Democratic Socialist Republic of Sri Lanka

Ministry of Agriculture, Livestock, Lands and Irrigation

MAHAWELI AUTHORITY OF SRI LANKA

PROCUREMENT OF WORKS UNDER NATIONAL COMPETITIVE BIDDING

BIDDING DOCUMENT

For

REHABILITATION OF LEFT BANK OF THE SPILLWAY TAIL CANAL AND RENOVATION OF RIP-RAP AT (0+000-0+085) km OF BOWATHENNA RESERVOIR

Contract No: DDG/TS/CON/HW/BOW/DAM/58

October 2026

Name of Bidder	

Contents of Bidding Documents

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Invitation for Bids (IFB)

Ministry of Agriculture, Livestock, Lands and Irrigation

MAHAWELI AUTHORITY OF SRI LANKA

BID NOTICE

1. On behalf of the Chairman, Department Procurement Committee of Mahaweli Authority of Sri Lanka, sealed Bids will be received by the Director General, Mahaweli Authority of Sri Lanka, 9th Floor, No. 500, T.B. Jayah Mawatha, Colombo 10, up to **1100 hrs** on **18.11.2026** for the under mentioned improvement works.

Description of Work	Contract No.	CIDA Registration	Bid Security / Non-Refundable Tender Fee	Pre bid meeting
Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir Location – Bowathenna Dam Premises, Naula Estimated Amount: **Rs. 44.5 Mn** without VAT excluding Contingencies Contract period **280 days**	**DDG/TS/CON/HW/BOW/DAM/58**	Grade: **C6, C5 and C4** Specialty: **Irrigation and Drainage Canals**	Bid Security value: **LKR 667,000.00** Validity: **17.03.2027** Non-refundable Tender deposit: **Rs. 7,800.00**	Date: **06.11.2026** Time: **10.00 a.m. onwards** Venue: **EIC Office, Bowathenna**

2. To be eligible for contract award, the successful bidder shall not have been blacklisted and shall meet the requirements in Bidding Data.

3. Bidders, who have the Grade and field of registration under the CIDA scheme of registration mentioned in the above table against the work and in the case of the contract value is above Rs.5Mn. registered in Department of the Registrar of companies under the provision of public contract Act No.3 of 1987 only will be eligible for bidding.

4. Bidding will be conducted through National Competitive Bidding (NCB) and shall apply the Public Finance Circular and other Government Circulars issued time to time.

5. Prospective Bidders can obtain the Bidding Documents by a written request on a company/firm letter head, addressed to the **Deputy Director General (Technical Services), Mahaweli Authority of Sri Lanka, 3rd Floor, No. 500, T.B. Jayah Mawatha, Colombo 10 from 28.10.2026 up to 17.11.2026 from 09:30 hrs to 15:00 hrs** on working days, on payment of a non-refundable tender fee as given above per set of Bidding Documents.

6. The Bidding documents may be available for inspection in **Deputy Director General (Technical Services) Office, Mahaweli Authority of Sri Lanka, 3rd Floor, No. 500, T.B. Jayah Mawatha, Colombo 10** for free of charge from **28.10.2026** up to **17.11.2026** from **09:30 hrs** to **16:00 hrs** on working days and in the **http//mahaweli.gov.lk website**.

7. Sealed Bids in **duplicate** clearly marked the contract name and the number on the top left corner of the envelope may be dispatched either by Registered Post or hand delivered or courier to the **Director General, Mahaweli Authority of Sri Lanka, 9th Floor, No. 500, T.B. Jayah Mawatha, Colombo 10 before 1100 hrs** on **18.11.2026** Bids will be opened immediately thereafter. Bidders or their authorized representatives, not exceeding two (2) in numbers are permitted to be present at the opening of bids.

8. For further details, please contact Technical Services Division of Mahaweli Authority of Sari Lanka on **Tel: 011-2689651, 011-2687475, e-mail: ddgts.masl@gmail.com**

Director General,
Mahaweli Authority of Sri Lanka

Section - 1

INSTRUCTIONS TO BIDDERS

Note:

Bidders are advised to refer Section 1 – Instructions to Bidders of Standard Bidding Document ICTAD Publication No. – ICTAD/SBD/01 – Second Edition- January 2007

Section - 2

STANDARD FORMS

Notes on Form of Letter of Acceptance

The Letter of Acceptance will be the basis for formation of the Contract as described in Clause 34 of the Instructions to Bidders. This Form of Letter of Acceptance should be filled in and sent to the successful bidder only after evaluation of Bids and after obtaining approval from the relevant authority.

FORM OF LETTER OF ACCEPTANCE

[Letter heading paper of the procuring entity]

……. *[date]*

To: ---------- *[name and address of the Contractor]* ---------

This is to notify you that your bid dated ---------- *[insert date]* for the construction and remedying defects of the **Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir , *DDG/TS/CON/HW/BOW/DAM/58*** for the Contract price of ----------[*name of currency]* ---------- [*amount in figures and words]* as corrected in accordance with Instructions to Bidders and/ or modified by a Memorandum of Understanding, is hereby accepted.

You are hereby instructed to proceed with the execution of the said Works in accordance with the Contract documents.

The Commencement Date shall be: …… *(fill the date as per Clause 8.1 of Conditions of Contract).*

The amount of Performance Security is *:* …… *(fill the amount as per Clause 4.2 of Conditions of Contract).*

The Performance Security shall be submitted on or before ……... *(fill the date as per Clause 4.2 of Conditions of Contract).*

Authorized Signature : ……

Name and title of Signatory : …….

FORM OF AGREEMENT

This Agreement made the ……. *[day]* of …… *[month]* 200…. *[year],* between ……. *[name and address of Employer]* (hereinafter called and referred to as "the Employer"), of the one part, and ……. *[name and address of Contractor*] (hereinafter called and referred to as "the Contractor"), of the other part:

Whereas the Employer desires that the Contractor execute **Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir, *DDG/TS/CON/HW/BOW/DAM/58*** *[name and identification no of Contract] (hereinafter called and referred to as "the Works")* and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and 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.
2. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all respects with the provisions of the Contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execute and complete the Works and remedy any 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 the day and year aforementioned in accordance with laws of Sri Lanka.

……..	……..
Authorized signature of Contractor	**Authorized signature of Employer**
COMMON SEAL	COMMON SEAL

In the presence of

Witnesses:

1. Name and NIC No.: …….
   Signature: ……..……
   Address: ……

2. Name and NIC No.: …….
   Signature: ……..……
   Address: ……

FORM OF PERFORMANCE SECURITY

(Unconditional)

---------- *[Issuing Agency's Name, and Address of Issuing Branch or Office]* ----------

Beneficiary: Director General, Mahaweli Authority of Sri Lanka

Date: ----------

PERFORMANCE GUARANTEE No.: ----------

We have been informed that ---------- *[name of Contractor]* (hereinafter called "the Contractor") has entered into Contract No. ***DDG/TS/CON/HW/BOW/DAM/58*** dated ---------- with you, for the **Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir,** (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 Contractor, we ---------- *[name of Agency]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of ---------- *[amount in figures]* (----------) *[amount in words]*, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the …. day of ……, 2025 *[insert date, 28 days beyond the Time for Completion]* and any demand for payment under it must be received by us at this office on or before that date.

_____

[signature(s)]

FORM OF ADVANCE PAYMENT SECURITY

---------- *[Name and address of Agency, and Address of Issuing Branch or Office]* ----

Beneficiary: Director General, Mahaweli Authority of Sri Lanka

Date: ----------

ADVANCE PAYMENT GUARANTEE No.: ----------

We have been informed that ---------- *[name of Contractor]* (hereinafter called "the Contractor") has entered into Contract No. ***DDG/TS/CON/HW/BOW/DAM/58 dated*** ---------- with you, for the **Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir** (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum ---------- *[amount in figures]* (----------) *[amount in words]* is to be made against an advance payment guarantee.

At the request of the Contractor, we ---------- *[name of issuing agency]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of ---------- *[amount in figures]* (----------) *[amount in words]*upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation in repayment of the Advance Payment under the Contract.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor.

This guarantee shall expire on ……. [*Insert the date, 28 days beyond the Time of Completion]*

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

_____

[signature(s)]

FORM OF RETENTION MONEY GUARANTEE

---------- *[Issuing Agency's Name, and Address of Issuing Branch or Office]* ----------

Beneficiary: Director General, Mahaweli Authority of Sri Lanka

Date: ----------

RETENTION MONEY GUARANTEE No.: ----------

We have been informed that ----------*[name of Contractor]* (hereinafter called "the Contractor") has entered into Contract No. ***DDG/TS/CON/HW/BOW/DAM/58*** dated ---------- with you, for the execution of **Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir (**hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, when the works have being taken over and the first half of the Retention Money has been certified for payment, payment of the second half of the Retention Money may be made against a Retention Money guarantee.

At the request of the Contractor, we ---------- *[name of agency]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of ----------*[amount in figures]* (----------) *[amount in words]* upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor has not attended to the defects in accordance with the Contract..

This guarantee shall expire, at the latest, ---------- [*insert 28 Days after the end of the Defects Liability Period*]. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

_____

[signature(s)]

Section - 3

Note :

Bidders are advised to refer Section 3 – Condition of Contract of Standard Bidding Document ICTAD Publication No. – ICTAD/SBD/01 –second edition-January 2007

CONDITIONS OF CONTRACT

Section - 4

FORM OF BID AND QUALIFICATION INFORMATION

FORM OF BID

Name of Contract: **Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir**

Contract Identification: ***DDG/TS/CON/HW/BOW/DAM/58***

To: ***The Director General, Mahaweli Authority of Sri Lanka***

Gentlemen:

1. Having examined the Standard Bidding Document - Procurement of Works – Major Contracts [ICTAD/SBD/01 - Second Edition, January 2007], Specifications, Drawings and Bills of Quantities and Addenda for the execution of the above-named Works, we the undersigned, offer to execute and complete such Works and remedy any defect therein in conformity with the aforesaid Conditions of Contract, Specifications, Drawings, Bills of Quantities and addenda for the sum of Sri Lankan Rupees…… ..... (LKR .....) or such other sums as may be ascertained in accordance with the said Conditions.

2. We acknowledge that the Contract Data forms part of our Bid.

3. We undertake, if our Bid is accepted, to commence the Works as soon as is reasonably possible after the receipt of the Engineer's notice to commence, and to complete the whole of the Works comprised in the Contract within the time stated in the Contract Data.

4. We agree to abide by this Bid until the date specified in ITB Clause 15.1 of Instructions to Bidders …… *[insert date]*, and it shall remain binding upon us and may be accepted at any time before that date.

5. Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding Contract between us.

6. We understand that you are not bound to accept the lowest or any bid you may receive.

1. We certify/confirm that we comply with the eligibility requirements as per ITB Clause 3 of the bidding documents.

Dated this ……... day of…….. 20……...…

in the capacity of …….…… duly authorized to sign bids for and on behalf of ……..

[in block capitals or typed]

Signature: ……..

Name :…….

Address:……

Witness:……..……..

Qualification Information

(To be completed and submitted by the bidder, with the Bid)

ICTAD Registration		
Registration number	*(attach copies of relevant pages from the registration book)*	
Grade		
Speciality		
Expiry Date		
Blacklisted Contractors		
Have you been declared as a defaulted contractor by NPA or any other Agency? (Yes/No)		
If yes provide details		
VAT Registration Number		
Construction Program	*(attach as annex)*	
Legal status	*(attach relevant status copies as annex)*	
Value of Construction works performed in last 5 years	*(attach copies of certificate of completion etc. and other documents such as profit-loss and income expenditure statements)*	
Year…….		
Year…….		
Year…….		
Year…….		
Year…….		
Value of similar work completed in the last 10 years (indicate only the three largest projects)	Value	Year
	1.	
	2.	
	3.	
	(attach copies of certificate of completion etc. an annex)	
Major items of construction equipment proposed	Type	Capacity
	1.	
	2.	
	3.	
	4.	
	5.	
Qualification and experience of key staff – site and head office (Permanent, Contract basis and consultants)	Technical 1. 2. 3.	
	Managerial 1. 2. 3.	
Other information requested under ITB Clause 4.1		

Schedule 1 - General Information

(i) If pre-qualification is done the bidders are required to include information subsequent to that submitted with the pre-qualification application.
(ii) For joint ventures, each joint venture partner shall furnish information separately.

ITB Clause reference	Description	Information *(to be filled by the Bidder)*	Remarks
4.1 (a)	**Legal Status**		*Provide certified copies of Registration*
	Written power of attorney of the signatory to the Bid	*Provide original or certified copy of the power of Attorney attested by a Notary and label as attachment to Clause 4.1(a)*	
	If a Joint Venture, names and addresses of Joint Venture Partners	1. …… 2. ……..……... 3. ……	*Provide a draft copy of the Joint Venture Agreement or alternatively the memorandum of understanding*
	If a Joint Venture, name of Lead Partner		
	For joint ventures, each joint venture partner shall furnish Legal Status separately		
	Name (Lead partner)		*Provide certified copies and label as attachment to Clause 4.1(a)*
	Legal status		
	Place of registration		
	Principle place of business		
	Written power of attorney of the signatory to the Bid	*Provide original or certified copy of the power of attorney attested by a Notary and label as attachment to Clause 5.1*	
	VAT Registration Number		

	Name (Partner 2)		*Provide certified copies and label as attachment to Clause 4.1 (a)*
	Legal status		
	Place of registration		
	Principle place of business		
	Written power of attorney of the signatory to the Bid	*Provide original or certified copy of the power of attorney attested by a Notary and label as attachment to Clause 4.1 (a)*	
	VAT Registration Number		
	Name (Partner 3)		*Provide certified copies and label as attachment to Clause 4.1 (a)*
	Legal status		
	Place of registration		
	Principle place of business		
	Written power of attorney of the signatory to the Bid	*Provide original or certified copy of the power of attorney attested by a Notary and label as attachment to Clause 4.1 (a)*	
	VAT Registration Number		
4.2 (a)	*CIDA Registration*		*Provide certified copies and label as attachment to Clause 4.2(a)*
	Registration number		
	Grade		
	Specialty		
	Expiry Date		

Schedule 2 - Annual Turn-over Information

(Construction only – from 2016 to 2025)

(i) If pre-qualification is done the bidders are required to include information subsequent to that submitted with the pre-qualification application.

(ii) For joint ventures, each joint venture partner shall furnish information separately.

Year	Turn-over	Remarks
		Attach audited annual accounts and audit reports any five years within last ten years. Attach audited reports and label as attachment to Clause 4.2

Schedule 3 - Adequacy of Working Capital

If pre-qualification is done the bidders are required to include information subsequent to that submitted with the pre-qualification application

Source of credit line	Amount	Remarks
		Provide documentary evidence and label as attachment to Clause 4.2
Total		

Schedule 4 A - Construction Experience in last Ten years

(i) If pre-qualification is done the bidders are required to include information subsequent to that submitted with the pre-qualification application.

(ii) For joint ventures, each joint venture partner shall furnish information separately.

Year	Employer	Description of Works	Amount	Contractor's Responsibility (%)
		Total		

Provide documentary evidence and label as attachment to Clause 4.2

Schedule 4 B - Similar Experience in last Ten years

Bidder's Legal Name: _____ Date: _____

JV Partner Legal Name: _____ Bidding No.: _____

Page _____ of _____ pages

Similar Contract Number: of ***(total number of contracts)*** **required.**	**Information**		
Contract Identification	_____		
Award date Completion date	_____ _____		
Role in Contract	☐ Contractor	☐ Management Contractor	☐ Subcontractor
Total contract amount	_____		LKR_____
If partner in a JV or subcontractor, specify participation of total contract amount	_____%	_____	LKR_____
Employer's Name:	_____		
Address: Telephone/fax number: E-mail:	_____ _____ _____ _____		

Schedule 4 B - Similar Experience in last Ten years (cont.)

Bidder's Legal Name: _____ Page _____ of _____ pages

JV Partner Legal Name: _____

Similar Contract Number: of ***(total number of contracts)*** **required.**	**Information**
Description of the similarity contracts given in the Form of General Experience	
Amount	_____
Physical size	_____
Complexity	_____
Methods/Technology	_____
Physical Production Rate	_____

Schedule 5 - Major Items of Construction Equipment Proposed

Type	Capacity

Schedule

e 6 - Construction Management Staff

A. Key Professionals		
Name	**Position**	**Task**
B. Support Staff		
Name	**Position**	**Task**

Full-time: _____ Part-time: **……**

Schedule 7 – Time Schedule for Key Staff

			Months (in the form of a Bar Chart)												
Name	**Position**	**Activities**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Number of Months**

Full-time: _____ Part-time: **……**

Schedule 8 - Work Programme

Sheet 1 of ……

Construction Activity	***[1st, 2nd, etc. are months from the Start Date.]***											
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th

Schedule 9 - Works in Hand

Contract	Name of the Employer	Description of work (attach a copy of letter of award)	Date of award of contract	Value of contract (Rs.)	Contract period	Whether extension of time has been granted	Percentage completion as at present
Contract 1							
Contract 2							
Contract 3							
Contract 4							
Contract 5							

Schedule 10 - Input percentage for Price Adjustment Format

Input Name *(Include major materials below the list, together with percentage for all inputs)*	**ICTAD Reference for Indices**	**Percentage** *(Percentages listed should added to 90.0)*
	Total	**90.0**

Schedule 12 - Non-collusion Affidavit

The undersigned bidder or agent, hereby solemnly, sincerely, and truly declares and affirms/makes an oath and states as follows ;

a) That he/she has not, nor has any other member, representative, or agent of the firm, company, corporation, or partnership representing him/her, entered into any combination, collusion, or similar agreement with any person in connection with the price to be bid;
b) That he/she or anyone representing him/her has not taken any step whatsoever to prevent any person from bidding, nor to induce anyone to refrain from bidding; and
c) That this bid is made without reference to any other bid and without any agreement, understanding, or combination with any other person in reference to this bid

He/she further states that no person, firm, or corporation has received or will receive, directly or indirectly, any rebate, fee, gift, commission, or thing of value in connection with the submission of this bid.

The bidder accepts full responsibility for ensuring the absence of collusion and hereby pledges to abide by fair and ethical competition practices throughout the procurement process and fully comply with the applicable Procurement Guidelines.

I hereby affirm, under the penalties for perjury, that all statements made by me in this affidavit are true and correct.

……

Signature of the Declarant

The foregoing Affidavit having been duly read over and explained by me to the Affirmant above named and he/she having understood the contents therein and admitted to be correct, affirmed and set his/her signature hereto before me on this …….. day of ……..… at …..……

BEFORE ME,

……..……..

JUSTICE OF THE PEACE/COMMISSIONER OF OATHS

……

Section - 5

BIDDING DATA AND CONTRACT DATA

G - Bidding Data

Instructions to Bidders Clause Reference	Entry
1.1	**Employer's Name and Address** Name : Director General, Mahaweli Authority of Sri Lanka Address: 9th Floor, No. 500, T.B. Jayah Mawatha, Colombo 10.
1.1	**Scope of Works** The works consists of **Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir** Contract No. **DDG/TS/CON/HW/BOW/DAM/58** Located at **Bowathenna**
1.2	**Time for Completion** The Time for Completion for the whole of works shall be **280 days**
1.3	**The office for collection of bid form is** Deputy Director General (Technical Services), Mahaweli Authority of Sri Lanka Address: 3rd Floor, No. 500, T.B. Jayah Mawatha, Colombo 10 The non-refundable fee is LKR 7,800.00 The Bid forms will be issued until 03.00 p. m. of 17.11.2026
2.1	**Source of funds** The source of funds is **Government of Sri Lanka**
4.2 (a)	**CIDA registration required** The registration required; **Specialty Irrigation and Drainage Canals** **Grade C6, C5 and C4**
4.3	**Qualification Information** The following information shall be provided in Section 9 - Schedules: • CIDA registration Registration number …… Grade …… Specialty …… Expiry date …… • VAT registration number ...…….. • Attach Construction Program • Attach Legal Status (Sole Proprietor, Partnership, Company etc.) • Attach authentication for signatory (shall be submitted with the bidding document) • Value of construction work performed for any 5 years within last 10 years

<table>
<tr><td></td><td>

- Experience in works of similar nature and complexity in last 10 years
- Major items of Construction equipment
- Statement of audited account for any 5 years within last 10 years
- Proof for liquid asset credit facilities
- Work in hand
- Staff to be attend on a full-time basis

Attach Work plan and method statement
</td></tr>
<tr><td>4.4 (b)</td><td>Average annual volume of construction work performed in last 10 years and any 5 years within these 10 years shall be at least Rs. 59.2 Mn</td></tr>
<tr><td>4.4 (c)</td><td>Experience as prime contractor in the construction of at least one works of a nature and complexity similar to the works over the last 10 years.
Civil Works in Irrigation Canals or structure of the value of at least
Rs. 25 Mn (Excluding VAT)</td></tr>
<tr><td>4.4 (d)</td><td>Essential equipment
Proposals for the timely acquisition (own, lease, hire, etc.) of the following essential equipment shall be;
Type — Capacity
1. Tipper — 3 cubes
2. Tractor — 0.75 cube
3. Excavator — 200 HP (long arm)
4. Concrete mixer
5. Earth Compactors — (roller, plate vibrator)
6. Water pump 2”</td></tr>
<tr><td>4.4 (e)</td><td>Qualifications and experience of the Contract Manager and other Key personnel
<table>
<tr><th>No.</th><th>Key Person</th><th>Qualifications and Experience</th><th>No. of Person</th></tr>
<tr><td>1</td><td>Contract Manager</td><td>B.Sc. (Engineering) or Equivalent plus at least 10 years’ experience in similar projects with Full Membership of the Institution of Engineers Sri Lanka and (Chartered Engineer) or equivalent</td><td>01</td></tr>
<tr><td>2</td><td>Site Engineer (Civil)</td><td>B.Sc. Civil Engineering degree or equivalent with 10years total experience and 5 years similar work experience.</td><td>01</td></tr>
<tr><td>3</td><td>Engineering Assistant (Civil)</td><td>NCT or equivalent with 8 years total experience and 5 years of similar work experience.</td><td>01</td></tr>
</table>
The Bidder must demonstrate that it will have a suitably qualified Contract Manager and suitably qualified other key personnel in adequate numbers in full-time basis as described in the table above.</td></tr>
</table>

4.4 (f)	**Liquid assets and/or credit facilities required** The minimum amount of liquid assets and/or credit facilities, net of other contractual commitments and exclusive of any advance payments which may be made under the Contract, shall be not less than **Rs. 12.5 Mn**
9.1	**Clarification of Bidding Documents** Employer's address for clarification of bidding documents is: Name of Officer: ***Deputy Director General (Technical Services Division)*** Address: ***Mahaweli Authority of Sri Lanka*** ***3rd Floor*** ***No. 500, T. B. Jayah Mawatha*** ***Colombo 10*** ***Phone: 011 269 6436*** ***Telefax: 011 268 9651***
13.4	**Adjustments for change in cost** The Contract is subjected to Price Adjustment
15.1	**Period of Bid Validity:** The Bid shall be valid up to **91 days** from the bid submission deadline date 18.11.2026 (date) The Bid shall be valid up to **17.02.2027** (date)
16.2	**Amount of Bid Security:** The amount of Bid Security is Sri Lanka Rupees: **Six Hundrad and Sixty-Seven Thousand (LKR 667,000.00)** Bid security shall only be an unconditional guarantee issued by a bank recognized by the **Central Bank of Sri Lanka** in accordance with the format given or Construction Guarantee Fund. **Validity of Bid Security (119 days)** The Bid Security shall be valid up to **17.03.2027** (date)
17.0	**Pre-Bid meeting** Pre-Bid meeting will be held Venue, time, and date of the pre-bid meeting. **Date: 06.11.2026** **Time: 10.00 am** **Venue: Engineer In Charge Office, Bowathenna** The Site visit will be held at **9.00 am** at **Engineer in Charge Office, Bowathenna** on **06.11.2026** before the Pre- Bid meeting.
19.2 (a)	**Employer's Address for Bid submission** Employer's address for the purpose of bid submission is: **Mahaweli Authority of Sri Lanka** **Procurement Division, 9th floor, No. 500, T. B. Jayah Mawatha, Colombo 10**

19.2 (b)	**Identification number of Contract** Identification Number of the Contract is: **DDG/TS/CON/HW/BOW/DAM/58**
20.1	**Deadline for submission of Bids** Deadline for submission of Bids: **18.11.2026**
20.1 (b)	**Bid opening** Venue, time, and date of bid opening **Mahaweli Authority of Sri Lanka** **Procurement Division, 9th Floor, No. 500, T. B. Jayah Mawatha** **Colombo 10** **Time: 11.00 am** **Date: 18.11.2026**
30.0	**Preference for Domestic Bidders: Not Applicable**
31.1	After evaluation of Bids according to procedures described in the Bidding Document, the employer will inform all the bidders in writing the selection of the successful bidder and the intention of contract award to such bidder. Any unsuccessful bidder, if they so wish, may make a request for a debriefing within three working days of such notice to Director General, MASL If any unsuccessful bidder, if wishes to submit an appeal shall be made before seven working days from intension to award letter issued date with the non-refundable cash deposit equivalent to the amount and address given below. **Address: Director General, Mahaweli Authority of Sri Lanka,** **500, T.B. Jayah Mawatha, Colombo 10.** **Cash Deposit: LKR 10,000.00**
35.1	**Amount of Performance Security** The Standard Form of Performance Security acceptable to the Employer shall be a Guarantee from an Agency accepted and stated in the Procurement Guidelines. The amount of the Performance Security is 7% of the Initial Contract Price. The Performance Security shall be valid until …… (date). (28 days beyond the Defect Liability Period) Performance security shall only be an unconditional guarantee issued by a bank recognized by the Central Bank of Sri Lanka in accordance with the format given.

Contract Data

Conditions of Contract Clause Number/s		
1.1	Employer's name and address	Name: ***Director General, Mahaweli Authority of Sri Lanka*** Address: ***Mahaweli Authority of Sri Lanka*** ***9th floor, No. 500, T. B. Jayah Mawatha*** ***Colombo 10***
	Employer's Representative	Name: ***Deputy Director General (TS), Mahaweli Authority of Sri Lanka*** Address: ***Mahaweli Authority of Sri Lanka*** ***3rd floor, No. 500, T. B. Jayah Mawatha, Colombo 10***
1.1	Contractor's name and address	Name: ……. Address: …….
1.1	Engineer's name and address	Name: ***Director, Division of Major Dams and Reservoir Operations*** Address: ***Mahaweli Authority of Sri Lanka*** ***Rajawella Road,*** ***Digana***
1.1	The site is located at	Bowathenna Reservoir, Naula.
1.1	The Start Date shall be 14 Days from the Letter of Acceptance	
8.1	Schedule of other contractors: Name ……. ……..	Period …….. ……..

<table>
<tr><td>9.1</td><td colspan="3">Key Personnel

After the sentence: "If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person." the following is added as a new paragraph:

"The Contractor's Personnel includes Key Personnel. If the Contractor intends to replace a Key Personnel, the Contractor shall, not less than 30 days before the intended date of replacement, give notice to the Engineer, the name, address, academic qualifications and relevant experience of the intended replacement Key Personnel. The Contractor shall not, without the prior consent of the Engineer, revoke the appointment of the Key Personnel or appoint a replacement."</td></tr>
<tr><td>13.1 / 13.2</td><td>Third party Insurance</td><td colspan="2">This Amount of insurance per occurrence is:

<table>
<tr><td></td><td>Minimum Insurance Amount</td><td>Maximum Deductible</td></tr>
<tr><td>(a) for the works, Plant and materials:</td><td>110% of the contract Price</td><td>Rs 50,000/-</td></tr>
<tr><td>(b) For loss or damage to equipment</td><td>Replacement value of the Equipment</td><td>Rs 50,000/-</td></tr>
<tr><td>(c) for losses or damage to property (except the works, plant, Materials, and Equipment) in connection with Contract</td><td>Rs 1.0 million</td><td>Rs 50,000/-</td></tr>
<tr><td>(d) for personal injury or death:

(i) of the Contractor's employees per event</td><td>Rs 1,000,000 per employee</td><td>No Deductible</td></tr>
<tr><td>(ii) of other people per event</td><td>Rs 1,000,000 per person</td><td>No Deductible</td></tr>
</table></td></tr>
<tr><td>17.1</td><td colspan="2">Time for Completion of the Works</td><td>Time for Completion is 280 Days</td></tr>
</table>

<table>
<tr><td>21.1</td><td colspan="2">The site possession date shall be 14 Days from the letter of acceptance</td></tr>
<tr><td>27.1</td><td colspan="2">The contractor shall submit a programme for the works within 21 days of delivery of the letter of acceptance</td></tr>
<tr><td>27.3</td><td colspan="2">The period between Programme update is one month.</td></tr>
<tr><td>35.1</td><td>Defects Notification Period</td><td>Defects Notification Period is 364 Days</td></tr>
<tr><td>39.2</td><td>Engineer’s Duties and Authority</td><td>The Engineer shall obtain the specific approval of the Employer before taking action under the following Sub-Clauses of these Conditions:
(a) Clause 39.2, where the final effect of the variations increases the Contract Price
(b) Sub-Clause ……</td></tr>
<tr><td>47.1</td><td>Weightings of Inputs</td><td>Non-adjustable element shall be:
• Preliminary Items (all items)
All Provisional Sum Items & Lump Sum Items.
<table>
<tr><th>CIDA No.</th><th>Input</th><th>%</th></tr>
<tr><td>L3</td><td>Unskilled Labour</td><td>25.29</td></tr>
<tr><td>M13</td><td>Reinforcement</td><td>17.10</td></tr>
<tr><td>M45</td><td>Earth</td><td>10.65</td></tr>
<tr><td>M4</td><td>Cement</td><td>10.04</td></tr>
<tr><td>M6</td><td>Rubble</td><td>9.47</td></tr>
<tr><td>L1</td><td>Skilled Labour</td><td>5.29</td></tr>
<tr><td>P1</td><td>Small Equipment</td><td>4.93</td></tr>
<tr><td>P2</td><td>Heavy Equipment</td><td>3.71</td></tr>
<tr><td>M21A</td><td>Formwork Plywood</td><td>3.52</td></tr>
<tr><td></td><td>Total</td><td>90.00</td></tr>
</table></td></tr>
<tr><td>48.1</td><td>The retention from each payment shall be</td><td>10% of certified work done</td></tr>
<tr><td></td><td>Limit of Retention Money</td><td>5% of the Initial Contract Price</td></tr>
</table>

	Alternative method for Payment of Retention	On reaching the limit of retention, stated in the Contract Data under Sub-Clause 14.3, the Contractor may substitute full retention money with an unconditional guarantee acceptable to the Employer to a value equal to the full retention money, and valid up to 28 Days beyond the end of Defect Notification Period. On receipt of such guarantee the Employer shall repay the full retention money. The guarantee will be released to the Contractor upon the certification of the Engineer that all Defects notified by the Engineer to the Contractor before the end of this period have been corrected.
49.1	Liquidated damages for the Works	**0.05%** of the Initial Contract Price per Day
50.1	Maximum amount of liquidated damages	**10%** of the Initial Contract Price
52.1	Amount of Performance Security	**5%** of the Initial Contract Price, in the currencies and proportions in which the Contract Price is payable. The acceptable form provided in Section 3, Standard Forms Performance Security shall only be an unconditional guarantee issued by a bank recognized by the Central Bank of Sri Lanka in accordance with the format given and from construction guarantee fund. (Shall be valid 28 days beyond completion.)
58.1	Schedule of operating and maintenance manual	
60.1	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the works id 25% of the contact price	
63.7	The attendance fee payable to the contractor on nominated sub-contract work shall not exceed 8%	

Appendix to contract data

APPENDIX A

A General Conditions of Dispute Adjudication Agreement

1. Definitions

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

(a) the "Employer";

(b) the "Contractor"; and

(c) the "Member" who is defined in the Dispute Adjudication Agreement as being one of the three persons who are jointly called the "DAB" (or "Dispute Adjudication 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 Adjudication Agreement, which incorporates this Appendix. In the Dispute Adjudication 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 Adjudication 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 Adjudication Agreement, or

(c) when the Employer, the Contractor and each of the Other Members have respectively each signed a Dispute Adjudication 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, 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 Engineer, nor any financial interest in the Contract except for payment under the Dispute Adjudication 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 Adjudication Agreement;

(c) have disclosed in writing to the Employer, the Contractor and the Other Members, before entering into the Dispute Adjudication 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 form's part;

(d) not, for the duration of the Dispute Adjudication 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;

(e) comply with the annexed procedural rules and with Sub-Clause 19.4 (Obtaining Dispute Adjudication Board's Decision) 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 enters 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 Adjudication Agreement;

(h) ensure his/her availability for all site visits and hearings as are necessary;

(i) become conversant with the Contract and with the progress of the Works (and of any other parts of the project of which the Contract form's part) by studying all documents received which shall be maintained in a current working file;

(j) treat the details of the Contract and all the DAB'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; 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.

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 DAB's activities under the Contract and the Dispute Adjudication Agreement. 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:

(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 is relieved from liability under the preceding paragraph.

Whenever the Employer or the Contractor refers a dispute to the DAB under Sub-Clause 19.4 (Obtaining Dispute Adjudication Board's Decision) of the Conditions of Contract, which will require the Member to make a site visit and attend a hearing, the Employer or the Contractor shall provide appropriate security for a sum equivalent to the reasonable expenses to be incurred by the

Member. No account shall be taken of any other payments due or paid to the Member.

6. Payment

The Member shall be paid as follows:

(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 sub-paragraphs (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 Adjudication 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 50%. This reduced fee shall be paid until the first day of the calendar month in which the Member resigns or the Dispute Adjudication Agreement is otherwise terminated.

(b) a daily fee which 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;

(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 (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, and faxes: 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.

The retainer and daily fees shall be as specified in the Dispute Adjudication Agreement. Unless it specifies otherwise, these fees shall remain fixed for the entire duration of the Contract.

The Member shall submit invoices for payment of the monthly retainer 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 Adjudication 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 DAB; 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 14.7 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 Adjudication 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 Adjudication 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 Adjudication 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 Members, for proceedings or decisions of the DAB 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) - (k) 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 of the DAB 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 Adjudication Agreement, or the breach, termination or invalidity thereof, shall be finally settled in accordance with Arbitration Act No 11, 1995 of Sri Lanka with a sole Arbitrator.

PROCEDURAL RULES

1. Unless otherwise agreed by the Employer and the Contractor, the DAB shall visit the site at intervals of not more than 70 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 DAB, the period between consecutive visits shall not be less than 35 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 DAB, the Employer and the Contractor, or in the absence of agreement, shall be decided by the DAB. The purpose of site visits is to enable the DAB 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 endeavor 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 coordinated 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 DAB 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 copy each to the members of the DAB all documents which the DAB may request, including Contract documents, progress reports, variation instructions, certificates and other documents pertinent to the performance of the Contract. All communications between the DAB and the Employer or the Contractor shall be copied to the other Party.

5. If any dispute is referred to the DAB in accordance with Sub-Clause 19.4 (Obtaining Dispute Adjudication Board's Decision) of the Conditions of Contract, the DAB shall proceed in accordance with Sub-Clause 19.4 (Obtaining Dispute Adjudication Board's Decision) and these Rules. Subject to the time allowed to give notice of a decision and other relevant factors, the DAB 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 DAB 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 DAB 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 DAB 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 DAB, among other things, to:

   (a) establish the procedure to be applied in deciding a dispute,

   (b) decide upon the DAB'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 Guidelines,

   (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 DAB shall not express any opinions during any hearing concerning the merits of any arguments advanced by the Parties. Thereafter, the DAB shall make and give its decision in accordance with Sub-Clause 19.4 (Obtaining Dispute Adjudication Board's Decision), or as otherwise agreed by the Employer and the Contractor in writing. The DAB:

   (a) shall convene in private after a hearing, in order to have discussions and prepare its decision;

   (b) shall endeavor 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) Member fails to attend a meeting or hearing, or to fulfill 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 to not make a decision.

DISPUTE ADJUDICATION AGREEMENT

[for each member of a three - person DAB]

Name and details of Contract

Name and address of Employer

Name and address of Contractor

Name and address of Member

Whereas the Employer and the Contractor have entered into the Contract and desire jointly to appoint the Member to act as one of the three persons who are jointly called the Dispute Adjudication Board (DAB) *[and desire the Member to act as chairman of the* DAB*]*

The Employer, Contractor and Member jointly agree as follows:

1. The conditions of this Dispute Adjudication Agreement comprise the "General Conditions of Dispute Adjudication Agreement" which is appended to the General Conditions of the "Standard Bidding Document, Procurement of Works, Major Contracts - Second Edition, January 2007" and the following provisions. In these provisions, which include amendments and additions to the General Conditions of Dispute Adjudication Agreement, words and expressions shall have the same meanings as are assigned to them in the General Conditions of Dispute Adjudication Agreement.

2. *[Details of amendments to the General Conditions of Dispute Adjudication Agreement, if any*

   For example:

   In the procedural rules annexed to the General Conditions of Dispute Adjudication Agreement, *Rule_____ is deleted and replaced by*: "……..*"]*

3 In accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement the Member shall be paid as follows:

   A retainer fee of _____ per calendar month,

   plus a daily fee of _____ per day.

4 In consideration of these fees and other payments to be made by the Employer and the Contractor in accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement, the Member undertakes to serve, as described in this Dispute Adjudication Agreement, as one of the three persons who are jointly to act as the DAB.

5 The Employer and the Contractor jointly and severally undertake to pay the Member, in consideration of the carrying out of these services, in accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement.

6 This Dispute Adjudication Agreement shall be governed by the law of _____

SIGNED by: _____	SIGNED by: _____	SIGNED by: _____
for and on behalf of the employer in the presence of	for and on behalf of the Contractor in the presence of	the Member in the presence of
Witness: _____	Witness: _____	Witness: _____
Name: _____	Name: _____	Name: _____
Address: _____	Address: _____	Address: _____
Date: _____	Date: _____	Date: _____

Section - 6

SPECIFICATIONS

SPECIFICATIONS FOR CIVIL WORKS

GENERAL TECHNICAL SPECIFICATIONS

The following publications shall be applicable as the General Technical Specifications for the Civil Works under this Contract:

1. **CIDA Publication No. SCA/3/1 – *Specifications for Irrigation and Drainage Works*;**
2. **CIDA Publication No. SCA/4/1 – *Specifications for Building Works – Volume I*;**
3. **CIDA Publication No. SCA/5 – *Standard Specifications for Construction and Maintenance of Roads and Bridges*;**
4. **CIDA/DEV/17 – *Specifications for Site Investigation for Foundations of Building and Civil Engineering Works*;**
5. **CIDA Publication No. SCA/3/2 – *Specifications for Water Supply, Sewerage & Storm Water Drainage Works*; and**
6. **CIDA/CE/107 – *Civil Engineering Standard Method of Measurement – Sri Lanka (CESMM-SL)*.**

The above publications shall be read in conjunction with the Particular Technical Specifications, Drawings, Bills of Quantities and other Contract Documents.
These publications are not included in the Bidding Document package. The Bidder/Contractor shall be responsible for obtaining the relevant publications from an appropriate and authorized source and shall ensure that the requirements specified therein are fully complied with in the execution of the Works.

PARTICULAR TECHNICAL SPECIFICATIONS

1 INTRODUCTION

The following Particular Specifications are part of the requirements for the work related to the Civil Works which are to be provided according to the stipulations of the Contract. Hence, the instructions given herein form an integral part of, and are applicable to, all technical and Contract Documents issued for the Works. **Addenda to these Specifications may be issued as required during the construction phase.**

These Particular Technical Specifications shall be read in conjunction with General Technical Specifications (CIDA), the Conditions of Contract and the Bidding Drawings. The Contractor shall comply with all provisions contained within the Contract Documents.

The General Technical Specifications and the Particular Technical Specifications in conjunction with the Bidding Drawings define the technical standard and quality to be achieved during construction.

It is the intent of these Specifications, together with other relevant documents issued as part of the Contract Documents or to follow later on, to provide the Contractor with complete and detailed information and subsequent instructions necessary to enable him to carry out the design, where and when required, and to execute properly the work prescribed.

It is the intent of these Particular Specifications to establish acceptable standards of quality. On the other hand they shall also allow the construction of the Works in an efficient and economical way. Minor deviations in details due to selected work procedures and due to manufacturer's standard shop process will be considered for acceptance provided that, in the opinion of the Project Manager / Engineer, the proposed substitutions are equal in quality to those specified.

The Drawings available shall serve as a basis for detail design drawings to be produced by the Contractor.

All work shall be executed according to the Drawings and requirements released for construction, in a professional and diligent manner, and all supplies and work shall comply with the quality requirements defined in the relevant Sections of these Specifications and other Contract Documents. The Contractor shall provide all necessary efforts to comply with the intent of the General and Particular Specifications to the satisfaction of the Project Manager / Engineer.

2 CONTRACTOR'S SUBMITTALS AND THE PROJECT MANAGER'S / ENGINEER'S APPROVAL

The Contractor shall provide the Project Manager / Engineer with all submittals as requested in these Specifications and other Contract Documents. Although their extent shall be to the discretion of the Contractor, they shall be complete enough to illustrate adequately their intent and facilitate full for the understanding of the Project Manager.

At any time, the Project Manager / Engineer may call for additional information, completion of the submittals.

The Contractor shall submit these documents to the Project Manager / Engineer so that, even if not specifically expressed, reasonable time will be given to the Project Manager / Engineer to comment or approve the submittals.

The approval of the Project Manager / Engineer shall always be given in written form prior to the commencement of any work under this Contract and the Contractor shall not be paid for any work that is performed without the express written approval or instruction by the Project Manager / Engineer.

3 SITE INSTALLATION, SERVICES AND ENVIRONMENTAL OBLIGATIONS

3.1 General

3.1.1 Scope of work

The Contractor shall be responsible for providing plant, equipment, materials and labour for the provision of all necessary site installations, temporary works and services adequate for the realisation of the Works under this Contract.

The Contractor shall furnish, install, maintain and operate all site installations, temporary works and Contractor's equipment for his own use and for the use of the Project Manager / Engineer and Subcontractors, and as required for third parties, including workshops, warehouses, storage and assembly areas, all machinery, vehicles, scaffolding, equipment, water and power supply, etc.

Site installations, temporary works and services provided by the Contractor for his own use as well as for that of the Project Manager / Engineer or for third parties shall conform to the applicable standards, codes and sanitary requirements set down by the Sri Lankan authorities for such purpose.

The construction, operation and maintenance of the Contractor's site installations, temporary works and services shall be subject to inspection and written consent by the Project Manager / Engineer.

All plants, facilities, installations and services for the Contractor's and Project Manager's / Engineer's use shall at all times remain the Contractor's property, except as specified

hereinafter. Should the Contractor wish to sell his plant after the Completion of the Contract facilities and equipment in the country of the Works, he shall pay any and all taxes and duties required by law as stipulated in the Conditions of Contract.

The scope of the Works includes but is not limited to following site installation parts:

a) All temporary structures required for the performance of the works such as access roads, temporary construction roads, temporary working platforms, lifting mechanisms, material conveyor systems / chutes, etc…
b) Stores, Warehouses, Materials Yards
c) Material testing Laboratory (If required only)
d) Construction equipment
e) Power supply and illumination
f) Water supply
g) Sanitation, sewerage and waste disposal
h) Communication System
i) Site security

All installations of any Subcontractors shall comply with these Specifications.

3.1.2 Submittals

Within 30 days from the date of contract award the Contractor shall submit to the Project Manager / Engineer updated layout plans showing, at adequate scale, the locations and arrangement of all site installations. These plans shall be consistent with the plan submitted by the Contractor with his Bid as well as with any amendments and additions.

Within 14 days from the date of contract award the Contractor shall submit to the Project Manager / Engineer an updated project schedule on paper and as soft copy in Microsoft MS Project form showing all the activities, he intends to perform to meet his obligations in contract and to complete the works within its stipulated time for completion. This baseline schedule will be used for monitoring progress each month and for evaluating the impacts of any departures from the baseline schedule.

3.2 Prior to construction works

The Contractor shall carry out all necessary surveying work required for the approved performance of the works and shall ensure that the position and elevation of all works thus constructed are correct. The measuring methods and devices used must meet the standard of accuracy required for this purpose.

3.3 Access Works

The construction and maintenance of permanent and temporary access roads or access ramps from public roads to the sites, including crossings, shall be the Contractor’s responsibility to the approval of the Project Manager / Engineer.

In general, all roads within the site area shall be the Contractor responsibility, construction and maintenance, during the works until final handover to the Project Manager / Engineer. Damages happened to existing roads and structures due to the execution of the contract, should be restored to the original state by the Contractor.

Proper maintenance of all roads being used by the Contractors during the entire construction period, both permanent existing ones as well as temporary roads, shall be the Contractor's responsibility.

Additional roads and ramps which have to be built to transport equipment and materials shall be constructed by the Contractor at his own expense and with the Project Manager's / Engineer's prior approval, and the maintenance of such roads during the construction period shall also be at the Contractor's expense. The same applies for existing public roads and bridges used by the Contractor in the vicinity of the site for the execution of the works.

Any work, improvement or modification at the existing access roads made by the Contractor, for his own convenience, and without being ordered by the Project Manager / Engineer, shall be at the Contractor's own risk and expense.

If any damage or pollution occurs during the execution of the works, the Contractor must restore and clean the roads immediately at his own cost.

After completion of the Contract and before delivering the work to the Project Manager / Engineer (final takeover), all temporary structures shall be removed to the satisfaction of the Project Manager / Engineer.

3.4 Construction Facilities

3.4.1 Stores, warehouse, workshops and material yards

The Contractor shall provide and equip, for his own and his Subcontractors' use, warehouses, materials storage areas and fuel storage areas, all of which shall be maintained in good condition until the completion of works.

Listed hereunder are the buildings, workshops and warehouses expected to be constructed and equipped by the Contractor for use in the performance of the work under this Contract, in addition to facilities explicitly specified elsewhere in these specifications:

a) Workshop and service facilities for vehicles and construction equipment
b) Main warehouse and parts store
c) Storage facilities for all materials applied within the conduction of the rehabilitation works

3.4.2 Materials testing laboratory

If required, The Contractor shall build and equip an adequate field laboratory for the sampling and for testing of all materials as specified in the pertinent sections of the specifications.

The laboratory shall be located in a building properly equipped with electricity, water, air-conditioning/heating, etc., and shall have enough room for storing the samples tested as required by the Project Manager / Engineer.

The equipment to be supplied and the methods of testing shall be in accordance with the relevant codes and standards and as approved by the Project Manager / Engineer. All apparatus and equipment shall be in good working conditions, functional and manufactured by a reputable manufacturer.

The Contractor shall operate and maintain the laboratory until the Completion of Works and make all facilities and services available to the Project Manager / Engineer as required. All sampling and testing to be undertaken shall be under the direct supervision of the Project Manager. The laboratory shall be run by Contractor's personnel experienced in sampling and testing of materials, and quality control.

Specialised testing which may be required and which cannot be performed in the Contractor's laboratory due to lack of time or equipment shall be assigned to an independent organisation approved by the Project Manager / Engineer. The Contractor shall accept all results, instructions or restrictions stipulated by the Project Manager in writing based on such tests.

Upon completion of the works, all laboratory equipment shall remain the property of the Contractor. However, the Project Manager / Engineer reserves the right to purchase some or all of the equipment by mutual agreement.

3.4.3 Construction equipment

The Contractor shall provide suitable and adequate temporary construction equipment until the completion of the works under this Contract.

A schedule including a list of quantities for temporary construction equipment has to be delivered to the Project Manager / Engineer on a monthly basis for information.

Full costs of all construction equipment shall be included under the unit prices of each part of the rehabilitation works.

3.5 Utilities

3.5.1 Power supply and illumination

The Contractor shall supply, install, operate and maintain an adequate power supply system and illumination for running the site and other site installation facilities during the whole construction period. The concept shall be approved by the Project Manager / Engineer.

3.5.2 Water supply

The Contractor shall provide, install, operate and maintain adequate and suitable water supplies for the works within the contract including storage for drinking purposes, sanitation, construction, cleaning, testing and commissioning of the various equipment items and plant components of the construction lot.

The water supplies shall be continuously available during working hours and rated to meet the maximum demand required during construction on the basis of 'firm supply' and shall supply all temporary installations.

The drinking water provided shall at all times meet the criteria of the local health authority.

The concept shall be approved by the Project Manager.

3.5.3 Sanitation, sewerage and waste disposal

The installations shall meet the requirements of the local health authorities and environmental regulation.

The Contractor shall collect waste material and garbage from site on a daily basis and transport it to an approved area where it shall be treated and disposed of in accordance with local environmental requirements.

The Site shall be kept clean and free of refuse at all times. No waste shall be dumped in areas other than those approved by the Project Manager / Engineer for waste disposal. No waste of any kind shall be deposited in any water courses.

3.5.4 Communication systems

The Contractor shall supply, install, operate and maintain a complete telephone system satisfying all his needs and the needs of the Project Manager / Engineer at site including external lines to the public switched telephone network and external connection to an internet access provider.

3.5.5 Office space

The Contractor shall supply, construct, equip and maintain an office for the sole and exclusive use of the Project Manager / Engineer, fully furnished and equipped with facilities and services.

The office building shall be provided with the necessary portable fire extinguishers and service facilities necessary for normal and comfortable occupation by 6 people. The building shall be air-conditioned.

The offices shall be equipped with adequate furniture (desk, chair etc.) and fittings (electricity, lights, toilets, water etc.) for use as an office. Furthermore, the office shall be equipped with an Internet connection.

The offices shall be maintained by the Contractor at his expense.

3.6 Site security

The Contractor shall employ an adequate force of trained security guards at the worksite and at the construction camp on 24-hour duty including weekends and holidays.

3.7 Demobilisation

Upon the completion of works the Contractor shall reinstate the site and dismantle and demobilize all temporary facilities erected by himself or his Subcontractors, and remove all debris, objectionable material and all other refuse which may have been deposited on site during the construction period. Such materials may be deposited only in areas approved by the Project Manager / Engineer.

All excavated areas shall be filled, graded and dressed in a clean and orderly condition acceptable to the Project Manager / Engineer. As far as possible such areas should conform to the natural appearance of the landscape.

3.8 Environmental obligations

The Contractor shall, during the whole period of the works comply fully with all national Sri Lankan laws and regulations relating to environmental protection, mitigating measures for reducing environmental impacts and remedial works on completion of the Works. This obligation shall extend to the construction sites themselves and all of the Contractor’s site installations.

Notwithstanding any specific obligations as these may be specified in prevailing Sri Lankan laws and regulations, the Contractor shall at all times comply with the following particular requirements for the protection of the environment, the local population and the workers at the construction site:

- Collect, treat, remove from site and dispose of in accordance with the regulations and to the satisfaction of the Project Manager / Engineer all domestic and industrial waste and excess construction materials (both solid and liquid), fuel, chemicals and other matter.

- Make every effort to minimise the harmful effects of transport to and from the site, in particular vehicle emissions and noise and the control of dust on roads.

The Contractor shall maintain close contact with local representatives and government institutions in addressing issues arising from the construction activities. Such issues needing particular attention are the following.

- Pollution caused by construction work
- Disruption to the local community
- Disputes related to the use of land for construction activities and/or site installations etc.
- Disputes arising from traffic congestion and restrictions on the use of the main project access road and roads in the project area
- All matters relating to road safety and the reduction to a minimum of the risk of traffic accidents.

3.9 Social obligations

As far as may be reasonably practicable, the Contractor shall recruit his unskilled labour from those persons from the local community who may apply for work. Suitably skilled workers in the local community should also be recruited wherever practicable.

4 SAFETY AND HEALTH PRECAUTIONS

4.1 General

This section covers the precautions that have to be taken for the health and safety of all personnel on Site that the Contractor and his Sub-Contractors shall apply in all civil construction and equipment erection works during the construction time.

4.2 Safety precautions

4.2.1 Safety programme and its implementation

A safety program shall detail policies, procedures, and plans which the Contractor intends implementing to ensure the safety and health of his employees. It shall comply with the standards and regulations in force in the country of the Works applicable to construction safety.

The Contractor shall designate a competent employee specially trained and experienced to act as Safety Officer, who will administer and be responsible for the implementation of the safety program. He shall carry out frequent and regular safety inspections of the working areas, materials, and equipment. The name and qualifications of the Safety Officer shall be submitted for approval to the Project Manager prior to his appointment.

The Contractor shall be responsible for the implementation of health and safety provisions for his subcontractors employed at Site.

All serious and fatal injuries and diseases caused by the progress of work shall be immediately investigated by the Contractor and a comprehensive report shall be submitted to the Project Manager / Engineer.

In case of a fatal accident, only rescue and emergency teams and operations shall be permitted at the place of the occurrence until the Project Manager / Engineer gives permission to resume normal operations.

4.2.2 Safety standards

In addition to the requirements of the following specified herein, the Contractor shall comply with all currently applicable safety documents and/or organizations:

4.2.3 Safety of personnel

The Contractor shall be responsible for the safety of all personnel on the Site and shall provide his employees and his sub-contractors employees working on the Site, the Project Manager / Engineer's staff and all visitors to the Site with safety equipment appropriate to the tasks upon which they are engaged, including helmets, high visibility vests or jackets, safety footwear and, where required, gloves, lamps, waterproof clothing, dust masks and/or safety belts. The use of such safety equipment shall be compulsory, as deemed necessary by the Project Manager / Engineer.

During drilling works and in areas where the personnel are exposed to harmful noise levels and dust, ear protectors and masks shall be furnished and required to wear.

Employees engaged in work having an inherent danger of eye or face injury shall be furnished and required to wear protection glasses, goggles or masks. Where irritant or toxic substances may come in contact with the skin or clothing, employees shall be wearing protective clothing or shall be required to apply a protective ointment by a competent physician.

Personnel working on steep slopes or otherwise subject to possible falls from levels not protected by fixed guardrail or safety nets, shall be secured by safety belts and lifelines.

Portable ladders shall be wooden or steel ladders sufficiently strong and with suitable size for the use intended. Wooden ladders shall have the steps fixed to the longitudinal posts by assembly. The use of ladders with steps nailed or wired along the longitudinal posts is not permitted.

4.2.4 Security of personnel and working areas

The Contractor shall take at all times the necessary measures to ensure the safety and security of all persons, work and property. This shall include but not be limited to the following:

- Access control to all areas related to the Works
- Installation of fences
- Security patrols

4.2.5 Maintenance of traffic and safety on roads

The Contractor shall be responsible for the safety on the roads related to the Site. He shall take all necessary precautions for the protection of the work and the safety of the public on the roads affected by his activities. Where the work will be carried out at the site of, or close to an existing road, the Contractor shall maintain the vehicular and pedestrian traffic safe at all times. If his operations can cause traffic hazards, he shall repair or fence or take other measures for ensuring safety which are satisfactory to the Project Manager / Engineer.

Roads subjected to interference with the work shall be kept open or suitable detours shall be provided and maintained by the Contractor, who shall provide, erect, and maintain all necessary barricades, suitable and sufficient flashlights, flagmen, danger signals, and signs.

Roads which will be closed to traffic shall be protected by effective barricades on which acceptable warning and detour signs shall be placed. All barricades and all lights shall be kept burning from sunset to sunrise.

The Contractor shall submit his weekly activities schedule and the locations of his work along the existing public roads to the authorities concerned, and obtain all necessary approvals prior to commencement of the respective work.

The Contractor shall provide temporary passes and bridges to give an access to the existing villages, houses, etc., to the satisfaction of the Project Manager / Engineer and the authorities concerned whenever he disturbs such existing ways during the execution of the Works.

4.2.6 Weather precautions

The Contractor must always pay attention on weather forecasting announcements of Department of Meteorology and flood warning alerts issued by Irrigation Department and Mahaweli Authority of Sri Lanka. In order that the Works may proceed according to the programme, the Contractor is to undertake at his expense all necessary precautions for protection against inclement weather, which shall be subject to the approval of the Project Manager / Engineer. Any damages or losses happened to the Contractor's personnel or properties (The Works, plants, material, equipment, etc…) as a result of extreme weather condition should be borne by the Contractor.

4.3 Health precautions

4.3.1 First aid

Prior to the commencement of construction, the Contractor shall organize and train a first aid team composed of his employees. This team shall be capable to render help after accidents.

The first aid team shall be organized in such a way that sufficient number of members will be ready for action at any time until the completion of the Works.

The team members shall be instructed and trained for their task by a qualified and experienced person. Each team member shall be skilled in giving first aid, dealing with the appliances for artificial respiration, and firefighting equipment and shall possess a good local knowledge. Adequate equipment for reaching even the remotest working area shall be at their disposal.

The Contractor shall submit the details of the proposed first aid team organization to the Project Manager / Engineer for approval.

4.3.2 Noise control

The Contractor shall take the provisions required to assure that noise from his construction activities and from the operations of any plants are within the limits established by the WHO for the health of his personnel, or shall provide his personnel with ear protectors. Ear protectors shall be provided to all personnel subject to noise levels above 85 dB on a continuous basis during work shifts.

4.3.3 Ventilation of sluices

The Contractor shall furnish, install and operate ventilating systems for work in sluice barrels. Details of the proposed ventilation systems shall be submitted to the Project Manager / Engineer for approval. This updated design shall include all calculations of fresh air supply volume, type of ventilation scheme, duct diameters, materials and equipment and position.

All parts of the works shall be maintained in a state which will not be injurious to the health of the personnel. The air in the sluice barrel shall contain no less than 20% oxygen and shall not contain a concentration of gases, vapours or dust greater than is safe for the health of workmen.

5 SITE SUPERVISION AND REPORTING

5.1 Site supervision

The Contractor is responsible for providing proper supervision of his site activities by employing suitably qualified and experienced site management and supervisory personnel so that he can carry out his obligations under the Contract.

5.2 Monthly progress report

Before the tenth day of each month, the Contractor shall submit three copies of a monthly progress report in a form acceptable to the Project Manager / Engineer detailing the progress during the preceding month. The monthly progress report shall show the amount of work completed, materials actually used, materials in storage and the cumulative results of all operations completed or in progress and shall be summarized in terms of percentage of completion referenced to the agreed programme for the works.

The monthly progress report shall include at least the following:

- Total percentage of work completed and total percentage programmed to be completed by the end of the reporting period;
- Actual percentage of each main work item completed including temporary works, as well as their scheduled percentage, both total and for the reporting period together with the estimated quantities;
- List of manpower by trade and foreign personnel by position for the reporting period;
- List of equipment and operational days for the reporting period and materials on site at the end of the period;
- Description of weather conditions for the period including records of each rainfall duration and recorded river water levels (if any);
- List of any accident except of minor nature and any damage that occurred;
- Any matter which affected or may affect the progress of the work, problems encountered and proposed remedial measures;
- Colour photographs with imprinted date, not smaller than 100 mm by 150 mm of the work progress during the period for all major components of the Works. The Contractor shall also provide digital versions as well as 5 sets of hard copies of these photographs in albums with titles.

Further the Contractor shall submit financial statements, purchasing and expediting reports, shipping reports, and any other data which the Project Manager / Engineer may reasonably ask for.

Additional to the photographs included in the progress reports, the Contractor shall arrange for the taking of progress colour photographs every month, covering all aspects of the Work. Two copies of such photographs, suitably dated and captioned, shall be submitted to the Project Manager / Engineer, plus a CD with all relevant files.

The Contractor shall submit the final report not later than one month after completion of the Work. This report shall include all relevant information related to the Works in a format approved by the Project Manager / Engineer. The Contractor shall submit to the Project Manager / Engineer one copy of the draft report. The final report shall be submitted in triplicate. The final report shall also be made available electronically in pdf format or alternative approved format. The submission of the final report shall follow within one week of acceptance of the draft report.

6 PREPARATION OF AS-BUILT DRAWINGS

During the construction and commissioning period any variations between the "Construction Drawings" and the "As-built Drawings" shall be agreed between the Contractor and Project Manager / Engineer at site.

All agreed modifications will be marked up by the Contractor's draughtsman and included on the originals at site. A complete set of these mark ups shall remain at site. The Contractor shall allow for the provision of a draughtsman as required at site to co-ordinate and include all modifications on the drawings. The originals shall then be returned to the Contractor's head office and these shall form the basis of the “As-built Drawings”.

The Contractor shall submit to the Project Manager / Engineer all final revisions of all original drawings depicting the “As-built” situation for the works. All drawings and documents prepared exclusively for the project shall become the property of the Project Manager / Engineer.

Final drawing prints shall be size A1 or smaller. Reproducible of the final drawings shall be supplied as follows:

- 2 prints of each drawing to the Project Manager / Engineer.
- 2 Softcopies with original AutoCAD drawing files to the Project Manager / Engineer

Where drawings are reduced, an appropriate scale shall be included on the reduced print. To accompany the drawings, the Contractor shall provide a Master Schedule of “As Built” drawings.

7 CARE OF WATER

7.1 Scope of work

The Contractor shall provide all method, procedures, labour and materials necessary to protect all existing works under construction and all personnel and equipment. He shall design, build, install, operate, maintain and dismantle temporary barriers, coffer dams, protective structures, etc… as per the instructions of the Project Manager / Engineer to dealing with environmental water flow issued through bottom outlets and seepage water flow beneath the spillway structure. Further he shall arrange dewatering facilities required to remove service water and natural surface flow or groundwater seepage from the working areas.

7.2 Submittals

After the date of issue of the Notice to Commence, the Contractor shall present the Project Manager / Engineer with conceptual details, designs, method statements, procedures and emergency plans for all required protection and dewatering systems.

7.3 Extent of the works

The work under "Care of Water" to be performed under this Contract shall include but not be limited to:

- Construction and maintenance of temporary cofferdams, drains and other protective works;
- Supply and installation, operation and maintenance of pumping systems for dewatering;
- Control and drainage of the water inflows on surfaces against which concrete shall be poured; and
- Handling of the water supply to areas downstream of the dam during construction.

Care of water during construction comprises all necessary measures to protect the works from the effects of water from any source during the construction period. The Contractor shall be fully responsible for the care of water during the construction of the works, including the construction of the upstream and downstream cofferdams, the sealing of their foundation and the handling of the water supply for the downstream users during construction.

The Contractor shall submit with his Tender his proposal and method statement for taking care of water during construction including quantity, type, capacity, arrangement, location, etc., of all required equipment.

The Contractor shall also submit with his Tender his proposal and method statement for the design and construction of cofferdams / water tightening structures and the handling of the water supply during construction.

All works shall be executed in accordance with the specifications of this Contract and in agreement with the Project Manager / Engineer. The approval given by the Project Manager / Engineer shall not relieve the Contractor from being fully responsible for the protection of the works.

7.4 Execution

7.4.1 Drainage and dewatering systems

The Contractor shall design, furnish, construct and install, operate and maintain all care of water facilities, including cofferdams, drainage systems etc. necessary to maintain all work areas as free as possible form water during construction. This shall include all necessary labour, materials, equipment, power supplies and auxiliary works as required for a safe and dry construction of the works.

The water inflow existing on surfaces or against which concrete shall be poured shall be collected through steel and/or plastic pipes or other approved methods and conveyed to drainage ditches and pits. These water collectors shall be sufficient to drain all concentrated water inflows and also possible scattered water inflow that can affect the quality of concrete at the moment of pouring.

The Project Manager's / Engineer's approval of any care of water facility under the Contractor's responsibility shall not relieve the Contractor of the full responsibility for any adverse event which may result from the inadequacy of failure of the protective structures.

Having served their purpose, the protective works and dewatering equipment shall be removed and all temporary drainage systems filled or plugged as directed.

7.4.2 Dewatering

General

The Contractor shall furnish, operate and maintain all necessary pumps, pipes and other dewatering devices as necessary for keeping all work areas free from water. The Contractor shall be held liable for any damage caused by failure of the drainage and dewatering systems.

The Contractor shall prepare and submit to the Project Manager / Engineer the design of all temporary drainage and dewatering systems and all auxiliary works required for safe and continuous operation of the drainage and dewatering system throughout the period of the works.

The design and installation shall be such that alterations and extensions of the system during operation are possible.

Diverted or pumped water shall be discharged at locations from which it cannot re-enter the work areas and in a manner which does not cause erosion, pollution or nuisance to other persons within or adjacent to the site.

Duration of drainage and dewatering

Drainage and dewatering shall continue until construction works are completed to a stage where drainage and dewatering are no longer necessary to prevent damage to the works or neighbouring works whether from flooding, hydrostatic pressures, flotation or by any other means to prevent hindrances of any kind.

The ceasing of drainage and dewatering measures requires the approval of the Project Manager / Engineer. The removal of dewatering systems and the abandoning, removal or closing of drainage systems requires the express permission of the Project Manager / Engineer.

Pumping systems and power supply

To remove water from various sections of the work and to handle the water supply to areas downstream of the site, pumping systems of sufficient capacity shall be provided. This shall include the supply, installation, operation and maintenance of all items comprising the pumping system.

The Contractor shall size his power supply and distribution system to have sufficient standby capacity to continue necessary dewatering work in case of failure of his main generating system.

Ready for service condition

The Contractor shall maintain ready for service and regularly clean all dewatering equipment and accessories and shall keep all accesses clear so that they can safely be used without the risk of accidents.

7.4.3 Cofferdams

All cofferdams shall be designed, constructed and maintained by the Contractor. The complete design of the cofferdams including all calculations, specifications of materials, proposed construction procedures, provisions for protection of existing or already completed works, provisions for protection against erosion, any necessary support work shall be submitted for the approval of the Project Manager / Engineer prior to the commencement of the work. No work shall be started without the written approval of the Project Manager / Engineer.

The Contractor shall be entirely responsible for the water tightness and maintenance of the cofferdams, care of water as well as safety of the works including sole liability for damages due to erosion and/or piping inside the cofferdam.

Where required by the different phases of the works, the Contractor shall modify, remove or dismantle and reconstruct the cofferdams as approved or directed by the Project Manager / Engineer.

On completion of the works, the Contractor shall remove or dismantle all cofferdams as approved or directed by the Project Manager. The materials shall be brought to approved location and according to the requirements of paragraph 3 of this specification.

8 SURFACE EXCAVATION

8.1 Scope of work

This section covers all surface excavation work to be performed under this Contract, which shall consist of removing all existing material of whatever nature to the lines and grades shown on the drawings or as otherwise directed by the Project Manager / Engineer in writing. This work shall include excavating, ripping, loading, hauling, double handling and disposal of materials in designated spoil or stockpile areas, according to these Specifications.

8.2 Submittals

Prior to the commencement of any surface excavation, the Contractor shall submit in writing to the Project Manager / Engineer details of the proposed excavation methods and sequences, including necessary safety precautions.

Prior to dumping or stockpiling any material, the Contractor shall submit in writing the layout of spoil or stockpile areas to the Project Manager / Engineer and wait the approval in writing. All pertinent data of working methods and provisions for the security, stability and temporary and permanent drainage of the areas shall be included by the Contractor. Details of volumes, material types, heights and grades shall be provided.

8.3 Lines and grades

The final excavation grades shall in general bed rock of specified quality. However, where the final excavation grades are defined by line and grade, the Contractor shall take every precaution and use the most appropriate method of excavation, to avoid the loosening of material or the breaking of rock beyond the lines and grades shown on the drawings. Loose weathered rock shall be removed.

The bottoms of all excavations shall be trimmed to line and grade to the satisfaction of the Project Manager / Engineer.

If, for any reason, excavation is carried out beyond the lines and grades shown on the drawings, the Contractor shall remove the excess material and take the necessary measures to restore the required lines and grades with approved backfill or concrete, at his own expense.

Should the Contractor wish to excavate beyond the limits given on the drawings for his own convenience, he may do so, at his own expense but only with the prior written approval of the Project Manager / Engineer.

8.4 Slopes, slides, geological over break and unsuitable foundations

If geological conditions during the performance of the work do not permit excavation of slopes as shown on the drawings, or where the material is unsuited to forming a firm foundation for the structures, the Contractor shall modify the drawings accordingly or issue a direct request to

the Project Manager / Engineer to change the grades. The prior written approval of the Project Manager / Engineer is mandatory.

If, in the Contractor's opinion the slopes as shown on the drawings are objectionable, and in his opinion should be changed, he shall obtain the written agreement of the Project Manager / Engineer prior to starting the work on such modified excavation.

If over break, slides or rock falls occur, which are due to improper working methods or negligence by the Contractor, and the effective excavated surfaces are beyond the excavation lines shown on the drawings, the Contractor shall remove all excessive material and place suitable and approved backfill material in the excavated voids. This work and material shall not be paid.

8.5 Execution

The surface excavation shall be performed by any approved method using any excavating and hauling equipment suitable for the work in accordance with the submitted detailed plans and time schedule or approved modifications thereof. The work areas shall be kept dry and drained.

The work areas shall be kept dry and drained at all times during construction.

All final or remaining surfaces shall be protected against damage by erosion and travel of the construction equipment with methods proposed by the Contractor and approved by the Project Manager / Engineer in writing. Any damage caused shall be repaired by the Contractor.

The Contractor shall exercise particular care when excavating in the vicinity of existing structures or those under construction. He shall reinstate any damage to structures or equipment caused by his operations, at his own cost.

The Contractor shall protect the subsoil and particularly the ground water from contamination by fuel or oil from his equipment.

8.5.1 Clearing and grubbing

Clearing means the removal, transport and appropriate disposal of all trees, brush, stumps, fences, existing structures, spoil, debris and other obstructions in the areas to be occupied by the Permanent works, surfaces of borrow and quarry areas, spoil and stockpile areas, and where interfering with the procedure or functioning of the work.

Grubbing means the removal, transport and disposal of all roots, buried logs, foundations of structures (except concrete or masonry in mortar) and other materials foreign to the natural topsoil in the areas to be occupied by Permanent works and surfaces of borrow and quarry areas.

Clearing and grubbing work shall be performed either manually or with mechanical equipment. The Contractor shall make every reasonable effort to salvage such material which may be put to beneficial use.

All materials from clearing and grubbing work shall remain the Employer’s property but the Contractor may, subject to written approval from the Project Manager / Engineer, retain any material for his use. Materials which the Contractor does not wish to use shall be disposed of in an approved manner.

Materials to be burnt shall be piled neatly in such a manner and in such locations as to not cause any fire risk and shall be burnt completely so that all material is reduced to ashes.

The Contractor shall have suitable equipment and supplies for fighting fire during the burning of material and shall take all necessary precautions to prevent fire from spreading. Toxic materials such as tyres etc. shall not be burnt but disposed of in the approved manner.

8.5.2 Stripping and loose excavation

Stripping consists of removing all rubbish, humus, vegetable material and all or part of the organic topsoil in the areas and to the depth as indicated on the drawings or as otherwise directed by the Project Manager / Engineer.

Loose Excavation means general excavation of material such as organic topsoil, clay, silt, sand, gravel, and boulders of up to 0.75 m^3 in volume and soft or disintegrated rock, which can be removed by common earth moving equipment without ripping or blasting.

Stripping and loose excavation shall be accomplished by proper excavation and hauling equipment suitable for the work which allows for an efficient work progress adopted to the soil conditions encountered.

8.5.3 Rock excavation by ripping

Rippable material is defined as rock which can be loosened or broken down by a bulldozer capable of developing 220 kW (300 PS) of continuous power equipped with a single shank rear-mounted, heavy-duty rock ripper, operating in low gear.

Material which in the opinion of the Contractor should be removed by ripping shall be exposed, and the Project Manager / Engineer notified before proceeding further. The top of the rock surface shall be surveyed by the Contractor. The survey and classification is subject to the written approval of the Project Manager / Engineer.

Contractor's failure to follow the procedure outlined above will forfeit his right to claim any classification other than that allowed by the Project Manager / Engineer, who, in such case, will classify the excavated quantities.

Ripping shall be performed in such manner that the ripper tooth does not damage the material lying beyond the final excavation lines. Any material remaining to the final excavation lines shall be removed by wedging, barring, broaching or other suitable methods approved by the Project Manager / Engineer.

8.5.4 Dental excavation

Dental excavation shall include the removal of unsuitable material from shear zones, clay seams, pockets, joints, cracks or from spaces between boulders beyond the lines of excavation as indicated by the Project Manager / Engineer established in the field, which are too small to be excavated by common earth moving equipment.

Dental excavation, depending on its extent, will require the use of a backhoe, hand tools, or other small excavating equipment, as well as the use of a high velocity air-water jet. The methods employed shall be such as to avoid fracturing of the rock adjacent to the material being removed.

Dental excavation shall be performed where directed. The extent to which such material shall be removed including the depth, direction, and dimensions of the work, shall be determined in agreement with the Project Manager / Engineer in writing. In general, however, excavation into cracks or seams shall be to the depth that is a minimum of three times the seam width and such excavation shall be backfilled with concrete. No blasting will be permitted.

8.6 Excavated materials

All suitable materials from the excavations shall be utilised to the fullest extent practicable as construction materials in permanent and temporary works, subject to the written approval of the Project Manager / Engineer.

The Contractor's excavating techniques shall be such, that as much as practicable, construction materials will be yielded.

The suitable material shall be stockpiled. If the moisture content of excavated materials suitable for embankments or backfill is too high after excavation, the material shall be drained and dried in the stockpile until the moisture content is sufficiently reduced to allow placement, or vice versa moistened if too dry.

8.7 Disposal of excavated materials

Excavated material which is not suitable for, or are in excess of the construction requirements shall be disposed of in the spoil area as directed or approved by the Project Manager / Engineer.

The spoil tips shall be located where they will not interfere with the natural flow of streams or rivers or other works. No rock material may be dumped into the river bed.

The Contractor shall shape and trim the stockpiles to the lines and grades as directed. Adequate diversion of water courses in such areas and proper drainage shall be provided as proposed by the Contractor and approved by the Project Manager / Engineer. The Contractor shall be liable for any damage to the works or to the property of third parties caused by poor drainage in the spoil or stockpile areas.

8.8 Preparation and protection of excavation surfaces

Excavation surfaces against or upon which concrete, embankment fill, or backfill will be placed shall be prepared and protected as specified herein and in combination with specifications contained in the pertinent sections of these specifications or as shown on the drawings.

If, during excavation work, materials beyond the limits of excavation shown on the drawings are loosened or disturbed, the Contractor shall re-compact the loosened material or remove it altogether and replace it with other compacted fill or concrete as directed.

Foundation excavation shall be kept well drained and free of standing water. The Contractor shall provide all necessary drains, ditches and sumps and use pumps when necessary to ensure that foundation surfaces are not harmed by water. When foundations are thus affected, the affected material shall be removed and replaced with approved backfill.

Any support to be applied to the finished excavation surfaces where it is deemed necessary shall be carried out by the Contractor and approved by the Project Manager / Engineer.

8.9 Dental filling works

Zones of unsatisfactory material below the foundation levels shown on the drawings or as directed by the Project Manager / Engineer in writing which will require excavation, may be encountered.

All such material should be removed and disposed of as directed by Project Manager / Engineer. Dental excavation shall consist of the removal of earth such as talus, or unsound rock in fault zones, such as soft, or highly weathered rock from below the foundation or other base excavation lines indicated on the drawings or directed by the Project Manager / Engineer where the use of power excavating equipment is not practicable.

Dental work consists of the treatment and filling with concrete of all fault joints and fractures or localised loose material where dental excavation has been done. Mainly the shear zones, fault joints, fractures and cracks which should be discovered in excavation the structure foundation and where the location is considered necessary by the Project Manager / Engineer shall be treated accordingly.

After excavation and cleaning with water under pressure the opening shall be filled with concrete in accordance with the related specifications. The depth of the filling shall be at least three times the width of loose zone or fault when less than 1 m wide and 1.5 to 2 times the width for those more than 1 m wide. Within the dam foundation area, faults or other discontinuities wider than 1 m shall be dealt with on an individual basis as approved by the Project Manager / Engineer in writing.

8.10 Particular excavation applications

8.10.1 Excavation of parts of an existing embankment

The excavation of part of an existing embankment such as the removal of a distinct part of the crest requires special care to be taken by the Contractor. In this respect the Contractor has to take all precautions to avoid the following:

- To destroy the existing structure to a larger extent than required;
- To demolish the function of any detail of the structure; and
- To be able to re-construct the particular part.

Prior to the start of any work the Contractor shall submit to the Project Manager / Engineer for written approval a method statement describing the procedure required to carry out the specific excavation. The method statement shall include but not be limited to the following:

- Excavation method (including the applied equipment, materials etc.).
- Storage procedure for the excavated materials and details regarding the protection of these.
- Description of all temporary support measures to ensure that the remaining embankment is kept unchanged, if applicable.
- Preparatory works (such as shaping of the slope) required for the reconstruction of the excavated part of the embankment.
- Reconstruction procedure in respect to the different material to be backfilled.

8.10.2 Excavation of trenches in existing embankments

The excavation of trenches such as for the removal and/or reconstruction of sluices barrels require special consideration and attention.

The excavation shall be wide enough to allow for backfill compaction parallel to the structure using heavy rolling compaction equipment. The inclination of the embankment slopes shall be as flat as possible to reduce differential strain. The final slope inclinations shall be determined by the Contractor. He shall provide evidence to the Project Manager / Engineer that the inclination he intends to use is sufficient stable. No work shall start before the Contractor receives the written approval of the Project Manager / Engineer.

The embankment material of the previously excavated slopes shall be cut back to well-compacted material that has not been affected by wetting or drying.

Excavation shall extent to rock foundation, where line, grade and density are uniform. Rocks and/or irregularities at the foundation contact that might create a stress concentration should be removed. Cleaning and backfilling should treat existing defects such as soft or pervious soil filling in the rock, fault gouges, fractures, erosion channels or solution cavities that cannot be removed. These defects require removal to an adequate depth and replacement with lean

concrete slush grout, dental concrete or specially compacted earth fill as specified or directed by the Project Manager / Engineer.

The embankment slopes as well as the foundation surfaces shall be protected until reconstruction commences.

9.1 MISCELLANEOUS FILL WORKS AND REHABILITATION MEASURES FOR EMBANKMENTS

9.1.1 General

The following paragraph deals with general requirements governing the execution of miscellaneous fill works and rehabilitation measures for embankment structures. The rehabilitation works for the embankment structure shall include but not be limited to the following:

- Reconstruction of existing layers of an embankment (particularly after the performance of other remedial measures).
- Filling of existing cracks.
- Other remedial measures within this context as directed by the Project Manager / Engineer.

9.1.1.1 Standards and codes

The work included in this section shall comply with the requirements of the following standards and codes, except where this specification differs from these standards and codes, in which case the requirements of the Specification shall take precedence:

- Earth Manual of "Bureau of Reclamation" – US Department of the Interior.
- All standards of the American Society for Testing and Materials (ASTM)

9.1.1.2 Submittals

Prior to the start of any works described herein, the Contractor shall submit to the Project Manager / Engineer details of the proposed methods and procedures. Daily report forms in agreed format detailing the activities shall be submitted to the Project Manager / Engineer for signature.

9.1.2 Material

Material for the rehabilitation of embankments shall be equivalent to the existing surrounding material, unless agreed otherwise by the Project Manager / Engineer.

Material to be double handed shall be investigated carefully in regard to possible contamination during the time of storage. If the material is considered to be inappropriate for further use, the Contractor shall propose to the Project Manager / Engineer details of the material he intends to use. In both cases, either the reinstatement or use of new material, the Contractor shall not be allowed to carry out any works prior to the written approval of the Project Manager / Engineer.

All applied materials shall be well graded. Material re-excavated for placement in the embankment will be subject to the same inspection as materials obtained directly from the quarry or excavation.

Preparation required to produce the materials shall include but not be limited to the combination of sieving, crushing, washing, separation and remixing of materials.

Materials shall be obtained, prepared, processed and stockpiled in such a manner that the rehabilitation works shall proceed without delay. The Contractor shall organize his operations taking into account all factors that may delay the work so that the approved schedule of the works is kept.

All applied material shall be well graded and shall be processed to be within the limits of the existing materials, unless otherwise approved by the Project Manager / Engineer.

9.1.3 Equipment

9.1.3.1 Compacting equipment

The type of the compacting equipment used for embankments, fills and backfills shall be proposed by the Contractor and approved in writing by the Project Manager / Engineer.

Compaction of material in areas where it is impracticable to use large equipment shall be performed by approved suitably sized small rollers, vibrating plates or hand power tampers.

9.1.3.2 Water supply and sprinkling equipment

The Contractor shall provide and maintain in perfect working condition suitable equipment such as pumps, tanks, hoses, etc. to provide water for dust prevention, for adjusting the water content of the materials and to wash in the materials as agreed with the Project Manager / Engineer.

9.1.3.3 Fill material testing equipment

The Contractor shall operate and maintain an adequate field laboratory for sampling (if applicable) and testing of materials. The laboratory shall be run by the Contractor's personnel or a Subcontractor suitably qualified and approved for sampling and testing of materials and quality control. All sampling and testing to be undertaken shall be under the direct supervision of the Project Manager / Engineer.

If new materials are to be applied for the rehabilitation of the embankment, the testing of materials shall be performed in the stockpiles, borrow areas and on the embankments.

Laboratory shall be equipped to perform with professional skill and care the following fill material testing:

- Grain size distribution — ASTM D 422
- Moisture content — ASTM D 2216
- Specific gravity & absorption — ASTM C 127
- Specific gravity of soils — ASTM D 854
- Compaction test (Proctor) — ASTM D 698
- Relative density — ASTM D 4254
- Field density test — USBR Earth Manual E-24

9.1.4 Construction procedures

The Contractor shall submit method statements and detailed construction schedule to the Project Manager / Engineer for written approval well in advance of the start of any construction. The Contractor shall not start with any work before receiving the written approval of the Project Manager / Engineer.

No material shall be placed on any portion of the area to be reconstructed until that portion has been inspected and agreed by the Project Manager / Engineer.

Each load of material shall be placed to achieve the best practicable distribution of the material. The Project Manager / Engineer may designate the location where the individual loads shall be placed and the Contractor shall be entitled to no additional allowance above the unit prices on account of this requirement.

Material in any zone that becomes contaminated with material from another zone, topsoil or any other objectionable material during or after placement shall be removed at the Contractor's expense.

In the event of slides or erosion in any part of the dams during construction, the Contractor shall remove material from the affected area, as instructed by the Project Manager / Engineer, and shall rebuild such portion of the embankment.

9.1.5 Fill Works

The Contractor shall place and compact suitable backfill material to the lines, grades and dimensions shown on the Drawings or as directed by the Project Manager / Engineer.

Material to be used as fill shall be subject to the approval of the Project Manager / Engineer, and shall be, as far as possible, obtained from approved quarries. As far as possible and depending on the suitability of the material, all materials shall be sourced locally as approved by the Project Manager / Engineer.

The materials to be applied shall be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material. Backfill material shall not include any organic matter.

Any material which is objectionable or inadequate in the opinion of the Project Manager / Engineer shall be removed by the Contractor. If the compacted surface of any layer of material is determined to be too smooth and impermeable to bond properly with the subsequent layers, it shall be loosened by harrowing or by other approved method before the succeeding layer is placed.

Backfilling adjacent to concrete structures shall not commence until 7 days after concrete placement. Prior to backfilling, forms shall be removed and the area cleaned of trash and debris. All works to be backfilled shall be inspected and approved in writing by the Project Manager / Engineer prior to the start of backfilling. Backfill shall be placed in proper sequences so that no differential earth pressures occur on any structures.

The Contractor shall maintain and protect the finished backfill in satisfactory condition at all times until completion and acceptance of the work. After backfilling operations have been finished and prior to final grading, the Contractor shall slope the surfaces to prevent ponding of water.

9.1.6 Particular applications

9.1.6.1 Rehabilitation of cracks in the existing embankment

The Contractor shall with the Project Manager investigate all existing cracks in the embankment. He shall document the findings of this investigation and submit them to the Project Manager / Engineer. During a site investigation the Contractor shall present all observed deficiencies to the Project Manager and explain the rehabilitation methods to be applied. These measures shall be subject to the written approval of the Project Manager / Engineer.

The method statement proposed by the Contractor shall include but not be limited to the following:

- Cleaning of the crack, including the removal of any loose or foreign material
- Backfilling and re-grading of the crack with approved material by carefully controlled washing of the various layers
- Reconstruction of the slope protection layer

The material to be applied shall conform to the materials used during initial construction. The filter criteria must be maintained for all materials to be applied for the rehabilitation of the cracks. It is the Contractor's responsibility to carry out the required measurements and calculations and present these to the Project Manager / Engineer for approval.

Washing-in of the material shall be carried out under controlled conditions. The Contractor shall take all precautions not to cause any harm to the existing dam structure. Any destruction caused by the works must be repaired at the expense of the Contractor.

9.1.6.2 Reconstruction of embankment layers

The Contractor shall propose methods and procedures how he intends to carry out the required remedial measures prior to the commencement of any work. The works shall not be started without the written approval of the Project Manager / Engineer.

Any works to be carried out for the reconstruction of the embankment shall be conducted also under the provisions presented in the relevant Technical Specification. The Contractor shall consider all methods and requirements described herein.

All materials the Contractor intends to use shall conform to the specification presented in this section. Any material to be applied throughout the works shall be approved in writing by the Project Manager / Engineer.

Throughout the works the Contractor shall take strict precautions to avoid any contamination of any material to be used.

No embankment shall be reconstructed until that portion has been inspected and approved in writing by the Project Manager / Engineer.

When directed by the Project Manager / Engineer, the Contractor shall remove and dispose of unsuitable material placed in the reconstruction area and material rendered unsuitable after being placed.

The thickness of the layers to be placed and the compaction required shall be determined by the Contractor and approved by the Project Manager / Engineer.

Spreading and compacting of material in the vicinity of concrete structures, instrumentation or other equipment shall be performed with adequate equipment and in such a manner that no damage occurs to concrete, instrumentation or other structures. Any damage shall be repaired by the Contractor at his own expense.

9.1.6.3 Placing of rip-rap

Rip-rap shall consist of individual rock fragments, dense, sound, un weathered (only materials not susceptible to weathering shall be accepted), resistant to abrasion and free of cracks, seams and other defects that would tend to increase unduly their susceptibility to destruction by water action. Angular rock fragments shall preferably be used. Well-rounded cobbles and boulders will not be accepted excepted on very flat slopes. The minimum dimension of any single rock shall not be less than one-third to one-fourth of its maximum dimension.

Material required for rip-rap shall be obtained and selected from local sources as far as possible, as approved by the Project Manager / Engineer.

Rip-rap shall be reasonable graded. Sand and rock dust may not exceed 5% of the total weight of the rip-rap material. Maximum size of the boulder shall be limited to the nominal thickness of the rip-rap.

Rip-rap shall be placed to the specified thickness in such a way to ensure that larger rock fragments are uniformly distributed, with smaller rocks filling the remaining spaces. Pockets of small stones shall be removed and replaced with larger material. Placing operations shall be such that the rip-rap layer is well-keyed, uniform and dense. End tipping from lorries or dumpers is not permitted.

Rip-rap shall be placed to the full layer thickness in one operation starting from the bottom of the slope and progressing to the top. Rip-rap shall be placed in such a manner as to minimize segregation and avoid displacing the underlying sub-base material. The finished layer shall be free from pockets of small stones, clusters of large stone and excessive voids.

Rip-rap shall be well-keyed and stable mass with adjacent stones in close contact but without alignment of longer faces so that open joints are formed. Stones shall have their greatest dimension across the slope and the smaller spaces between stones shall be left open.

9.2 GEOTEXTILE

9.2.1 Scope of work

The work consists of furnishing all material, equipment and labour necessary for the installation of geotextiles.

9.2.2 Material

Geotextile fabric shall be labelled in accordance with ASTM D 4873 and must clearly show the manufacturer's product style number and unique roll number.

Geotextile shall consist of high modulus polypropylene fibers. They shall be formed into a stable network of filaments or yarns retaining dimensional stability relative to each other. The geotextile shall be mildew-resistant, rot-proof and designed for use in separation or erosion control. The geotextile shall be free of defects, free of any chemical treatment or coating that significantly reduces its porosity. Fibres shall contain stabilizers and/or inhibitors to enhance resistance to ultraviolet light.

Geotextiles shall be classified based on the method used to place the threads or yarns forming the fabric. The geotextiles shall be grouped into woven and non-woven types:

- Woven fabrics are formed by the uniform and regular interweaving of the threads or yarns in two directions. Woven fabrics shall be manufactured from monofilament yarn formed into a uniform pattern with distinct and measurable opening, retaining their position relative to each other. The edges of fabric shall be selvedge or otherwise finished to prevent the outer yarn from unravelling.
- Nonwoven fabrics are formed by a random placement of thread in a mat and bonded by heat-bonding, resin-bonding or needle punching. Nonwoven fabrics shall be manufactured from individual fibers formed into a random pattern with distinct, but variable small openings, retaining their position relative to each other when bonded by needle punching, heat or resin bonding. The use of nonwovens is restricted and requires the prior written approval of the Project Manager / Engineer.

Woven geotextile such as Macaferri Mac Text PP MXC 60, Fibertex F40, Synthetic Industries 801 (I) or similar in accordance with the following requirements shall be used:

Physical Property	Test Method	Value
Grab tensile strength	ASTM D 4632	Min. 1000 N
Grab tensile elongation	ASTM D 4632	Max. 50 %
Trapezoidal tear resistant	ASTM D 4533	Min. 350 N
Permittivity	ASTM D 4491	Min. 0.10 sec^{-1}
Apparent opening size	ASTM D 4751	Not smaller than 0.212 mm (#70)
Puncture resistant	ASTM D 4833	Min. 400 N

All physical property requirements are MARV (Minimum Average Roll Values) determined in accordance with ASTM 4759.

9.2.3 Storage

Geotextiles shall be stored in a clean, dry location out of direct sunlight, not subject to extremes of either hot or cold temperatures and with the manufacturer's protective cover undisturbed. Receiving, storage and handling at the site shall be in accordance with the requirements listed in ASTM D 4873.

9.2.4 Surface preparation

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. It shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions, and standing or flowing water.

9.2.5 Placement

Before the geotextile is placed, the soil surface shall be reviewed for quality assurance of the design and construction. The Project Manager / Engineer shall approve the surface preparation prior to the start of the work. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings. The geotextile shall be unrolled along the placement area and loosely laid, without stretching, in such a manner that it conforms to the surface irregularities when material or gabions are placed on or against it. The geotextile may be folded and overlapped to permit proper placement in designated area(s).

The geotextile shall be joined by overlapping a minimum of 45 cm (unless otherwise specified) and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacturer and the Project Manager / Engineer, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. Pins shall be steel or fiberglass formed as a U, L, or T shape or contain "ears" to prevent total penetration through the geotextile. Steel washers shall be provided on all but the U-shaped pins. The upstream upslope geotextile shall overlap the abutting downslope geotextile. At vertical laps, securing pins shall be inserted through the bottom layers along a line through approximately the mid-point of the overlap. At horizontal laps and across slope labs, securing shall be inserted through the bottom layer only. Securing pins shall be placed along a line about 5 cm in from the edge of the placed geotextile at intervals not to exceed 3.5 m unless otherwise specified. Additional pins shall be installed as necessary and where appropriate to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to remain in place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps or sewn joint disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used and overlaying the existing geotextile. When the geotextile seams are required to be sewn, the

overlay patch shall extend a minimum of 30 cm beyond the edge of any damaged area and joined by sewing as required for the original geotextile except that the sewing shall be a minimum of 15 cm from the edge of the damaged geotextile. Geotextile panels joined by overlap shall have the patch extend a minimum of 60 cm from the edge of any damaged area.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. In no case shall material be dropped on uncovered geotextile from a height of more than 1 m.

9.3 MONITORING

The Contractor shall be responsible for the procurement of all the instrumentation components in due time. Before placing the purchase order, the Contractor shall seek for the Project Manager's / Engineer's approval of the instruments.

The equipment to be supplied and installed comprises the following:

a) Levelling monuments and fix points;

The Contractor shall be prepared to accept changes in the instrumentation layout or additional installations of instruments, if required by the Project Manager / Engineer, and shall also be prepared to receive installation instructions for changed site conditions. The Contractor shall provide access to any instrumentation location at any time during the construction.

9.3.1 Levelling monuments and fix points

A network of levelling points and fix points shall be installed on the embankment as indicated herein or as directed by the Project Manager / Engineer.

If not already existent, a minimum of 2 permanent fix points shall be established on each abutment. The location of each fix point shall be marked in detail on drawings supplied by the Contractor. The levelling monuments shall be built along the dam crest at intervals of 100 m close to the upstream dam shoulder.

The Contractor shall supply, install and survey all monuments including survey pins, pipes and caps, concrete and backfill as shown on the drawings or as directed by the Project Manager / Engineer. Levelling pins shall be of stainless steel, cast iron or steel bolts embedded in concrete of suitable size. A stainless-steel plate fixed to the monument shall mark the chainage of the dam.

Immediately after installation of any point, its position and level shall be precisely surveyed. The level and coordinates shall be computed and submitted in writing to the Project Manager / Engineer.

9.3.2 Installation of Standpipe piezometers

Standpipe piezometer tips shall be of porous ceramic not less than 150mm long and at least 40mm diameter and shall be protected at each end by unplasticized polyvinyl chloride (uPVC) fittings. The ceramic shall be high air-entry type.

Standpipe tubing shall consist of uPVC tubing to BS 3506 Class 6. Tubing to extend existing standpipes shall be of the same size as the existing tubes and have an appropriate jointing detail to provide a flush internal joint.

During earthwork filling operations standpipes shall be extended in 1.5 m lengths. Fill material shall then be placed and compacted around the tube by hand in a mound shape, the tube being maintained vertical with the top of the mound 750mm higher than the surrounding fill at all times.

Installation of standpipe piezometers in boreholes shall be as follows:

(i) Each piezometer shall be installed in a separate borehole 100 mm minimum diameter. The installation shall be completed as soon as practicable after drilling so as to minimize the amount of deterioration or alteration that occurs in the ground around the location of the piezometer tip. Holes shall be cased through unstable ground.

(ii) After drilling to the required depth, using percussive or rotary methods, but without the use of air flush or drilling mode in the vicinity of the tip position, the hole shall be flushed clean.

(iii) Sand falling wholly between the limits of grading 1200 and 200 microns will be placed to a minimum depth of 150 mm at the base of the hole by flushing using clean water and a tremie pipe. The piezometer tip, saturated in water prior to the installation, shall then be coupled to the appropriate standpipe tube and lowered onto the sand, and more sand added by flushing through the tremie pipe to surround and cover the tip and to fill the hole to the level shown on the Drawings.

(iv) A plug of bentonite formed of either stiff hand rolled balls or pellets shall then be tamped over the sand approximately 500 mm thick. The hole shall then be backfilled with a 3:1 by weight bentonite/cement grout mix prepared by thorough mixing using equipment approved by the Project Manager / Engineer with just sufficient water to allow it to be tremied to the bottom of the hole.

(v) Casing if used to maintain the hole open shall be withdrawn concurrently with the progress of the backfilling.

(vi) An accurate record of the depths of the piezometers, sand surround and seals shall be kept.

At final ground level the standpipes shall be protected by a lockable vandal-proof cover set in a concrete surround.

9.4 REPAIR OF DEFECTIVE CONCRETE

9.4.1 General

Concrete that is damaged from any cause, structural concrete that has cracked, concrete that is honeycombed, fractured or otherwise defective and concrete that – because of excessive surface depressions, must be excavated and built up to bring the surfaces to the prescribed lines, shall be repaired or replaced in accordance with these particular specifications, the ICTAD specification and the contract requirements.

All design requirements shall be as specified herein. Designs by the Contractor shall be subject to the approval of the Project Manager / Engineer.

9.4.2 Quality assurance

All concrete shall be repaired as necessary to produce surfaces conforming to the specified tolerances and finish requirements of the contract and in which these specifications are incorporated.

If in the opinion of the Project Manager / Engineer, the results of concrete repair indicate that proper quality control procedures are not being consistently utilized; further repair work may

be suspended in the whole or in part at the discretion of the Project Manager / Engineer. Such supervision will be effective until the Contractor demonstrates substantial improvement in quality control procedures and repair results.

9.4.3 Materials and workmanship

The Contractor shall furnish all materials for repair or maintenance of concrete and shall furnish all materials for forming, curing, and protection of the repairs, as required. All materials shall meet materials specifications and all equipment used and methods of operation for the repair or maintenance of concrete shall be subject to approval of the Project Manager / Engineer.

The reference to materials in the specifications, wherein manufacturer's products or brands are specified by "brand name or equal" purchase descriptions, are made as standards of comparison only as to type, design, character, or quality of the article required, and do not restrict the Contractor to the manufacturer's products or to the specific brands named. It shall be the responsibility of the Contractor to prove equality of materials and products to those referenced and to provide all necessary to prove the equality of materials or products which the Contractor offers as being equal to those referenced.

Concrete shall be repaired by skilled workmen.

9.4.4 Safety and environmental precautions

All work shall be performed in accordance with the applicable safety and health standards, the contract and these specifications. Certain additional safety precautions shall be employed to prevent skin and eye contact with chemicals and resins.

All contaminated materials such a swipes, empty containers, and waste material shall be continually deposited in containers that are protected from spillage. Spillage shall be immediately and thoroughly cleaned up and disposed of in accordance with applicable regulations.

9.4.5 Preparation for repair

All damaged, deteriorated, loosened, or un bonded portions of existing concrete shall first be removed by water blasting, bush hammering, jack hammering, or any other approved method and equipment. Finally, all surfaces of the existing concrete shall be prepared by contained wet sandblasting, or water blasting to remove any micro fractured surfaces resulting from the initial removal process.

The surface shall then be cleaned and allowed to dry thoroughly, unless the specific repair technique requires application of materials to a saturated surface.

Concrete removal processes involving the use of jack hammers in excess of 15 kg, dry sandblasting, or scabblers shall not be used without the prior approval of the Project Manager. The use of acids for cleaning or preparing concrete surfaces for repair will not be permitted.

9.4.5.1 Saw cut edges

The perimeters of repairs to concrete that involve concrete removal and subsequent material replacement shall be saw cut perpendicular to the repair surface to a minimum depth of 2.5 cm. Featheredge repairs to concrete shall not be used.

9.4.5.2 Reinforcement

All loose scale, rust, corrosion by products or concrete shall be removed from exposed reinforcing steel. Reinforcing steel exposed for more than one-third of its circumference shall be completely exposed to provide 2.5 cm minimum clearance between the steel and the concrete.

Damaged or deteriorated reinforcement steel shall be removed and replaced as directed by the Project Manager / Engineer.

9.4.5.3 Maintenance of prepared surfaces

After the concrete has been prepared and cleaned, it shall be kept in a clean, dry condition until the repair has been completed. Any contamination, including oil, solvent, dirt accumulation, or foreign material shall be removed by additional wet sandblasting and air-water jet clean up followed by drying.

9.4.6 General repair procedures

Concrete that is damaged or defective, such as that containing spalls, broken edges, rock pockets, honeycombs, or unconsolidated concrete shall be repaired by removing the damaged or defective concrete to sound concrete.

All repair work shall be finished to the same standard as the surrounding concrete, and shall be adequately cured. Plastering or rendering of surfaces to produce a smooth surface finish shall not be permitted.

No repair of defective concrete shall be undertaken until the imperfections have been inspected by the Project Manager / Engineer. The methods used to repair each individual area of imperfection shall be approved by the Project Manager prior to the start of the works. Repairs shall be performed by skilled workmen.

For bonding new concrete to older one, a bonding medium of epoxy, formulated for this purpose, shall be used in accordance with the manufacturer's instructions. Alternatively, a neat cement paste may be used. A paste of Portland cement and water mixed to a thick cream consistency shall be applied to damp, clean concrete. The concrete shall have no free water on its surface.

Concrete shall be repaired as follows:

9.4.6.1 Minor areas of defective concrete

The Contractor shall drill a hole of such diameter in the defective area into sound concrete, that the defective concrete is completely removed. The minimum diameter of such a hole shall be 50 mm, the minimum depth shall be equal to the diameter of the hole drilled and the maximum depth shall be 70 mm. The hole shall then be reamed out such that the diameter at the bottom of the hole is at least 20 mm larger than the hole at the surface. Finally, the hole shall be cleaned and washed out, the surplus water removed and filled with suitable material and methods as approved by the Project Manager / Engineer and as described below.

9.4.6.2 Large areas of defective concrete

Concrete which contains defective areas too large to be repaired as described above shall be cut to a minimum of 25 mm into sound concrete in all directions and to the far face of surface reinforcement or further if necessary to remove all the defective material, and then the edges undercut. The area to be removed shall be outlined to a depth of 15 mm with a diamond saw

prior to removing the defective concrete. The fresh concrete surface shall then be cleaned, washed down and thoroughly soaked with water until the concrete becomes saturated. The concrete surface shall be damp. Finally the hole shall be filled with suitable material as approved by the Project Manager / Engineer and as described below.

9.4.7 Fillings

All fillings for depressions shall be bonded tightly to the surfaces of the holes and shall be sound and free from shrinkage cracks and drummy areas after fillings have been cured and have dried. Repairs shall be made with concrete filling, dry-pack filling, or epoxy concrete and/or epoxy mortar. Concrete, mortar and dry pack mortar filling shall each be mixed in proportions to produce a repair at least equivalent in strength and durability to concrete in which the repair is required.

9.4.7.1 Dry-pack mortar

Dry-pack mortar fillings shall be used for filling holes having a depth nearly equal to, or greater than the least surface dimension; for narrow slots cut for repair of cracks and for grout pipe recesses. Dry-pack mortar shall not be used for filling behind reinforcement, for filling of holes that extend completely through a concrete section or for any critical repairs which will be expected to be exposed to severe service conditions e.g. high velocity water flow.

The dry-pack mortar shall consist of 1 part type I or II Portland cement (according to ASTM C150) to 2.5 part of clean sand that will pass the US Standard Sieve No.16 (1.18 mm). Only enough water shall be used to produce a mortar which will stick together when moulded into a ball by a slight pressure of the hands and will not exude water but will leave the dry-pack in thin layers.

A careful inspection of the concrete shall be carried out to ensure that the hole is thoroughly clean and is in sound concrete. The interior surface of the hole shall be pre-soaked prior to application of the dry pack.

A mortar bond coat shall be applied to the concrete hole surface prior to placing dry pack. The mortar bond coat shall consist of 1 part Portland cement to 1 parts and mixed with water to give a fluid paste consistency. The mortar bond coat shall be thoroughly brushed onto the hole surfaces.

Dry-pack mortar shall be placed and packed in layers. Each layer shall be solidly compacted over the entire surface by use of a hardwood stick and hammer.

Proper curing is essential for a successful dry-pack repair. The surface of the repair area shall be protected from drying and shall be kept continuously moist for 7 days. After 7 days and while the surface is still damp, two coats of curing compound shall be applied to prevent moisture loss.

9.4.7.2 Concrete filling

Concrete filling shall be used for holes extending entirely through concrete sections, for holes in which no reinforcement is encountered and which are greater in area than 0.1 m^2 and deeper than 100 mm, and for holes in reinforced concrete which are greater in area than 0.05 m^2. Holes in reinforced concrete which extend beyond the reinforcement shall be enlarged as necessary to permit satisfactory filling of the hole with concrete.

Concrete filling shall be tightly packed and completely bonded to the surfaces of the hole. The mix proportions of the filling materials shall be such as to provide a strong, dense repair.

A non-shrink agent shall be used where a watertight joint is required. The surface of patches shall be smooth and flush with the surrounding concrete.

9.4.7.3 Epoxy mortar and concrete

General

Deficient concrete which is exposed to flowing water shall be repaired with epoxy mortar or epoxy concrete and shall conform to the requirements specified hereunder.

Except otherwise directed by the Project Manager / Engineer, repairs less than 5 cm deep shall be carried out applying epoxy mortar, whereas epoxy concrete shall be applied for repairs with a depth greater than 5 cm.

The locations where epoxy mortar or concrete shall be used will be agreed with the Project Manager / Engineer, who will approve the type and brand to be used.

The method of repair, the proportions of the epoxy mortar and concrete and the method of mixing and placing shall be as recommended by the manufacturer. The product used shall not contain toxic elements. The same epoxy resin system shall be used for both the bond coat and the epoxy mortar and concrete.

Particular safety precautions using epoxy materials

Additional safety precautions shall be employed when using epoxy materials. Skin contact with uncured epoxy shall be avoided. Protective clothing, including rubber or plastic gloves, shall be worn by all persons handling epoxy materials. All exposed skin areas that may come in contact with the material shall be protected with a protective barrier cream formulated for that purpose. Appropriate solvent may be used to clean tools and spray guns, but in no case shall the solvents be incorporated in any epoxy resin or in the placing operation. Solvents shall not be used to remove epoxy materials from skin. Only soap, water and rags shall be used for this purpose.

Material

Epoxy resin: The epoxy resin shall meet the requirements of ASTM C881 for a type I, grade 2, class B or C or a type III, grade 2, class B or C epoxy system. In addition, it shall be a 100 percent solids system, and no unreactive diluents, wetting agents, or volatile solvents shall be used.

Aggregates for epoxy concrete: The aggregates used for epoxy concrete shall be clean and dry. Except for gradation, fine and coarse aggregates shall meet the requirements of ASTM C33, Standard Specification for Concrete Aggregates. Aggregates for epoxy concrete shall meet the requirements for gradation specified below, except that the percentages of fine aggregates passing a No.100 sieve shall be held to the lower limit specified to the greatest extent practicable. The fine and coarse aggregates used in the preparation of epoxy resin concrete shall be oven dry and shall be conditioned to a temperature of 15 to 20°C prior mixing the epoxy resin binder. Gradation of the coarse and fine aggregate shall conform to the following requirements when tested in accordance with ASTM C136, Standard Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.

The gradation of fine aggregates shall be as follows:

Maximum size of fine aggregates D_{max} shall be 3 mm. The fineness modulus of the fine aggregates shall lie between 2.3 and 3.1. The amount of fines (i.e. passing sieve No. 200) should generally be kept to 5% or less by weight. Fine aggregates with an amount of fines in excess

of 5% shall only be used for concrete if clearly demonstrated by tests that this will not deteriorate neither strength, nor water tightness or durability of the concrete.

Approximate gradation for coarse aggregate for epoxy concrete is given below:

Sieve size (ASTM Standard)	Openings in mm	Percentage passing by weight
¾''	19.1	100
½''	12.7	90 – 100
3/8''	9.52	40 – 70
No. 4	4.76	0 – 15
No. 8	2.38	0 – 5

Aggregates for epoxy mortar: Except for gradation, fine aggregate for use in epoxy mortar shall conform to the requirements to ASTM D404, Standard Specification for Aggregate for Masonry Grout. The gradation of fine aggregate for epoxy mortar shall conform to the requirements specified below. The aggregate used in the preparation of the epoxy resin mortar shall be oven dry and shall be conditioned to a temperature of 15 to 20°C prior to mixing the epoxy resin binder. Gradation of the fine aggregate shall conform approximately to the following requirements when tested in accordance with ASTM C136, Standard Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.

Sieve size (ASTM Standard)	Openings in mm	Percentage passing by weight
No. 4	4.76	100
No. 8	2.38	95 – 100
No. 16	1.19	60 – 100
No. 30	0.595	35 – 70
No. 50	0.297	15 – 35
No. 100	0.149	2 – 5
No. 200	0.074	0 – 2

The aggregate shall be well graded from coarse to fine and the material passing the No. 100 sieve shall be held to a minimum.

Commercially available sand grading prepared specifically for epoxy mortars may be used on approval of the Project Manager / Engineer.

Mixing and batching

The epoxy components shall be mixed thoroughly prior to the application of the bond coat and prior to the addition of the aggregates. The epoxy mortar shall be thoroughly mixed with a slow-speed mechanical stirrer or other equipment producing equivalent results. The mortar shall be mixed in small-sized batches so that each batch will be completely mixed and placed within approximately 30 minutes form the time the two components for the epoxy resin are combined. The rate of mixing should be such that entrained air is held to a minimum.

To obtain epoxy concrete the fine aggregate shall be added to the epoxy resin binder and the material shall be mixed until a rich mortar consistency is attained. Then the coarse aggregate shall be added and the epoxy concrete thoroughly mixed.

To obtain epoxy mortar the fine aggregate shall be added to the binder gradually and mixing continued until all particles are coated providing a stiff, workable mixture.

Surface preparation

Epoxy concrete: All fines, dust and other loose materials on the contract surface shall be removed by scrubbing with a stiff bristle brush, followed by washing. The dry, cleaned surface shall receive a prime coat of epoxy resin binder of composition as recommended by the manufacturer of the epoxy resin. The prime coat shall be applied in a thin coat and briskly scrubbed into the dry concrete surface with a still bristle brush.

Care shall be exercised to confine the epoxy resin to the area being bonded and to avoid contamination of adjacent surfaces. However, the epoxy bond coat shall extend slightly beyond the edges of the repair area.

Epoxy mortar: The surface of the existing concrete to which epoxy mortar is to be bonded shall be prepared and maintained in a clean and dry condition, unless epoxy mortar application to wet concrete surfaces is approved by the Project Manager / Engineer.

Epoxy mortar shall be placed only on sound clean and dry surfaces. All repairs shall be protected from rain or seepage water for at least 12 hours and from all types of traffic for a period of 24 hours.

The dry, cleaned surface of the cavity shall receive a prime coat of epoxy resin binder of composition as recommended by the manufacturer of the epoxy. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff bristle brush.

Care shall be exercised to confine the epoxy resin to the area being bonded and to avoid contamination of adjacent surfaces. However, the epoxy bond coat shall extend slightly beyond the edges of the repair area.

Placement of epoxy mortar and concrete

Epoxy concrete and mortar shall be placed when the atmospheric and concrete temperatures are less than 40°C and remain below this value for a period of at least 24 hours. If the work is required to be carried out at temperature higher than those specified, approved measures such as recommended by the manufacturer of the epoxy binder and approved by the Project Manager / Engineer shall be provided to lower the ambient and concrete temperatures as required for satisfactory work. Such measure might include but are not limited to cooling equipment and necessary shelters.

Forms shall be used as necessary to prevent slumping or sagging of finished epoxy-bonded epoxy mortar and concrete. Such forms shall be covered with polyethylene film. Form oil shall not be used.

Epoxy concrete: Placement of the epoxy resin concrete shall be delayed until the prime coat becomes tacky. The epoxy resin shall be places in layers not over 10 cm in thickness. The thickness of courses and time interval between courses shall be such that the temperature of the epoxy concrete does not exceed 60°C any time during hardening.

Mechanical plate, screed, or float vibrators or hand tampers shall be used to consolidate the epoxy concrete. Excess epoxy concrete which becomes spread on the adjacent surfaces of the hardened concrete shall be removed before it hardens.

Epoxy mortar: Placement of epoxy resin shall be delayed until the prime coat becomes tacky. The epoxy resin may be allowed to stiffen to a very tacky condition rather than a fluid condition before epoxy mortar is placed on steep sloping or vertical surfaces, in which case special care

shall be taken to thoroughly compact the epoxy mortar against the stiffening bond coat. If any bond coat has cured beyond the tacky state, it shall be completely removed by sandblasting, and proper clean-up, and drying shall be accomplished a new bond coat applied.

The epoxy mortar shall then be placed in the cavity in layers not exceeding 3 cm in thickness. The time interval between placements of additional layers shall be such that the temperature of the epoxy resin mortar does not exceed 60°C at any time during hardening.

The prepared epoxy mortar shall be tamped, flattened and smoothed into place in all areas. The mortar shall be worked to grade and given a steel trowel finish. Special care shall be taken at the edges of the area being repaired to ensure complete filling and levelling and to prevent the mortar from being spread over surfaces not having the epoxy bond coat application. Steel trowelling shall be performed in a manner to best suit the prevailing conditions but, in general, shall be performed by applying slow, even strokes. After levelling of the epoxy mortar to the finished grade, the mortar shall be covered with panels smoothly lined with polyethylene sheeting and weighted with sandbags or otherwise braced or by other means acceptable to the Project Manager until danger from slumping has passed. When polyethylene sheeting is used, no attempt shall be made to remove it from the epoxy mortar repair before final hardening.

Mechanical plate, screed or float vibrators or hand tampers shall be used to consolidate the epoxy resin mortar. Excess epoxy resin mortar which becomes spread on the adjacent surfaces of the hardened concrete shall be removed before it hardens.

Epoxy mortar repairs shall be cured immediately after completion of each repair area until the mortar is hard.

In no case shall epoxy-bonded epoxy mortar be subjected to moisture until after the specified post curing has been completed.

9.4.8 Sealing of cracks with resin injection

When hardened concrete is cracked in depth or when hollow plane delamination or open joints exist in hardened concrete and when structural integrity or water tightness must be restored for the structure to be serviceable, resin injection shall be used for repair, as directed by the Project Manager / Engineer.

However, since not all cracked, delaminated, or jointed concrete can be restored to serviceable condition by resin injection, resin injection repairs shall be made only as directed by the Project Manager / Engineer.

Two basic types of injection resin are used to repair concrete:

- Epoxy resins are used to rebond cracked concrete and to restore structural soundness. Epoxy resins may also be used to eliminate water leakage from concrete cracks or joints, provided that cracks to be injected with epoxy resin are stationary. Cracks that are actively leaking water and that cannot be protected from uncontrolled water shall not be injected with epoxy resin. Cracks to be injected with epoxy resin shall be between 0.125 mm and 5 mm in width.
- Hydrophilic polyurethane resin is used to eliminate or reduce water leakage from concrete cracks and joints and to inject cracks subject to some degree from movements. Hydrophilic joints shall be used when restoration of structural bond is desired. Cracks to be injected with polyurethane resin shall be 0.125 mm in width or greater.

Other types of injection resin are available for nonstandard or specialized repair applications. Use of these materials shall require the prior approval of the Project Manager / Engineer.

The Contractor shall submit to the Project Manager / Engineer evidence that the contractor is qualified to perform resin injection repairs. The data shall show that the Contractor has a minimum of 3 years of experience in performing resin injection work similar to that detailed in the drawings.

The Contractor shall submit to the Project Manager / Engineer prior to the start of the works a detailed proposal for the injection repairs for approval.

The Contractor shall provide a full-time, onsite supervisor throughout the duration of the resin injection works.

Epoxy resin for injection shall meet the requirements of specification ASTM C 881 for a type I, grade 1 epoxy system. The class of the system shall be appropriate for the temperature of the application.

The polyurethane resin system for injection into cracked concrete shall be a two-part system composed of 100 percent hydrophilic polyurethane resin and water. The polyurethane resin, when mixed with water, shall be capable of forming either a flexible closed-cell foam or a cured gel dependent upon the water-to-resin mixing ratio. The amount of water mixed with the polyurethane resin shall be such that the cured material meets the following physical properties:

- minimum tensile strength 140 kPa
- bond to concrete (wet) greater than 140 kPa
- minimum elongation 400 percent

The injection of pure polyurethane resin, not mixed with water shall not be allowed.

Additional safety precautions as described in paragraph 9.4.7.3 shall apply.

The concrete surface to be repaired by resin injection shall be thoroughly cleaned of all deteriorated concrete, efflorescence and all other loose material. The area to be injected shall then be thoroughly inspected and an injection port drilling and pumping pattern established.

Upon completion of resin injection, all excess materials shall be removed from the exterior surfaces of the concrete.

The application of resin injection for concrete repair shall include the following:

- Epoxy resin injection repair

The epoxy resin shall fill the entire crack or hollow plane delamination with liquid epoxy resin system and shall contain the resin system in the crack until it has hardened. The Contractor shall be responsible for drilling and removing three cores, minimum 50 mm diameter, from the injected concrete at locations determined by the Project Manager / Engineer to determine the completeness of the injection repair. Injection shall be considered complete if more than 90 percent of the void is filled with hardened epoxy. If injection is not complete, reinjection and additional cores may be required at the direction of the Project Manager / Engineer at no additional cost. Epoxy injection repair methods shall be in accordance with the approved detailed proposal for epoxy injection repair and shall be adjusted to fit the repair situations encountered at site.

- Hydrophilic polyurethane resin injection repair

The process used for polyurethane injection of cracks or joints to reduce water leakage shall consist of the following basic steps:

1. Intercept the water flow paths with valved drains installed into the concrete to control the leakage.

2. Install injection ports by drilling holes designed to intersect the cracks at depth below the concrete surface. The maximum spacing of injection ports shall not exceed 150 cm and closer spacing of ports may be required.
3. All injection holes shall be flushed with clean water to remove drilling dust and loose debris and to clean the intersected crack line. Each drill hole shall be water tested at the resin injection pressure to determine if the crack intersection is open. Polyurethane resin shall not be pumped into a drill hole that refuses to take water at the resin injection pressure.
4. Inject polyurethane resin system into cracks or joints at the minim pressure required to obtain the desired travel, filling and sealing. The mix water to resin ratio shall be 1:1 unless otherwise approved by the Project Manager / Engineer. The Contractor should anticipate the necessity to provide a surface seal for the crack or joint to retain the injection resin. It may also be necessary to inject the crack or joint in an intermittent manner to achieve filling and sealing. Injection shall be by the method of split spacing unless otherwise approved by the Project Manager / Engineer. Primary holes shall be drilled and injected on centers not exceeding 3 m. Secondary holes, half between the primary holes, will then be drilled and injected. If resin take occurs in the secondary holes, a series of tertiary holes, half way between the secondary and primary holes, shall then be drilled and injected. All holes shall be injected to absolute refusal.
5. Remove drains, injection ports, and excess polyurethane upon completion of resin cure.

This process shall entirely stop the water leakage to a dust dry condition or as directed by the Project Manager / Engineer.

The pump used to inject the polyurethane resin system shall be a two-component positive-displacement-type pump with static mixing head and pressure regulation necessary to control injection pressures while pumping low volumes. The equipment will be subject to approval by the Project Manager / Engineer. The use of single component pumps and/or the injection of pure water followed by injection of pure resin will not be approved.

Polyurethane resin injection methods shall be in accordance with the approved, detailed proposals for injection repair and shall be adjusted to fit the repair situation encountered at site.

9.4.9 Repair of existing open joints

Repair of existing open joints, for example in stilling basins shall be repaired with a mastic product. The mastic shall be flexible, waterproof, easy to apply to existing joints, have good bonding properties to existing mastic and concrete and be appropriate for the climatic conditions at site.

The method of application shall be as recommended by the manufacturer.

The joint shall be cleaned and the existing mastic shall be removed as far as possible and replaced by the new joint mastic. The product and methodology shall be submitted by the Contractor to the Project Manager / Engineer for written approval before the product is ordered from the manufacturer.

9.5 Doweling

9.5.1 Applicable Standards

All doweling works shall be carried out in accordance with the relevant national and international standards governing concrete works, reinforcement steel, rock drilling, anchorage performance and non-shrink grout application. The primary references for this activity include **CIDA SCA/4/1** for concrete works and **CIDA SCA/3/1** for the provisions relating to earthworks and rockworks. Reinforcement steel properties, including strength and ductility,

shall comply with **BS 4449** or **SLS 375**, ensuring that the 25 mm diameter high-yield steel dowel bars meet the required structural performance. Procedures for drilling into bedrock shall follow **ASTM D2113**, which covers the proper methods, equipment selection, and quality control measures for rock drilling.

Requirements for non-shrink grout used to embed the dowels shall conform to **ASTM C1107**, ensuring adequate flowability, strength development, and zero shrinkage during curing. The installed dowels shall be subject to performance verification in accordance with **ASTM E488**, which provides the criteria for pull-out testing and capacity confirmation of anchors installed in rock. All grout mixing, placement and curing processes shall strictly follow the manufacturer's recommendations to maintain material integrity and achieve the required bond strength between the dowel and the bedrock.

9.5.2 Material and Equipment

The doweling works shall utilise 25 mm diameter high-yield reinforcing steel bars conforming to BS 4449/SLS 375, together with a pre-approved non-shrink cementitious grout complying with ASTM C1107. Additional materials include water for cleaning, bonding agents if specified, and formwork or grout retention aids where required. The equipment required for the works consists of a heavy-duty rotary or percussion rock drill suitable for achieving the specified hole diameter and depth, compressed air or water pumps for hole cleaning, grout mixing machines with controlled mixing speeds, grout delivery pumps or hand-operated grouting guns, steel brushes for hole preparation, and bar insertion tools. All tools and machinery shall be in good working condition, calibrated where necessary, and operated by trained personnel to ensure accuracy and safety throughout the installation process.

9.5.3 Setting Out

The dowel locations shall be marked on the exposed bedrock surface strictly in accordance with the structural drawings. The Contractor shall verify that the specified spacing, embedment length, inclination, and minimum edge distance are maintained throughout. If the bedrock surface is uneven, dowel depths shall be adjusted as necessary to achieve the required effective anchorage length. Any such adjustments must be justified and carried out only with the prior approval of the Project Manager / Engineer.

9.5.4 Drilling Into Bedrock

Drilling into the bedrock shall be performed using suitable rotary or pneumatic hammer drills capable of cutting through hard rock formations. The drill holes shall have a diameter of approximately 35-40 mm, providing sufficient grout cover around the 25 mm reinforcing bar. The minimum embedment length shall be 1000 mm, and in cases where the bedrock is fractured or weathered, the embedment length shall be as directed by the Engineer. Drilling shall be undertaken with care to maintain the alignment shown on the drawings, ensuring that the dowels are installed vertically or at the specified angle without over-drilling or damaging the surrounding rock.

9.5.5 Cleaning of Drill Holes

After drilling, each hole shall be thoroughly cleaned to ensure proper bond between the rock, grout, and dowel bar. Cleaning shall be carried out by blowing out the drill dust using compressed air, brushing the interior of the hole with an appropriately sized wire brush, and

performing a second air blow-out. A vacuum cleaning step shall then be applied to remove remaining fine particles. The prepared hole must be clean, dry, and completely free of dust and loose rock fragments prior to grouting.

9.5.6 Placement of Dowel Bars and Grouting

- Grout Preparation

The non-shrink cementitious grout shall be mixed strictly in accordance with the manufacturer's recommendations. Mechanical mixers shall be used to ensure a uniform and consistent mixture. The water content shall be carefully controlled to achieve the required workability while preventing segregation. Only fresh grout shall be used, and re-tempering of partially set grout will not be permitted under any circumstance.

- Grouting Procedure

Each drill hole shall be partially filled with grout to approximately two-thirds of its depth, or alternatively, grout may be pumped from the bottom up where relevant equipment is available. The 25 mm dowel bar shall then be inserted slowly, with a slight rotational movement to eliminate entrapped air and ensure full grout encapsulation. As the bar is inserted, grout shall rise around it to fill the void, and any settlement shall be topped up immediately. The dowels shall be held in position with suitable supports until the grout has adequately set.

- Curing

The grout shall be protected from rapid drying, vibration, and any external disturbance during the curing phase. Curing shall comply with the manufacturer's specified requirements, generally requiring an undisturbed curing period of 24–48 hours depending on ambient conditions.

9.5.7 Inspection and Testing

All aspects of the dowel installation shall be subject to inspection, including verification of hole diameter, depth, cleanliness, dowel alignment, and projection. Grout preparation records, including batch numbers and mixing details, shall be maintained. The completeness of grout encapsulation shall be checked visually or by light tapping. Where specified, pull-out tests shall be performed in accordance with ASTM E488 to confirm the required anchorage capacity. Any dowels found to be defective or inadequately bonded shall be removed and reinstalled only with the Engineer's approval.

9.5.8 Safety Measures

All personnel involved in the doweling works shall wear appropriate personal protective equipment such as gloves, safety goggles, hearing protection, and dust masks. Drilling operations shall be conducted carefully to avoid rock splintering or flying debris. Handling and mixing of grout shall follow the manufacturer's safety data sheets, with special attention to chemical additives and dust inhalation risks.

9.5.9 Environmental Controls

The Contractor shall ensure that rock dust, drill slurry, and grout residues are prevented from entering nearby water bodies or drainage paths. All waste grout, hardened material, and drilling debris shall be collected and disposed of at approved locations. Noise and vibration from

drilling equipment shall be controlled, particularly due to the environmentally sensitive nature of the reservation area of the reservoir.

9.5.10 Records and Documentation

A complete record of doweling works shall be maintained by the Contractor, including details of hole dimensions, dowel installation logs, grout type and batch information, photographs of key activities, and results of any pull-out testing. An as-built layout of all installed dowels shall also be prepared. All records shall be compiled and submitted to the Engineer for verification and final approval.

9.6 MISCELLANEOUS

9.6.1 Clearance of vegetation

Inappropriate vegetative growth and animals are a common concern regarding the maintenance and in some rare cases also regarding the stability of the embankment slopes.

The Contractor shall undertake the following corrective measures:

General

- Trimming of vegetative growth.

Upstream slope

- Removal of dead and smaller trees with trunk perimeter <100 cm including the refurbishment of damaged embankment sections.
- Trimming of large trees with trunk perimeter ≥100 cm which cannot be removed due to the size of the root system.

Downstream slope

- Removal of dead and smaller trees with trunk perimeter <30 cm including the refurbishment of damaged embankment sections.
- Trimming of large trees with trunk perimeter ≥30 cm which cannot be removed due to the size of the root system.

9.6.2 Clearance and restoration of existing toe drain

The Contractor shall clean all areas of the existing surface drain. “Cleaning” refers to the removal of all accumulated sediments, debris, vegetation (including bushes), garbage or any other foreign material and its disposal to the satisfaction of the Project Manager / Engineer and according to the provision presented in the technical specification. The attention of the Contractor is drawn particularly to paragraph “Site Installation, Services and Environmental Obligations”.

The Contractor shall take all precautions to avoid any damage to existing structure. Any destruction caused by the works carried out under this Contract shall be repaired on expense of the Contractor.

9.6.3 Removal of ant mounds

Ant colonies generally consist of a complex series of tunnels that exacerbate existing cracks leading to “softening” of the embankment and thus threatening the structural integrity of an earthen embankment.

To reduce ant populations, the Contractor shall physically destroy visible ant mounds. This can be accomplished by simply knocking down or disturbing mounds with a stick or a shovel. In a second step the anthill including the queens of the colonies shall be completely removed to the satisfaction of the Project Manager / Engineer.

Fumigants and chemical treatment shall be the second step to control ant populations. Both must be purchased and applied by a certified pesticide applicator. The treatment should be tailored to the type of ant species present and the extent of infestation. The Contractor shall contact a professional pest removal company for assistance to achieve a long term solution.

After the ant population has been eradicated the area of the mound shall be be refilled with selected material according to the specifications of this document and as directed by the Project Manager / Engineer.

Section - 7

BILLS OF QUANTITIES

Notes:

In preparation of the bidding document the users are advised to:

(1) Include the VAT Component separately and shall not carry the VAT component to the Form of Bid.

(2) Any discount offered will not be considered for Provisional Sum

A. General Information

Location of the Site

Bowatenna Dam Premises, Naula

Salient Features

Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir

B. Scope of Work

The scope of work includes,

- The complete construction of the retaining wall structure at the left bank of the spillway tail canal of Bowathenna reservoir, including site preparation and setting out, excavation and foundation preparation, disposal of unsuitable materials, construction of the reinforced concrete foundation, base and retaining wall in accordance with the approved drawings and specifications, supply and fixing of reinforcement, formwork, concrete placing, compaction and curing, provision of necessary drainage arrangements including weep holes and drainage layers, backfilling and compaction with approved materials, erosion protection and associated works where required, and all necessary labour, materials, plant, equipment, temporary works, testing, quality control, safety measures and environmental protection measures required for the satisfactory completion and handover of the works.

- Renovation of Rip-Rap of Bowatenna Dam U/S (0+000-0+085) km, including bund formation using well graded aggregate and construction of Rip Rap and all necessary labour, materials, plant, equipment, temporary works, testing, quality control, safety measures and environmental protection measures required for the satisfactory completion and handover of the works.

Miscellaneous Requirements

Where in the course of the execution of the Works and existing foundations, walls, sewers, drains, pipes, wires, cables and other structures, places and things are exposed or are otherwise affected by the execution of the works, they shall be properly maintained and adequately supported and protected. And expedients adopted as will prevent inconvenience and ensure the safety and continuity in use of all services, all to the approval of the Engineer.

The contractor shall provide, erect and maintain suitable and sufficient warning lights, danger signals, signs and barricades, and shall take necessary precautions for the protection of the Works and the safety of the public. Roads closed to traffic shall be protected by effective barricades and suitable diversions provided where necessary. Obstructions shall be illuminated at night form sunset until sunrise.

The contractor shall minimize the pollution of and disturbance to the river, lands and other places on and around the Site. No trees or other vegetation shall be damaged or stripped except to the extent necessary for the works.

Excavated material and other things shall not be tipped or stockpiled near rivers or in places from which they could become dislodge, whether by reason of climatic condition of otherwise. The contractor shall provide, maintain and remove on completion of the Works, setting lagoon and other facilities to minimize pollution due to his operations such as, inter alia, quarrying, aggregate washing, concrete mixing and grouting.

The contactor shall as be required by the Engineer, deliver to the Engineer or the Engineer's Representative a return in such detail and at such intervals as the Engineer may prescribe showing the delivery, consumption and stock of materials, operating hours and fuel consumption of plant, concrete returns, labor returns and similar information.

C. Preamble to the Bill of Quantities

1.1 The Bill of Quantities shall be read in conjunction with all parts of this entire Bidding Document; the Instructions to Bidders, General and Particular Conditions of Contract, Technical Specifications, Drawings, and supplementary information.

1.2 The Bill of Quantities includes lump sum items, unit price items and provisional sum items. The lump sum price quoted will be deemed to be full compensation for completion of work items and paid in full when the work is completed. The quantities given in the Bill of Quantities for the unit price items are estimated and provisional, and are given to provide a common basis for bidding. They are not intended to be the maximum or minimum quantities for payment. The unit prices will be considered full compensation for those work items. The basis of payment will be the actual quantities of work carried out under the provisions of the Contract, measured and valued at the applicable rates and prices in the priced Bill of Quantities.

1.3 The rates and prices bid in the priced Bill of Quantities shall, except as otherwise provided under the Contract, include all construction plant, machinery, equipment, labour, supervision, materials, transport, erection, all necessary testing, maintenance, insurance, overheads, profit, taxes, and duties, together with all general risks, liabilities, and obligations set out or implied in the Contract.

1.4 A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.

1.5 The rates and prices entered in the Bill of Quantities shall be full compensation for completed work and shall have taken full account of all requirements and obligations, covered by all parts of the contract, including but not limited to, the following, unless expressly stated otherwise:

a. All setting out and survey works including Pre and Post Construction Surveys.
b. All additional site surveys and investigations, preparation of field amendment drawings, shop drawings and As-Built drawings.
c. Mobilization and Demobilization of labour, all construction plant and equipment.
d. Establishment, Maintenance and Removal of all temporary facilities (Contractor's and Engineer's) including offices, workshops, houses, labour camps construction and storage yards, Laboratory facilities and Equipment, Transport for staff and labour etc.
e. Labour and all costs in connection therewith, including but not limited to social charges or fringe benefits.
f. The supply of material and goods, storage and costs in connection therewith including delivery to site and handling material within the site/sites.
g. Taking delivery of materials and goods supplied by others, unloading, storage, handling materials within site, and costs in connection therewith.

h. Construction Plant and Equipment and all costs in connection therewith.
i. Fixing, erecting and installing or placing of materials and goods in position, including usual auxiliary material etc.
j. Temporary Works.
k. Complying with any limitations and constraints on the use of the site/sites including coordinating with other Contractor's, with regard to site access, security etc., maintenance of access to households and other users, maintenance of existing roads, waterways etc.
l. Dealing with the existing flow of water from any source including irrigation flow requirement, rainfall and surface runoff, groundwater, wave action and the like. This includes all and any dewatering operations necessary for the execution of the Works as well as coffer damming if required.
m. General obligations, liabilities and risks involved in the execution of the Works set forth or reasonably implied in the documents on which the tender is based.
n. Overheads and profit.
o. Waste of material.
p. Attendance and transport for surveys including provision of boats and survey instruments, sampling and necessary testing carried out by the Engineer.
q. Performing all sampling and necessary testing which are required to be carried out by the Contractor, and supplying results of such tests.
r. Providing required material delivery certificates.
s. Coordination with Regulatory Institutes and all stake holders.
t. Disposal of all waste material.
u. Complying with all requirements in Specifications and Conditions of Contract where separate items have not been provided.

1.6 Where Bill of Quantities items describe the replacement of existing equipment or components, including mechanical and electrical equipment, the equipment removed remains the property of the Employer, unless stated otherwise in the contract documents. The rates entered shall include for delivery of such equipment to the Employer or for disposal if so directed by the Employer.

1.7 The whole cost of complying with the provisions of the Contract (excluding VAT) shall be included in the Items provided in the priced Bill of Quantities, 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.

1.8 General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities.

1.9 Provisional Sums included and so designated in the Bill of Quantities shall be expended in whole or in part or not at all at the direction and discretion of the Engineer and in accordance with the Conditions of Contract. Where the expenditure against a

Provisional Sum is made in the form of a Variation, the payment for the work will be made in accordance with Clause 37 of the Conditions of Contract.

1.10 The method and unit of measurement of completed work for payment shall be in accordance with the method described in the specifications for each item or in the Bill of Quantities. For Lump Sum items, measurements for Interim Payment Certificates shall be based on percentage completion of such item of work or milestone as per the Contractor's proposed schedule of monthly payments, as approved by the Engineer.

D. LIST OF WORKS

Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir

Note :- Please refer to the definition of rectification categories at the end

Item Description	Rectification Category	Work Description
Jungle clearing	D	Clearing vegetation and secondary growths. Disposals of all waste as directed by the Engineer.
Reinforced Concrete Wall	N	Reinforcement Concrete work as per drawing and directed by the Engineer
Gabion wall	N	Gabion wall construction as per the drawing and directed by the Engineer
Earth Filling	N	Filling and Compaction of embankment including benching, forming and sloping as instructions of the engineer.
Protection for earth filling	N	Supplying turf sods to site, preparation and dressing of surface, firmly placing and full turfing to new fill and watering and kept moist till grass root up as directed by the Engineer

Rectification Categories:

D: Demolition and Removal of Existing Entity
DR: Demolition and Removal of Existing Entity and Construction of New Structure.
E: Existing Entity, Improvements no need
N: New Construction
R: Minor Improvements to Existing Entity

E BILLS OF QUANTITIES

SUMMARY

Bill No.	Description	Amount (LKR)
Bill No. 01	Preliminaries	
Bill No. 02	Civil Works (Rehabilitation of Left bank of the spillway Tail Canal of Bowathenna Reservoir)	
Bill No. 03	Civil Works (Renovation of Rip-Rap Bowatenna Reservoir Earth Dam)	
A	**Sub Total 1 (Bill No. 01 + Bill No. 02 + Bill No. 03)**	
B	**Provisional Sum**	**4,075,000.00**
C	**Sub Total 2 (A - B)**	
D	Discount if any (%)	
E	**Sub Total 3 (C - D + B)**	
F	**Total Bid Price, carried to letter of Bid (E)**	
Total Bid Price (Amount in words):		
G	Provisional Sum - 10% Physical Contingencies (0.1 x F)	
H	Provisional Sum - 4% Price Contingencies (0.07 x F)	
I	VAT- **18 %** of Bid Price (F×0.18)	
GRAND TOTAL INCLUDING VAT (F+G+H+I)		
Bill No. 04	Day Works	
J	**Sub Total 5 (F + Bill No. 4) - Bid Price with Day works** (Will be considered only for evaluation purpose)	

Signature of Bidder: ……

Seal:

Bill No. 01 - Preliminaries

Item No:	Description	Unit	Qty	Rate/ (Rs.)	Amount / (Rs)	Rate in words
	Insurance, Security bond and Management Services					
1.1	Allow Provisional sum for providing security bonds and guarantees etc.	Provisional sum			220,000.00	
1.2	Allow Provisional sum for providing a performance bond.	Provisional sum			180,000.00	
1.3	Allow Provisional sum for insurance of property, material and works at site.	Provisional sum			110,000.00	
1.4	Allow Provisional sum for third party insurance.	Provisional sum			110,000.00	
1.5	Allow Provisional sum for insurance against accidents and injury to workmen.	Provisional sum			110,000.00	
1.6	Contract management services.	Lump Sum				
1.7	Protecting & safe guard the workers, materials & plants against damage, trespasses or theft.	Lump Sum				
	General Site Infrastructure and Facilities					

1.8	Allow for carrying out all necessary general surveying works by the Contractor, including site reconnaissance, establishment temporary and permanent Bench Marks (BM), complete with all equipment, labor, materials, and records required for accurate execution of the works, in accordance with the Engineer's instructions."	Lump Sum		
1.9	Preparation of necessary temporary roads for construction work.	Provisional sum	500,000.00	
	Infrastructure and Facilities for the Employer and the Engineer			
1.10	Preparation, operation and maintenance of Employer's and Engineer's site office including furnishing fittings, office equipment, site facilities, etc.	Provisional sum	1,000,000.00	
1.11	Employers share of Dispute Adjudication Board (DAB) expenses.	Provisional Sum	400,000.00	
	Contractor's Site Facilities			
1.12	Preparation, operation and maintenance of contractor's site facilities, including the construction of temporary camps, site office, yards, buildings, workshops, infrastructure and services as specified(Ensuring the inclusion of all required sanitary amenities is crucial) with the removal and restoration at the end of the construction as directed by the Engineer.	Lump Sum		
	Health and Safety			
1.13	Allow Provisional Sum to provide and maintain health, safety & environmental standards throughout the period of construction as specified.	Provisional Sum	500,000.00	

	Quality,Standards and Progress			
1.14	Provision of all progress reports and photographs in accordance with the Specifications.	Provisional sum	120,000.00	
1.15	Provision of as built drawings (5 copies) as directed by the Engineer.	Provisional sum	125,000.00	
1.16	Provision of the any special testing in accordance with the specifications.	Provisional sum	200,000.00	
	Total Amount of Bill No. 1 carried to Summary			

Bill No. 02 – Civil Works (Rehabilitation of Left bank of the spillway Tail Canal of Bowathenna Reservoir)

Item No:	Description work with specification	Unit	Qty	Rate Rs Cts.	Amount Rs Cts.	Remarks
2.1	**EARTH WORK**				-	
2.1.1	Common excavation, including loading, hauling & stacking pile and disposal of surplus excavated material to an Engineer-approved location, with all lifts, labour, plant and incidentals, complete as directed by the Engineer including any height of lift and any haul.	m^3	357.00			
2.1.2	Furnishing ,placing ,spreading ,watering and compacting earth as per Engineers instruction including any haul and any height of lift (by machinery). Approved earth filling material shall be placed in layers not exceeding the specified compacted thickness and compacted to the density specified by the Engineer/Technical Specification.	m^3	1820.00			
2.1.3	Excavation of hard rock by controlled blasting, including use of approved chemical rock blasting agents where necessary, breaking, removal, loading, hauling and disposal, complete as directed by the Engineer including applicable safety requirements.	m^3	70.00			
2.2	**AGGREGATE LAYER**				-	
2.2.1	Supplying well graded coarse aggregate (size between 25mm- 75mm),lifting ,placing ,watering & compacting by machinery including transport for use of aggregate filter layer behind the retaining wall ,as directed by the Engineer.	m^3	121.000			
2.3	**CONCRETE WORK**				-	

2.3.1	Cement Concrete Grade 15 (40 mm aggregate) hoisting ,placing in position as directed (curing as specified, providing expansion / construction joint etc..,&making good after removal of formwork).Form works are paid separately .	m^3	13.00			
2.3.2	Grade 15 (1:3:6) Plum Concrete using 40mm aggregate with 20% plums (rubble stones 150-225mm) embedded. Rate to include for any haul and any height of lift,placing plums, compacting, and curing using concrete mixer.	m^3	10.00			
2.3.3	Cement Concrete Grade C16/20 (1:2:4-20mm) hoisting, placing in position including vibrating as directed (curing as specified ,providing expansion/ construction joint etc.,&making good after removal of formwork). Formworks are paid separately.	m^3	10.00			
2.3.4	Cement Concrete Grade 30 hoisting, placing in position including vibrating excluding formwork as directed (curing as specified, providing expansion/ construction joint etc., & making good after removal of form work).	m^3	253.00			
2.4	**FORMWORK**				-	
2.4.1	Providing, erecting, supporting, maintaining and removing plywood formwork to concrete surfaces, including all necessary supports, ties, release agent, alignment and making good after removal, complete as specified and approved by the Engineer.	m^2	525.00			
2.5	**REINFORCEMENT**				-	

2.5.1	Supply, cut, bend and fix Tor steel reinforcement bars, including binding wire, spacers, chairs, laps and all necessary accessories, labour and equipment, complete as per drawings and Engineer's instructions.	kg	22678.0			
2.5.2	Supply, transport, cut, bend and fix Mild steel reinforcement bars, including binding wire, spacers, chairs and all laps, complete as per drawings and Engineer's instructions.	kg	296.00			
2.6	**GABION WORK**				**-**	
2.6.1	Supplying and placing PVC coated Gabion boxes (Mesh Wire Dia. 2.7 ,selvadge wire dia.3.4 Lacing wire dia. 2.2), including 40% 6" x 9" & 60% 6" x 4" rubble packing ,placing (Diaphrams 1.0 m centers) and arranging along the channal for 2.0 m × 1.0 m × 1.0 m Gabion box.	Nos	16.00			
2.6.2	Supplying and placing PVC coated Gabion boxes (Mesh Wire Dia. 2.7 ,selvadge wire dia.3.4 Lacing wire dia. 2.2), including 40% 6" x 9" & 60% 6" x 4" rubble packing ,placing (Diaphrams 1.0 m centers) and arranging along the channal for 1.5 m × 1.0 m × 1.0 m Gabion box.	Nos	32.00			
2.7	**MISCELLANEOUS**				**-**	
2.7.1	Supply and fixing of 32 mm dia. Tor steel dowels, max. 2000 mm long, including drilling, cleaning of drilled holes, grouting and all necessary materials, labour, tools and equipment, complete as per drawings, specifications and Engineer's instructions. (Min.Ground-embedded dowel length: 1000 mm)	Nos.	126.00			

2.7.2	Furnishing , laying and jointing 160 mm diameter PVC pipe with holes drilling and perforated drainage pipes, complete in accordance with the drawings, specifications and Engineer's instructions.	m	30.00			
2.7.3	Supplying and laying non-woven geotextile filter fabric, T.S.30 grade or approved equivalent, behind gabion retaining walls, minimum mass 155 g/m², tensile strength 12 kN/m, CBR puncture resistance 1,750 N, and suitable filtration/permeability characteristics, including surface preparation, cutting, minimum 300 mm overlaps, fixing, protection from damage, wastage and all incidental works, complete to the required lines and levels and to the Engineer's approval.2	m^2	249.00			
2.7.4	Supply, fabricate and install steel handrail complete with 75 × 75 × 3 mm thick steel box bars, 12 × 12 × 1.6 mm thick steel box bars, 50 ×50 x 3.0 mm thick steel bars, 200 × 200 × 12 mm thick steel base plates, 12 mm diameter 110 mm long steel anchor bolts, including approved chemical anchoring system for fixing to the existing concrete structure, and all necessary cutting, welding, drilling, chemical anchoring, fixing, preparation and accessories, complete in accordance with the drawings and Engineer's instructions. The rate shall include application of one coat of zinc phosphate metal primer and two coats of approved anticorrosive paint, including all surface preparation, materials, labour, tools, equipment, chemical anchor materials and accessories, complete as specified in the drawings and to the satisfaction of the Engineer.	m	30.00			
2.7.5	Furnishing turf ,transporting & planting using pegs includingwatering till take roots,Turf species/type shall be approved by the Engineer.	m^2	573.00			

2.7.6	Provisional Sum for rehabilitation/modification of existing drain, including demolition/removal of defective sections, reconstruction, connection to proposed drainage system and all associated works, as directed by the Engineer.	PS			500,000.00	
2.8	**CONSTRACTION / EXPANSION JOINT**					
2.8.1	Supplying & fixing of 10 mm thick compressible joint filler board (expanded polystyrene or approved equivalent)	m^2	41.00			
	Total Amount of Bill No. 2 carried to Summary					

Bill No. 03 – Civil Works (Renovation of Rip-Rap Bowatenna Reservoir Earth Dam)

Item	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)	Source of Rate & Rate No.
3.1	Piling Available Rubble (Excisting rip-rap area rubble)	Cu.m	33.000			
3.2	Stripping top soil (approx 1.5m lift) and removing debris by machinery. Rate to include for loading and transporting debris off-site as directed by the Engineer.	m3	146.625			
3.3	Excavation from borrow area , loading, and transporting by machinery any height of lift and any haul. Rate to include for spreading, watering, compacting, and forming slopes ,work complete as directed by the Engineer.	m^3	219.938			
3.4	Supplying and laying geotextile layer behind gabion retaining walls type T.S. 30.	Sq.m	977.500			
3.5	Forming, spreading, and grading Tank Bund to required profile by machinery. Rate to include for watering and compaction. Rate excludes cost of supplying filling material, transport of material, and transport of machinery . Work complete as directed by the Engineer.	m^3	195.500			
3.6	Supplying of Coarse aggregate 3/4" (20mm) (Rate include loading and unloading).	m^3	65.167			
3.7	Supplying of Coarse aggregate 1"(25mm) (Rate include loading and unloading).	m^3	65.167			
3.8	Supplying of Coarse aggregate 1 1/2" (37.5mm) (Rate include loading and unloading).	m3	65.167			

3.9	Transport of Metal, Rubble, Sand, Gravel, Earth up to any haul	km/m^3	195.500			
3.10	Dry rubble packing (rubble size over 225mm)	m^3	439.875			
3.11	Supplying of Rubble (0.225-0.450) for Bowatenna earth dam.	Cubes	143.772			
	Total Amount of Bill No. 2 carried to Summary					

Bill No. 03 - Day Works

The day works rates quoted for labour shall be the total amounts payable and shall include all costs such as allowances for complying with the Labour Laws, insurance, accommodation, travelling time, overtime compensation, use and maintenance of small tools of trade, supervision, overhead and profit. Only the actual time engaged upon the work will be paid for.

Item No.	Description	Unit	Qty	Rate (LKR)	Amount (LKR)	Rate in Words
1.1	**Labour**					
1.1.1	Equipment Operator(Semi Skilled)	Hrs	250.00			
1.1.2	Skilled Labour	Hrs	250.00			
1.1.3	Semi- skilled Labour	Hrs	350.00			
1.1.4	Unskilled Labour	Hrs	750.00			
1.2	**Material**					
1.2.1	Cement	50 kg bags	25.00			
1.2.2.	River Sand	Cube	10.00			
1.2.3.	Rubble 6" x 9"	Cube	25.00			
1.2.4	Coarse aggregate 3/4" (20mm)	Cube	10.00			
1.2.5	Coarse aggregate 1"(25mm)	Cube	10.00			
1.2.6	Tor Steel Reinforcement	MT	0.25			
1.2.7	Mild Steel Reinforcement	MT	0.125			
1.2.8.	Timber Plywood Sheet (15mm thick) (4'x8')	Nos	25.00			

1.3	**Contractor's Equipment**					
1.3.1	Dozer (Crawler Tractor)D-4 D-41 (80-100Hp)	Hrs	10.00			
1.3.2	Crawler Excavator PC200 or equivalent	Hrs	15.00			
1.3.3	Backhoe Loader (90 Hp) & 2WD	Hrs	25.00			
1.3.4	Wheel loader 1.4- 1.7 cu..	Hrs	25.00			
1.3.5	Vibrating Roller 0.5 - 1.0 ton	Hrs	17.00			
	Haulage Vehicles					
1.3.6	Tipper 1 Cube (max. distance 75km per day)	Days	5.00			
1.3.7	Tractor& Trailor 0.75 Cube	Days	5.00			
	Cranes					
1.3.8	Mobile crane, 25 T capacity	Hrs	25.00			
	Concrete Equipment					
1.3.9	Concrete mixer, 400 L	Hrs	30.00			
	Miscellaneous Equipment					
1.3.10	Water pump 4" dia (With Operator)	Hrs	60.00			
	Total carried to Bill No. 04					

Section - 8

DRAWINGS

Section - 9

STANDARD FORMS

FORM OF BID SECURITY

[this Guarantee form shall be filled in accordance with the instructions indicated in brackets]

---------- [insert issuing agency's name, and address of issuing branch or office]

Beneficiary: ***Director General, Mahaweli Authority of Sri Lanka, 500, T.B. Jaya Mawatha, Colombo 10***

Date: ---------- *[insert (by issuing agency) date]*

BID GUARANTEE No.: ---------- *[insert (by issuing agency) number]*
We have been informed that ---------- *[insert (by issuing agency) name of the Bidder]* (hereinafter called "the Bidder") has submitted to you its bid dated ---------- *[insert (by issuing agency) date]* (hereinafter called "the Bid") for the execution of ***Rehabilitation of Left Bank of the Spillway Tail Canal and renovation of Rip Rap at (0+000 – 0+085) km of Bowathenna Reservoir,*** under Invitation for Bids No. ***DDG/TS/CON/HW/RANT/RD/53*** ("the IFB").

Furthermore, we understand that, according to your conditions, Bids must be supported by a Bid Guarantee.

At the request of the Bidder, we ---------- *[insert name of issuing agency]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of ---------- *[insert amount in figures]* ---------- *[insert amount in words]*) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

(a) has withdrawn its Bid during the period of bid validity specified; or
(b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB") of the IFB; or
(c) having been notified of the acceptance of its Bid by the Employer/Purchaser 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 ITB.

This Guarantee shall expire: (a) if the Bidder is the successful bidder, upon our receipt of copies of the Contract signed by the Bidder and of the Performance Security issued to you by the Bidder; or (b) if the Bidder is not the successful bidder, upon the earlier of (i) the successful bidder furnishing the performance security, otherwise it will remain in force up to ---------- *(insert date)*

Consequently, any demand for payment under this Guarantee must be received by us at the office on or before that date ----------

Annex - 01

Check List for Bidders

Bidders are advised to fill the following table:

ITEM	YES (tick)	REFERENCE
Form of Bid		
Addressed to the Employer?		
Completed?		
Signed?		
Bid Security		
Submitted in the given format?		
Qualification Information		
All relevant information completed?		
Signed?		
Addendum		
Contents of the addendum (if any) taken into account?		
Other		
Affidavit completed as Schedule 12?		
Liquid Assets and/or Credit Facilities		
Construction Programme		
CV of personnel to be engaged in construction management services and key personals to be engaged in this contract.		
List of Resources intended to be deployed for this tender		
BID package		
All the documents given in ITB Clause 12 enclosed in the original and copy?		