees shall be cleared of limbs and tops and cut into suitable pieces as directed by the Engineer.

4.20.19.1. Stacking and Disposal

Wood, branches, twigs of trees and other useful material shall be the property of the Government. The serviceable materials shall be stacked in the manner as directed by the Engineer upto a lead of 500 m.

All unserviceable material, which in the opinion of Engineer cannot be used or auctioned shall be removed from the area and disposed off as per the directions of the Engineer. Care shall be taken to see that unsuitable waste materials are disposed off in such a manner that there is no likelihood of these getting mixed up with the materials meant for construction.

4.21. Cement Concrete Works

Reinforced cement concrete work may be cast-in-situ or Precast as may be directed by Engineer according to the nature of work. Reinforced cement concrete work shall comprise of the following which may be paid separately or collectively as per the description of the item of work.

- a) Form work (Centering and Shuttering)
- b) Reinforcement
- c) Concreting: (Cast-in-situ)

4.21.1. Form Work (Centering & Shuttering)

4.21.1.1. Form Work

Form work shall include all temporary or permanent forms or moulds required for forming the concrete which is cast-in-situ, together with all temporary construction required for their support.

4.21.1.2. Design & Tolerance in Construction

Form work shall be designed and constructed to the shapes, lines and dimensions shown on the drawings with the tolerance given below.

- a) Deviation from specified dimension of cross section of columns and beams :
+12mm to – 6mm
- b) Deviation from dimensions of footings : - +50mm to – 12mm. 0.02 times the width of the footing in the direction of deviation but not more than 50 mm.
 - i) Dimension in Plan
 - ii) Eccentricity in plan
 - iii) Thickness : + 0.05 times the specified thickness.

(Note- These tolerance apply to concrete dimensions only, and not to positioning of vertical steel or dowels).

4.21.1.3. General Requirement

It shall be strong enough to withstand the dead and live loads and forces caused by ramming and vibrations of concrete and other incidental loads, imposed upon it during and after casting of concrete. It shall be made sufficiently rigid by using adequate number of ties and braces, screw jacks or hard board wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete.

Form shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections, care shall be taken to see that no piece is keyed into the concrete.

4.21.1.4. Material for Form Work

Propping and Centering : All propping and centering should be either of steel tubes with extension pieces or built up sections of rolled steel.

4.21.1.5. Centering/Staging

Staging should be as designed with required extension pieces as approved by Engineer to ensure proper slopes, as per design for slabs/ beams etc. and as per levels as shown in drawing. All the staging to be either of Tubular steel structure with adequate bracings as approved or made of built up structural sections made from rolled structural steel sections. In case of structures with two or more floors, the weight of concrete, centering and shuttering of any upper floor being cast shall be suitably supported on one floor below the top most floor already cast.

Form work and concreting of upper floor shall not be done until concrete of lower floor has set at least for 14 days.

4.21.1.6. Shuttering:

Shuttering used shall be of sufficient stiffness to avoid excessive deflection and joints shall be tightly butted to avoid leakage of slurry. If required, rubberized lining of material as approved by the Engineer shall be provided in the joints. Steel shuttering used or concreting should be sufficiently stiffened. The steel shuttering should also be properly repaired before use and properly cleaned to avoid stains, honey combing, seepage of slurry through joints etc.

- a) Runner Joists: RSJ, MS Channel or any other suitable section of the required size shall be used as runners.
- b) Assembly of beam head over props. Beam head is an adopter that fits snugly on the head plates of props to provide wider support under beam bottoms.
- c) Only steel shuttering shall be used, except for unavoidable portions and very small works for which 12 mm thick water proofing ply of approved quality may be used.

Form work : shall be properly designed for self weight, weight of reinforcement, weight of fresh concrete, and in addition, the various live loads likely to be imposed during the construction process (such as workmen, materials and equipment). In case the height of centering exceeds 3.50 metres, the prop may be provided in multi-stages.

Camber: Suitable camber shall be provided in horizontal members of structure, especially in cantilever spans to counteract the effect of deflection. The form work shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per metre (1 to 250) or as directed by the Engineer, so as to offset the subsequent deflection, For cantilevers the camber at free end shall be 1/50th of the projected length or as directed by the Engineer.

Walls : The form faces have to be kept at fixed distance apart and an arrangement of wall ties with spacer tubes or bolts is considered best.

4.21.1.7. Removal of Form work (Stripping Time):

- Forms shall not be released until the concrete has achieved a strength of at least twice the stress to which the concrete may be subjected at the time of removal of formwork. The strength referred to shall be that of concrete using the same cement and aggregates and admixture, if any, with the same proportions and cured under conditions of temperature and moisture similar to those existing on the work.
- While the above criteria of strength shall be the guiding factor for removal of formwork, in normal circumstances where ambient temperature does not fall below 15°C and where **ordinary Portland cement** is used and adequate curing is done, following striking period may deep to satisfy the guideline given above.

Type of Formwork	Minimum Period before Striking Formwork
a) Vertical formwork to columns, walls beams	16-24 h
b) Soffit formwork to slabs (Props to be re-fixed immediately after removal of formwork)	3 days

c) Soffit formwork to beams (Props to be re-fixed immediately after removal of formwork)	7 days
d) Props to slabs: 1) Spanning upto 4.5 m 2) Spanning over 4.5 m	7 days 14 days
e) Props to beams and arches: 1) Spanning up to 6 m 2) Spanning over 6 m	14 days 21 days

For other cements and lower temperature, the stripping time recommended above may be suitably modified.

The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

Where the shape of the element is such that the formwork has re-entrant angles, the formwork shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

4.21.1.8. Surface Treatment

Oiling the Surface: Shuttering gives much longer service life if the surfaces are coated with suitable mould oil which acts both as a parting agent and also gives surface protections. A typical mould oil is heavy mineral oil or purified cylinder oil containing not less than 5% pentachlorophenol conforming to IS 716 well mixed to a viscosity of 70-80 centipoises. After 3-4 uses and also in cases when shuttering has been stored for a long time, it should be recoated with mould oil before the next use. The second categories of shuttering oils / leavening agents are Polymer based water soluble Compounds. They are available as concentrates and when used diluted with water in the ratio of 1:20 or as per manufacturer specifications. The diluted solution is applied by brush applications on the shuttering both of steel as well as ply wood. The solution is applied after every use.

The design of form work shall conform to sound Engineering practices and relevant IS codes.

4.21.1.9. Inspection of Form Work

The completed form work shall be inspected and approved by the Engineer before the reinforcement bars are placed in position.

Proper form work should be adopted for concreting so as to avoid honey combing, blow holes, grout loss, stains or discoloration of concrete etc. Proper and accurate alignment and profile of finished concrete surface will be ensured by proper designing and erection of form work which will be approved by Engineer.

Shuttering surface before concreting should be free from any defect/ deposits and full cleaned so as to give perfectly straight smooth concrete surface. Shuttering surface should be therefore checked for any damage to its surface and excessive roughness before use.

4.21.1.10. Erection of Form Work (Centering and shuttering):

Following points shall be borne in mind while checking during erection.

- a) Any member which is to remain in position after the general dismantling is done should be clearly marked.
- b) Material used should be checked to ensure that, wrong items/ rejects are not used.
- c) If there are any excavations nearby which may influence the safety of form works, corrective and strengthening action must be taken.
- d) (i) The bearing soil must be sound and well prepared and the sole plates shall bear well on the ground.
(ii) Sole plates shall be properly seated on their bearing pads or sleepers.
(iii) The bearing plates of steel props shall not be distorted.
(iv) The steel parts on the bearing members shall have adequate bearing areas.
- e) Safety measures to prevent impact of traffic, scour due to water etc. should be taken. Adequate precautionary measures shall be taken to prevent accidental impacts etc.
- f) Bracing, struts and ties shall be installed along with the progress of form work to ensure strength and stability of form work at intermediate stage. Steel sections (especially deep sections) shall be adequately restrained against tilting, overturning and form work should be restrained against horizontal loads. All the securing devices and bracing shall be tightened.
- g) The stacked materials shall be placed as catered for, in the design.
- h) When adjustable steel props are used. They should:
 - 1. be undamaged and not visibly bent.
 - 2. have the steel pins provided by the manufacturers for use.
 - 3. be restrained laterally near each end.
 - 4. have means for centralizing beams placed in the forkheads.
- i) Screw adjustment of adjustable props shall not be over extended.
- j) Double wedges shall be provided for adjustment of the form to the required position wherever any settlement/ elastic shorting of props occurs. Wedges should be used only at the bottom end of single prop. Wedges should not be too steep and one of the pair should be tightened/ clamped down after adjustment to prevent shifting.
- k) No member shall be eccentric upon vertical member.
- l) The number of nuts and bolts shall be adequate.
- m) All provisions of the design and/or drawings shall be complied with.
- n) Cantilever supports shall be adequate.
- o) Props shall be directly under one another in constructions as far as possible.
- p) Guy ropes or stays shall be tensioned properly.

- q) There shall be adequate provision for the movements and operation of vibrators and other construction plant and equipment.
- r) Required camber shall be provided over long spans.
- s) Supports shall be adequate, and in plumb within the specified tolerances.

4.21.2. Reinforcements

4.21.2.1. General Requirements

Steel conforming for reinforcement shall be clear and free from loose mill scales, dust, loose rust, coats of paints, oil or other coating which may destroy or reduce bond. It shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. Prior to assembly of reinforcement on no account any oily substance shall be used for removing the rust.

4.21.2.2. Assembly of Reinforcement :

Bars shall be bent correctly and accurately to the size and shape as shown in the detailed drawing or as directed by Engineer. Preferably bars of full length shall be used. Necessary cutting and straightening is also included. Overlapping of bars, where necessary shall be done as directed by the Engineer. The overlapping bars shall not touch each other and these shall be kept apart with concrete between them by 25mm or 11/4 times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be bound together at intervals not exceeding twice the dia. of such bars with two strands annealed steel wire of 0.90 mm to 1.6 mm twisted tight. The overlaps/ splices shall be staggered as per directions of the Engineer. But in no case the overlapping shall be provided in more than 50% of cross sectional area at one section.

4.21.2.3. Bonds and Hooks Forming End Anchorages:

Reinforcement shall be bent and fixed in accordance with procedure specified in IS 2502, code of practice of bending and fixing of bars for concrete reinforcement. The details of bends and hooks are shown below for guidance.

4.21.2.4. Anchoring Bars in Tension :

Deformed bars may be used without end anchorages provided, development length equipment is satisfied. Hooks should normally be provided for plain bars in tension. Development length of bars will be determined as per IS: 456.

4.21.2.5. Anchoring Bars in Compression :

The anchorage length of straight bar in compression shall be equal to the 'Development length' of bars in compression as specified in IS: 456. The projected length of hooks, bend and straight lengths beyond bend, if provided for a bar in compression, shall be considered for development length.

4.21.2.6. Binders, stirrups, links etc.

In case of binders, stirrups, links etc. the straight portion beyond the curve at the end shall be not less than eight times and nominal size of bar.

4.21.2.7. Welding of Bars

Wherever facility for electric arc welding or gas pressure welding is available, welding of bars shall be done in lieu of overlap. The location and type of welding shall be got approved by the Engineer.

4.21.2.8. Placing in Position

Fabricated reinforcement bars shall be placed in position as shown in the drawings or as directed by the Engineer. The bars crossing one another shall be tied together at every intersection with two strands of annealed steel wire 0.9 to 1.6 mm thickness twisted tight to make the skeleton of the steel work rigid so that the reinforcement does not get displaced during deposition of concrete.

Tack welding in crossing bars shall also be permitted in lieu of binding with steel wire if approved by Engineer.

4.21.2.9. Tolerance on Placing of Reinforcement :

Unless otherwise specified by the Engineer, reinforcement shall be placed within the following tolerances:

Tolerance in spacing

(a) For effective depth, 200 mm or less +10 mm

(b) For effective depth, more than 200 mm + 15 mm

4.21.2.10. Cover :

The minimum nominal cover to meet durability requirements shall be as under:-

Exposure	Nominal Concrete cover in mm not less than
Mild	25
Moderate	35
Severe	50
Very severe	60
Extreme	75

Notes :

- For main reinforcement upto 12 mm diameter bar for mild exposure the nominal cover may be reduced by 5 mm.
- Unless specified otherwise, actual concrete cover should not deviate from the required nominal cover by + 10 mm.
- For exposure condition 'severe' and 'very severe' reduction of 5 mm may be made, where concrete grade is M35 and above.
- Nominal cover to meet specified period of fire resistance shall not be less than as given in Table 16A of IS 456.

4.21.3. Concrete

4.21.3.1. General

Concrete grade shall be as designated on drawings. In concrete grade M15, M20, M35 etc. the number represents the specified characteristic compressive strength of 150mm cube at 28 days, expressed in N/sq. mm as per IS: 456.

4.21.3.2. Design mix concrete

Mix Design & Testing: For Design Mix Concrete, the mix shall be designed to provide the grade of concrete having the required workability and characteristic strength not less than appropriate values given in IS: 456. The design mix shall be in addition to such that it is cohesive and does not segregate and should result in a dense and durable concrete and also capable of giving the finish as specified. The Contractor shall exercise great care while designing the concrete mix and executing the works to achieve the desired result.

It will be the Contractor's sole responsibility to adopt appropriate nominal mix proportions to yield the specified strength. The minimum cement content for Design Mix Concrete shall be as per Appendix-A of IS: 456 or as given below, whichever is higher.

Grade of Concrete	Minimum Cement Content in Kg/cum. of Concrete (for 20mm downgraded aggregates)
M15	260
M20	315
M25	360
M30	420
M35	460

The Contractor shall submit details of the source of all material and the proposed quantities of each ingredient per cubic meter of fully compacted concrete. The Contractor shall then make trial mixes for each class of concrete using the same Contractor's Equipment and the same materials as are proposed for the Permanent Works. He shall furnish to the Engineer at least 30 days before concreting operations, a statement of proportions proposed to be used for the various concrete mixes and the strength results obtained. The strength requirements of the concrete mixes ascertained on 150 mm cubes as per IS: 516 shall comply with the requirements of IS: 456.

7 days & 28 days Compressive strength of Different Grade of Concrete.

Part of IS 456 : 2000 Page No. 30			
Table II Characteristic Compressive Strength Compliance Requirement			
(Clauses 16.1 and 16.3)			
Specified Grade		Mean of the Group 4 Non Overlapping Consecutive Test Results in N/mm ²	Individual Test Results in N/mm ²
(1)		(2)	(3)

M15	$\geq$	$f_{ck} + 0.825 \times \text{established standard deviation}$ (rounded off to nearest 0.5 N/mm ²)	$\geq f_{ck}^{-3} \text{ N/mm}^2$
	Or		
		$f_{ck} + 3 \text{ N/mm}^2$ whichever is greater	
M20 or above	$\geq$	$f_{ck} + 0.825 \times \text{established standard deviation}$ (rounded off to nearest 0.5 N/mm ²)	$\geq f_{ck}^{-4} \text{ N/mm}^2$
	Or		
		$f_{ck} + 4 \text{ N/mm}^2$ whichever is greater	

NOTE: In the absence of established value of standard deviation, the values given in Table 8 may be assumed, and attempt should be made to obtain results of 30 samples as early as possible to establish the value of standard deviation.

Amend No 3 to IS 456 : 2000

(Page 23, Table 9) - Number the existing note as "NOTE 1" and add the following "NOTE 2"

NOTE 2 - Quantity of water required from durability point of view may be less than the value given above.

(Page 29, Clause 15.1.1 last line) - Add in accordance with 16 at the end.

(Page 30, Table II, col 2) -Substitute $f_{ck} + 3 \text{ N/mm}^2$ for $f_{ck} + 4 \text{ N/mm}^2$ against M20 or above.

Page 30 Table II, col 3 (see also Amendment No I)] - Substitute $f_{ck} - 3 \text{ N/mm}^2$ for $f_{ck} - 4 \text{ N/mm}^2$ against M20 or above

Page 42, Clause 26.1.1 - Add the following at the end.

Congestion of reinforcement should be avoided during detailing. Various methods such as choosing the diameter and grade of steel carefully and bunding of reinforcement, if required, are available.

[Page 45, clause 26.2.5.1 (a)] - Substitute the following for the existing.

The Contractor shall give 24 hours notice of such trials to enable the Engineer to attend. For each trial mix, three separate and consecutive batches of concrete shall be made by the Contractor and the specimens shall be tested at 7 days and 28 days (9 specimens at 7 days and 9 specimens at 28 days). For 7 days test the acceptance criteria shall be 70% of the corresponding target mean strength.

The Contractor shall not commence concreting in the Permanent Works until details of trial mixes and test results for each class of concrete have been submitted to and approved by the Engineer.

Unless otherwise specified, only medium graded fine aggregate shall be used.

A trial mix design will be approved by the Engineer with respect to strength if the average compressive strength of the nine specimens each at 7 days and 28 days is more than the specified target mean strength appropriate to the grade of concrete.

The Contractor shall not alter the approved mix proportions nor the approved source of supply of any of the ingredients without having previously obtained the approval of the Engineer.

During production, the Engineer may require trial mixes to be made before a substantial change is made in the materials or in the proportions of the materials to be used.

A range of slumps which shall generally be used for various types of construction unless otherwise instructed by the Engineer is given below:

Range of Concrete Slump for Different Structure/Member.

Structure/Member	Slump in millimeters	
	Maximum	Minimum
Reinforced foundation walls and footings	75	40
Slabs, Beams and reinforced walls	100	40

4.21.3.3. Batching & Mixing of Concrete

It is expected that batching plants of suitable capacity shall be used. However, the Contractor shall submit monthly program of concrete works to the approval of the Engineer. Proportions of aggregates and cement, as determined by the concrete mix design, shall be preferably by weight. These proportions shall be maintained during subsequent concrete batching by means of weigh batchers capable of controlling the weights within one percent of the desired value.

Based on the adopted nominal mixes, aggregates may be measured by volume. However cement shall be by weight only

Amount of water added shall be such as to produce dense concrete of required consistency, specified strength and satisfactory workability and shall be so adjusted to account for moisture content in the aggregates. Water- cement ratio specified for use by the Engineer shall be maintained. Each time the work stops, the mixer shall be cleaned out, and while recommencing, the first batch shall have 10% additional cement to allow for sticking in the drum.

Arrangement should be made by the Contractor to have the cubes tested in an approved laboratory or in field with prior consent of the Engineer. Sampling and testing of strength and workability of concrete shall be as per IS: 1199, IS: 516 and IS: 456.

4.21.3.4. Construction joints

Concreting shall be carried out continuously upto the construction joints, the position and details of which shall be as shown in structural drawing, Construction joints should comply with IS 11817.

4.21.3.5. Expansion Joints

Expansion joints shall be provided as per the approved structural drawings. The structures exceeding 45 m in length shall be divided by one or more expansion joints. The filling of these joints with bitumen filler, bitumen felt or any such material and provision of copper plate, etc in accordance with MORTH specifications.

4.21.3.6. Curing

After the concrete has begun to harden i.e. about 1 to 2 hours after its laying, it shall be protected from quick drying by covering with moist gunny bags, sand, canvass Hessian or any other material approved by the Engineer. After 24 hours of laying of

concrete, the surface shall be cured by ponding with water for a minimum period of 7 days from the date of placing of concrete.

4.21.3.7. Finishing

Top surface shall be finished even and smooth with wooden trowel, before the concrete begins to set. Sprinkling of dry cement while finishing shall not be resorted. Immediately on removal of forms, the R.C.C. work shall be examined by the Engineer, before any defects are made good.

The work that has sagged or contains honey combing to an extent detrimental to structural safety or architectural concept shall be rejected as given for visual inspection test. Surface defects of minor nature may be accepted. On acceptance of such a work by the Engineer.

4.21.3.8. Testing of Concrete

Regular mandatory tests on the workability of the fresh concrete shall be done to achieve the specified compressive strength of concrete. These will be of two types

- (a) Mandatory Lab, Test
- (b) Mandatory Field Test

Results of Mandatory Field Test will prevail over mandatory Lab. Test.

Cube Test for Compressive Strength of Concrete - Mandatory Lab Test

Additional Test : Additional test, if required, shall be carried out.

Slump Test : This test shall be carried out .

Visual Inspection Test : The concrete will be inspected after removal of the form work .

The concrete is liable to be rejected if:

- (i) It is porous or honeycombed.
- (ii) Its placing has been interrupted without providing a proper construction joint.
- (iii) The reinforcement has been displaced beyond tolerance specified or construction tolerances have not been met.

4.21.3.9. Standard of Acceptance - for Nominal Mix

Mandatory Lab. Test: For concrete sampled and tested as the following requirement shall apply.

4.21.3.10. 7 days' Tests

Sampling: The average of the strength of three specimen shall be accepted as the compressive strength of the concrete provided the variation in strength of individual specimen is not more than + 15% of the average. Difference between the maximum and minimum strength should not exceed 30% of average strength of three specimens. If the difference between maximum and minimum strength exceeds 30% of the average strength, then 28 days' test shall have to be carried out.

Strength: If the actual average strength of sample accepted in para 'sampling' above is equal to or higher than specified strength upto +15% then strength of the concrete shall be considered in order.

In case the actual average strength of sample accepted in the above para is lower than the specified or higher by more than 15% then 28 days' test shall have to be carried out to determine the compressive strength of concrete cubes.

4.21.3.11. 28 days' Test

- (a) The average of the strength of three specimen be accepted as the compressive strength of the concrete provided the strength of any individual cube shall neither be less than 70% nor higher than 130% of the specified strength.
- (b) If the actual average strength of accepted sample exceeds specified strength by more than 30% the Engineer, if he so desires, may further investigate the matter. However, if the strength of any individual cube exceeds more than 30% of specified strength, it will be restricted to 130% only for computation of strength.
- (c) If the actual average strength of accepted sample is equal to or higher than specified strength upto 30% then strength of the concrete shall be considered in order and the concrete shall be accepted at full rates.
- (d) If the actual average strength of accepted sample is less than specified strength but not less than 70% of the specified strength, the concrete may be accepted at reduced rate at the discretion of Engineer.
- (e) If the actual average strength of accepted sample is less than 70% of specified strength, the Engineer shall reject the defective portion of work represented by sample and nothing shall be paid for the rejected work. Remedial measures necessary to retain the structure shall be taken at the risk and cost of contractor. If, however the Engineer so desires, he may order additional tests.

4.21.3.12. Acceptance Criteria of Field Test (Additional Test - Not Mandatory)

- (a) In the beginning the standard test cubes of the specified mix shall be prepared by field units before undertaking any concrete work in each project.
- (b) At least 18 standard cubes necessary for formation of one specimen of specified mix, shall be cast by site staff well in advance. From these 18 cubes any 3 cubes may be selected at random to be tested for crushing strength of 7 days. The crushing strength obtained should satisfy the specified strength for the mix as per specification or agreement. If the strength is satisfactory then the remaining cube will form the standard samples for calibration of rebound hammer. In case of failure, the site staff should totally reject the samples and remove them also and then make another set of samples by fresh mixing or alternatively, out of the remaining 15 cubes, 3 cubes will be tested on 28 days. If the 28 days' tests are found satisfactory then remaining 12 cubes will form the standard sample for calibration at 28 days' strength otherwise all samples shall be rejected and whole procedure repeated to form a fresh specimen. All the results shall be recorded in a register.
- (c) No concreting will be allowed unless the standard specimen cubes are obtained. The criteria for acceptance and calibration of hammer will be 28 days' strength. The 7 days' strength is only to facilitate the work to start.

- (d) No work (for the concrete cast between 8th and 28th day) shall be allowed to be paid unless 28 days' cube strength is obtained. For the concrete cast between 8th and 28th day, *the decision to make the payment may be taken by the Engineer on the basis of existing criteria. Concrete work will be rejected if 28 days' strength falls short as per acceptance criteria. No further work will be allowed till the acceptable standard cubes are obtained.*
- (e) Frequency: it will be once in each quarter or as per the direction and discretion of Engineer. Whenever the acceptance criteria is changed or concrete mix or type of cement is changed or Engineer feels it necessary for recorded reasons with the approval of the authority according to technical sanction, fresh specimen shall be prepared.

4.21.3.13. Curing

After having been cast in the mould or form the concrete shall be adequately protected during setting in the first stages of hardening from shocks and from harmful effects of frost, sunshine, drying winds and cold. The concrete shall be cured at least for 7 days from the date of casting.

4.21.3.14. Design Mix

Design mix concrete is that concrete in which the design of mix i.e. the determination of proportions of cement, aggregate & water is arrived as to have target mean strength for specified grade of concrete. The minimum mix of M25 shall be used in all structural elements in both load bearing & RCC framed construction.

4.21.3.15. Water Cement Ratio and Slump

In proportioning a particular mix, the manufacturer/ producer/ contractor shall give due consideration to the moisture content in the aggregates, and the mix shall be so designed as to restrict the maximum free water cement ratio to less than 0.5.

Due consideration shall be given to the workability of the concrete thus produced. Slump shall be controlled on the basis of placement in different situations. For normal methods of placing concrete, maximum slump shall be restricted to 100 mm when measured in accordance with IS 1199.

4.21.3.16. Approval of Design Mix

The producer/ manufacturer/ contractor of concrete shall submit details of each trial mix of each grade of concrete designed for various workability conditions to the Engineer for his comments and approval. Concrete of any particular design mix and grade shall be produced/ manufactured for works only on obtaining written approval of the Engineer. For any change in quality/ quantity in the ingredients of a particular concrete, for which mix has been designed earlier and approved by the Engineer, the mix has to be redesigned and approval obtained again.

4.21.3.17. Batching Plants and Batching Equipment:

Hoppers for weighing cement, mineral admixtures, aggregates and water and chemical admixture (if measured by mass) shall consist of suitable container freely suspended from a scale or other suitable load-measuring device and equipped with a suitable discharging mechanism. The method of control of the loading mechanism shall be such that, as the quantity required in the weighing hopper is approached the material may be added at controllable rate and shut off precisely within the weighing tolerances specified in Annex C. The weighing hoppers for cement, mineral

admixtures aggregate shall be capable of receiving their rated load, without the weighed material coming into contact with the loading mechanism. Where the rated capacity of a batching plant mixing cycle is less than 2.0 m³, additional precautions shall be taken to ensure that the correct numbers of batches are loaded into the truck mixer. The weighing hoppers shall be constructed so as to discharge efficiently and prevent the buildup of materials. A tare adjustment, up to 10 percent of the nominal capacity of the weigh scale, shall be provided on the weighing mechanism so that the scale can be adjusted to zero at least once each day. Dust seals shall be provided on cement hoppers between the loading mechanism and the weigh hopper, and shall be fitted so as to prevent the emission of cement dust and not affect weighing accuracy. The hopper shall be vented to permit escape of air without emission of cement dust.

Vibrator or other attachment, where fitted, shall not affect the accuracy of weighing. There shall be sufficient protection to cement and aggregate weigh hoppers and weighing mechanisms to prevent interference with weighing accuracy by weather conditions or external build-up of materials.

Where chemical admixture dispensers are used, they shall be capable of measurement within the tolerance and calibrated container or weigh scales shall be provided to check the accuracy of measurement at least once a month.

Where a continuous mixer with ribbon loading is used the batching procedure specified by the manufacture of the plant shall be followed.

Each control on the batching console and weigh-dial or display shall be clearly labeled with its function and where concerned with the batching of materials, the materials type.

When more than one type or grade of cement is being used, the weighing device and discharge screw or other parts of the transfer system shall be empty before changing from one type of cement to another.

When pulverized fuel ash and other mineral admixtures are batched through the cement weigh system, the weighing device and discharge screw or other parts of the transfer system shall be empty when the weighing system has returned to zero reading or completed the batch.

Where a back weigh system is utilized to weigh materials a system shall be in place so as to prevent materials being loaded during the process of weighing.

4.21.3.18. Concrete Admixtures & Plasticizers

Accelerating, retarding, water-reducing and air entraining admixtures shall conform to IS: 9130 and integral water proofing admixture to IS:2645. Admixtures are to be added before or during mixing with a view to modify one or more properties of concrete in plastic or hardened state. Concrete admixtures are proprietary items of manufacturers and shall be obtained from established manufacturers having proven track record, with Engineer's approval.

4.21.3.19. Transporting Concrete

From batching plant concrete to the location of proposed construction shall be transported through transit mixers or concrete pumps only. Contractor shall specify the make & type and number of transit mixers to be deployed along with concrete pumps with their make, capacity. The path to be used by transit mixers will be strictly as per the instructions of Engineer. From the transit mixers concrete shall be

transported to the final floor level / position through pumping or builders hoist only. Concrete and mortar shall be transported speedily and deposited in its place in the works without contamination, loss of ingredients or segregation.. Buckets of builders hoist shall be large enough to contain an integral number of batches. No concrete shall be placed in the works until the contractors' proposed method of transporting concrete have been approved. When concrete is conveyed in chutes from transit mixers, the equipment shall be of such size and design as to ensure a continuous flow in the chute. The chute shall be of metal or metal lined, and if two or more lengths are used they all shall have approximately the same slope. If the distance of the discharge end of the chute above the surface of the concrete is more than 1 metre, a spout or "elephant trunk" shall be used and the lower end positioned as near to the surface of deposit as practicable. The chute or "elephant trunk" shall be thoroughly cleaned before and after each run. The debris and any water shall be discharged outside the forms.

4.21.3.20. Concrete placement

General

Concrete, when deposited, shall have a temperature of not less than 5oC (41oF) and not more than 32oC (90oF). The concrete shall be placed in the positions and sequences indicated on the drawings, in this specification and/or as directed by the Engineer. Contractor shall give adequate notice to the Engineer of his intention to concrete any section of the works.

Except where otherwise directed, concrete shall not be placed unless the representative of the Engineer is present and has previously examined and approved the positioning, fixing and condition of the reinforcement or any other items to be embedded and the cleanliness, positioning and suitability of the concreting surface.

The concrete shall be deposited as nearly as possible in its final position. It shall be placed in such a manner as to avoid segregation of the concrete and displacement of the reinforcement, other embedded items, or formwork. It shall be brought up in horizontal layers not exceeding 450 mm in compacted thickness unless otherwise authorised or directed by Engineer. Concrete shall not be placed simultaneously on each side of large horizontal specified or approved construction joints.

Shutters for walls or thin sections of considerable height shall be provided with openings or other devices that will facilitate the cleaning of the accumulation of hardened concrete on the shutters or on the metal reinforcement above the level of the concrete and the removal of concrete in the case of segregations.

4.21.3.21. Placing concrete in extreme weather

No concrete shall be mixed or placed while the ambient temperature is above 40 degree C. on a rising thermometer or below 5 degree C. on a falling thermometer. The contractor shall supply an accurate maximum and minimum thermometer and hang it in an approved position on the works. Aggregates that have been exposed to frost shall not be used until completely thawed. Concrete shall be maintained by approved means at a temperature of not less than 4 degree C. during placing, and for a period of three days thereafter. All concrete placed during cold weather or when a frost is predicated or is likely to occur or occurs contrary to expectation, shall be protected from freezing by approved means.

4.21.3.22. Placing of concrete in wet weather

Concrete shall not be mixed and or placed in rainy weather or when there is likelihood of impending heavy showers. If it becomes necessary to place concrete during rainy weather, the contractor shall provide adequate protection by means of tarpaulin or similar other water proof material to immediately cover fresh concrete to prevent rain falling over it. This protection shall be left on the concrete for a period of 24 hours after placing of concrete.

4.21.3.23. Concrete placement under water

Concrete placed under water shall be deposited through a pipe the diameter of which shall be at least 8 times the size of the largest aggregate used in the concrete mix. The construction of and the method of handling the pipes shall be approved by the Engineer. The pipes shall be waterproof and sufficiently strong to withstand severe handling conditions and any joints must be sealed with adequate gaskets.

At the commencement of work the bottom of the pipe shall be sealed before being lowered in to position. The seal shall only be broken by the concrete being placed. The concrete placed in contact with a horizontal construction joint shall have a lower proportion of coarse aggregate and a higher proportion of cement than the remainder of the concrete. The proportion shall be agreed with the Engineer's Representative.

All underwater concrete shall be placed in still water within a cofferdam or formwork which shall extend above water level.

The proportions of the mixes shall be agreed in accordance with the strength and workability required by the specification. To allow for losses an addition of 10% of cement shall be added to mixes of concrete scheduled to be placed under water.

4.21.3.24. Maintenance of Plant and Equipment

The contractor shall keep Bathing Plant , weight batching machines, mixing machines, compressors, vibrators and other plant and equipment for concrete and mortar work clean, well maintained and adjusted and where appropriate, shall check the accuracy of the measuring devices at regular intervals, all to the approval of the Engineer's 's Representative. Mixer blades shall be replaced when worn down by 20 mm.

4.21.3.25. Compacting Concrete

The concrete shall be fully compacted throughout the full extent of the layer. It shall be thoroughly worked against the moulds, and around any reinforcement and other embedded items without displacing them, and in to corners of the moulds. Successive layers of the same lift shall be thoroughly worked together adjacent to the common face. The date of laying concrete shall be marked for curing and removal of form work.

Immersion vibrators shall be of approved type and shall have frequency of not less than 10000 oscillations per minute. They shall penetrate the full depth of the concrete to be vibrated and be immersed at sufficiency close spacing so that the whole volume of the concrete is satisfactorily and uniformly compacted.

Where the underlying layer is of fresh concrete, immersion vibrators shall also penetrate that layer to ensure homogeneity. Immersion vibrators shall be withdrawn slowly to prevent formation of voids. Vibrators shall not be used to work the concrete along the moulds or in such a way as to damage shuttering or other parts of the

structure or to displace the reinforcement or other embedded items. Immersion vibrators shall only be operated by those who have received proper instruction and training in their use.

External vibrators shall be of approved type and shall have a frequency of not less than 3000 oscillations per minute. They shall be securely and rigidly clamped to the shuttering. External vibrators shall only be used on shuttering which is strong enough to withstand the vibration without displacement, distortion or other damage.

The contractor shall ensure that sufficient standby vibrators and ancillary equipment are available during concreting operations.

4.22. Structural Steel Work

4.22.1. Scope

The fabrication and erection of the steel work consists of accomplishing of all jobs here-in enumerated including providing all labour, tools and plant all materials and consumables such as welding electrodes, bolts and nuts, oxygen and acetylene gases, oils for cleaning etc. of approved quality as per relevant IS. The work shall be executed according to the drawings, specifications, relevant codes etc. in an expeditious and workman like manner, as detailed in the specifications and the relevant Indian Standard Codes and Standard Practice and to the complete satisfaction.

4.22.2. Fabrication Drawings

The contractor shall prepare all fabrication and erection drawings on the basis of design drawings and submit the same in triplicate to the Engineer for review, Engineer shall review and comment, if any, on the same. Such review, if any, by the Engineer, does not relieve the contractor of any of his required guarantees responsibilities. The contractor shall however be responsible to fabricate the structural strictly conforming to specifications and reviewed drawings.

Fabrication drawings shall include the following:

- Member sizes and details
- Types and dimensions of welds and bolts
- Shapes and sizes of edge preparation for welding
- Details of shop and field joints included in assemblies.

Connections, splices etc. other details not specifically detailed in design drawings shall be suitably given on fabrication drawings considering normal detailing practices and developing full member strengths. Where asked for calculations for the merit shall also be submitted for approval.

4.22.3. Fabrication

Fabrication shall be in accordance with IS: 800 Section V in addition to the following:

Fabrication shall be done as per approved fabrication drawings adhering strictly to work points and work lines on the same. The connections shall be welded or bolted as per design drawings. Work shall also include fabricating built up sections.

Any defective material used shall be replaced by the contractor at his own expense, care being taken to prevent any damage to the structure during removal.

All the fabricated and delivered items shall be suitably packed to be protected from any damage during transportation and handling. Any damage caused at any time shall be made good by the Contractor at his own cost.

Any faulty fabrication pointed out at any stage of work shall be made good by the contractor at his own cost.

4.22.4. Cutting

Members shall be cut mechanically (by saw or shear or by oxyacetylene flame).

All sharp, rough, or broken edges, and all edges of joints which are subjected to tensile or oscillating stresses, shall be ground.

No electric metal arc cutting shall be allowed.

All edges cut by oxyacetylene process shall be cleaned of impurities prior to assembly.

Cutting tolerances shall be as follows :

- a) For members connected at both ends + 1 mm.
- b) Elsewhere + 3 mm.

The edge preparation for welding of members more than 12 mm thick shall be done by flame cutting and grinding. Cut faces shall not have cracks or be rough.

Edge preparation shall be as per IS : 823 - 1964.

4.22.5. Drilling

Bolts holes shall be drilled.

Drilling shall be made to the diameter specified in drawings.

No enlarging of holes filling, by mandrolling or oxyacetylene flame shall be allowed.

Allowed variations for holes (out-of-roundness, eccentricity, plumb-line deviation) shall be as per IS: 800.

- Maximum deviation for spacing of two holes on the same axis shall be + 1 mm.
- Two perpendicular diameters of any oval hole shall not differ by more than 1 mm.

Drilling faults in holes may be rectified by reaming the holes to the next upper diameter, provided that spacing of new hole centres and distance of hole centres to the edges of members are not less than allowed and that the increase of hole diameter does not impair the structural strength. Hole reaming shall be allowed if the number of faulty holes does not exceed 15% of the total number of holes for one joint.

4.22.6. Preparation of Members for Welding

Assembly of structural members shall be made with proper jigs and fixtures to ensure correct positioning of members (angles, axes nodes etc.)

Sharp edges, rust of cut edges, notches, irregularities and fissures due to faulty cutting shall be chipped or ground or filled over the length of the affected area, deep enough to remove faults completely.

Edge preparation for welding shall be carefully and accurately made so as to facilitate a good joint. Generally no special edge preparation shall be required for members under 8 mm thick.

Edge preparation (beveling) denotes cutting of the same so as to result in V, X K or U seam shapes as per IS: 823.

The members to be assembled shall be clean and dry on the welding edges. Under no circumstances shall wet, greasy, rust or dirt covered parts be assembled. Joints shall be kept free from any foreign matter likely to get in to the gaps between members to be welded.

Before assembly the edges to be welded as well as adjacent areas extending for atleast 20 mm shall be cleaned (until metallic polish is achieved).

When assembling members, proper care shall be taken of welding shrinkage and distortions, as the drawing dimensions cover finished dimensions of the structure.

The elements shall be got checked and approved by the Engineer or their authorised representative before assembly.

The permissible tolerances for assembly of members preparatory to welding shall be as per IS: 823-1964.

After the assemble has been checked, temporary tack welding in position shall be done by electric welding, keeping in view finished dimensions of the structure.

4.22.7. Welding procedures

Welding shall be carried out only by fully trained and experienced welders as tested and approved by the Engineer. Any test carried out either by the Engineer or their representative or the inspectors shall constitute a right by them for such tests and the cost involved thereon shall be borne by the contractor himself.

Qualification tests for welders as well as tests for approval of electrodes will be carried out as per IS: 823. The nature of test for performance qualification of welders shall be commensurate with the quality of welding required on this job as judged by the Engineer.

The steel structures shall be automatically, semi-automatically or manually welded.

Welding shall begin only after the checks have been carried out.

The welder shall mark with his identification mark on each element welded by him.

When welding is carried out in open air, steps shall be taken to protect the face of welding against wind or rain. The electrodes, wire and parts being welded shall be dry.

Before beginning the welding operation, each joint shall be checked to ensure that the parts to be welded are clean and root gaps provided as per IS: 823.

For continuing the welding of seems discontinued due to some reason, the end of the discontinued seem shall be melted in order to obtain a good continuity. Before resuming the

welding operation, the groove as well as the adjacent parts shall be well cleaned for a length of approx. 50 mm.

For single butt welds (in V, 1/2 V or U) and double butt welds (in K, double U etc.) the rewelding of the root is mandatory but only the metal deposit on the root has been cleaned by back gouging or chipping.

The welding seams shall be left to cool slowly. The contractor shall not be allowed to cool the welds quickly by any other method.

For multi-layer welding, before welding the following layer, the formerly welded layer shall be cleaned metal bright by light chipping and wire brushing. Backing strips shall not be allowed.

The order and method of welding shall be so that -

- No unacceptable deformation appears in the welded parts.
- Due margin is provided to compensate for contraction due to welding in order to avoid any high permanent stresses.

4.23. Road Lighting

4.23.1. Median Street Lighting

- a. Access and survey the site for number of Pole and location of Feeder Pillar and
- b. Design the Feeder pillar.
- c. Co-coordinate with CESU/Electric Distribution Company for taking the Supply along with applicable fees/charges.
- d. The Feeder requirement for taking supply also contractor's Scope.
- e. Supply and fixing of GI decorative type Street light pole through the median.
- f. Supply fixing of outdoor type Energy efficient Light Fixture (Preferably LED)
- g. Supply fixing of weather proof junction box
- h. Supply Fixing of Feeder pillar
- i. Supply fixing of Incoming power cable (CU) to Feeder Pillar and Feeder pillar to Light Pole JB including Glanding and termination.
- j. Earthing required as per system design.

4.23.2. Street Light Pole:

Double arm lighting poles for street lights shall be of Octagonal GI decorative type steel poles construction as per applicable standard. These poles shall be coated with Galvanized. Outdoor lighting shall be done at adequate height to suit road width and an approximate spacing of 25 m. the installation scope includes excavation required for pole, construction of 600 x 600 mm concrete base for pole etc., earthing of pole, junction box and luminaire and laying of cable from junction box to luminaire from inside of the pole.

The street light pole erection shall be complete with:

- a. Street light pole of adequate height.

- b. Street lighting luminaire (LED)
- c. 50mm dia. GI conduit sleeves for incoming and outgoing cables up to junction box.
- d. 1.5 M long 20mm dia. Galvanized MS rod earth electrode for earthing of each 5th street lighting pole.
- e. Loop-in-loop-out type weatherproof Junction box with terminal blocks suitable for terminating.
- f. The lighting cable shall be laid underground at a depth of minimum 700mm below ground level with a protection of sand and bricks.

4.23.3. Junction Boxes

Junction boxes with terminals shall be supplied for branching and terminating lighting cables when required for outdoor areas, 3 phase receptacles etc. The junction boxes shall be dust and vermin proof and shall be fabricated from 14-gauge sheet steel or more than 2mm thick PVC and shall be complete with removable cover plate with gaskets, two earthing terminals each with nut, bolt and washer. Boxes shall be additionally weather proof. The boxes shall have provision for wall, column, pole or structure mounting and shall be provided with cable/conduit entry knock outs, terminal blocks, as required.

4.23.4. Feeder Pillar Panel - technical specification

Supply of metal clad, Pedestal mounted 415 volts. Weather proof Feeder Pillar Panel made of CRCA Sheet, Powder coated painting on a suitable size angle iron frame (MS channel base for grouting in the RCC and proper gland in the bottom) with required hardware such as nuts, bolts, washers, provision for earthing with 40mmx5mm GI strip on both sides of the feeder pillar panel, complete with Ammeter & Voltmeter along with selector switches and CTs, LED indicating lamps for each phase with the technical specification as given below-

- 1. Copper bus bar & Interconnecting copper wires.
- 2. Feeder pillar panel shall be of class IP-55 & a canopy shall be provided at its top to protect the feeder pillar panel against the rain & sunlight.
- 3. Feeder pillar panel shall be of double door type with provision of gasket. Provision of transparent sheet shall be made to take reading of Ammeter & Voltmeter without opening the door.
- 4. Incoming to Feeder Pillar cable size: At least 2x3.5cx50sqmm.
- 5. Outgoing from FP cable size: at least 3.5cx10sqmm.
- 6. Cable entry/ outgoing from bottom through PVC glands only.
- 7. Powder coating shade shall be RAL 7032 with a thickness of 80 micron minimum.
- 8. Neutral cables for incomer and outgoing will be terminated in neutral bus bar.
- 9. Lifting hook to be provided for easy handling of Feeder Pillar Panel.
- 10. Pedestal shall be made of RCC mixture 1:1.5:3.
- 11. All dimensions are in mm. General tolerances on dimensions ± 10 mm.

12. Manufacturer has to submit GA drawings with exact size and arrangement of all the components of reputed brands for approval.

4.23.5. Lighting Fixtures (Luminaires)

LED Luminaires shall be designed for continuous trouble-free operation without reduction in lamp life or without deterioration of materials and internal wiring. Outdoor fittings shall be weather-proof and rain-proof type. The Luminaires shall be designed to facilitate easy maintenance, including cleaning, replacement of lamps/starters etc. Connections between different components shall be made in such a way that they will not work loose by small vibration. All Luminaires shall be supplied complete with lamps suitable for operation on a supply voltage and the variation in supply voltage and frequency indicated in the Employer's Requirements.

LED type Luminaires shall be complete with accessories like lamps, ballasts, starters. These shall be mounted as far as possible in the luminaire housing only. If these cannot be accommodated integral with the Luminaires then a separate metal enclosed control gear box shall be included to accommodate the control accessories together with a terminal block suitable for loop-in, loop-out connections. Outdoor type fixtures shall be provided with outdoor type weather-proof box. Each luminaire shall have a terminal block suitable for loop-in, loop-out and T-off connection.

4.23.6. Earthing System

To achieve total earth resistance to less than 1-ohm earthing shall be carried out as per IS: 3043. The scope includes supply of earthing conductors, earth electrodes, installation and approval to the satisfaction of electrical inspector under this tender specification. Earthing system shall be provided to ensure equipment safety, personnel safety and to facilitate designed operation of protective switching during earth fault conditions in the associated system.

Each earth pit shall be provided with earth pit marker.

4.23.7. L.T. Cables

4.23.7.1. General

L.T. Cables shall be supplied, inspected, laid tested and commissioned in accordance with drawings, specifications, relevant Indian Standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written on the drums. The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

4.23.7.2. Materials

L.T. Cables shall be XLPE insulated and PVC sheathed copper conductor armored cables conforming to IS: 7098 (Part I)-1988. Cables shall be of 1100volt and with ISI certification mark. Conductor of power cables shall be made of electrical purity conforming to IS 8130-1984.

4.23.7.3. Installation of cables

Cables shall be laid directly in ground, pipes, masonry ducts, on cable tray, surface of wall/ceiling etc. as indicated on drawings and/or as per the direction of Engineer-in-Charge. Cable laying shall be carried out as per CPWD specifications.

4.23.7.4. Inspection

All cables shall be inspected at site and checked for any damage during transit.

4.23.7.5. Joints in cables

The Contractor shall take care to see that the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoiding of cable joints. This apportioning shall be got approved from Engineer-in-Charge before the cables are cut to lengths.

4.23.7.6. Laying cables in ground

Cable laying shall be as per IS:1255-1983 with up to date amendments and as specifying. Cables shall be laid by skilled experienced workmen using adequate rollers to minimize stretching of the cables. The cable drums shall be placed on jacks before unwinding the cable. With great care it shall be unrolled on over wooden rollers placed in trenches at intervals not exceeding 2 metres. Cables shall be laid at depth of 0.75 metres below ground level. A cushion of sand total of 250mm shall be provided both above and below the cable, joint boxes and other accessories. Cable shall not be laid in the same trench or alongside a water main. The cable shall be laid in excavated trench over 80mm layer of sand cushion. The relative position of the cables laid in the same trench shall be preserved. At all changes in direction in horizontal and vertical planes, the cables shall be bent smooth with a radius of bent not less than 12 times the diameter of cables. Minimum 3-metre-long loop shall be provided at both end of cable. Distinguishing marks may be made on the cable ends for identifications of phases. Insulation, tapes of appropriate voltage and in red, yellow and blue colours shall be wrapped just below the sockets for phase identifications.

4.23.7.7. Protection of cables

The cables shall be protected by bricks laid on the top layer of the sand for the full length of underground cable. Where more than one cables is laid in the same trench, the bricks shall cover all the cables and shall project a minimum of approximately 80mm on either side of the cables. Cable under road crossings and any other places subject to heavy traffic, shall be protected by running them through Hume Pipes of suitable size.

4.23.7.8. Excavation & back fill

All excavation and back fill required for the installation of the cables shall be carried out by the Contractor in accordance with the drawings and requirements laid down elsewhere. Trenches shall be dug true to line and grades. Back fill for trenches shall be filled in layer not exceeding 150mm. Each layer shall be properly rammed and consolidated before laying the next layer. The Contractor shall restore all surface, road ways, side walks, kerbs wall or the works cut by excavation to their original condition to the satisfaction of the Engineer-in-Charge.

4.23.7.9. Cables tags

Cable tags shall be made out of 2mm thick aluminium sheets, each tag 1-1/2 inch in dia with one hole of 2.5mm dia, 6mm below the periphery. Cable designations are

to be punched with letter/number punches and the tags are to be tied inside the panels beyond the glanding as well as below the glands at cable entries. Trays tags are to be tied at all bends. On straight lengths, tags shall be provided at every 5 metres.

4.23.7.10. Testing of cables

Prior to installation burying of cables, following tests shall be carried out. Insulation test between phases, phase & neutral, phase & earth for each length of cable.

- a. Before laying.
- b. After laying.
- c. After jointing.

On completion of cable laying work, the following tests shall be conducted in the presence of the Engineer in Charge.

- a. Insulation Resistance Test (Sectional and overall).
- b. Continuity Resistance Test.
- c. Earth Test.

All tests shall be carried out in accordance with relevant Indian Standard code of practice and Indian Electricity Rules. The Contractor shall provide necessary instruments, equipments and labour for conducting the above tests & shall bear all expenses of conducting such tests.

4.24. Quality Control / Quality Assurance Policy

In accordance with the Conditions of Contract, the Contractor shall apply the formal requirements of Quality Control/Quality Assurance to the design, supply, construction and maintenance of the requirements of BS: 5750 or an equivalent International Standard. Positive commitment to Quality Control/Quality Assurance shall be expressed in a formal policy statement given in the Contractor's Quality Manual.

4.24.1. Objectives

It shall be the stated aim of the Contractor to achieve and demonstrate the achievement of quality by due care and diligence of the design, supply, construction and maintenance of the Works as defined by the Employer's Requirements. The criteria to define due care and diligence shall be explained in the Contractor's Quality Plan and shall embody all of the design, supply, construction and maintenance requirements of the Works.

4.24.2. Quality System

The Quality System shall be fully integrated for all of the Works. This system will be defined by the organizational structure, responsibilities, activities, resources, and events that together demonstrate the capability of the Contractor to meet the stated quality requirements. The Contractor shall ensure that all sub-contractors and sub-consultants establish quality systems and shall supply to the Engineer and the Employer such evidence as is necessary to demonstrate the effective implementation of a quality system in each sub-contractor or sub-consultant organization.

The quality system of the Contractor and of his sub-consultants will be subject to periodic audits undertaken by the Engineer. The Engineer will give two weeks' notice of such audits that will involve a full assessment of the performance and efficiency of the quality system and will include review of the feedback and records derived from the Contractor's monitoring and internal reviews. On a day-to-day basis the Contractor shall afford reasonable availability of staff and documentation for the Engineer to assess the implementation of the quality system. The Contractor shall ensure that all relevant personnel and documentation are available for such audits.

4.24.3. Quality Plan

The implementation of the quality system shall be through the establishment of a comprehensive quality plan issued to and approved by the Engineer. The document procedures shall include but not be limited to:

1. Quality Assurance
2. Management procedures;
3. Design
4. Supply/procurement;
5. Construction;
6. Quality Checks during execution of works
7. Putting to work/commissioning/reliability trial/performance test;
8. Operator training and maintenance;
9. Interface control.

4.24.4. Quality Performance, Monitoring and Review

There shall be procedures to control transmission across all interfaces both internally (that is, within the Contractor's quality system) and externally. Those of the latter shall include all statutory bodies, authorities and the Engineer. Formal assessment of any non-compliance with the quality plan shall be achieved through periodic reviews undertaken by a team appointed by the Contractor. All deficiencies shall be recorded and appropriate corrective measures shall be assessed, within an appropriate timescale through subsequent formal reviews undertaken by the Contractor.

4.24.5. Quality Assurance Methodologies in General

Maintain continuity of quality assurance surveillance throughout fabrication of products and execution of work. Submit details of quality assurance tests and methods inclusive of the specification. Perform inspection and testing in accordance with specified referenced standards or as otherwise approved by the Engineer. Calibrate measuring and testing devices periodically against certified standard equipment. Calibration shall be verified by the Engineer.

4.24.6. Quality Assurance of the Works on Site

Provide an assurance system to ensure quality assurance by phased inspection as follows:

1. Preparatory phase inspection: A construction risk workshop should be arranged before construction commences to evaluate the risk and develop measures to mitigate those risks.
2. Perform inspections prior to commencement of each part of the Works which shall be a review of requirements with the supervisors directly responsible for that part of the Works:
 - a. Such review shall be in the form of written statements of the processes to be followed and critical characteristics, tests and similar evaluations which will be a part of inspection procedures.
 - b. Verify that products incorporated with that part of the Works which have been tested and applicable submissions have been made for control testing.
 - c. Verify that proceeding work has been completed and approved.
 - d. Verify products incorporated with that part of the Works confirm to submission data and Contract requirements and that necessary materials and equipment are easily and readily available.

4.24.7. Schedule of Quality Assurance Operations

The Contractor shall provide the Engineer with a minimum of three copies of a schedule of quality assurance operations, both on-site and off-site to outline the procedures, instructions and reports which will be used, as follows:

1. Quality assurance organization.
2. Qualifications of quality assurance personnel
3. Authority and responsibilities of each quality assurance person
4. Schedule of inspections and tests with personnel assigned to each task and duration of each task.
5. Schedule of required services to be provided by inspection and testing firms.
6. Coordination required in order that quality assurance is integrated.
7. Test methods which will be utilized.
8. Methods of performing and documenting quality assurance operations.

4.24.8. Tests Required by Jurisdictional Authorities

The Contractor shall be responsible for inspection and testing required by jurisdictional authorities in conformance with the performance requirements. If the Engineer so desires, he may delegate inspection and testing of materials by an independent body/agency. Any such delegation shall be affected for this purpose shall be considered as an assistant of the Engineer. Notice of such appointment (not being less than 14 days) shall be given by the Engineer to the Contractor.

4.24.9. Quality Assurance Reports

Reports shall be in an approved format and shall certify off-site item produced correctly, as applicable. Similarly, the report shall certify items that are defective with a statement of records on corrective measures taken. The Contractor shall:

1. Document each test and inspection on a report and submit the report in triplicate to the Engineer.
2. Include on each report the purpose of the inspection or test, a description of methods used observations made and personnel involved.
3. Maintain in the approved format a log book of all tests performed which shall include the date of test, type of test and the results of the test.

If inspection and testing procedures are sub-contracted to an approved inspection and testing firm only copies of test reports signed by the approved inspection and testing firm will be acceptable.

4.24.10. Quality Feedback

The system shall include for the reporting back, recording and incorporation into the system of deficiencies and remedial measures to correct them noted during the control of the project.

4.25. Storm Water Box Drain cleaning & desilting

4.25.1. Scope of work

The work of cleaning & desilting of box drain is not in the scope of work. The Contractor has to prepare comprehensive operation and maintenance manual having following provisions.

4.25.2. Description

The work shall include all labour, tools, equipment and related items as may be required for the complete cleaning and internal inspection and television monitoring of the storm drain and removing and disposing of all deposits cleaned from the drains.

The work shall include the thorough cleaning of storm drains in order to permit an unrestricted inspection by closed circuit television. All storm drains will be cleared prior to television inspection. If the television inspection shows drains were improperly cleaned, the Engineer will direct the appropriate cleaning and re-cleaning. Re-cleaning shall be done at no additional cost.

The purpose of the television inspection work is to determine the structural condition of the storm drains and identify areas of the storm drains with vertical misalignments, collapsed or broken structures.

4.25.3. Cleaning Procedures and Equipment

The Contractor shall clean storm drains prior to internal inspection, utilizing cleaning equipment approved for use by the Engineer. Cleaning equipment may consist of heavy duty

mud pump for removing of deposited silt and may use smaller machines like bobcat for cleaning through the maintenance access.

All cleaning equipment, including machines, devices, tools, etc., required for the entire cleaning operations shall be owned or leased and operated by the Contractor. The Contractor will certify that backup cleaning equipment is available and can be delivered to the site within twenty-four (24) hours. The equipment utilized shall be capable of removing all sand, dirt, rocks and other debris (where ordered by the Engineer), from the drain line to allow adequate internal inspection (in the opinion of the Engineer) of all internal surfaces. The equipment used shall suit the conditions and size of the drain to be cleaned.

All safety precautions before entry shall have to be ensured regarding presence of gases and act as per safety guide outlines by agencies having jurisdiction, shall be followed by the Contractor during cleaning operations. All precautions shall be taken by the Contractor to protect the storm drain from damage that might result from the use of unsuitable equipment or improper use of approved cleaning equipment. Any drains damaged during the cleaning operations as a result of the Contractor's operations shall be promptly repaired to an acceptable condition (as determined by the Engineer) by and at the expense of the Contractor. If the Contractor's cleaning equipment becomes immobilized within a storm drain, , said equipment shall be retrieved at the Contractor's expense. The Contractor shall act immediately to remedy problems created by the cleaning procedure, which represent a hazard to the general public, such as the collapse of the ground surface above a storm drain. If equipment retrieval necessitates excavation, the Contractor shall be responsible for accomplishing the work at his own expense. Following removal of the equipment, the Contractor shall restore the line and the site in accordance with the construction specifications of the governing body having jurisdiction.

4.25.4. Debris Removal & Disposal

Remove and collect silt debris and material of any kind and prevent material from being discharged into the drainage system. Dispose of all materials removed from box drain not designated as regulated material or Acid Producing Soil, as follows:

1. Once material leaves the Project Limits, the Contractor is responsible for ensuring that the handling procedures, placement method, and disposal location are according to applicable pollution control board rules and local municipal laws, rules, and requirements, including permits that may be issued for the Project.
2. If the disposal of excess material results in a violation notice from any governmental authority, immediately correct the violation. Indemnify and defend the Engineer for any violation incurred, penalty assessed, or any claims, suits, losses, demands or damages of whatever kind or nature arising out of, or claimed to arise out of, the improper disposal of excess materials.
3. If the Contractor does not correct the violation to the satisfaction of the governmental authority that issued the violation notice, the Contractor is responsible for assessed penalties including costs incurred by the City to remedy the violations.
 - a) Transport subcontractor name, address, permit number, and telephone number;
 - b) Type and quantity of material removed;
 - c) Weight of vehicle with weigh slip;
 - d) Date of removed from the Project Limits;

e) Signature of transport vehicle operator.

The Engineer will sign the bills of lading for the City as the generator within the Project Limits. Submit 1 copy of the bill of lading to the City by the end of each working day that the transport vehicle leaves the site. The licensed hauler shall transport the regulated material to the disposal/recycling facility with no unauthorized stops in between, except as required by regulatory authority. The hauler shall use appropriate vehicles and operating practices to prevent spillage or leakage from occurring during transport. Remove excess soil adhering to the wheels or under carriage of the vehicles before leaving the Project Limits. If soil or water escapes to the public roads, immediately clean the road to restore it to the original condition and immediately notify the Engineer. Do not transport regulated material over public roads if they contain free liquid or are sufficiently wet to be potentially flowable during transport. Submit 1 copy of the documentation of the disposal facility's acceptance of the regulated material, including the weight ticket slips, to the Engineer and the county of origin within 15 days of acceptance at the disposal facility. Immediately submit written notification to the Engineer if problems arise, regarding the facility chosen to accept the regulated material for off-site management, that would require the return of waste, or if the chosen facility has violated any environmental regulation that may result in regulatory enforcement action. Propose an alternate disposal facility, and obtain the Engineer's written approval of off-site management at such facility.

Chapter-5: PRE-CAST BOX DRAIN

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5: Pre-Cast Box Drain

5.1 Scope

This chapter is in addition to Chapter No 4, **Scope and Technical Specification of Civil & Structural Requirement of Box drain**, for Pre-Cast sections of Box Drain This scope covers single - cell and multi - cell precast reinforced concrete box units cast monolithically or “clam shell”. It includes rigid frame boxes, both four sided units.

Design Criteria

In addition to Chapter No 4, Design and drawing of Box drain 4.18, Design Criteria 4.23, the design requirements for precast box drain shall comply with ASTM C 1433 -16B. Contractor have to provide interior box dimensions as per requirement and approved drawing.

Design Considerations

- i) Constructability** – Design and manufacturing requirements needed to maintain the structural integrity of the precast element for handling during loading, transportation and placement.
- ii) Shippable Size** – Restrictions of width and limited height of precast units should be decided on verifying availability of available shipping space.
- iii) Shippable Mass** – This will have to comply the rules of Odisha State Traffic Rules and Regulations and taking considerations of road conditions in terms of load carrying capacity.
- iv) Foundation & Bedding** – Precast box drain should be placed on good, improved soil base after certification of bearing capacity matching to design requirement of box drain . In this regard , the stipulations and suggestions already mentioned in chapter 4 of bid document to be referred which stands here.

5.2 Design and Submission Requirements

All box units shall be designed according to with ASTM C 1433 -16B and ASTM C 1577 – 18 and in comply with design requirements given in chapter 4 and additional requirements for pre cast sections shall be as under;

- Fabrication details
- Assembly details
- Lifting details

5.3 Shop Drawings

The shop drawings represent the details of precast products to be supplied by the precast producer, as interpreted from the Contract Documents and Drawings. Shop drawings, including any supporting documentation should be submitted by the Contractor for review and approval from Engineer. The shop drawings may include the following information but not limited to:

- i. Precast element details.
- ii. Material Specifications, i.e. concrete, reinforcement, etc.
- iii. Reinforcing steel schedules.
- iv. iv)Method of Construction
- v. Lifting point locations and Handling requirements.
- vi. Details and location of all temporary supports, if applicable.
- vii. vi)Methodology for placing at field (At drain section)
- viii. Details of bracing installed to provide adequate support and stability to the precast element during construction, if applicable.

5.4 Production

1. Precast elements are to be manufactured in a facility

- Precast sections should be used in projects should be fabricated by a precast producer possessing NPCA Certificate (National Precast Concrete Association) issued under the Plant Prequalification Program as outlined in the publication, this is Prequalification Requirements for supplier Precast Concrete Drainage Products.

2. Placement of Reinforcement

- The concrete cover to the WWF shall be $40 \text{ mm} \pm 5 \text{ mm}$, and the cover to reinforcing bars shall be $50 \text{ mm} \pm 15 \text{ mm}$.
- The clear distance of the end perimeter reinforcement shall not be less than 35 mm or greater than 50 mm from the ends of the box unit.
- Box units reinforced with WWF may be assembled using any combination of single or double layers of the fabric. Box units using reinforcing steel bars shall be assembled with single layers of reinforcement in each face in each direction.

3. Laps, Welds, and Spacing of Reinforcement

- Welding of steel reinforcement shall be according to IS 2751, performed by a qualified welder working for a company certified by the approved /authorized third party certification
- Splices in the perimeter reinforcement shall be made by lapping. Reinforcement shall not be lapped in tension zones. Sheets of the WWF shall be tack welded at lap locations.
- The overlap measured between the outermost longitudinal wires of each
- WWF sheet, shall not be less than the spacing of the longitudinal wires plus 50mm or 250 mm, whichever is greater. The centre to centre spacing of the perimeter wires shall

not be less than 50 mm or more than 105 mm. The centre to centre spacing of the longitudinal wires shall not be more than 200 mm.

4. Joints

- The joint design shall consist of a bell or groove on one end of a unit of box and a spigot or tongue on the adjacent end of the joining box, with a smooth interior and free of irregularities, capable of accepting a jointing material.

5. Curing

- Except for exposed ends, Wet Cast box units shall be cured by leaving the box units in the form or by low pressure steam. Dry Cast box units and the exposed ends of the Wet Cast box units shall be covered and cured by low pressure steam or other system that will maintain a moist atmosphere
- Box units shall be cured until a minimum strength of 25 MPa is achieved or for four days, whichever occurs first.
- Curing procedures specific to a precast plant may be used if the procedures have been shown to produce a finished concrete product that meets or exceeds all of the performance requirements specified in IS 9013: 1978, where applicable.
- Elements containing silica fume shall be moist cured for 7 days.
- Curing compounds are not an acceptable method of curing.

6. Forms

- The forms used in the production process shall be sufficiently rigid and accurate to maintain the specified box unit dimensions.
- All casting surfaces shall be of smooth, nonporous, and non - staining material. Insulated forms shall not be used.

7. Handling

- Lifting hardware will be permitted in each box unit for the purpose of handling and installing.

8. Markings should be clearly marked on each section of box:

- Size: Span X Rise dimensions
- Specification designation
- Date of manufacture
- Precast producer's name or trademark
- Plant identification
- Plant Prequalification Program stamp
- Other markings as specified by the owner

5.5 Handling, Storage, and Shipping.

Handle, store, and ship precast box Drain in a manner that prevents chipping, cracks, fractures, and excessive bending stress. Do not ship precast box Drain before the concrete attains the required 28-day strength.

The manufacturer is permitted to verify the shipping strength test, before 28 days, by testing compressive strength cylinders that are cured under the conditions similar to the product or by testing temperature match cured cylinders. The manufacturer may use the maturity method, ASTM C-1074, pulse velocity method in accordance with ASTM C-597, or any other approved non-destructive test method to estimate the strength of concrete for determining form removal and handling strengths or before verification of shipping strength by test cylinders.

Curing temperature and cycle must be monitored on a minimum of one box culvert curing cell from each day of production when non-destructive test methods or temperature match cured cylinders are used to determine concrete strengths.

The shipping strength test is the average compressive strength of two test cylinders. Do not ship any products until the QC Manager's stamp is affixed to the product.

5.6 Trench, Foundation, Laying, and Backfill.

General:

Meet the requirements of approved design specifications, for trench excavation, foundation construction, laying and backfilling and the following:

After installation of sheet piles, dewatering arrangement and removal of slush and providing soil improvement, confirmation of bearing capacity of soil after conducting plate load test at founding level, laying of precast box drain sections shall be done on dry foundation to ensure uniform bearing across the full width of the bottom slab.

Bedding:

Provide bedding that consists of a minimum 150mm depth of select material, with not more than 15% fines passing the No. 200 U.S. Standard sieve, in accordance with Design Standards or other granular material approved by the Engineer. Place bedding in maximum 150mm compacted layers below the box drain to a minimum width of 300 inches outside the exterior walls of the box drain to meet the density requirements.

When coarse aggregate is approved for use as an alternate bedding material, wrap the bottom and sides of the coarse aggregate with a layer of Type D-4 geotextile filter fabric as specified in ASTM D - 6241, and substituted the coarse aggregate with select material within 1.20m of the cut-off box drain toe walls at each end of the precast box culvert. Obtain the Engineer's approval before using flowable fill for bedding material. Provide other special bedding material, when required by the Contract Documents. Set grade forms 300mm outside each exterior wall of the box culvert. Uniformly compact this material and

then grade off using the forms. Set the grade forms approximately 10mm inches to 15mm above the theoretical grade line to allow for soil compression. Adjust this distance to yield the proper grade, but do not use in lieu of the proper compaction of the granular bedding material. Remove the forms after placing the precast box culvert section.

Placement of Precast Box Culvert Sections:

Obtain the Engineer's approval of the method of controlling line and grade during culvert installation. Use a method that allows rapid checking of the previously laid sections. Maintain line and grade on sections previously set. The Engineer will consider sections which do not retain the plan line within 30mm grade laying of subsequent sections, as not having been laid to line and grade, relay sections not to line and grade without additional compensation.

Placement of Multiple Barrel Drain:

For multiple barrel installations using single-cell precast box sections, provide positive lateral support between the precast box Drain consisting of non-shrink grout, concrete meeting the requirements or non-excavatable flowable fill prior to backfilling. Provide partial height backfill or bracing to maintain alignment, when approved by the Engineer.

Backfilling:

Begin backfilling only after the Engineers approval. Seal block outs and holes provided for lifting or joint restraint by plugging using an epoxy mortar or non-shrink grout in accordance with ASTM C 1090 and properly cure to ensure a sound and watertight plug, prior to backfilling.

Underdrain and Weep Holes:

Provide a continuous underdrain in accordance with Design Standards.

5.7 Joints.

General:

Make field joints for precast concrete box culvert sections with either profile rubber gaskets or preformed joint sealants, unless otherwise detailed in the plans or approved shop drawings. Joint openings at the outside face must not exceed 40mm in the assembled position at any location along the joint perimeter. Ensure a minimum 50% overlap of the joint tongue and groove around the entire perimeter of the box in the assembled position. Completely wrap the outside of each joint with Type D-3 geotextile filter fabric as specified in ASTM D – 6241. Provide fabric with a minimum width of 600mm and a length sufficient to ensure a minimum overlap of 600mm. The filter fabric must extend a minimum of 300mm beyond each side of the joint. Secure the fabric tightly against the box culvert sections with metal or plastic strapping. Other methods which will hold the fabric securely against the wall of the culvert until the backfill is placed and compacted, may be used when approved by the Engineer. When specified in the plans, secure the joint by a suitable device capable of holding the sections to line and grade as well as fully home. Remove these devices and repair locations as necessary if intrusive into the concrete after placing and compacting sufficient backfill to secure the sections.

Profile Rubber Gaskets:

Install field joints in accordance with the joint manufacturer's instructions and meet the following:

Meet the requirements of ASTM C1677, Store all gaskets in a cool place prior to use, Furnish to the Engineer written details regarding configuration of the joint and gasket required to create a soil-tight seal. Do not apply mortar, joint compound or other filler which would restrict the flexibility of the joint.

Preformed Flexible Joint Sealants:

Install field joints in accordance with the joint manufacturer's instructions and meet the following:

Meet the requirements of ASTM C990, Furnish to the Engineer a written recommendation of the size (cross-sectional area) of joint sealant which will create a soil-tight seal. Ensure that this amount is the minimum quantity of bitumen sealant used. Do not brush or wipe joint surfaces which are to be in contact with the joint sealant with cement slurry. Fill minor voids with non-shrink grout,

1. Thoroughly clean and dry all joint surfaces which are to be in contact with the sealant material. When recommended by the sealant manufacturer, apply a primer of the type recommended to all joint surfaces which are to be in contact with the sealant material.
2. Apply sealant to form a continuous seal around each joint. The sealant must be protected by a removable wrapper. Do not remove the paper wrapper on the exterior surface of the preformed flexible joint sealant until immediately prior to joining the precast sections. Apply the joint sealant only to dry surfaces. When the atmospheric temperature is below 16°C, either store the joint sealant in an area above 70°F, or artificially warm the joint sealant to 22°C in a manner satisfactory to the Engineer. After assembly, ensure that there is full contact and compression of the sealant for the entire perimeter of the joint, as evidenced by the presence of minor bulging along any visible edges of the sealant. Neatly trim any extruded sealant flush with the concrete surface.

Water-tight Joint Treatment:

1. Provide water-tight joints when shown in the Contract Documents. Utilize an external sealing band in accordance with ASTM C877. Determine the minimum width of sealing bands by substituting the larger of the clear rise or span of the precast concrete box section, for the equivalent pipe diameter in ASTM C877 Tables 1 and 2. Install external sealing band wrap in accordance with the manufacturer's instructions prior to wrapping the joint with geotextile filter fabric.

5.8 Quality Assurance

Precast concrete box units shall be fabricated by a precast producer possessing a certificate of the Plant Prequalification Program, indicating the plant's conformance to the Prequalification Requirements for Precast Concrete Drainage Products.

The latest test results of the precast producer's quality control procedures specified in the subsection for Quality Control shall be submitted to the Owner.

The Engineer may request submission of samples for nondestructive testing. The Engineer shall be provided access to the precast producer's plant, at times and locations determined by the Owner, to perform independent inspection, sampling, and testing.

5.9 Quality Control

All testing shall be carried out by a qualified person (approved by Engineer) holding third party certification.

Testing and inspection protocol shall be carried out as outlined in the requirements of the Plant Prequalification Program for precast box units.

Tests with concrete include compressive strength, air void system for Wet Cast concrete, salt scaling for Dry Cast concrete on box units as per relevant IS code and international standards and frequency.

Inspection of box units include box unit dimensions with tolerances for span and rise, slab and wall thickness, length of unit, squareness, straightness of joints, and concrete cover over reinforcement. Refer to ASTM C 1433 -16B for box drain.

A set of two cylinders shall be made for determining the 28 - Day strength of the concrete. The cylinders shall be made, cured, sampled, and tested according to IS 456, except both cylinders shall be either 150 x 300 mm or 100 x 200 mm in size and test frequency shall be as per relevant IS and international standard. .

The testing shall be carried out at a certified laboratory approved by the Engineer Owner. The compressive strength result shall as per IS 456 and other relevant IS and international code.



ORISSA WATER SUPPLY AND SEWERAGE BOARD

(A Government of Orissa Undertaking)

Mahanadi Vihar, Naya Bazar, Cuttack, Odisha PIN 753004, India

Phone: +91-671-2444511, Fax: +91-671-2441616

JICA ASSISTED ODISHA INTEGRATED SANITATION IMPROVEMENT PROJECT (ID-P252)

BIDDING DOCUMENTS

FOR

**CONSTRUCTION OF BOX DRAINS WITH ROAD BETWEEN CHAINAGE
3300 – 5150 OF MAIN DRAIN – 1, CUTTACK, DESIGN BUILD
(PACKAGE NO. JICA/OWSSB/OISIP/04 – II / LOT 1)**

ON

INTERNATIONAL COMPETITIVE BIDDING

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APPENDIX– SECTION VII GENERAL CONDITIONS

December 2020

Section VII. General Conditions (GC)

The General Conditions governing this Contract are the Standard General Conditions of Contract set forth in Part 3, Section VII of the Standard Bidding Documents for Procurement of Electrical and Mechanical Plant, and for Building and Engineering Works, Designed by the Contractor (Trial Version) published by JICA in July, 2015.

Those General Conditions of Contract are in the Appendix of this Bidding Documents. .

Section VIII. Particular Conditions

Part A - Contract Data

Conditions	Sub-Clause	Data
Employer's name and address	1.1.2.2 & 1.3	The Engineer -in- Chief, OISIP, JICA Orissa Water Supply & Sewerage Board (OWSSB) Mahanadivihar, Nayabazar, Cuttack Odisha PIN No.753004. Phone: +91-671-2444511 Fax: +91-671-2441616 e-mail: ce_jica@owssb.in
Engineer's name and address	1.1.2.4 & 1.3	The Project Engineer (Drainage) PMU-III, OISIP, JICA, OWSSB, Mahanadivihar, Nayabazar, Cuttack Odisha 753004. Phone No. - 671-2440381, Fax No. - 0671-2441616 E-mail - pe_cd@owssb.in
Bank's name	1.1.2.11	Japan International Cooperation Agency (JICA)
Borrower's name	1.1.2.12	The President of India
Time for Completion	1.1.3.3	The Works shall be completed within 18months from the Commencement Date. The time for completion of each Milestones are referring to Table: Summary of Milestones below
Defects Notification Period	1.1.3.7	One year
Sections	1.1.5.6	Not applicable.
Electronic transmission systems	1.3	E-mail will be an acceptable form of written electronic transmission, provided a signed hard copy of the entire contents of E-mail, including any attachments, is received within two (2) days of the transmission of the E-mail. The Contractor's address in the Contract Agreement.:
Governing Law	1.4	The Law of the Republic of India
Ruling language	1.4	English
Language for communications	1.4	English
Time for access to, and	2.1	The date effective access to the site is

possession of all parts of, the Site		granted: 14 days after Commencement Date.
Project Management Consultants (PMC)	3.1	Team Leader, Engineering & Project Management Consultants (PMC) JICA assisted Odisha Integrated Sanitation Improvement Project Plot No. E-51, Infocity, Patia Bhubaneswar-751024, Odisha Phone: +91-674-6603333 Fax: +91-674-6603311
Engineer's Duties and Authority	3.1(B)(ii)	Variations resulting in an increase of the Accepted Contract Amount in excess of 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 10 percent of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount. Performance Security of this contract is in accordance with the ICC Publication No.758, the 6th paragraph, "The Employer shall return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate" is deleted.
General Design Obligations	5.1	Period for notifying errors, faults and defects in the Employer's Requirements: 28 days.
Normal working hours	6.5	Normal working hours at the Site shall not be exceeded the limit of working hours in the law of India; constructible at site in between 08:00AM to 9:00PM on Monday to Saturday; excluding gazetted and national holidays. The Contractor shall be responsible to obtain the written consent of the Employer's Representative if he desires to work outside these times during the execution of work till wet run test. Detailed restricted hours and period of works (including traffics) are referred to Section VI Employer's Requirements.
Delay damages for the Works	8.7	Refer to Table: Summary of Milestones below
Maximum amount of delay damages	8.7	Not exceeding 10 % of the final Contract Price.
Provisional Sums	13.5.(b)(ii)	A sum for the Contractor's overhead

		charges and profit for Plant, Materials or services to be purchased by the Contractor from a nominated Subcontractor or otherwise is 15% of the actual amounts spent.
Total advance payment	14.2	10 %, Percentage of the Accepted Contract Amount payable in the currencies and proportions in which the Accepted Contract Amount is payable. Advance Payment shall be released in two (2) equal installments;; First installment shall be paid in accordance with GC 14.7 (a). Second installment shall be made at the time of commencement of physical Construction notified by the Engineer and when the Contractor submits a bank guarantee.
Repayment amortization rate of advance payment	14.2(b)	20 %
Percentage of Retention	14.3(c)	5 %
Limit of Retention Money	14.3(c)	5 % of the Accepted Contract Amount
Minimum Amount of Interim Payment Certificates	14.6	1% of the Accepted Contract Amount.
Periods for submission of insurance: a. evidence of insurance. b. relevant policies	18.1	 14 days 28days
Maximum amount of deductibles for insurance of the Employer's risks	18.2(d)	INR 1,00,000
Minimum amount of third party insurance	18.3	Amount of third party insurance: INR 25,00,000 per occurrence.
Minimum amount of professional indemnity insurance	18.5	Not less than five percent (5%) of the Accepted Contract Amount; or the value of Design in the Accepted Contract amount; whichever is higher amount.
Minimum period that professional indemnity insurance to be maintained	18.5	up to Defect Notification Period (DNP) completed
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 Members
Appointment (if not agreed)	20.3	ICC

to be made by		

Table: Summary of Milestones

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)
Section A: Completion of final Survey and Design report.	3 months from the Commencement Date.	<u>Per Day, 0.1% of the 5% of the Accepted Contract Price.</u>
Section B: 50% of total length of Box Drains functional completion.	11 months from the Commencement Date.	<u>Per Day, 0.1% of the 50% of the Contract Price.</u>
Section C: Completion of the Works.	18 months from the Commencement Date.	<u>Per Day, 0.1% of the Contract Price.</u>

Particular Conditions

Part B - Specific Provisions

Sub-Clause 1.15 Inspections and Audit by the Employer	<i>Add New Sub-Clause 1.15 with:</i> “The Contractor shall establish exclusive local bank account for the Project under direct operation of the Contractor’s Representative or person appointed by the Contractor. The Contractor shall permit the Employer and/or persons appointed by the Employer to inspect the Contractor’s accounts and records relating to the performance of the Contract and to have such accounts and records audited by auditors appointed by the Employer if required by the Employer.” This is not applicable for Foreign Currency Payments.
Sub-Clause 3.1 Engineer’s Duties and Authority	<i>Added following paragraph at the end of Sub-Clause 3.1 with:</i> “The Employer has appointed the Project Management Consultants (PMC) and named in the Contract Data, to assist to carry out the duties assigned to Engineer in the Contract such as review of plan and design, preparation of variation orders, monitoring work progress (including conducting progress review meeting), verification of invoices, quality control (including onsite inspections), dispute resolution, environmental monitoring and any other task assigned under sub-clause 3.2 of General Conditions. The PMC is responsible to obtain, verify and record the documents of the works carried by the contractor and report to the Engineer from time to time during the contract period.”
Sub-Clause 4.4 Subcontractors	<i>Added the following paragraph at the end of Sub-Clause 4.4 with:</i> ““In the Contract, “Specialist Subcontractor” means a subcontractor whose experience in the key activities was evaluated in the Technical Bid and is stated in the Contract. During the execution of the work, the Contractor shall not alter the composition without the prior consent of the Engineer.”
Sub-Clause 4.13 Rights of Way and Facilities	<i>Add paragraph a) at the end of the clause:</i> “a) The Employer’s obligation to provide rights of way whether permanent or temporary is limited to the existing rights of way at the time of tender. Contractor shall be deemed to have understood the condition and availability of existing access and rights of way before submitting the Tender”
Sub-Clause 4.15 Access Route	<i>Added new Paragraph (f):</i> “The Contractor shall obtain the permission from relevant department for movement of construction vehicle (heavy, over size and carrying hazardous material etc.) to access the routes. Employer will assist the contractor to obtain the permission from relevant authority.”
Clause 4.21:	<i>Replace the first sentence of Sub-Clause 4.21 with the following:</i>

Progress Reports	“Monthly progress reports shall be prepared by the Contractor in a format approved by the Engineer and submitted to the Engineer in six copies.” <i>Add to the end of paragraph of Sub Clause 4.21, with the following:</i> "The report shall be covered the Resource Plan and Fund Flow Graph / Table reflecting actual resource utilization / funds utilized vis-a-vis programmed vide Sub-clause 8.3 [Programme]. Soft copies of the reports also to be submitted.”
Sub-Clause 6.10 Records of Contractor’ Personnel and Equipment	<i>Add to the end of Sub-Clause 6.10, the following:</i> “Submission of Fortnightly Record of Labour The contractor shall submit by the 4th and 19th of every month, to the Engineer a true statement showing in respect of the second half of the preceding month and the first half of the current month respectively: (i) The number of labourers employed by him on the work, (ii) Their working hours, (iii) The wages paid to them, (iv) The accidents that occurred during the said fortnight showing the circumstances under which they happened, and the extent of damage and injury caused by them, and (v) The number of female workers who have been allowed maternity benefit and the amount paid to them.”
Sub-Clause 8.7 Delay Damages	<i>Add to the end of Sub-Clause 8.7, the following:</i> “The Delay Damages shall be applied for delay of the milestones not subject to Taking Over due to: (i) If the Contractor, does not complete each of the milestones timely, the Employer has the burden of desilting of the Entire Drain (which is taken over by the Employer from Municipality for Construction) before each monsoon lies with the Employer for which huge financial loss is incurred every season. (ii) In case of delay in execution of the Box Drain, Connectivity of the Box Drain to the already constructed open drain will be delayed resulting in siltation/erosion of the completed open drain portion and liability of taking over of completed open drain portion and its O&M remains with the Employer for which huge financial burden will come. The Delay Damages for the milestones not subject to Taking Over shall be the sum stated in the Table of Milestones in this Section VIII Particular Conditions.”
Sub-Clause 13.3 (c) Variation Procedure	<i>Add Sub-Clause 13.3 (c) as following sentence</i> “The variation proposal shall be estimated by the Item Rate base, and source of rates or price shall be used whichever from following method: (i) the appropriate rate or price in BOQ / Price Schedule (or similar work in the BOQ), or Odisha Public Works Department Schedule of Rate (OPWDSOR) 2018 (as the Base Date rate), with the reasonable adjustments in the Conditions of Contract,

	or (ii) the market rate or price added 15% of overhead and profit, if not applicable of above (i).”																		
Sub-Clause 14.4 Schedule of Payments	Add to the end of Sub-Clause 14.4, the following Payment Schedule shall be regulated as under: The designation 'P' means progressive monthly payments up to the limits indicated, based on progress made by the Contractor. The Engineers shall not be bound to issue an Interim Payment Certificate if the length of each completed Work Activity in the claimed is less than a minimum of 100 meters of the Box Drain length. The designation "LS" means that lump sum payment is made upon completion of the activity described. <table><tr><th>Work Category</th><th>Type of Payment</th><th>Total Amount (in % of The Contract Price)</th></tr><tr><td colspan="3">Box Drain Works:</td></tr><tr><td>1. On completion of Site Preparation and Shoring and Shuttering Works: including items of the Water diversion, Dewatering, sheet piling, shoring and shuttering, Dismantling of dilapidated unserviceable items, making access /approach to work spot and space, safety barricading, making arrangement for traffic diversion, with all other allied items / works, etc.</td><td>P</td><td>27 % , with adjustment²⁾</td></tr><tr><td>2. On completion of sub soil improvement works: including items of Water Diversion, Dewatering, traffic diversion, Safety barricading, Excavation, removal of slush, soil and its disposal, completion of sub soil improvement works till bottom of foundation Plain Cement Concrete (PCC), etc. Pass the Plate load Test for Safe Bearing Capacity (SBC) of soil.</td><td>P</td><td>16 % , with adjustment²⁾</td></tr><tr><td colspan="3">3. On Completion of Box Drain Structure: to apply either 3.1 In-situ Box Drain or 3.2 Precast Box Drain, whichever is executed.</td></tr><tr><td>3.1. In situ Box Drain</td><td></td><td></td></tr></table>	Work Category	Type of Payment	Total Amount (in % of The Contract Price)	Box Drain Works:			1. On completion of Site Preparation and Shoring and Shuttering Works: including items of the Water diversion, Dewatering, sheet piling, shoring and shuttering, Dismantling of dilapidated unserviceable items, making access /approach to work spot and space, safety barricading, making arrangement for traffic diversion, with all other allied items / works, etc.	P	27 % , with adjustment ²⁾	2. On completion of sub soil improvement works: including items of Water Diversion, Dewatering, traffic diversion, Safety barricading, Excavation, removal of slush, soil and its disposal, completion of sub soil improvement works till bottom of foundation Plain Cement Concrete (PCC), etc. Pass the Plate load Test for Safe Bearing Capacity (SBC) of soil.	P	16 % , with adjustment ²⁾	3. On Completion of Box Drain Structure: to apply either 3.1 In-situ Box Drain or 3.2 Precast Box Drain, whichever is executed.			3.1. In situ Box Drain		
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Box Drain Works:																			
1. On completion of Site Preparation and Shoring and Shuttering Works: including items of the Water diversion, Dewatering, sheet piling, shoring and shuttering, Dismantling of dilapidated unserviceable items, making access /approach to work spot and space, safety barricading, making arrangement for traffic diversion, with all other allied items / works, etc.	P	27 % , with adjustment ²⁾																	
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3. On Completion of Box Drain Structure: to apply either 3.1 In-situ Box Drain or 3.2 Precast Box Drain, whichever is executed.																			
3.1. In situ Box Drain																			

	(a) On completion of Foundation for the Box Drain: including items of Water Diversion, Dewatering, traffic diversion,. Safety barricading laying of PCC, RCC base slab /RCC Base raft casting, including pass the testing.	P	9 %
	(b) On completion of the Box Drain Structure: including items of Water Diversion, Dewatering, traffic diversion, Safety barricading, RCC walls and roof slab, wearing coat on roof slab, providing arrangements within or above roof slab for passing utility, providing weep holes on wall, arrangement for ventilation, arrangement for joining of laterals/ catch water drain etc and all other allied items in achieving completion of casting of RCC works etc.	P	23 %
	3.2. Precast Box Drain-On completion of Installation: including items of Water Diversion, Dewatering, traffic diversion, Safety barricading, PCC, Preparation of form work / Mould up to Sizes (providing openings for weep holes, ventilation, man holes, provision for lateral joining) Curing arrangement. Fabrication of reinforcement, Casting, Curing, ND Test, Transportation & shifting to site, positioning in place, wearing coat on roof slab and making joints as per approved drawings.	P	32 %
	4. On completion of finishing of Box drain Works: including items of floor screed concrete & finish plaster with neat cement punning inside drain to floor and walls, placing filter media around weep holes, construction of laterals/ tertiary drains joining box drain with fixing of bar screen and sluice gates as defined in agreement, connection of laterals/ tertiary drains	P	6 %

	with box drain with de silting chamber and flow control arrangement, back filling at outer faces of walls, man hole covers, ventilating shaft, control gates for flow regulations between two vents, step iron etc. All other allied items / works in complete shape.		
	Road Works		
	5. On Functional completion of Road Works: in accordance with all requirements of the contract excluding item 6 below.	P	7 %
	6. On completion of Allied Infrastructure: including items of Installation of traffic signals, installation of electrical poles, cabling and fixing of control system with light fixtures, and taking necessary approvals including installation transformers etc as and where required complete.	P	2 %
	Successfully completion of the Commissioning and the Test on Completion and Taking Over of the Works	LS	10% of the Contract Price
<i>Note: functional completion:</i> 1) “On completion” means that each Work Category is successfully completed in accordance with the Contract and approved by the Engineer. The Contractor shall not, without the prior approval of the Engineer, commence the execution of next Work Category. Each Work Category sequence shall be continuously executed by a construction segment, without any delay until completion of the Road Work. 2) “with Adjustment” means that the payment shall be adjusted from the amount calculated in Sl.No.1 and 2, based on the actual quantity executed for the procurement of sheet piles, the sheet piling and the soil stabilization works, or other similar items of work approved by Design.. 3) The Construction of On Functional Completion of Road Works: means that the road is completed in all aspects for allowing traffic movement on the road in accordance with the Contract. Payment shall be measured the actual completed road by chainage of Box Drain. No payment shall be acceptable by individual items of the Work. (e.g. road base, each layer of pavement of road, pedestrian passage, etc). 4) Successfully completion of the Commissioning and the Test on Completion and Taking Over of the Works: including the completion of cleaning of inside area of drain, attending minor			

	repairs, cleaning out side are of drain, lifting of debris, garbage and dumped materials etc. for whole length of drain and Road& then the Commissioning and Test on Completion. 5) In these conditions, provisions including the expressions “Design Build” require this Design to be 2.5% of the value of the Build portion and is included in the Accepted Contract Amount. 6) Amount in this table is excluding the cost of Dispute Board (DB). Payment for Cost of DB shall be in accordance with the Dispute Board Agreement.
Sub-Clause 14.9 Payment of Retention Money	Add following new paragraph between fifth and sixth paragraph (before the last paragraph) of this Sub-Clause as: “When the deposit of accumulated sum of Retention Money reaches more than 1% of the Accepted Contract Amount and the Contractor submits the Bank Guarantee, the Engineer may certify for the release of Retention Money against the Bank Guarantee.”
Sub-Clause 14.16 JICA’s Disbursements	Add new sub-clause 14.16 as following; “In accordance with the Loan Agreement, following disbursement procedure applied: ➤ The bank charges for payments in foreign Currencies under commitment procedure shall be borne by the Contractor. ➤ Reimbursement Procedure for payments in local Currencies: The bank charges for payments under disbursement procedure shall be borne by the Employer.”
Sub-Clause 18.5 Insurance for Design	Insert new Sub-Clause: “The Contractor shall affect professional indemnity insurance, which shall cover the risk of professional negligence in the design of the Works. This insurance shall be for a limit not less than the amount shown on the Contract Data. The Contractor shall maintain the professional indemnity insurance in full force and effect until the date shown in the Contract Data. The Contractor undertakes to notify the Employer promptly of any difficulty in extending, renewing or reinstating this insurance.”

Section IX. Annex to the Particular Conditions - Contract Forms

Table of Forms

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Letter of Acceptance

[Insert letterhead paper of the Employer]

[Insert date]

To: *[Insert name and address of the Contractor]*

This is to notify you that your Bid dated *[insert date]* for execution of the Construction of Box Drains with Road between Chainage 3300 – 6700 of Main Drain - 1, Cuttack, Design Build, *[insert “Lot 1: Chainage from 3300 to 5150 (JICA/OWSSB/OISIP/04-II / LOT 1)”]* **IFB No. 01/2020** for the Accepted Contract Amount of the equivalent of *[insert amount in words and figures]* *[insert name of currency]*, as corrected and modified in accordance with the Instructions to Bidders, is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose one of the Performance Security Forms included in Section IX, Annex to the Particular Conditions - Contract Forms, of the Bidding Documents

Authorized Signature: _____
Name and Title of Signatory: _____
Name of Agency: _____

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made the *[insert day]* day of *[insert month]*, 2020, between Orissa Water Supply and Sewerage Board (hereinafter “the Employer”), of the one part, and *[insert name of the Contractor]* (hereinafter “the Contractor”), of the other part:

WHEREAS the Employer desires that the Works known as Construction of Box Drains with Road between Chainage 3300 – 5150 of Main Drain - 1, Cuttack, Design Build, *[insert “Lot 1: Chainage from 3300 to 5150 (JICA/OWSSB/OISIP/04-II / LOT 1)”]* should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.

- (i) **the Letter of Acceptance;**
- (ii) **the Letter of Bid ;**
- (iii) **the addenda Nos *[insert addenda numbers, if any]* (if any);**
- (iv) **the Particular Conditions;**
- (v) **the General Conditions;**
- (vi) **the Employer’s Requirements;**
- (vii) **the completed Schedules;**
- (viii) **the Contractor’s Proposal and any other documents forming part of the Contract**
- (ix) **the Acknowledgement of Compliance with Guidelines for Procurement under Japanese ODA Loans.**

3. In consideration of the payments to be made by the Employer to the Contractor as specified in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of the Republic of India on the day, month and year specified above.

Signed by _____

Signed by _____

for and on behalf of the Employer
in the presence of

for and on behalf the Contractor
in the presence of

Witness, Name, Signature, Address, Date

Witness, Name, Signature, Address, Date

Schedules

Notes on Schedules

‘Schedule’ means the document(s) entitled schedules, completed by the Contractor and submitted with the letter of tender, as included in the Contract. Such documents may include data, lists, and/or design and/or other technical criteria, for the Works.

(List the items comprising Schedules. Typical Schedules are as followings)

SCH 1 : Schedule of Prices

Note: *Insert Schedule of Prices submitted with the Letter of (Price) Bid and finalized at signing of the Contract*

SCH 2: Schedule of Payment

Note: *Insert Schedule of included in Bidding Documents and finalized at signing of the Contract (if any).*

SCH3: Schedule of Adjustment

Note: *Insert Schedule of Adjustment submitted with the Letter of (Price) Bid.*

SCH 3: Schedule of Guarantee

Note: *Insert Schedule of Guarantee submitted with the Letter of (Technical) Bid.*

Contractor's Proposal

Notes on Contractor's Proposal

'Contractor's Proposal' means the documents entitled proposal, which the Contractor submitted with the letter of tender, as included in the Contract.

(List the items of Contractor's Proposal comprising Technical Proposal)

Performance Security (Bank Guarantee)

[Insert Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Insert name and Address of the Employer]*

Date: *[Insert date of issue]*

PERFORMANCE GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with the Beneficiary, for the execution of Construction of Box Drains with Road between Chainage 3300 – 5150 of Main Drain - 1, Cuttack, Design Build, *[insert "Lot 1: Chainage from 3300 to 5150 (JICA/OWSSB/OISIP/04-II / LOT 1)"]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]* (*[insert amount in words]*),¹ such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for its demand or the sum specified therein.

¹ The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency(cies) of the Contract or a freely convertible currency acceptable to the Beneficiary.

This guarantee shall expire, no later than the *[insert the day]* day of *[insert month]*, *[insert year]*², and any demand for payment under it must be received by us at this office indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

[signature(s)]

[Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.]

² *Insert the date twenty-eight days after the expected completion date as described in GC Clause 11.9.”*

Advance Payment Security

Demand Guarantee

[Insert Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Insert name and address of the Employer]*

Date: *[Insert date of issue]*

ADVANCE PAYMENT GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called “the Applicant”) has entered into Contract No. *[insert reference number of the contract]* dated *[insert date of the contract]* with the Beneficiary, for the execution of Construction of Box Drains with Road between Chainage 3300 – 5150 of Main Drain - 1, Cuttack, Design Build, *[insert “Lot 1: Chainage from 3300 to 5150 (JICA/OWSSB/OISIP/04-II / LOT 1)”]*, (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum *[insert amount in figures]* (*[insert amount in words]*) is to be made against an advance payment guarantee.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]* (*[insert amount in words]*)¹ upon receipt by us of the Beneficiary’s complying demand supported by the Beneficiary’s statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating either that the Applicant:

¹ The Guarantor shall insert an amount representing the amount of the advance payment and denominated either in the currency(ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the Employer.

(a) **has used the advance payment for purposes other than the costs of mobilization in respect of the Works; or**

(b) **has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Applicant has failed to repay.**

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the advance payment referred to above has been credited to the Applicant on its account number *[insert number]* at *[insert name and address of Applicant's bank]*.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Applicant as specified in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that ninety (90) percent of the Accepted Contract Amount, less provisional sums, has been certified for payment, or on the *[insert day]* day of *[insert month]*, *[insert year]*,² whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date..

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

[signature(s)]

[Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.]

² Insert the expected expiration date of the Time for Completion.

Retention Money Security

Demand Guarantee

[Insert Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Insert name and Address of Employer]*

Date: *[Insert date of issue]*

RETENTION MONEY GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with the Beneficiary, for the execution of Construction of Box Drains with Road between Chainage 3300 – 5150 of Main Drain - 1, Cuttack, Design Build, *[insert “Lot 1: Chainage from 3300 to 5150 (JICA/OWSSB/OISIP/04-II / LOT 1)”]*, (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, the Beneficiary retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, payment of *[insert the second half of the Retention Money or if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security]* is to be made against a Retention Money guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]* (*[insert amount in words]*)¹ upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed

¹ The Guarantor shall insert an amount representing the amount of the second half of the Retention Money or if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security and denominated either in the currency(ies) of the second half of the Retention Money as specified in the Contract, or in a freely convertible currency acceptable to the Beneficiary.

document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or show grounds for its demand or the sum specified therein.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the second half of the Retention Money as referred to above has been credited to the Applicant on its account number *[insert account's number]* at *[insert name and address of Applicant's bank]*.

This guarantee shall expire no later than the *[insert day]* day of *[insert month]*, *[insert year]*², and any demand for payment under it must be received by us at the office indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

[signature(s)]

[Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.]

² *Insert the same expiry date as set forth in the Performance Security, representing the date twenty-eight days after the completion date described in GC Clause 11.9.*



ORISSA WATER SUPPLY AND SEWERAGE BOARD

(A Government of Orissa Undertaking)

Mahanadi Vihar, Naya Bazar, Cuttack, Cuttack, Odisha PIN 753004, India

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JICA ASSISTED ODISHA INTEGRATED SANITATION IMPROVEMENT PROJECT (ID-P252)

BIDDING DOCUMENTS

FOR

**CONSTRUCTION OF BOX DRAINS WITH ROAD BETWEEN CHAINAGE
3300 – 5150 OF MAIN DRAIN – 1, CUTTACK, DESIGN BUILD
(PACKAGE NO. JICA/OWSSB/OISIP/04 – II / LOT 1)**

ON

INTERNATIONAL COMPETITIVE BIDDING

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Part 1 - BIDDING PROCEDURES

Part 2 - EMPLOYER'S REQUIREMENTS

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APPENDIX– SECTION VII GENERAL CONDITIONS

December 2020

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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 not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries where the relevant labour laws provide for non-discrimination in employment, the Contractor shall comply with such laws. When the relevant labour laws are silent on non-discrimination in employment, the Contractor shall meet this Sub-Clause's requirements. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination.

7 Plant, Materials and Workmanship

7.1 Manner of Execution

The Contractor shall carry out the manufacture of Plant, the production and manufacture of Materials, and all other execution of the Works:

- (a) in the manner (if any) specified in the Contract,
- (b) in a proper workmanlike and careful manner, in accordance with recognised good practice, and
- (c) with properly equipped facilities and non-hazardous Materials, except as otherwise specified in the Contract.

7.2 Samples

The Contractor shall submit the following samples of Materials, and relevant information, to the Engineer for review in accordance with the procedures for Contractor's Documents described in Sub-Clause 5.2 [Contractor's Documents]:

- (a) manufacturer's standard samples of Materials and samples specified in the Contract, all at the Contractor's cost, and
- (b) additional samples instructed by the Engineer as a Variation.

Each sample shall be labelled as to origin and intended use in the Works.

7.3 Inspection

The Employer's Personnel shall at all reasonable times:

- (a) have full access to all parts of the Site and to all places from which natural Materials are being obtained, and
- (b) during production, manufacture and construction (at the Site and elsewhere), be entitled to examine, inspect, measure and test the materials and workmanship, and to check the progress of manufacture of Plant and production and manufacture of Materials.

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].

15.6 Corrupt or Fraudulent Practice

If the Employer determines that the Contractor has engaged in corrupt, fraudulent, collusive or coercive practices, in competing for or in executing the Contract, then the Employer may, after giving 14 days notice to the Contractor, terminate the Contractor's employment under the Contract and expel him from the Site, and the provisions of Clause 15 shall apply as if such expulsion had been made under Sub-Clause 15.2 [Termination by Employer].

Should any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive or coercive practice during the execution of the Works, then that employee shall be removed in accordance with Sub-Clause 6.9 [Contractor's Personnel].

For the purpose of this Sub-Clause:

- (a) "corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in the Contract execution.
- (b) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of the Contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designated to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition.
- (c) "collusive practice" means a scheme or arrangement between two or more bidders, with or without the knowledge of the Borrower, designated to establish bid prices at artificial, non-competitive levels.
- (d) "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the procurement process or affect the execution of a contract.

16 Suspension and Termination by Contractor

16.1 Contractor's Entitlement to Suspend Work

If the Engineer fails to certify in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates] or the Employer fails to comply with Sub-Clause 2.4 [Employer's Financial Arrangements] or Sub-Clause 14.7 [Payment], the Contractor may, after giving not less than 21 days' notice to the Employer, suspend work (or reduce the rate of work) unless and until the Contractor has received the Payment Certificate, reasonable evidence or payment, as the case may be and as described in the notice.

Notwithstanding the above, if the Bank has suspended disbursements under the loan or credit from which payments to the Contractor are being made, in whole or in part, for the execution of the Works, and no alternative funds are available as provided for in Sub-Clause 2.4 [Employer's Financial Arrangements], the Contractor may by notice suspend work or reduce the rate of work at any time, but not less than 7 days after the Borrower having received the suspension notification from the Bank.

The Contractor's action shall not prejudice his entitlements to financing charges under Sub-Clause 14.8 [Delayed Payment] and to termination under Sub-Clause 16.2 [Termination by Contractor].

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 sub-paragraphs (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.