

REPUBLICA DOMINICANA

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COMISION NACIONAL DE POLITICA ENERGETICA
INSTITUTO NACIONAL DE RECURSOS HIDRAULICOS
CORPORACION DOMINICANA DE ELECTRICIDAD

RIO YUBOA HYDROELECTRIC PROJECT
CONSTRUCTION OF CIVIL WORKS AND
INSTALLATION OF ELECTRO - MECHANICAL EQUIPMENT
IFB NO. PCH-2-85
LOT II - VOLUMEN I

FINANCED BY AGENCY FOR INTERNATIONAL DEVELOPMENT (US -AID / DR)
TECHNICAL ASSISTANCE BY HARZA ENGINEERING COMPANY INTERNATIONAL S.A.

JANUARY 1986

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INSTITUTO NACIONAL DE RECURSOS HIDRAULICOS
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Traducción
de Cortesia

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OF ELECTRO - MECHANICAL EQUIPMENT

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FINANCED BY AGENCY FOR INTERNATIONAL DEVELOPMENT (US-AID/DR)
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NOVEMBER 1985

CONTRACT DOCUMENTS

Lot II

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PART I
INSTRUCTIONS TO BIDDERS

INVITATION FOR BIDS NO. PCH 2-85
ISSUED NOVEMBER, 1985

1.01 Introduction

The Corporacion Dominicana de Electricidad, hereafter called the CONTRACTING AGENCY, invites experienced firms of civil engineering contractors to submit bids for the construction of the Rio Yuboa Hydroelectric Project.

Only prequalified firms of civil engineering contractors invited by the CONTRACTING AGENCY to submit bids for the execution of the Work described in these Documents may do so. Firms invited by the CONTRACTING AGENCY to submit bids are under no obligation to do so. Bidders will not be reimbursed for any costs incurred in connection with the preparation and submission of their bids and in any subsequent visits to the CONTRACTING AGENCY's and/or the ENGINEER's offices prior to award of the Contract.

These Instructions to Bidders are intended to aid bidders in the preparation of their bids. The periods named in these Instructions to Bidders shall be consecutive calendar days, except that, if a due date falls on a local holiday, the due date will be the next workday.

1.02 Bid Opening

The original and four completed copies of the bid must be delivered in person or sent by registered mail to the following address:

Corporacion Dominicana de Electricidad
Ave. Independencia Esq. Fray Cipriano de Utrera
Centro de los Heroes, Apartado Postal 1428 - TLXHIDRCDE 3460581
Santo Domingo, Dominican Republic
Attention: Direccion de Desarrollo Hidroelectrico

All documents must be enclosed in sealed packages endorsed on the outside with the words "IFB No. PCH-2-85. BID DOCUMENTS Rio Yuboa Hydroelectric Project, Do not open before ~~JUNE 23~~ 1986" and must be delivered not later than 12 noon local time on -----, 1986. The bids will be opened at that time at the address shown above in the presence of the public. Only the Bidder's names and the total Bid Prices will be announced.

1.03 Late Bids

Bidders will be held responsible for ensuring that their bids are received in accordance with the instructions stated herein and a late bid will not be considered even though it became late as a result of circumstances beyond the bidder's control. A late bid will be considered only if the sole cause of its becoming a late bid was attributable to the CONTRACTING AGENCY, its employees or agents.

1.04 Modification of Bids

Any bidder has the right to withdraw, modify, or correct its bid after it has been delivered to the CONTRACTING AGENCY, provided the request for such withdrawal, modification, or correction together with full details of such modification or correction is received by the CONTRACTING AGENCY at the address given above by letter, telegram, or telex before the time set for opening bids. The original bid as amended by such communication will be considered as the bidder's offer. The CONTRACTING AGENCY may ask any bidder for a clarification of its bid. Clarifications which are not material modifications and do not change the bid price may be accepted. However, no bidder will be permitted to alter its bid price after bids have been opened. Bids must remain valid for 150 days and may not be withdrawn except with the written permission of the CONTRACTING AGENCY.

1.05 Contents of Bids

Bidders must submit bids for the whole of the works. Bids submitted for separate sections only or bids which are incomplete will not be considered.

Bidders are required to complete the following in an original and four copies:

- (1) Form of Contract and Appendix;
- (2) The Bid Form

Bidders shall fill in the Unit Price for each item of work in the schedule of prices in the Unit Price column in figures. For each item, the quantity given in the "Estimated Quantity" column shall be multiplied by the Unit Price, and the result entered in the "Total Amount" Column. In any case of discrepancy between a Unit Price and a Total Amount the Unit Price will be taken as correct and the Total amount adjusted accordingly. Where in the "Unit Price" column the word "Total Price" is stated the sum shall be entered in the "Total Amount" column by the bidder. Any item against which no Unit Price or sum is quoted will not be paid for by the employer when the work described therein is executed and it shall be deemed to be covered by other Unit Prices and sums in the schedule of prices.

No alterations shall be made to the forms provided which shall be completed in indelible ink or typed print. The completed forms shall have no interlineations or erasures except those necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

One original copy of the completed bid is to be clearly marked "ORIGINAL BID" and the other completed copies of The Bid are to be marked "COPY OF BID." In case of any discrepancy, the copy marked "ORIGINAL BID" shall govern.

(3) Bid Bond

Bids must be accompanied by a bid bond in the amount of TEN(10) percent of the bid price. No bid will be considered unless it is so secured.

The bid bond provided by unsuccessful bidders will not be repaid or discharged until the expiration of 180 days from the day of bid opening or until such earlier time as a bid shall have been accepted by the CONTRACTING AGENCY and a Performance Bond shall have been duly provided by the bidder whose bid is

- 11'

accepted.

The bond provided by the bidder whose bid is accepted shall be discharged when the Performance Bond has been duly entered into and executed.

All correspondence, documents, Contract, etc. in connection with the bid and the Contract is to be in the Spanish language.

1.06 Signature of Bid

The Bid must be signed by one duly authorized to do so. A bid submitted by a corporation must bear the seal of the corporation and be attested by its secretary. Associated companies or joint ventures shall jointly designate in one power-of-attorney persons authorized to obligate all the companies of the association or joint venture. A bid submitted by a joint venture must be accompanied by the document of formation of the joint venture, duly registered and authenticated by a Notary Public, in which is defined precisely the conditions under which it will function, its period of duration, the persons authorized to represent and obligate it, the participation of the several firms forming the joint venture, the principal member of the joint venture and address for correspondence for the joint venture. Bidders are advised that the joint venture agreement must include a clause stating that the members of the joint venture are severally and jointly bound.

1.07 Addenda to the Invitation for Bids

If for any reason prior to bid opening it becomes necessary to modify the Bid Documents, an Addendum will be issued to and be binding on all bidders. Receipt of all Addenda shall be acknowledged by bidders but nonacknowledgement of receipt shall not relieve the bidders of being bound by such Addenda provided the Addenda were communicated to bidders by telex or registered mail. Addenda will be numbered consecutively commencing with No. 1 and bidders are required to insert the appropriate numbers in the space provided on the Form of Tender. Should any bidder have questions to ask or should it have any doubt about the meaning of the Bid Documents, it should refer them in writing to the CONTRACTING AGENCY not later than 16 days before the date set for opening of bids.

1.08 Site Visits

Visits to the site should be arranged through the CONTRACTING AGENCY.

11.09 Currency and Payment

Bidders shall quote prices in the schedule of prices in U.S. dollars and in local currency. The total bid price will be calculated by converting local currency to U.S. dollars at the rate quoted by the Central Bank of the Dominican Republic on the date of bid opening.

Any fees to agents in the Dominican Republic will be payable in local currency.

Dollar payments for items quoted in dollars in the schedule of prices will be paid under a Letter of Commitment issued through the U.S. Agency for International Development. Payment will be made by the CONTRACTING AGENCY for items quoted in local currency in the Schedule of Prices.

1.10 Acceptance of Bids

The contract will be awarded to the lowest responsive, responsible bidder. A "responsive" bid is one that complies with all the terms and conditions in the IFB without material modification. A material modification is one which affects in any way the price, quality, scope, or completion date of construction services or which limits in any way any responsibilities, duties, or liabilities of the bidder or any rights of the CONTRACTING AGENCY or AID as any of the foregoing have been specified or defined in the IFB. Bidders may not modify nonresponsive bids after bid opening in order to make them responsive. However, the CONTRACTING AGENCY may request a bidder to clarify its bid as long as no material modification is made.

The CONTRACTING AGENCY reserves the right to reject any or all bids and to waive minor informalities in the bids received if it appears in the CONTRACTING AGENCY's best interests to do so.

Failure on the part of the successful bidder to provide a Performance Bond in accordance with the Conditions of Contract shall be sufficient grounds for the annulment of the award. The

Traducción
de Cortesía

IFB No. PCH 2-85 LOT II

award may then be made to another bidder or the CONTRACTING AGENCY may call for new bids.

All recipients of the Bid Documents (whether they submit a bid or not) shall treat the details of the Bid Documents as private and confidential.

The Bid of any bidder which does not conform to the foregoing instructions may be rejected.

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PART II BID FORM

Section 2.1 - PROPOSAL

CONTRACT FORM

(Note: The Appendix forms part of the bid)

To Corporacion Dominicana de Electricidad
Ave. Independencia Esq. Fray Cipriano de Utrera
Centro de los Heroes
Apartado Postal 1428 - TLXHIDRCDE 3460581
Santo Domingo, Dominican Republic
Attention: Direccion de Desarrollo Hidroelectrico

Gentlemen,

A. Having examined the Drawings, Conditions of Contract, Specifications, and Schedule of Prices for the execution of the Work, we, the undersigned, offer to execute, complete, and maintain the whole of the said Works in conformity with the Drawings, Conditions of Contract, and Specifications, for the sum of

(\$ -----)

B. We undertake, if our Bid is accepted, to commence work under the contract within 10 days of receipt of both the confirmation that a Letter of Credit has been opened and the Notice to Proceed from the CONTRACTING AGENCY and to complete and deliver the whole of the Works comprised in the Contract within 560 days calculated from the last day of the aforesaid period in which the work is to commence.

C. If our bid is accepted we will, if required, obtain the guaranty of an Insurance Company or Bank or other sureties (to be approved by you) to be jointly and severally bound with us in a sum not exceeding 100 percent of the above-named sum for the due performance of the Contract under the terms of a Bond to be approved by you.

D. We certify that we are not included on any list of suspended, debarred, or ineligible bidders used by AID.

E. (Applicable only if the Bidder is incorporated or legally organized in the United States.) We certify that we are

in compliance with our equal opportunity obligation under Executive Order 11246, as amended, and regulations and orders issued thereunder.

F. We certify that we meet the nationality requirements set forth in the clause 5.2-21 of the contract entitled "Nationality, Source, and Cargo Preference."

G. We agree to abide by this Bid for the period of 150 days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

H. 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.

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

J. We acknowledge receipt of Addenda ___ through ___ to the Invitation for Bids as originally issued.

Appendix

Amount of Performance Bond	100%
Minimum Amount of Third Party Insurance	-----
Period for commencement of work on site from CONTRACTING AGENCY's order to commence	10 days
Time for completion	560 days
Amount of Liquidated Damages	U.S.\$100 per day*
Limit of Liquidated Damages	U.S.\$ 180,000.00*
Period of Maintenance	----- days
Percentage for Adjustment of Provisional Sums	-----

Dated this _____ day of _____ 19 _____

Signature _____ in the capacity of _____

duly authorized to sign bids for and on behalf of _____

(BLOCK CAPITALS)

Witness _____

Address _____

Occupation _____

* Or its equivalent in RD\$

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PART II - BID FORM

Section 2.2 - SCHEDULE OF PRICES

2.2-01 General Remarks Regarding Schedule of Prices.

A. The quantities set forth in the Schedule of Prices are believed to represent the character of the work to be carried out and are given for the purpose of enabling the CONTRACTING AGENCY to compare tenders on an equal basis. There is no guarantee to the Contractor that it will be required to carry out the quantities of work indicated under any one particular Item or group of items in the Schedule of Prices, although in the Contract as a whole the quantities are believed to represent the overall value of the work to be carried out.

B. The prices inserted in the Schedule of Prices will be used for valuing the work executed and the ENGINEER will measure the whole of the Works executed in accordance with this Contract.

C. The prices inserted in the Schedule of Prices are to be the full inclusive costs of the Works described under the Items, complete in place and in accordance with the Specifications, including all costs and expenses which may be required in and for the construction of the Works described, together with any temporary works and installations which may be necessary and all general risks, liabilities and obligations set forth or implied in the documents on which the bid is based.

D. The brief description of the Items given in the Schedule of Prices are purely for the purpose of identification and in no way modify or supersede the detailed descriptions given in the Conditions of Contract or Specifications. When pricing Items, reference is to be made to the Conditions of Contract and Specifications for the full directions and descriptions of work and materials.

PART II - BID FORM.
SECTION 2.2 - SCHEDULE OF PRICES

2-2-02 Schedule of Prices
IFB No. PCH-2-85
Page: 1 of 8

Name of Bidder

Item No.	Description	Estimated Quantity	Unit	Unit Price		Total Amount	
				RD \$	US \$	RD \$	US\$
1	Mobilization, Demobilization and Miscellaneous Work						
1.1	Mobilization		L.S.				
1.2	Demobilization		L.S.				
2	Care and Removal of Water						
2.1	Care and Removal of Water		L.S.				
3	Excavation, Fill and Backfill						
3.1	Common Excavation	30,486	CUM				
3.2	Rock Excavation	860	CUM				
3.3	General Fill Material	14,210	CUM				
3.4	Filter Material	275	CUM				
3.5	Riprap Class A	25	CUM				
3.6	Riprap Class B	400	CUM				
3.7	Riprap Class C	330	CUM				
3.8	Riprap Class D	280	CUM				
3.9	Riprap Bedding	550	CUM				
3.10	Powerhouse Yard Surfacing	24	CUM				

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IFB NO. PCH-2-85 LOT II

PART II - BID FORM
SECTION 2.2 - SCHEDULE OF PRICES

2-2-02 Schedule of Prices
IFB No. PCH-2-85
Page: 2 of 8

Name of Bidder

Item No.	Description	Estimated Quantity	Unit	Unit Price		Total Amount	
				RD \$	US \$	RD \$	US\$
3.11	Access Road and Yard Fill	420	CUM				
3.12	Grass Cover	127,000	Sqm				
3.13	Stone Masonry	850	CUM				
4	Drilling and Nchoring						
4.1	Rock Anchors	30	LINm				
4.2	Anchor Bars	250	LINm				
4.3	Drain Holes	50	LINm				
5	Concrete Work						
5.1	Spillway Concrete	900	CUM				
5.2	Low Level Outlet, Desilting Basin and Forebay Concrete	1,500	CUM				
5.3	Flume and Box Culvert Concrete	470	CUM				
5.4	Penstock Support Concrete	50	CUM				

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2
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IFB NO. PCH-2-85 LOT II

PART II - BID FORM
SECTION 2.2 - SCHEDULE OF PRICES

2-2-02 Schedule of Prices
IFB No. PCH-2-85
Page: 3 of 8

Name of Bidder

Item No.	Description	Estimated Quantity	Unit	Unit Price		Total Amount	
				RD \$	US \$	RD \$	US\$
5.5	Powerhouse Concrete	370	CUM				
5.6	Lean Concrete	250	CUM				
5.7	Miscellaneous Concrete	50	CUM				
5.8	Canal Lining Concrete	4,300	Sqm				
5.9	Steel Reinforcement	123,000	Kgs				
5.10	Welded Wire Fabric	9,300	Kgs				
5.11	Culvert Pipe 12 In. D.	10	LINm				
5.12	Culvert Pipe 24 In. D.	10	LINm				
5.13	Culvert Pipe 36 In. D.	30	LINm				
5.14	Culvert Pipe 48 In. D.	10	LINm				
5.15	Culvert Pipe 60 In. D.	250	LINm				
5.16	Underdrain Pipe 4" In. D.	1,400	LINm				
6	Yardwork, Roadwork and River Crossings						
6.1	Road Surfacing	600	Sqm				

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IFB NO. PCH-2-85 LOT II

PART II - BID FORM
SECTION 2.2 - SCHEDULE OF PRICES

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2-2-02 Schedule of Prices

IFB No. PCH-2-85

Page: 4 of 8

Name of Bidder

Item No.	Description	Estimated Quantity	Unit	Unit Price		Total Amount	
				RD \$	US \$	RD \$	US \$
7	Penstock						
7.1	Penstock		L.S.				
8	Metalwork						
8.1	Trashrack, Supporting Frame and Guides at Intake		L.S.				
8.2	Trashrack, Supporting Frame and Guides at Penstock		L.S.				
8.3	Sealing Frame and Guides for Bulkhead at Intake		L.S.				
8.4	Sealing Frame and Guides for Bulkhead in Low Level Outlet Sluice		L.S.				
8.5	Sealing Frame and Guides for Bulkhead at Forebay		L.S.				
8.6	Powerhouse Crane Rails, Mounting hardware and Accessories	1,000	Kgs				
8.7	Cast Iron Frames, Covers and Gratings	2,000	Kgs				

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IFB NO. PCH-2-85 LOT 11

PART II - BID FORM
SECTION 2.2 - SCHEDULE OF PRICES

Traducción
de Cortesía

2-2-02 Schedule of Prices
IFB No. PCH-2-85
Page: 5 of 8

Name of Bidder

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Item No.	Description	Estimated Quantity	Unit	Unit Price		Total Amount	
				RD \$	US \$	RD \$	US\$
8.8	Miscellaneous Metalwork	500	Kgs				
8.9	Barbed Wire Fence	2,000	LINm				
8.10	Chain Link Fence	100	LINm				
9	Architectural Work						
9.1	Concrete Block Masonry (includes Reinforcing, Mortar, Dovetail Anchor, Anchor Slot and Lintels)	100	Sqm				
9.2	Water Proofing Topcoat for Roof	105	Sqm				
9.3	Aluminum Windows	54	Sqm				
9.4	Aluminum Doors	2	Each				
9.5	Rolling Steel Door	1	Each				
10	Painting						
10.1	Painting Interior Walls of the Powerhouse	140	Sqm				
11	Powerhouse Crane						
11.1	Powerhouse Crane	1	L.S.				

IFB NO. PCH-2-85 LOT II

PART II - BID FORM
SECTION 2.2 - SCHEDULE OF PRICES

2-2-02 Schedule of Prices

IFB No. PCH-2-85

Page: 6 of 8

Name of Bidder

Item No.	Description	Estimated Quantity	Unit	Unit Price		Total Amount	
				RD \$	US \$	RD \$	US\$
12	Piping and Plumbing						
12.1	Piping	1,800	Kgs				
12.2	Service Sink	1	Each				
12.3	Water Closet	1	Each				
12.4	Lavatory	1	Each				
12.5	Sanitary Sewer Line, Septic Tank and Septic Field Lines		L.S.				
13	Ventilation Fans and Louvers						
13.1	Ventilating Work		L.S.				
14	Gates, Frames, Guides and Hoists						
14.1	Low Level Outlet Sluice Gate at Spillway, Frame Crank Operated Floor Stand and Appurtenances		L.S.				
14.2	Intake Control Sluice Gate, Frame, Crank Operated Floor Stand and Appurtenances		L.S.				

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for

IFB NO. PCH-2-85 LOT II

PART II - BID FORM
SECTION 2.2 - SCHEDULE OF PRICES

Traducción
de Cortesia

2-2-02 Schedule of Prices
IFB No. PCH-2-85
Page: 7 of 8

Name of Bidder

Item No.	Description	Estimated Quantity	Unit	Unit Price		Total Amount	
				RD \$	US \$	RD \$	US \$
14.3	Sediment Sluice Gate Near Intake, Frame, Crank Operated Floor Stand and Appurtenances		L.S.				
14.4	Sediment Sluice Gate in Desilting Basin, Frame, Crank Operated Floor Stand and Appurtenances		L.S.				
14.5	Control Sluice Gate at Penstock Forebay, Frame, Crank Operated Floor Stand and Appurtenances		L.S.				
14.6	Portable; Gasoline Powered Gate Hoist Actuators		L.S.				
14.7	Sediment Sluice Gate at Penstock Forebay, Frame, Crank Operated Floor Stand and Appurtenances		L.S.				
15	General Electric Work						
15.1	Electrical Metallic Conduits, Boxes, Fittings, and Hardware		L.S.				
15.2	Insulated Wire and Cable, including Connecting and Terminal Equipment		L.S.				

PART II - BID FORM
SECTION 2.2 - SCHEDULE OF PRICES

2-2-02 Schedule of Prices
IFB No. PCH-2-85
Page: 8 of 8

Name of Bidder

Item No.	Description	Estimated Quantity	Unit	Unit Price		Total Amount	
				RD \$	US \$	RD \$	US\$
15.3	Cable Trays and Supports		L.S.				
15.4	Grounding System		L.S.				
15.5	Lighting System		L.S.				
16	Transportation, Storage and Installation of CONTRACTING AGENCY Furnished Equipmet						
16.1	Transportation, Storage and Installation of CONTRACTING AGENCY Furnished Equipment		L.S.				
17	Sub-Transmission and Distribution Lines						
17.1	Contractor Furnished Materials, Construction and Installation of Distribution Lines		L.S.				

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PART II BID FORM

SECTION 2.3 CONSTRUCTION SCHEDULE

The construction schedule shall be submitted on the Drawing PCH-2-85-150, "Construction Schedule" which is included in Volume II, "Bid Drawings".

The construction schedule shall show the order in which the Bidder proposes to design, furnish, construct, fabricate and erect the principal components of the project, the date on which he will start the various features (including procurement of materials, plant, and equipment), and the contemplated dates for completing same. For the purpose of preparing the construction schedule, award of contract shall be assumed to be April 1, 1986.

,PART II BID FORM

SECTION 2.5 01 LIST OF MAJOR ITEMS OF CONSTRUCTION EQUIPMENT

The Bidder shall list major items of his own construction equipment which he proposes to use on the work.

<u>Equipment</u>	<u>Age</u>	<u>Condition</u>	<u>Location</u>
------------------	------------	------------------	-----------------

2.5 02 RENTAL EQUIPMENT

The Bidder shall list major items of rented construction equipment that he proposes to use or that he may use on the work.

Rental Equipment

Equipment	Lessor	Per Hour	Per Day	Per Week
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PART III-FORM OF AGREEMENT

THIS AGREEMENT is made the _____ day of _____
19__ between _____
_____ (hereinafter called "CONTRACTING AGENCY") and _____
_____ (hereinafter called "the Contractor"). The employer
has accepted a Bid by the Contractor for the execution, completion,
and maintenance of _____ Works as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

- (a) The form of Bid (including the Appendix).
- (b) Contract Documents IFB-No. PCH-2-85. Lot II. Volumes I and II.
- (c) Schedule of Prices
- (d) The Specifications

3. In consideration of the payments to be made by the CONTRACTING AGENCY to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the CONTRACTING AGENCY to execute, complete, and maintain the Works in conformity in all respects with the provisions of the Contract.

4. The CONTRACTING AGENCY hereby covenants to pay the Contractor in consideration of the execution, completion, and maintenance of the Works the Contract Price at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused their respective Seals to be affixed (or have set their respective hands and seals) the day and year first above written.

CONTRACTOR

ENGINEER

(Signature)

(Signature)

(Typed name)

(Typed Name)

(Title)

(Title)

(Date)

(Date)

PART IV - BID, PERFORMANCE, AND
PAYMENT BOND FORMS

BID BOND <i>(See Instructions on reverse)</i>	DATE BOND EXECUTED (Must not be later than bid opening date)
---	--

PRINCIPAL (Legal name and business address)	TYPE OF ORGANIZATION ("X" one) <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> PARTNERSHIP <input type="checkbox"/> JOINT VENTURE <input type="checkbox"/> CORPORATION STATE OF INCORPORATION
---	---

SURETY(IES) (Name and business address)

PENAL SUM OF BOND					BID IDENTIFICATION	
PERCENT OF BID PRICE	AMOUNT NOT TO EXCEED				BID DATE	INVITATION NO
	MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENTS		
					FOR	

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the * (hereinafter called the ** in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: *Provided*, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the bid identified above.

NOW, THEREFORE, if the Principal, upon acceptance by the ** of his bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), shall execute such further contractual documents, if any, and give such bond(s) as may be required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by him, or in the event of failure so to execute such further contractual documents and give such bonds, if the Principal shall pay the ** for any cost of procuring the work which exceeds the amount of his bid, then the above obligation shall be void and of no effect.

Each Surety executing this instrument hereby agrees that its obligation shall not be impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to the ** notice of which extension(s) to the Surety(ies) being hereby waived; provided that such waiver of notice shall apply only with respect to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this bid bond and have affixed their seals on the date set forth above.

PRINCIPAL			
Signature(s)	1	2	Corporate Seal
	(Seal)	(Seal)	
Name(s) & Title(s) (Typed)	1	2	

INDIVIDUAL SURETIES			
Signature(s)	1	2	(Seal)
Name(s) (Typed)	1	2	

CORPORATE SURETY(IES)			
Name & Address	STATE OF INC	LIABILITY LIMIT	Corporate Seal
Signature(s)	1	2	
Name(s) & Title(s)	1	2	

CORPORATE SURETY(IES) (Continued)

Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
1	2			
1	2			
Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
1	2			
1	2			
Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
1	2			
1	2			
Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
1	2			
1	2			
Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
1	2			
1	2			
Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
1	2			
1	2			

INSTRUCTIONS

1. This form is authorized for use whenever a bid guaranty is required in connection with construction work or the furnishing of supplies or services. There shall be no deviation from this form without approval by the _____.

2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

3. The penal sum of the bond may be expressed as a percentage of the bid price if desired. In such cases, a maximum dollar limitation may be stipulated.

4. Corporations executing the bond as sureties must be among those appearing on the Treasury Department's list of approved sureties and must be acting within the limitations set forth therein. When more than a single corporate surety is involved their names and addresses (city and State) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY (IES)", and in the space designated "SURETY" on the face of this form only the letter identification of the Sureties shall be inserted.

5. Corporations executing the bond shall affix their corporate seals.

6. The name of each person signing this bid bond should be typed in the space provided.

PERFORMANCE BOND
(See Instructions on reverse)

DATE BOND EXECUTED (Must be same or later than date of contract)

PRINCIPAL (Legal name and business address)	TYPE OF ORGANIZATION ("X" one) <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> PARTNERSHIP <input type="checkbox"/> JOINT VENTURE <input type="checkbox"/> CORPORATION STATE OF INCORPORATION								
SURETY(IES) (Name(s) and business address(es))	PENAL SUM OF BOND <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:25%;">MILLION(S)</td> <td style="width:25%;">THOUSAND(S)</td> <td style="width:25%;">HUNDRED(S)</td> <td style="width:25%;">CENT(S)</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table> CONTRACT DATE CONTRACT NO.	MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENT(S)				
MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENT(S)						

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the * (hereinafter called the **Owner**) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally; *Provided*, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into the contract identified above;

NOW, THEREFORE, if the Principal shall promptly and faithfully perform said Contract, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

1. Complete the Contract in accordance with its terms and conditions, or
2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

The rights and liabilities of the parties shall be determined under and in accordance with the laws of _____. The Surety agrees that any judgment against it may be enforced in the United States of America. Any suit under this bond must be instituted before the expiration of one (1) year from the date on which final payment under the Contract falls due.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this performance bond and have affixed their seals on the date set forth above.

PRINCIPAL					
	1.		2.		<i>Corporate Seal</i>
Signature(s)		<i>(Seal)</i>		<i>(Seal)</i>	
	1.		2.		
Name(s) & Title(s) (Typed)					
INDIVIDUAL SURETY(IES)					
	1.		2.		
Signature(s)		<i>(Seal)</i>		<i>(Seal)</i>	
	1.		2.		
Name(s) (Typed)					
CORPORATE SURETY(IES)					
SURETY A	Name & Address			STATE OF INC	LIABILITY LIMIT
	Signature(s)	1.	2.		<i>Corporate Seal</i>
	Name(s) & Title(s) (Typed)	1.	2.		

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CORPORATE SURETY(IES) (Continued)

SURETY B	Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1	2		
	Name(s) & Title(s) (Typed)	1	2		
SURETY C	Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1	2		
	Name(s) & Title(s) (Typed)	1	2		
SURETY D	Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1	2		
	Name(s) & Title(s) (Typed)	1	2		
SURETY E	Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1	2		
	Name(s) & Title(s) (Typed)	1	2		
SURETY F	Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1	2		
	Name(s) & Title(s) (Typed)	1	2		
SURETY G	Name & Address		STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1	2		
	Name(s) & Title(s) (Typed)	1	2		

INSTRUCTIONS

1. This form is authorized for use in connection with contracts for construction work. There shall be no deviation from this form without approval by _____.

2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

3. Corporations executing the bond as sureties must be among

those appearing on the U.S. Treasury Department's list of approved sureties and must be acting within the limitations set forth therein. Where more than a single corporate surety is involved, their names and addresses (city and State) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY (IES)", and in the space designated "SURETY (IES)" on the face of this form only the letter identification of the Sureties shall be inserted.

4. Corporations executing the bond shall affix their corporate seals.

5. The name of each person signing this performance bond should be typed in the space provided.

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PRINCIPAL (Legal name and business address)	TYPE OF ORGANIZATION ("X" one) <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> PARTNERSHIP <input type="checkbox"/> JOINT VENTURE <input type="checkbox"/> CORPORATION STATE OF INCORPORATION								
SURETY(IES) (Name(s) and business address(es))	PENAL SUM OF BOND <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">MILLION(S)</td> <td style="width: 25%;">THOUSAND(S)</td> <td style="width: 25%;">HUNDRED(S)</td> <td style="width: 25%;">CENT(S)</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table> CONTRACT DATE CONTRACT NO	MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENT(S)				
MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENT(S)						

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: *Provided*, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any, or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into the contract identified above;

NOW, THEREFORE, if the Principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety(ies) being hereby waived, then the above obligation shall be void and of no effect.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this payment bond and have affixed their seals on the date set forth above.

PRINCIPAL			
	1. Signature(s)	2. (Seal)	Corporate Seal
	Name(s) & Title(s) (Typed)	2. (Seal)	
INDIVIDUAL SURETY(IES)			
	1. Signature(s)	2. (Seal)	Corporate Seal
	Name(s) (Typed)	2. (Seal)	
CORPORATE SURETY(IES)			
SURETY A	Name & Address	STATE OF INC	LIABILITY LIMIT
	1. Signature(s)	2. (Seal)	Corporate Seal
	Name(s) & Title(s) (Typed)	2. (Seal)	

CORPORATE SURETY(IES) (Continued)

SURETY B	Name & Address	STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	2		
	Name(s) & Title(s) (Typed)	2		
SURETY C	Name & Address	STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	2		
	Name(s) & Title(s) (Typed)	2		
SURETY D	Name & Address	STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	2		
	Name(s) & Title(s) (Typed)	2		
SURETY E	Name & Address	STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	2		
	Name(s) & Title(s) (Typed)	2		
SURETY F	Name & Address	STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	2		
	Name(s) & Title(s) (Typed)	2		
SURETY G	Name & Address	STATE OF INC	LIABILITY LIMIT	Corporate Seal
	Signature(s)	2		
	Name(s) & Title(s) (Typed)	2		

INSTRUCTIONS

1. This form, for the protection of persons supplying labor and material, shall be used whenever a payment bond is required under the act of August 24, 1935, 49 Stat. 793, as amended (40 U.S.C. 270a-270e). There shall be no deviation from this form without approval by the Administrator of General Services.

2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of the form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

3. (a) Corporations executing the bond as sureties must be among those appearing on the Treasury Department's list of approved sureties and must be acting within the limitations set forth therein. Where more than a single corporate surety is involved, their names and addresses (city

and State) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY (II. 1)", and in the space designated "SURETY(IES)" on the face of this form only the letter identification of the Sureties shall be inserted.

(b) Where individual sureties execute the bond, they shall be two or more responsible persons. A completed Affidavit of Individual Surety (Standard Form 28), for each individual surety, shall accompany the bond. Such sureties may be required to furnish additional substantiating information concerning their assets and financial capability as the Government may require.

4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal"; and, if executed in Maine or New Hampshire, shall also affix an adhesive seal.

5. The name of each person signing this payment bond should be typed in the space provided.

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PART V - GENERAL CONDITIONS

SECTION 1 - GENERAL

5.1-01. DEFINITIONS AND INTERPRETATIONS

A. DEFINITIONS. In the Contract, as hereinafter defined, the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

1. "Employer" or "CONTRACTING AGENCY" is the Government of the Dominican Republic, represented by the "Corporacion Dominicana de Electricidad."

2. "AID" means the Agency for International Development of the United States of America.

3. The Contract Documents include:

- Part I, Instructions to Bidders
- Part II, Bid Form
- Part III, Agreement Form
- Part IV, Bid, Performance, and Payment Bonds
- Part V, General Conditions
- Part VI, Special Conditions
- Part VII, Technical Provisions
- Part VIII, Bid Drawings

Plus the bid and accompanying data submitted by the Successful Bidder and approved for inclusion in the Contract, plus Supplementary Drawings, Contractor's Drawings, and Drawings as defined herein. These Documents are complementary, and any work called for by one is as binding upon the parties as if called for by all. The interpretation of the ENGINEER will govern in the event of conflict between the Contract Documents.

4. "CDE": Corporacion Dominicana de Electricidad, Santo Domingo, D.N.; Dominican Republic, the Owner.

5. Project: The Rio Yuboa Hydroelectric Project is

located approximately 8 Kms south of Bonao, and 80 Kms north of Santo Domingo, Dominican Republic.

6. "Contractor" means the person or persons, firm or company whose tender has been accepted by the Employer and includes the Contractor's personal representatives, successors and permitted assigns.

7. "ENGINEER" is the CONTRACTING AGENCY's representative

8. "ENGINEER's representative" means any resident engineer or assistant of the ENGINEER, or any clerk of works appointed from time to time by the Employer or the ENGINEER to perform the duties set forth in Clause 5.1-02 hereof, whose authority shall be notified in writing to the Contractor by the ENGINEER.

9. "Works" shall include both Permanent Works and Temporary Works.

10. "Contract" means the Conditions of Contract, Specifications, Drawings, Schedule of Prices, if any, Tender, Letter of Acceptance and the Contract Agreement, if completed.

11. "Contract Price" means the sum named in the Letter of Acceptance, subject to such additions thereto or deductions therefrom as may be made under the provisions hereinafter contained.

12. "Bidder": Any party or parties submitting a proposal for the work covered by these Contract Documents.

13. "Successful Bidder": The Bidder selected for award of the Contract.

14. "Constructional Plant" means all appliances or things of whatsoever nature required in or about the execution or maintenance of the Works but does not include materials or other things intended to form or forming part of the Permanent Works.

15. "Temporary Works" means all temporary works of every kind required in or about the execution or maintenance of the Works.

16. "Permanent Works" means the permanent works to be executed and maintained in accordance with the Contract.

17. "Specification" means the specifications referred to in the Tender and any modification thereof or addition thereto as may from time to time be furnished or approved in writing by the

ENGINEER.

18. "Drawings" means the drawings referred to in the Specification and any modification of such drawings approved in writing by the ENGINEER and such other drawings as may from time to time be furnished or approved in writing by the ENGINEER.

19. "Bid Drawings": Drawings included in these Contract Documents for bidding purposes.

20. "Supplementary Drawings": Drawings of structures and equipment furnished to the Contractor after award of the Contract to furnish additional details of construction.

21. "Contractor's Drawings": Drawings provided by the Contractor to define the work to be done and/or the equipment to be furnished under these Contract documents.

22. "Site" means the land and other places on, under, in or through which the Permanent Works or Temporary Works designed by the ENGINEER are to be executed and any other lands and places provided by the Employer for working space or any other purpose as may be specifically designated in the Contract as forming part of the site.

23. "Approved" means approved in writing, including subsequent written confirmation of previous verbal approval and "approval" means approval in writing, including as aforesaid

24. "Furnish": Work done and all expenses, including labor, materials, tests, plant, and overhead, incurred by the Contractor in providing and delivering to a geographical location designated in these Contract Documents as specified item, article, or piece of apparatus or equipment.

25. "Erect," "Install," "Place," "Apply," "Lay": Work done and all expenses, including labor, materials, tests, plant and overhead, incurred in receiving a specified item, article, or piece of apparatus or equipment at a geographical location designated in these Contract documents, in transporting it to and storing it at the site, and there erecting, installing, placing, applying, or laying it as shown on the Drawings or as directed.

26. "Furnish and Erect," "Furnish and Install," "Furnish and Place," "Furnish and Apply," "Furnish and Lay": Work done and all expenses, including labor, materials, tests, plant, and overhead incurred in providing, delivering, transporting, storing, and erecting, installing, placing, applying, or laying a specified item, article, or piece of apparatus or equipment as shown on Drawings or as directed.

27. "To Design": To determine and draw the principal features of the specified article so it will perform the functions and meet the conditions stipulated.

28. "To Detail": To prepare Drawings of all parts of the designed article in accordance with the design, so it can be fabricated and/or erected exactly, without doubt regarding any portion.

29. "Commercial Operation": A generator-turbine unit is considered ready for commercial operation when the installation of such unit and its auxiliaries has been completed and tested sufficiently to be capable of continuous delivery on a scheduled basis of at least its rated power.

B. SINGULAR AND PLURAL. Words importing the singular only also include the plural and vice versa where the context requires.

C. HEADINGS OR NOTES. The headings and subtitles in these Conditions of Contract shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or of the Contract.

D. COST. The word "cost" shall be deemed to include overhead costs whether on or off the Site.

5.1-02 ENGINEER AND ENGINEER'S REPRESENTATIVE

A. DUTIES AND POWERS OF ENGINEER AND ENGINEER'S REPRESENTATIVE. The ENGINEER shall carry out such duties in issuing decisions, certificates and orders as are specified in the Contract. In the event of the ENGINEER being required in terms of his appointment by the Employer to obtain the specific approval of the Employer for the execution of any part of these duties, this shall be set out in Part 5.2 of these Conditions.

B. The ENGINEER's Representative shall be responsible to the ENGINEER and his duties are to watch and supervise the Works and to test and examine any materials to be used or workmanship employed in connection with the Works. He shall have no authority to relieve the Contractor of any of his duties or obligations under the Contract nor, except as expressly provided hereunder or elsewhere in the Contract to order any work involving delay or any extra payment by the Employer, nor to make any variation of or in the Works.

The ENGINEER may from time to time in writing delegate to the ENGINEER's Representative any of the powers and authorities vested in the ENGINEER and shall furnish to the Contractor and to the employer a copy of all such written delegations of powers and authorities. Any written instruction or approval given by the ENGINEER's Representative to the Contractor and within the terms of such delegation, but not otherwise, shall bind the Contractor and the Employer as though it had been given by the ENGINEER. Provided always as follows:

1. Failure of the ENGINEER's Representative to disapprove any work or materials shall not prejudice the power of the ENGINEER thereafter to disapprove such work or materials and to order the pulling down, removal or breaking up thereof.

2. If the Contractor shall be dissatisfied by reason of any decision of the ENGINEER's Representative he shall be entitled to refer the matter to the ENGINEER, who shall thereupon confirm, reverse or vary such decision.

5.1-03 ASSIGNMENT

The Contractor shall not assign the Contract or any part thereof, or any benefit or interest therein or thereunder, otherwise than by a charge in favour of the Contractor's bankers of any monies due or to become due under this Contract, without the prior written consent of the Employer.

5.1-04 SUB-LETTING

The Contractor shall not sub-let the whole of the Works. Except where otherwise provided by the Contract, the Contractor shall not sub-let any part of the Works without the prior written consent of the ENGINEER, which shall not be unreasonably withheld, and such consent, if given, shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any sub-contractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents, servants or workmen. Provided always that the provision of labour on a piecework basis shall not be deemed to be a subletting under this clause.

There will be no contractual relation between the Subcontractors and the CONTRACTING AGENCY and the Contractor

shall be fully responsible for all the work under these Contract Documents.

5.1-05 CONTRACT DOCUMENTS

A. LANGUAGE/S AND LAW. There shall be stated in part 5.2 of these Conditions:

1. the language or languages in which the Contract documents shall be drawn up and

2. the country or state, the law of which is to apply to the Contract and according to which the Contract is to be construed.

If the said documents are written in more than one language, the language according to which the Contract is to be construed and interpreted shall also be designated in Part 5.2 being therein designated the "Ruling Language".

B. DOCUMENTS MUTUALLY EXPLANATORY. Except if and to the extent otherwise provided by the Contract, the provisions of the Conditions of Contract Parts 5.1 and 5.2 shall prevail over those of any other document forming part of the Contract. Subject to the foregoing, the several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be explained and adjusted by the ENGINEER who shall thereupon issue to the Contractor instructions thereon. Provided always that if, in the opinion of the ENGINEER, compliance with any such instructions shall involve the Contractor in any cost, which by reason of any such ambiguity or discrepancy could not reasonably have been foreseen by the Contractor, the ENGINEER shall certify and the Employer shall pay such additional sum as may be reasonable to cover such costs.

5.1-06 DRAWINGS

A. CUSTODY OF DRAWINGS. The Drawings shall remain in the sole custody of the ENGINEER, but two copies thereof shall be furnished to the Contractor free of charge. The Contractor shall provide and make at his own expense any further copies required by him. At the completion of the Contract the Contractor shall return to the ENGINEER all Drawings provided under the Contract.

B. ONE COPY OF DRAWINGS TO BE KEPT ON SITE. One copy of the Drawings, furnished to the Contractor as aforesaid, shall be kept by the Contractor on the Site and the same shall at all reasonable times be available for inspection and use by the ENGINEER and the ENGINEER's Representative and by any other person authorized by the ENGINEER in writing.

C. DISRUPTION OF PROGRESS. The Contractor shall give written notice to the ENGINEER whenever planning or progress of the Works is likely to be delayed or disrupted unless any further drawing or order, including a direction, instruction or approval, is issued by the ENGINEER within a reasonable time. The notice shall include details of the drawing or order required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late.

D. DELAYS AND COST OF DELAY OF DRAWINGS. If by reason of any failure or inability of the ENGINEER to issue within a time reasonable in all the circumstances any drawing or order requested by the Contractor in accordance with sub-clause (C) of this Clause, the Contractor suffers delay and/or incurs costs then the ENGINEER shall take such delay into account in determining any extension of time to which the Contractor is entitled under Clause 5.1-44 hereof and the Contractor shall be paid the amount of such cost as shall be reasonable.

5.1-07 FURTHER DRAWINGS AND INSTRUCTIONS

The ENGINEER shall have full power and authority to supply to the Contractor from time to time, during the progress of the Works, such further drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and maintenance of the Works. The Contractor shall carry out and be bound by the same.

5.1 08 CONTRACTOR'S GENERAL RESPONSIBILITIES

A. The Contractor shall, subject to the provisions of the Contract, and with due care and diligence, execute and maintain the Works and provide all labour, including the supervision thereof, materials, Constructional Plant and all other things, whether of a temporary or permanent nature, required in and for such execution and maintenance, so far as the

necessity for providing the same is specified in or is reasonably to be inferred from the Contract.

B. The Contractor shall take full responsibility for the adequacy stability and safety of all site operations and methods of construction, provided that the Contractor shall not be responsible, except as may be expressly provided in the Contract, for the design or specification of the Permanent Works, or for the design or specification of any Temporary Works prepared by the ENGINEER.

5.1-09 CONTRACT AGREEMENT

The Contractor shall when called upon so to do enter into and execute a Contract Agreement, to be prepared and completed at the cost of the Employer, in the form annexed with such modification as may be necessary.

5.1-10 PERFORMANCE BOND

If, for the due performance of the Contract, the Tender shall contain an undertaking by the Contractor to obtain, when required, a bond or guarantee of an insurance company or bank, or other approved sureties to be jointly and severally bound with the Contractor to the Employer, in a sum not exceeding that stated in the Letter of Acceptance for such bond or guarantee, the said insurance company or bank or sureties and the terms of the said bond or guarantee shall be such as shall be approved by the Employer. The obtaining of such bond or guarantee or the provision of such sureties and the cost of the bond or guarantee to be so entered into shall be at the expense in all respects of the Contractor, unless the Contract otherwise provides.

5.1-11 INSPECTION OF SITE

The Employer shall have made available to the Contractor with the Tender documents such data on hydrological and sub-surface conditions as shall have been obtained by or on behalf of the Employer from investigations undertaken relevant to the Works and the Tender shall be deemed to have been based on such data, but the Contractor shall be responsible for his own interpretation thereof.

The Contractor shall also be deemed to have inspected and examined the Site and its surroundings and information available in connection therewith and to have satisfied himself, so far as is practicable, before submitting his Tender, as to the form and nature thereof; including the subsurface conditions, the hydrological and climatic conditions, the extent and nature of work and materials necessary for the completion of the Works, the means of access to the Site and the accommodation he may require and, in general, shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Tender.

5.1-12 SUFFICIENCY OF TENDER, ADVERSE PHYSICAL CONDITIONS AND ARTIFICIAL OBSTRUCTIONS

The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his Tender for the Works and of the prices stated in the Schedule of Prices, if any, which Tender prices shall, except insofar as it is otherwise provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper execution and maintenance of the Works. If, however, during the execution of the Works the Contractor shall encounter physical conditions, other than climatic conditions on the Site, or artificial obstructions, which conditions or obstructions could, in his opinion, not have been reasonably foreseen by an experienced contractor, then the ENGINEER shall certify and the Employer shall pay the additional cost to which the contractor shall have been put by reason of such conditions, including the proper and reasonable cost

1. of complying with any instruction which the ENGINEER may issue to the Contractor in connection therewith, and

2. of any proper and reasonable measures approved by the ENGINEER which the Contractor may take in the absence of specific instructions from the ENGINEER.

as a result of such conditions or obstructions being encountered.

5.1-13 WORK TO BE TO THE SATISFACTION OF ENGINEER

Save insofar as it is legally or physically impossible, the Contractor shall execute and maintain the Works in strict accordance with the Contract to the satisfaction of the ENGINEER and shall comply with and adhere strictly to the ENGINEER's instructions and directions on any matter whether mentioned in the Contract or not, touching or concerning the Works. The Contractor shall take instructions and directions only from the ENGINEER or, subject to the limitations referred to in Clause 5.1-02 hereof, from the ENGINEER's Representative.

5.1-14 PROGRAMME TO BE FURNISHED

A. Within the time stated in Part 5.2 of these Conditions, the Contractor shall, after the acceptance of his Tender, submit to the ENGINEER for his approval a programme showing the order of procedure in which he proposes to carry out the Works. The Contractor shall whenever required by the ENGINEER or ENGINEERS' Representative, also provide in writing for his information a general description of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works.

B. If at any time it should appear to the ENGINEER that the actual progress of the Works does not conform to the approved programme referred to in sub-clause (A) of this Clause, the Contractor shall produce, at the request of the ENGINEER, a revised programme showing the modifications to the approved programme necessary to ensure completion of the Works within the time for completion as defined in Clause 5.1-43 hereof.

C. The submission to and approval by the ENGINEER or ENGINEERS'S Representative of such programmes or the furnishing of such particulars shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

5.1-15 CONTRACTOR'S SUPERINTENDENCE

The Contractor shall give or provide all necessary superintendence during the execution of the works and as long thereafter as the ENGINEER may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract.

The Contractor, or a competent and authorized agent or representative approved of in writing by the ENGINEER, which approval may at any time be withdrawn, is to be constantly on the Works and shall give his whole time to the superintendence of the same. If such approval shall be withdrawn by the ENGINEER, the Contractor shall, as soon as is practicable, having regard to the requirement of replacing him as hereinafter mentioned, after receiving written notice of such withdrawal, remove the agent from the Works and shall not thereafter employ him again on the Works in any capacity and shall replace him by another agent approved by the ENGINEER. Such authorized agent or representative shall receive, on behalf of the Contractor, directions and instructions from the ENGINEER or, subject to the limitations of Clause 5.1-02 hereof, the ENGINEER's Representative. The Contractor's Superintendent shall be able to read, write and speak the Spanish language.

5.1-16 CONTRACTOR'S EMPLOYEES

A. The Contractor shall provide and employ on the Site in connection with the execution and maintenance of the Works

1. only such technical assistants as are skilled and experienced in their respective callings and such sub-agents, foremen and leading hands as are competent to give proper supervision to the work they are required to supervise, and

2. such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely execution and maintenance of the works.

B. The ENGINEER shall be at liberty to object to and require the Contractor to remove forthwith from the Works any person employed by the Contractor in or about the execution or maintenance of the Works who, in the opinion of the ENGINEER, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose employment is otherwise considered by the ENGINEER to be undesirable and such person shall not be again employed upon the Works without the Written permission of the ENGINEER. Any person so removed from the Works shall be replaced as soon as possible by a competent substitute approved by the ENGINEER.

5.1-17 SETTING-OUT AND LINES AND GRADES

A. SETTING-OUT. The Contractor shall be responsible for the true and proper setting-out of the Works in relation to original points, lines and levels of reference given by the ENGINEER in writing and for the correctness, subject as above mentioned of the position, levels, dimensions and alignment of all parts of the Works and for the provision of all necessary instruments, appliances and labour in connection therewith. If, at any time during the progress of the Works, any error shall appear or arise in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required so to do by the ENGINEER or the ENGINEER's Representative, shall, at his own cost, rectify such error to the satisfaction of the ENGINEER or the ENGINEER's Representative, unless such error is based on incorrect data supplied in writing by the ENGINEER or the ENGINEER's Representative, in which case the expense of rectifying the same shall be borne by the Employer. The checking of any setting-out or of any line or level by the ENGINEER or the ENGINEER's Representative shall not in any way relieve the Contractor of his responsibility for the correctness thereof and the Contractor shall carefully protect and preserve all bench-marks, sight-rails, pegs and other things used in setting-out the Works.

B. LINES AND GRADES. Reference base lines and reference bench marks will be established by the ENGINEER. Using these lines and marks the Contractor shall take the necessary topography for quantitative estimates, locate all structures, and establish all grades necessary for the accomplishment of the work. The lines and grades established by the Contractor may be checked by the ENGINEER. Checking by the ENGINEER will not relieve the Contractor of his responsibility for the accuracy of the lines and grades. All original field notes, computations, and other records taken by the Contractor for the purpose of layouts and quantity surveys shall be furnished promptly to the ENGINEER, and shall become the property of the CONTRACTING AGENCY. Unless waived in each specific case, quantity surveys shall be made with a representative of the ENGINEER present. The Contractor shall carefully preserve bench marks, reference points and stakes, and in case of willful or careless destruction, he shall be charged with resulting expense of replacement and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

No separate payment will be made for taking topography for quantitative estimates, locating structures and establishing grades, and the cost thereof shall be included in the prices for the miscellaneous work in the Schedule of Prices.

5.1-18 BOREHOLES AND EXPLORATORY EXCAVATION

If, at any time during the execution of the Works, the ENGINEER shall require the Contractor to make boreholes or to carry out exploratory excavation, such requirement shall be ordered in writing and shall be deemed to be an addition ordered under the provisions of Clause 5.1-51 hereof, unless a provisional sum in respect of such anticipated work shall have been included in the Schedule of Prices.

5.1-19 WATCHING AND LIGHTING

The Contractor shall in connection with the Works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or required by the ENGINEER or the ENGINEER's Representative, or by any duly constituted authority, for the protection of the Works, or for the Safety and convenience of the public or others.

5.1-20 CARE OF WORKS AND EXCEPTED RISKS

A. CARE OF WORKS. From the commencement of the Works until the date stated in the Certificate of Completion for the whole of the Works pursuant to clause 5.1-48 hereof the Contractor shall take full responsibility for the care thereof. Provided that if the ENGINEER shall issue a Certificate of Completion in respect of any part of the Permanent Works the Contractor shall cease to be liable for the care of that part of the Permanent Works from the date stated in the Certificate of Completion in respect of that part and the responsibility for the care of that part shall pass to the Employer. Provided further that the Contractor shall take full responsibility for the care of any outstanding work which he shall have undertaken to finish during the Period of Maintenance until such outstanding work is completed. In case any damage, loss or injury shall happen to the Works, or to any part thereof, from any cause whatsoever, save and except the excepted risks as defined in sub-clause (B) of this Clause, while the Contractor shall be responsible for the care thereof the Contractor shall, at his own cost, repair and make good the same, so that at completion the Permanent Works shall be in good order and condition and in conformity in every

respect with the requirements of the Contract and the ENGINEER's instructions. In the event of any such damage, loss or injury happening from any of the excepted risks, the Contractor shall, if and to the extent required by the ENGINEER and subject always to the provisions of Clause 5.1-65 hereof, repair and make good the same as aforesaid at the cost of the Employer. The Contractor shall also be liable for any damage to the Works occasioned by him in the course of any operations carried out by him for the purpose of completing any outstanding work or complying with his obligations under Clauses 5.1-49 or 5.1-50 hereof.

B. EXCEPTED RISKS. The "excepted risks" are war, hostilities (whether war be declared or not), invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, or unless solely restricted to employees of the Contractor or of his sub-contractors and arising from the conduct of the Works, riot, commotion or disorder, or use or occupation by the Employer of any part of the Permanent Works, or a cause solely due to the ENGINEER's design of the Works, or ionising radiations or contamination by radio-activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive, nuclear assembly or nuclear component thereof, pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds, or any such operation of the forces of nature as an experienced contractor could not foresee, or reasonably make provision for or insure against all of which are herein collectively referred to as "the excepted risks".

5.1-21 INSURANCE OF WORKS, ETC.

Without limiting his obligations and responsibilities under Clause 5.1-20 hereof, the Contractor shall insure in the joint names of the Employer and the Contractor against all loss or damage from whatever cause arising, other than the excepted risks, for which he is responsible under the terms of the Contract and in such a manner that the Employer and Contractor are covered for the period stipulated in Clause 5.1-20(A) hereof and are also covered during the Period of Maintenance, and for any loss or damage arising by the Contractor in the course of any operations carried out by him for the purpose of complying with his obligations under Clauses 5.1-49 and 5.1-50 hereof:

1. The Works for the time being executed to the estimated current contract value thereof, or such additional sum

as may be specified in Part 5.2 in the Clause numbered 5.2-11 together with the materials for incorporation in the Works at their replacement value.

2. The Constructional Plant and other things brought on to the Site by the Contractor to the replacement value of such Constructional Plant and other things.

Such insurance shall be effected with an insurer and in terms approved by the Employer, which approval shall not be unreasonably withheld, and the Contractor shall, whenever required, produce to the ENGINEER or the ENGINEER's Representative the policy or policies of insurance and the receipts for payment of the current premiums.

5.1-22 DAMAGE TO PERSONS AND PROPERTY AND INDEMNITY BY EMPLOYER

A. DAMAGE TO PERSONS AND PROPERTY. The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the Employer against all losses and claims in respect of injuries or damage to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution and maintenance of the Works and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation or damages for or with respect to:

1. The permanent use or occupation of land by the Works or any part thereof.

2. The right of the Employer to execute the Works or any part thereof on, over, under, in or through any land.

3. Injuries or damage to persons or property which are the unavoidable result of the execution or maintenance of the Works in accordance with the Contract.

4. Injuries or damage to persons or property resulting from any act or neglect of the Employer, his agents, servants or other contractors, not being employed by the Contractor, or for or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or where

the injury or damage was contributed to by the Contractor, his servants or agents such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the Employer, his servants or agents or other contractors for the damage or injury.

B. INDEMNITY BY EMPLOYER. The Employer shall indemnify the Contractor against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the proviso to sub-clause (A) of this Clause.

5.1-23 THIRD PARTY INSURANCE, MINIMUM AMOUNT OF THIRD PARTY INSURANCE, AND PROVISION TO INDEMNIFY EMPLOYER

A. THIRD PARTY INSURANCE. Before commencing the execution of the Works the Contractor, but without limiting his obligation and responsibilities under Clause 5.1-22 hereof, shall insure against his liability for any material or physical damage, loss or injury which may occur to any property, including that of the Employer, or to any person, including any employee of the Employer, by or arising out of the execution of the Works or in the carrying out of the Contract, otherwise than due to the matters referred to in the proviso to Clause 5.1-22(A) hereof.

B. MINIMUM AMOUNT OF THIRD PARTY INSURANCE. Such insurance shall be effected with an insurer and in terms approved by the Employer, which approval shall not be unreasonably withheld, and for at least the amount stated in the Tender. The Contractor shall, whenever required, produce to the ENGINEER or the ENGINEER's Representative the policy or policies of insurance and the receipts for payment of the current premiums.

C. PROVISION TO INDEMNIFY EMPLOYER. The terms shall include a provision whereby, in the event of any claim in respect of which the Contractor would be entitled to receive indemnity under the policy being brought or made against the Employer, the insurer will indemnify the employee against such claims and any costs, charges and expenses in respect thereof.

Traducción
de Cortesia

5.1-24 ACCIDENT OR INJURY TO WORKMEN AND INSURANCE AGAINST
ACCIDENT, ETC. TO WORKMEN

A. ACCIDENT OR INJURY TO WORKMEN. The Employer shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or any sub-contractor, save and except an accident or injury resulting from any act or default of the Employer, his agents, or servants. The Contractor shall indemnify and keep indemnified the Employer against all such damages and compensation, save and except as aforesaid, and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

B. INSURANCE AGAINST ACCIDENT, ETC. TO WORKMEN. The Contractor shall insure against such liability with an insurer approved by the Employer, which approval shall not be unreasonably withheld, and shall continue such insurance during the whole of the time that any persons are employed by him on the Works and shall, when required, produce to the ENGINEER or the ENGINEER's Representative such policy of insurance and the receipt for payment of the current premium. Provided always that, in respect of any persons employed by any sub-contractor, the Contractor's obligation to insure as aforesaid under this sub-clause shall be satisfied if the sub-contractor shall have insured against the liability in respect of such persons in such manner that the Employer is indemnified under the policy, but the Contractor shall require such sub-contractor to produce to the ENGINEER or the ENGINEER's Representative, when required, such policy of insurance and the receipt for the payment of the current premium.

5.1-25 REMEDY ON CONTRACTOR'S FAILURE TO INSURE

If the Contractor shall fail to effect and keep in force the insurances referred to in Clauses 5.1-21, 5.1-23 and 5.1-24 hereof, or any other insurance which he may be required to effect under the terms of the Contract, then and in any such case the Employer may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the Employer as aforesaid from any monies due or which may become due to the Contractor, or recover the same as a debt due from the Contractor.

5.1-26 GIVING OF NOTICES AND PAYMENT OF FEES AND COMPLIANCE WITH STATUTES, REGULATIONS, ETC.

A. GIVING OF NOTICES AND PAYMENT OF FEES. The Contractor shall give all notices and pay all fees required to be given or paid by any National or State Statute, Ordinance, or other Law, or any regulation, or bye-law of any local or other duly constituted authority in relation to the execution of the Works and by the rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Works.

B. COMPLIANCE WITH STATUTES, REGULATIONS, ETC. The Contractor shall conform in all respects with the provisions of any such Statute, Ordinance or Law as aforesaid and the regulations or bye-laws of any local or other duly constituted authority, which may be applicable to the works and with such rules and regulations of public bodies and companies as aforesaid and shall keep the Employer indemnified against all penalties and liability of every kind for breach of any such Statute, Ordinance or Law, regulation or bye-law.

C. The Employer will repay or allow to the Contractor all such sums as the ENGINEER shall certify to have been properly payable and paid by the Contractor in respect of such fees.

5.1-27 FOSSILS, ETC

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site of the Works shall as between the Employer and the Contractor be deemed to be the absolute property of the Employer. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such article or thing and shall immediately upon discovery thereof and, before removal, acquaint the ENGINEER's Representative of such discovery and carry out, at the expense of the Employer, the ENGINEER's Representative's orders as to the disposal of the same.

5.1-28 PATENT RIGHTS AND ROYALTIES

The Contractor shall save harmless and indemnify the CONTRACTING AGENCY, his funcionarios, agents and employees, from and against all claims and proceedings for or on account of infringement of any patent rights, design trademark or name or other protected rights in respect of any Constructional Plant, machine work, or material used for or in connection with the Works or any of them and from and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. Except where otherwise specified, the Contractor shall pay all tonnage and other royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the Works or any of them.

5.1-29 INTERFERENCE WITH TRAFFIC AND ADJOINING PROPERTIES

All operations necessary for the execution of the Works shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with the convenience of the public, or the access to, use and occupation of public or private roads and footpaths to or of properties whether in the possession of the Employer or of any other person. The Contractor shall save harmless and indemnify the Employer in respect of all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of, or in relation to, any such matters in so far as the Contractor is responsible therefor.

**5.1-30 EXTRAORDINARY TRAFFIC, SPECIAL LOADS SETTLEMENT
OF EXTRAORDINARY TRAFFIC CLAIMS AND WATERBORNE TRAFFIC**

A. EXTRAORDINARY TRAFFIC. The Contractor shall use every reasonable means to prevent any of the highways or bridges communicating with or on the routes to the Site from being damaged or injured by any traffic of the Contractor or any of his sub-contractors and, in particular, shall select routes, choose and use vehicles and restrict and distribute loads so that any

such extraordinary traffic as will inevitably arise from the moving of plant and material from and to the Site shall be limited, as far as reasonably possible, and so that no unnecessary damage or injury may be occasioned to such highways and bridges.

B. SPECIAL LOADS. Should it be found necessary for the Contractor to move one or more loads of Constructional Plant, machinery or pre-constructed units or parts of units of work over part of a highway or bridge, the moving whereof is likely to damage any highway or bridge unless special protection or strengthening is carried out, then the Contractor shall before moving the load on to such highway or bridge give notice to the ENGINEER or ENGINEER's Representative of the weight and other particulars of the load to be moved and his proposals for protecting or strengthening the said highway or bridge. Unless within fourteen days of the receipt of such notice the ENGINEER shall by counter-notice direct that such protection or strengthening is unnecessary, then the Contractor will carry out such proposals or any modification thereof that the ENGINEER shall require and, unless there is an item or are items in the Schedule of Prices for pricing by the Contractor of the necessary works for the protection or strengthening aforesaid, the costs thereof shall be paid by the Employer to the Contractor.

C. SETTLEMENT OF EXTRAORDINARY TRAFFIC CLAIMS. If during the execution of the Works or at any time thereafter the Contractor shall receive any claim arising out of the execution of the Works in respect of damage or injury to highways or bridges he shall immediately report the same to the ENGINEER and thereafter the Employer shall negotiate the settlement of and pay all sums due in respect of such claim and shall indemnify the Contractor in respect thereof and in respect of all claims, proceedings, damages, costs, charges and expenses in relation thereto. Provided always that if and so far as any such claims or part thereof shall in the opinion of the ENGINEER be due to any failure on the part of the Contractor to observe and perform his obligations under sub-clauses (A) and (B) of this Clause, then the amount certified by the ENGINEER to be due to such failure shall be paid by the Contractor to the Employer.

D. WATERBORNE TRAFFIC. Where the nature of the Works is such as to require the use by the Contractor of waterborne transport the foregoing provisions of this Clause shall be construed as though "highway" included a lock, dock, seawall or other structure related to a waterway and "vehicle" included craft, and shall have effect accordingly.

5.1-31 OPPORTUNITIES FOR OTHER CONTRACTORS

The Contractor shall, in accordance with the requirements of the ENGINEER, afford all reasonable opportunities for carrying out their work to any other contractors employed by the Employer and their workmen and the workmen of the Employer and of any other duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the Works. If, however, the Contractor shall, on the written request of the ENGINEER or the ENGINEER's Representative, make available to any such other contractor, or to the Employer or any such authority, any roads or ways for the maintenance of which the Contractor is responsible, or permit the use by any such of the Contractor's scaffolding or other plant on the Site, or provide any other service of whatsoever nature for any such, the Employer shall pay to the Contractor in respect of such use or service such sum or sums as shall, in the opinion of the ENGINEER, be reasonable. CONTRACTING AGENCY reserves the right for contracting any Contractors in relation with this project.

5.1-32 CONTRACTOR TO KEEP SITE CLEAR

During the progress of the Works the Contractor shall keep the Site reasonably free from all unnecessary obstruction and shall store or dispose of any Constructional Plant and surplus materials and clear away and remove from the Site any wreckage, rubbish or Temporary Works no longer required.

5.1-33 CLEARANCE OF SITE ON COMPLETION

On the completion of the Works the Contractor shall clear away and remove from the Site all Constructional Plant, surplus materials, rubbish and Temporary Works of every kind, and leave the whole of the Site and Works clean and in a workmanlike condition to the satisfaction of the ENGINEER.

5.1-34 LABOUR

A. ENGAGEMENT OR LABOUR. The Contractor shall make his own arrangements for the engagement of all labour, local or

otherwise, and, save insofar as the Contract otherwise provides, for the transport, housing, feeding and payment thereof.

B. SUPPLY OF WATER. The Contractor shall, so far as is reasonably practicable, having regard to local conditions, provide on the Site, to the satisfaction of the ENGINEER's Representative, an adequate supply of drinking and sanitation facilities for the use of the Contractor's staff and work people.

C. ALCOHOLIC LIQUOR OR DRUGS. The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor, or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his sub-contractors, agents or employees.

D. ARMS AND AMMUNITION. The Contractor shall not give, barter or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or suffer the same as aforesaid.

E. FESTIVALS AND RELIGIOUS CUSTOMS. The Contractor shall in all dealings with labour in his employment have due regard to all recognised festivals, days of rest and religious or other customs.

F. EPIDEMICS. In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities for the purpose of dealing with and overcoming the same.

G. DISORDERLY CONDUCT, ETC. The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his employees and for the preservation of peace and protection of persons and property in the neighborhood of the Work against the same.

H. OBSERVANCE BY SUB-CONTRACTORS. The Contractor shall be responsible for observance by his sub-contractors of the foregoing provisions.

I. Any other conditions affecting labour and wages shall be as set out in Part 5.2 in the Clause numbered 5.2-13 as may be necessary.

5.1-35 RETURNS OF LABOUR, ETC

The Contractor shall, if required by the ENGINEER, deliver to the ENGINEER's Representative, or at his office, a return in detail in such form and at such intervals as the ENGINEER may prescribe showing the supervisory staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such information respecting Constructional Plant as the ENGINEER's Representative may require.

5.1-36 QUALITY OF MATERIALS AND WORKMANSHIP AND TESTS, COST OF SAMPLES, COST OF TESTS, AND COST OF TESTS NOT PROVIDED FOR, ETC.

A. QUALITY OF MATERIALS AND WORKMANSHIP AND TESTS. All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the ENGINEER's instructions and shall be subjected from time to time to such tests as the ENGINEER may direct at the place of manufacture or fabrication, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity, of any material used and shall supply samples of materials before incorporation in the Works for testing as may be selected and required by the ENGINEER.

B. COST OF SAMPLES. All samples shall be supplied by the Contractor at his own cost if the supply thereof is clearly intended by or provided for in the Contract, but if not, then at the cost of the Employer.

C. COST OF TESTS. The cost of making any test shall be borne by the Contractor if such test is clearly intended by or provided for in the Contract and, in the cases only of a test under load or of a test to ascertain whether the design of any finished or partially finished work is appropriate for the purposes which it was intended to fulfill, is particularised in the Contract in sufficient detail to enable the Contractor to price or allow for the same in his Tender.

D. COST OF TESTS NOT PROVIDED FOR, ETC. If any test is ordered by the ENGINEER which is either:

1. Not so intended by or provided for, or
2. (in the cases above mentioned) is not so particularised, or
3. though so intended or provided for is ordered by the ENGINEER to be carried out by an independent person at any place other than the Site or the place of manufacture or fabrication of the materials tested,

then the cost of such test shall be borne by the Contractor, if the test shows the workmanship or materials not to be in accordance with the provisions of the Contract or the ENGINEER's instructions, but otherwise by the Employer.

5.1-37 INSPECTION OF OPERATIONS

The ENGINEER and any person authorised by him shall at all times have access to the Works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the Works and the Contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

5.1-38 EXAMINATION OF WORK BEFORE COVERING UP AND UNCOVERING AND MAKING OPENINGS

A. EXAMINATION OF WORK BEFORE COVERING UP. No work shall be covered up or put out of view without the approval of the ENGINEER or the ENGINEER's Representative and the Contractor shall afford full opportunity for the ENGINEER or the ENGINEER's Representative to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the ENGINEER's Representative whenever any such work or foundations is or are ready or about to be ready for examination and the ENGINEER or the ENGINEER's Representative shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such work or of examining such foundations.

B. UNCOVERING AND MAKING OPENINGS. The Contractor shall uncover any part or parts of the Works or make openings in or through the same as the ENGINEER may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the ENGINEER. If any such part or parts have been covered up or put out of view after compliance with the requirement of sub-clause (A) of this Clause and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating and making good the same shall be borne by the Employer, but in any other case all costs shall be borne by the Contractor.

5.1-39 REMOVAL OF IMPROPER WORK AND MATERIALS AND DEFAULT OF CONTRACTOR IN COMPLIANCE

A. REMOVAL OF IMPROPER WORK AND MATERIALS. The ENGINEER shall during the progress of the Works have power to order in writing from time to time:

1. the removal from the Site, within such time or times as may be specified in the order, of any materials which, in the opinion of the ENGINEER, are not in accordance with the Contract,

2. the substitution of proper and suitable materials and,

3. the removal and proper re-execution, notwithstanding any previous test thereof or interim payment therefor, of any work which in respect of materials or workmanship is not, in the opinion of the ENGINEER, in accordance with the Contract.

B. DEFAULT OF CONTRACTOR IN COMPLIANCE. In case of default on the part of the Contractor in carrying out such order, the Employer shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any monies due or which may become due to the Contractor.

5.1 40 SUSPENSION OF WORK AND SUSPENSION LASTING MORE THAN 90 DAYS

A. SUSPENSION OF WORK. The Contractor shall, on the written order of the ENGINEER, suspend the progress of the Works or any part thereof for such time or times and in such manner as the ENGINEER may consider necessary and shall during such suspension properly protect and secure the work, so far as is necessary in the opinion of the ENGINEER. The extra cost incurred by the Contractor in giving effect to the ENGINEER's instructions under this Clause shall be borne and paid by the Employer unless such suspension is:

1. Otherwise provided for in the Contract, or
2. necessary by reason of some default on the part of the Contractor, or
3. necessary by reason of climatic conditions on the Site, or
4. necessary for the proper execution of the Works or for the safety of the Works or any part thereof insofar as such necessity does not arise from any act or default by the ENGINEER or the Employer or from any of the excepted risks defined in Clause 5.1-20(B) hereof.

Provided that the Contractor shall not be entitled to recover any such extra cost unless he gives written notice of his intention to claim to the ENGINEER within twenty-eight days of the ENGINEER's order. The ENGINEER shall settle and determine such extra payment and/or extension of time under Clause 5.1-44 hereof to be made to the Contractor in respect of such claim as shall, in the opinion of the ENGINEER, be fair and reasonable.

B. SUSPENSION LASTING MORE THAN 90 DAYS. If the progress of the Works or any part thereof is suspended on the written order of the ENGINEER and if permission to resume work is not given by the ENGINEER within a period of ninety days from the date of suspension then, unless such suspension is within paragraph (1), (2), (3) or (4) of sub-clause (A) of this Clause, the Contractor may serve a written notice on the ENGINEER requiring permission within twenty-eight days from the receipt thereof to proceed with the Works, or that part thereof in regard to which progress is suspended and, if such permission is not

granted within that time, the Contractor by a further written notice so served may, but is not bound to, elect or treat the suspension where it affects part only of the Works as an omission of such part under Clause 5.1-51 hereof, or, where it affects the Whole Works, as an abandonment of the Contract by the Employer.

5.1-41 COMMENCEMENT OF WORKS

The Contractor shall commence the Works on Site within the period named in the Tender after the receipt by him of a written order to this effect from the ENGINEER and shall proceed with the same with due expedition and without delay, except as may be expressly sanctioned or ordered by the ENGINEER, or be wholly beyond the Contractor's control.

5.1-42 POSSESSION OF SITE AND WAYLEAVES

A. POSSESSION OF SITE. Save insofar as the Contract may prescribe, the extent of portions of the Site of which the Contractor is to be given possession from time to time and the order in which such portions shall be made available to him and, subject to any requirement in the Contract as to the order in which the Works shall be executed, the Employer will, with the ENGINEER's written order to commence the Works, give to the Contractor possession of so much of the Site as may be required to enable the Contractor to commence and proceed with the execution of the Works in accordance with the programme referred to in Clause 5.1-14 hereof, if any, and otherwise in accordance with such reasonable proposals of the Contractor as he shall, by written notice to the ENGINEER, make and will, from time to time as the Works proceed, give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the execution of the Works with due despatch in accordance with the said programme or proposals, as the case may be. If the Contractor suffers delay or incurs cost from failure on the part of the Employer to give possession in accordance with the terms of this Clause, the ENGINEER shall grant an extension of time for the completion of the Works and certify such sum as, in his opinion, shall be fair to cover the cost incurred, which sum shall be paid by the Employer. The land for the construction sites and for the access thereto from the existing roads will be furnished by the CONTRACTING AGENCY as shown on the Drawings. The CONTRACTING AGENCY will also provide rights-of-way for approved Contractor's camp, storage, and plant

area; and also for the borrow or spoil areas shown on the Drawings. The Contractor will be permitted to use such lands for construction purposes, but any additional land or rights of-way desired by the Contractor for construction purposes shall be provided by the Contractor without expense to the CONTRACTING AGENCY.

B. WAYLEAVES, ETC. The Contractor shall bear all costs and charges for special or temporary wayleaves required by him in connection with access to the Site. The Contractor shall also provide at his own cost any additional accommodation outside the Site required by him for the purposes of the Works.

5.1-43 TIME FOR COMPLETION

Subject to any requirement in the Contract as to completion of any section of the Works before completion of the whole, the whole of the Works shall be complete, in accordance with the provisions of Clause 5.1-48 hereof, within the time stated in the Contract calculated from the last day of the period named in the Tender as that within which the Works are to be commenced, or such extended time as may be allowed under Clause 5.1-44 hereof.

5.1 44 EXTENSION OF TIME FOR COMPLETION

Should the amount of extra or additional work of any kind or any cause of delay referred to in these Conditions, or exceptional adverse climatic conditions, or other special circumstances of any kind whatsoever which may occur, other than through a default of the Contractor, be such as fairly to entitle the Contractor to an extension of time for the completion of the Works, the ENGINEER shall determine the amount of such extension and shall advise the Employer and the Contractor accordingly. Provided that the ENGINEER is not bound to take into account any extra or additional work or other special circumstances unless the Contractor has within twenty-eight days after such work has been commenced, or such circumstances have arisen, or as soon thereafter as is practicable, submitted to the ENGINEER's Representative full and detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.

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5.1 45 NO NIGHT OR SUNDAY WORK

Subject to any provision to the contrary contained in the Contract, none of the Permanent Works shall, save as hereinafter provided, be carried on during the night or on Sundays, if locally recognised as days of rest, or their locally recognised equivalent without the permission in writing of the ENGINEER's Representative, except when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the ENGINEER's Representative. Provided always that the provisions of this Clause shall not be applicable in the case of any work which it is customary to carry out by rotary or double shifts.

5.1 46 RATE OF PROGRESS

If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the Works or any section is at any time, in the opinion of the ENGINEER, too slow to ensure completion by the Prescribed time or extended time for completion, the ENGINEER shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as are necessary and the ENGINEER may approve to expedite progress so as to complete the Works or such section by the prescribed time or extended time. The Contractor shall not be entitled to any additional payment for taking such steps. If, as a result of any notice given by the ENGINEER under this Clause, the Contractor shall seek the ENGINEER's permission to do any work at night or on Sundays, if locally recognised as days of rest, or their locally recognised equivalent, such permission shall not be unreasonably refused.

5.1 47 LIQUIDATED DAMAGES FOR DELAY, REDUCTION OF LIQUIDATED DAMAGES, AND BONUS FOR COMPLETION

A. LIQUIDATED DAMAGES FOR DELAY. If the Contractor shall fail to achieve completion of the Works within the time prescribed by Clause 5.1-43 hereof, then the Contractor shall pay to the Employer the sum stated in the Contract as liquidated damages for such default and not as a penalty for every day or part of a day which shall elapse between the time prescribed by Clause 5.1 43 hereof and the date of certified completion of the Works. The Employer may, without prejudice to any other method of

recovery, deduct the amount of such damages from any monies in his hands, due or which may become due to the Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligations and liabilities under the Contract.

B. REDUCTION OF LIQUIDATED DAMAGES. If, before the completion of the whole of the Works any part or section of the Works has been certified by the ENGINEER as completed, pursuant to Clause 5.1-48 hereof, and occupied or used by the Employer, the liquidated damages for delay shall, for any period of delay after such certificate and in the absence of alternative provisions in the Contract be reduced in the proportion which the value of the part or section so certified bears to the value of the whole of the Works.

C. BONUS FOR COMPLETION. If it is desired to provide in the Contract for the payment of a bonus in relation to completion of the Works or of any part or section thereof this shall be set out in Part 5.2 in the clause numbered 5.2-14.

5.1-48 CERTIFICATION OF COMPLETION OF WORKS AND COMPLETION BY STAGES

A. CERTIFICATION OF COMPLETION OF WORKS. When the whole of the Works have been substantially completed and have satisfactorily passed any final test that may be prescribed by the Contract, the Contractor may give a notice to that effect to the ENGINEER or to the ENGINEER's Representative accompanied by an undertaking to finish any outstanding work during the Period of Maintenance. Such notice and undertaking shall be in writing and shall be deemed to be a request by the Contractor for the ENGINEER to issue a Certificate of Completion in respect of the Works. The ENGINEER shall, within twenty-one days of the date of delivery of such notice either issue to the Contractor, with a copy to the Employer, a Certificate of Completion stating the date on which in his opinion the Works were substantially completed in accordance with the Contract or give instructions in writing to the Contractor specifying all the work which in the ENGINEER's opinion requires to be done by the Contractor before the issue of such Certificate. The ENGINEER shall also notify the Contractor of any defects in the Works affecting substantial completion that may appear after such instructions and before completion of the Works specified therein. The Contractor shall be entitled to receive such Certificate of Completion within twenty-one days of completion to the satisfaction of the ENGINEER of the works so specified and making good any defects so notified.

B. CERTIFICATION OF COMPLETION BY STAGES. Similarly, in accordance with the procedure set out in sub clause (A) of this Clause, the Contractor may request and the ENGINEER shall issue a Certificate of Completion in respect of:

1. any section of the Permanent Works in respect of which a separate time for completion is provided in the Contract and,

2. any substantial part of the Permanent Works which has been both completed to the satisfaction of the ENGINEER and occupied or used by the Employer.

C. If any part of the Permanent Works shall have been substantially completed and shall have satisfactorily passed any final test that may be prescribed by the Contract, the ENGINEER may issue a Certificate of Completion in respect of that part of the Permanent Works before completion of the whole of the Works and, upon the issue of such Certificate, the Contractor shall be deemed to have undertaken to complete any outstanding work in that part of the Works during the Period of Maintenance.

D. Provided always that a Certificate of Completion given in respect of any section or part of the Permanent Works before completion of the whole shall not be deemed to certify completion of any ground or surfaces requiring reinstatement, unless such Certificate shall expressly so state. When all the work included under these Contract Documents has been completed and the equipment has been installed and satisfactorily tested, CONTRACTING AGENCY, with the recommendations of the ENGINEER, will issue a Provisional Acceptance Certificate. After 365 calendar days from the date of Provisional Acceptance, and after thorough inspection of the work CONTRACTING AGENCY, again with the recommendation of the ENGINEER, will issue a Final Acceptance Certificate.

5.1-49 DEFINITION OF 'PERIOD OF MAINTENANCE', EXECUTION OF WORK OF REPAIR, COST OF EXECUTION OF WORK OF REPAIR, AND REMEDY ON CONTRACTOR'S FAILURE TO CARRY OUT WORK REQUIRED

A. DEFINITION OF 'PERIOD OF MAINTENANCE'. In these Conditions the expression "Period of maintenance" named in the Tender, calculated from the date of completion of the Works, certified by the ENGINEER in accordance with Clause 5.1-48 hereof, or, in the event of more than one certificate having been

issued by the ENGINEER under the said Clause, from the respective dates so certified and in relation to the Period of Maintenance the expression "the Works" shall be construed accordingly.

B. EXECUTION OF WORK OF REPAIR, ETC. To the intent that the Works shall at or as soon as practicable after the expiration of the Period of Maintenance be delivered to the Employer in the condition required by the Contract, fair wear and tear excepted, to the satisfaction of the ENGINEER, the Contractor shall finish the work, if any, outstanding at the date of completion, without additional cost to CDE, as certified under Clause 5.1 18 hereof, as soon as practicable after such date and shall execute all such work of repair, amendment, reconstruction, rectification and making good defects, imperfections, shrinkages or other faults as may be required of the Contractor in writing by the ENGINEER during the Period of Maintenance, or within fourteen days after its expiration, as a result of an inspection made by or on behalf of the ENGINEER prior to its expiration.

C. COST OF EXECUTION OF WORK OF REPAIR, ETC. All such work shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of the ENGINEER, be due to the use of materials or workmanship not in accordance with the Contract, or to neglect or failure on the part of the Contractor to comply with any obligation, expressed or implied, on the Contractor's part under the Contract. If, in the opinion of the ENGINEER, such necessity shall be due to any other cause, the value of such work shall be ascertained and paid for as if it were additional work.

D. REMEDY ON CONTRACTOR'S FAILURE TO CARRY OUT WORK REQUIRED. If the Contractor shall fail to do any such work as aforesaid required by the ENGINEER, the Employer shall be entitled to employ and pay other persons to carry out the same and if such work is work which, in the opinion of the ENGINEER, the Contractor was liable to do at his own expense under the Contract, then all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any monies due or which may become due to the Contractor.

5.1 50 CONTRACTOR TO SEARCH

The Contractor shall, if required by the ENGINEER in writing, search under the directions of the ENGINEER for the cause of any defect, imperfection or fault appearing during the progress of the Works or in the Period of Maintenance. Unless such defect, imperfection or fault shall be one for which the

Contractor is liable under the Contract, the cost of the work carried out by the Contractor in searching as aforesaid shall be borne by the Contractor and he shall in such case repair, rectify and make good such defect, imperfection or fault at his own expense in accordance with the provisions of Clause 5.1-49 hereof.

5.1-51 VARIATIONS AND ORDERS FOR VARIATIONS TO BE IN WRITING

A. VARIATIONS. The ENGINEER shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion be desirable, he shall have power to order the Contractor to do and the Contractor shall do any of the following:

1. Increase or decrease the quantity of any work included in the Contract,
2. omit any such work,
3. change the character or quality or kind of any such work,
4. change the levels, lines, position and dimensions of any part of the Works, and
5. execute additional work of any kind necessary for the completion of the Works.

And no such variation shall in any way vitiate or invalidate the Contract, but the value, if any, of all such variations shall be taken into account in ascertaining the amount of the Contract Price.

B. ORDERS FOR VARIATIONS TO BE IN WRITING. No such variations shall be made by the Contractor without an order in writing of the ENGINEER. Provided that no order in writing shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this Clause, but is the result of the quantities exceeding or being less than those stated in the Schedule of Prices. Provided also that if for any reason the ENGINEER shall consider it desirable to give any such order verbally, the Contractor shall comply with such order and any confirmation in writing of such verbal order given by the ENGINEER, whether before or after the carrying out of the order, shall be deemed to be an order in writing within the meaning of this Clause.

Provided further that if the Contractor shall within seven days confirm in writing to the ENGINEER and such confirmation shall not be contradicted in writing within fourteen days by the ENGINEER, it shall be deemed to be an order in writing by the ENGINEER.

5.1-52 VALUATION OF VARIATIONS, POWER OF ENGINEER TO FIX PRICES, VARIATIONS EXCEEDING 10 PERCENT, DAYWORK, AND CLAIMS

A. VALUATION OF VARIATIONS. All extra or additional work done or work omitted by order of the ENGINEER shall be valued at the prices set out in the Contract if, in the opinion of the ENGINEER, the same shall be applicable. If the Contract does not contain any prices applicable to the extra or additional work, then suitable prices shall be agreed upon between the ENGINEER and the Contractor. In the event of disagreement the ENGINEER shall fix such prices as shall, in his opinion be reasonable and proper.

B. POWER OF ENGINEER TO FIX PRICES. Provided that if the nature or amount of any omission or addition relative to the nature or amount of the whole of the Works or to any part thereof shall be such that, in the opinion of the ENGINEER, the price contained in the Contract for any item of the Works is, by reason of such omission or addition, rendered unreasonable or inapplicable, then a suitable price shall be agreed upon between the ENGINEER and the Contractor. In the event of disagreement the ENGINEER shall fix such other price as shall, in his opinion, be reasonable and proper having regard to the circumstances.

Provided also that no increase or decrease under sub-clause (A) of this Clause or variation of price under sub-clause (B) of this Clause shall be made unless, as soon after the date of the order as is practicable, and in the case of extra or additional work, before the commencement of the work or as soon thereafter as is practicable, notice shall have been given in writing:

1. By the Contractor to the ENGINEER of his intention to claim extra payment or a varied price, or

2. by the ENGINEER to the Contractor of his intention to vary a price.

C. VARIATIONS EXCEEDING 10 PER CENT. If, on certified completion of the whole of the Works it shall be found that a

reduction or increase greater than ten percent of the sum named in the Letter of Acceptance, excluding all fixed sums, provisional sums and allowance for dayworks, if any, results from:

1. The aggregate effect of all Variation Orders, and
2. all adjustments upon measurement of the estimated quantities set out in the Schedule of Prices, excluding all provisional sums, dayworks and adjustments of price made under Clause 5.1 70 (A) hereof,

but not from any other cause, the amount of the Contract Price shall be adjusted by such sum as may be agreed between the Contractor and the ENGINEER or, failing agreement fixed by the ENGINEER having regard to all material and relevant factor, including the Contractor's Site and general overhead costs of the Contract.

D. DAYWORK. The ENGINEER may, if, in his opinion it is necessary or desirable, order in writing that any additional or substituted work shall be executed on a daywork basis. The Contractor shall then be paid for such works under the conditions set out in the Daywork Schedule included in the Contract and at the prices affixed thereto by him in his Tender.

The Contractor shall furnish to the ENGINEER such receipts or other vouchers as may be necessary to prove the amounts paid and, before ordering materials, shall submit to the ENGINEER quotations for the same for his approval.

In respect of all work executed on a daywork basis, the Contractor shall, during the continuance of such work, deliver each day to the ENGINEER's Representative an exact list in duplicate of the names, occupation and time of all workmen employed on such work and a statement, also in duplicate, showing the description and quantity of all materials and plant used thereon or therefor (other than plant which is included in the percentage addition in accordance with the Schedule hereinbefore referred to). One copy of each list and statement will, if correct, or when agreed, be signed by the ENGINEER's Representative and returned to the Contractor.

At the end of each month the Contractor shall deliver to the ENGINEER's Representative a priced statement of the labour, material and plant, except as aforesaid, used and the Contractor shall not be entitled to any payment unless such lists and statements have been fully and punctually rendered. Provided always that if the ENGINEER shall consider that for any reason the sending of such lists or statements by the Contractor, in

accordance with the foregoing provision, was impracticable he shall nevertheless be entitled to authorize payment for such work, either as daywork, on being satisfied as to the time employed and plant and materials used on such work, or at such value therefor as shall, in his opinion, be fair and reasonable.

E. CLAIMS. The Contractor shall send to the ENGINEER's Representative once in every month an account giving particulars, as full and detailed as possible, of all claims for any additional payment to which the Contractor may consider himself entitled and of all extra or additional work ordered by the ENGINEER which he has executed during the preceding month.

No final or interim claim for payment for any such work or expense will be considered which has not been included in such particulars. Provided always that the ENGINEER shall be entitled to authorize payment to be made for any such work or expense, notwithstanding the Contractor's failure to comply with this condition, if the Contractor has, at the earliest practicable opportunity, notified the ENGINEER in writing that he intends to make a claim for such work.

5.1-53 PLANT, TEMPORARY WORKS AND MATERIALS

A. PLANT, ETC., EXCLUSIVE USE FOR THE WORKS. All Constructional Plant, Temporary Works and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Works and the Contractor shall not remove the same or any part thereof, except for the purpose of moving it from one part of the Site to another, without the consent, in writing, of the ENGINEER, which shall not be unreasonably withheld.

B. REMOVAL OF PLANT, ETC. Upon completion of the Works the Contractor shall remove from the Site all the said Constructional Plant and Temporary Works remaining thereon and any unused materials provided by the Contractor.

C. EMPLOYER NOT LIABLE FOR DAMAGE TO PLANT, ETC. The employer shall not at any time be liable for the loss of or damage to any of the said Constructional Plant, Temporary Works or materials save as mentioned in Clauses 5.1-20 and 5.1-65 hereof.

D. RE-EXPORT OF PLANT. In respect of any Constructional Plant which the Contractor shall have imported for the purposes

of the Works, the Employer will assist the Contractor, where required, in procuring any necessary Government consent to the re-export of such Constructional Plant by the Contractor upon the removal thereof as aforesaid.

E. CUSTOMS CLEARANCE. The Employer will assist the Contractor, where required, in obtaining clearance through the Customs of Constructional Plant, materials and other things required for the Works.

F. Any other conditions affecting Constructional Plant, Temporary Works and materials, shall be set out in Part 5.2 in the Clause numbered 5.2-16 as may be necessary.

5.1-54 APPROVAL OF MATERIALS, ETC., NOT IMPLIED

The operation of Clause 5.1-53 hereof shall not be deemed to imply any approval by the ENGINEER of the materials or other matters referred to therein nor shall it prevent the rejection of any such materials at any time by the ENGINEER.

5.1-55 QUANTITIES

The quantities set out in the Schedule of Prices are the estimated quantities of the work, but they are not to be taken as the actual and correct quantities of the Works to be executed by the Contractor in fulfillment of his obligations under the Contract.

5.1-56 WORKS TO BE MEASURED

The ENGINEER shall, except as otherwise stated, ascertain and determine by measurement the value in terms of the Contract of work done in accordance with the Contract. He shall, when he requires any part or parts of the Works to be measured, give notice to the Contractor's authorised agent or representative, who shall forthwith attend or send a qualified agent to assist the ENGINEER or the ENGINEER's Representative in making such measurement, and shall furnish all particulars required by either of them. Should the Contractor not attend, or neglect or omit to send such agent, then the measurement made by the ENGINEER or approved by him shall be taken to be the correct measurement of the work. For the purpose of measuring such permanent work as is to be measured by records and drawings, the ENGINEER's

Representative shall prepare records and drawings month by month of such work and the Contractor, as and when called upon to do so in writing, shall, within fourteen days, attend to examine and agree such records and drawings with the ENGINEER's Representative and shall sign the same when so agreed. If the Contractor does not so attend to examine and agree such records and drawings, they shall be taken to be correct. If, after examination of such records and drawings, the Contractor does not agree the same or does not sign the same as agreed, they shall nevertheless be taken to be correct, unless the Contractor shall, within fourteen days of such examination, lodge with the ENGINEER's Representative, for decision by the ENGINEER, notice in writing of the respects in which such records and drawings are claimed by him to be incorrect.

5.1-57 METHOD OF MEASUREMENT

The Works shall be measured net, notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the Contract.

5.1-58 PROVISIONAL SUMS

A. DEFINITION OF "PROVISIONAL SUMS". "Provisional Sum" means a sum included in the Contract and so designated in the Schedule of Prices for the execution of work or the supply of goods, materials, or services, or for contingencies, which sum may be used, in whole or in part, or not at all, at the direction and discretion of the ENGINEER. The Contract Price shall include only such amounts in respect of the work, supply or services to which such Provisional Sums relate as the ENGINEER shall approve or determine in accordance with this Clause.

B. USE OF PROVISIONAL SUMS. In respect of every Provisional Sum the ENGINEER shall have power to order:

1. Work to be executed, including goods, materials or services to be supplied by the Contractor. The Contract Price shall include the value of such work executed or such goods, materials or services supplied determined in accordance with Clause 5.1-52 hereof.

2. Work to be executed or goods, materials or services to be supplied by a nominated Sub-Contractor as hereinafter defined. The sum to be paid to the Contractor therefor shall be determined and paid in accordance with Clause

5.1-59 (D) hereof.

3. Goods and materials to be purchased by the Contractor. The sum to be paid to the Contractor therefor shall be determined and paid in accordance with Clause 5.1-59(D) hereof.

C. PRODUCTION OF VOUCHERS, ETC. The Contractor shall, when required by the ENGINEER, produce all quotations, invoices, voucher and accounts or receipts in connection with expenditure in respect of Provisional Sums.

D. LIENS. Final payment will not be made until the Contractor delivers to the CONTRACTING AGENCY a complete release of all actual or potential liens arising out of this Contract, including releases from all Subcontractors, or receipts in full in lieu thereof and, in either case, an affidavit stating that so far as he has knowledge or information the releases and receipts include all the labor.

5.1-59 NOMINATED SUB-CONTRACTORS

A. DEFINITION OF "NOMINATED SUB-CONTRACTORS." All specialists, merchants, tradesmen and others executing any work or supplying any goods, materials or services for which Provisional Sums are included in the Contract, who may have been or be nominated or selected or approved by the Employer or the ENGINEER, and all persons to whom by virtue of the provisions of the Contract the Contractor is required to sub-let any work shall, in the execution of such work or the supply of such goods, materials or services, be deemed to be sub-contractors employed by the Contractor and are referred to in this Contract as "nominated Sub-Contractors".

B. NOMINATED SUB-CONTRACTORS; OBJECTION TO NOMINATION. The Contractor shall not be required by the Employer or the ENGINEER or be deemed to be under any obligation to employ any nominated Sub-Contractor against whom the Contractor may raise reasonable objection, or who shall decline to enter into a sub-contract with the Contractor containing provisions:

1. That in respect of the work, goods, materials or services the subject of the sub-contract, the nominated Sub-Contractor will undertake towards the Contractor the like obligations and liabilities as are imposed on the Contractor towards the Employer by the terms of the Contract and will save

harmless and indemnify the Contractor from and against the same and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of or in connection therewith, or arising out of or in connection with any failure to perform such obligations or to fulfil such liabilities, and

2. that the nominated Sub-Contractor will save harmless and indemnify the Contractor from and against any negligence by the nominated Sub-Contractor, his agents, workmen and servants and from and against any misuse by him or them of any Constructional Plant or Temporary Works provided by the Contractor for the purposes of the Contract and from all claims as aforesaid.

C. DESIGN REQUIREMENTS TO BE EXPRESSLY STATED. If in connection with any Provisional Sum the services to be provided include any matter of design or specification of any part of the Permanent Works or of any equipment or plant to be incorporated therein, such requirement shall be expressly stated in the Contract and shall be included in any nominated Sub-Contract. The nominated Sub-Contract shall specify that the nominated Sub-Contractor providing such services will save harmless and indemnify the Contractor from and against the same and from all claims; proceedings, damages, costs, charges and expenses whatsoever arising out of or in connection with any failure to perform such obligations or to fulfill such liabilities.

D. PAYMENTS TO NOMINATED SUB-CONTRACTORS. For all work executed or goods, materials, or services supplied by any nominated Sub-Contractor, there shall be included in the Contract Price:

1 The actual price paid or due to be paid by the Contractor, on the direction of the ENGINEER, and in accordance with the Sub-Contract;

2. the sum, if any, entered in the Schedule of Prices for labour supplied by the Contractor in connection therewith, or if ordered by the ENGINEER pursuant to Clause 5.1-58 (3) 2 hereof, as may be determined in accordance with Clause 5.1-52 hereof;

3. in respect of all other charges and profit, a sum being a percentage price of the actual price paid or due to be paid calculated, where provision has been made in the Schedule of Prices for a price to be set against the relevant Provisional Sum, at the price inserted by the Contractor against that item or, where no such provision has been made, at the price inserted

by the Contractor in the Tender and repeated where provision for such is made in a special item provided in the Schedule of Prices for such purpose.

E. CERTIFICATION OF PAYMENTS TO NOMINATED SUB-CONTRACTORS. Before issuing, under Clause 5.1-60 hereof, any certificate, which includes any payment in respect of work done or goods, materials or services supplied by any nominated Sub-Contractor, the ENGINEER shall be entitled to demand from the Contractor reasonable proof that all payments, less retentions, included in previous certificates in respect of the work or goods, materials or services of such nominated Sub-Contractor have been paid or discharged by the Contractor, in default whereof unless the Contractor shall:

1. inform the ENGINEER in writing that he has reasonable cause for withholding or refusing to make such payments and

2. produce to the ENGINEER reasonable proof that he has so informed such nominated Sub-Contractor in writing,

the employer shall be entitled to pay to such nominated Sub-Contractor direct, upon the certificate of the ENGINEER, all payments, less retentions, provided for in the Sub-Contract, which the Contractor has failed to make to such nominated Sub-Contractor and to deduct by way of set-off the amount so paid by the Employer from any sums due or which may become due from the Employer to the Contractor. Provided always that, where the ENGINEER has certified and the Employer has paid direct as aforesaid, the ENGINEER shall in issuing any further certificate in favour of the Contractor deduct from the amount thereof the amount so paid, direct as aforesaid, but shall not withhold or delay the issue of the certificate itself when due to be issued under the terms of the Contract.

F. ASSIGNMENT OF NOMINATED SUB-CONTRACTORS' OBLIGATIONS. In the event of a nominated Sub-Contractor, as hereinbefore defined, having undertaken towards the Contractor in respect of the work executed, or the goods, materials or services supplied by such nominated Sub-Contractor, any continuing obligation extending for a period exceeding that of the Period of Maintenance under the Contract, the Contractor shall at any time, after the expiration of the Period of Maintenance, assign to the Employer, at the Employer's request and cost, the benefit of such obligation for the unexpired duration thereof.

5.1-60 CERTIFICATES AND PAYMENT

A. CERTIFICATES AND PAYMENT. Unless otherwise provided, payments shall be made at monthly intervals in accordance with the conditions set out in Part 5.2 in the Clause numbered 5.2-17.

B. ADVANCES ON CONSTRUCTIONAL PLANT AND MATERIALS. Where advances are to be made by the Employer to the Contractor in respect of Constructional Plant and materials, the conditions of payment and repayment shall be as set out in Part 5.2 in the Clause numbered 5.2-17.

C. PAYMENT IN FOREIGN CURRENCIES. If the execution of the Works shall necessitate the importation of materials, plant or equipment from a country other than that in which the Works are being executed, or if the Works or any part thereof are to be executed by labour imported from any other such country, or if any other circumstances shall render it necessary or desirable, a proportion of the payments to be made under the Contract shall be made in the appropriate foreign currencies and in accordance with the provisions of Clause 5.1-72 hereof. The conditions under which such payments are to be made shall be as set out in part 5.2 in the Clause numbered 5.2-17.

5.1-61 APPROVAL ONLY BY MAINTENANCE CERTIFICATE

No certificate other than the Maintenance Certificate referred to in Clause 5.1-62 hereof shall be deemed to constitute approval of the Works.

5.1-62 MAINTENANCE CERTIFICATE, CESSATION OF EMPLOYER'S LIABILITY AND, UNFULFILLED OBLIGATIONS

A. MAINTENANCE CERTIFICATE. The Contract shall not be considered as completed until a Maintenance Certificate shall have been signed by the ENGINEER and delivered to the Employer stating that the Works have been completed and maintained to his satisfaction. The Maintenance Certificate shall be given by the ENGINEER within twenty-eight days after the expiration of the Period of Maintenance, or, if different periods of maintenance shall become applicable to different sections or parts of the Works, the expiration of the latest such period, or as soon thereafter as any works ordered during such period, pursuant to Clauses 5.1-19 and 5.1-50 hereof, shall have been completed to the satisfaction of the ENGINEER and full effect shall be given

to this Clause, notwithstanding any previous entry on the Works or the taking possession, working or using thereof or any part thereof by the Employer. Provided always that the issue of the Maintenance Certificate shall not be a condition precedent to payment to the Contractor of the second portion of the retention money in accordance with the conditions set out in part 5.2 in the Clause numbered 5.2-17.

B. CESSATION OF EMPLOYER'S LIABILITY. The employer shall not be liable to the Contractor for any matter or thing arising out of or in connection with the Contract or the execution of the Works, unless the Contractor shall have made a claim in writing in respect thereof before the giving of the Maintenance Certificate under this Clause.

C. UNFULFILLED OBLIGATIONS. Notwithstanding the issue of the Maintenance Certificate the Contractor and, subject to sub-clause (B) of this Clause, the Employer shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issue of the Maintenance Certificate which remains unperformed at the time such Certificate is issued and, for the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties hereto.

5.1-63 DEFAULT OF CONTRACTOR, VALUATION AT DATE OF FORFEITURE AND, PAYMENT AFTER FORFEITURE

A. DEFAULT OF CONTRACTOR. If the Contractor shall become bankrupt, or have a receiving order made against him, or shall present his petition in bankruptcy, or shall make an arrangement with or assignment in favour of his creditors, or shall agree to carry out the Contract under a committee of inspection of his creditors or, being a corporation, shall go into liquidation (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), or if the Contractor shall assign the Contract, without the consent in writing of the Employer first obtained, or shall have an execution levied on his goods, or if the ENGINEER shall certify in writing to the Employer that in his opinion the Contractor:

1. has abandoned the Contract, or
2. without reasonable excuse has failed to commence the Works or has suspended the progress of the Works for twenty-eight days after receiving from the ENGINEER written notice to proceed, or

3. has failed to remove materials from the Site or to pull down and replace work for twenty-eight days after receiving from the ENGINEER written notice that the said materials or work had been condemned and rejected by the ENGINEER under these conditions, or

4. despite previous warnings by the ENGINEER, in writing, is not executing the Works in accordance with the Contract, or is persistently or flagrantly neglecting to carry out his obligations under the Contract, or

5. has, to the detriment of good workmanship, or in defiance of the ENGINEER's instructions to the contrary, sub-let any part of the Contract

then the Employer may, after giving fourteen days' notice in writing to the Contractor, enter upon the Site and the Works and expel the Contractor therefrom without thereby voiding the Contract, or releasing the Contractor from any of his obligations or liabilities under the Contract, or affecting the rights and powers conferred on the employer or the ENGINEER by the Contract, and may himself complete the Works or may employ any other contractor to complete the Works. The Employer or such other contractor may use for such completion so much of the Constructional Plant, Temporary Works and materials, which have been deemed to be reserved exclusively for the execution of the Works, under the provisions of the Contract, as he or they may think proper, and the Employer may, at any time, sell any of the said Constructional Plant, Temporary Works and unused materials and apply the proceeds of sale in or towards the satisfaction of any sums due or which may become due to him from the Contractor under the Contract.

B. VALUATION AT DATE OF FORFEITURE. The ENGINEER shall, as soon as may be practicable after any such entry and expulsion by the Employer, fix and determine ex parte, or by or after reference to the parties, or after such investigation or enquiries as he may think fit to make or institute, and shall certify what amount, if any, had at the time of such entry and expulsion been reasonably earned by or would reasonably accrue to the Contractor in respect of work then actually done by him under the Contract and the value of any of the said unused or partially used materials, any Constructional Plant and any Temporary Works.

C. PAYMENT AFTER FORFEITURE. If the Employer shall enter and expel the Contractor under this Clause, he shall not be liable to pay to the Contractor any money on account of the Contract until the expiration of the Period of Maintenance and thereafter until the cost of execution and maintenance, damages for delay in completion, if any, and all other expenses incurred

by the Employer have been ascertained and the amount thereof certified by the ENGINEER. The Contractor shall then be entitled to receive only such sum or sums, if any, as the ENGINEER may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall upon demand, pay to the Employer the amount of such excess and it shall be deemed a debt due by the Contractor to the Employer and shall be recoverable accordingly.

5.1-64 URGENT REPAIRS

If, by reason of any accident, or failure, or other event occurring to in or in connection with the Works, or any part thereof, either during the execution of the Works, or during the Period of Maintenance, any remedial or other work or repair shall, in the opinion of the ENGINEER or the ENGINEER's Representative, be urgently necessary for the safety of the Works and the Contractor is unable or unwilling at once to do such work or repair, the Employer may employ and pay other persons to carry out such work or repair as the ENGINEER or the ENGINEER's Representative may consider necessary. If the work or repair so done by the Employer is work which, in the opinion of the ENGINEER, the Contractor was liable to do at his own expense under the Contract, all expenses properly incurred by the Employer in so doing shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any monies due or which may become due to the Contractor. Provided always that the ENGINEER or the ENGINEER's Representative, as the case may be, shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof in writing.

5.1-65 SPECIAL RISKS

Notwithstanding anything in the Contract contained:

A. NO LIABILITY FOR WAR, ETC., RISKS. The Contractor shall be under no liability whatsoever whether by way of indemnity or otherwise for or in respect of destruction of or damage to the Works, save to work condemned under the provisions of Clause 5.1-39 hereof prior to the occurrence of any special risk hereinafter mentioned, or to property whether of the Employer or third parties, or for or in respect of injury or loss of life which is the consequence of any special risk as

hereinafter defined. The Employer shall indemnify and save harmless the Contractor against and from the same and against and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising thereout or in connection therewith.

B. DAMAGE TO WORKS, ETC., BY SPECIAL RISKS. If the Works or any materials on or near or in transit to the Site, or any other property of the Contractor used or intended to be used for the purposes of the Works, shall sustain destruction or damage by reason of any of the said special risks the Contractor shall be entitled to payment for:

1. Any permanent work and for any materials so destroyed or damaged, and so far as may be required by the ENGINEER, or as may be necessary for the completion of the Works, on the basis of cost plus such profit as the ENGINEER may certify to be reasonable;

2. replacing or making good any such destruction or damage to the Works;

3. replacing or making good such materials or other property of the Contractor used or intended to be used for the purposes of the Works.

C. PROJECTILE, MISSILE, ETC. Destruction, damage, injury or loss of life caused by the explosion or impact whenever and wherever occurring of any mine, bomb, shell, grenade, or other projectile, missile, munition, or explosive of war, shall be deemed to be a consequence of the said special risks.

D. INCREASED COSTS ARISING FROM SPECIAL RISKS. The employer shall repay to the Contractor any increased cost of or incidental to the execution of the Works, other than such as may be attributable to the cost of reconstructing work condemned under the provisions of Clause 5.1-39 hereof, prior to the occurrence of any special risk, which is howsoever attributable to or consequent on or the result of or in any way whatsoever connected with the said special risks, subject however to the provisions in this Clause hereinafter contained in regard to outbreak of war, but the Contractor shall as soon as any such increase of cost shall come to his knowledge forthwith notify the ENGINEER thereof in writing.

E. SPECIAL RISKS. The special risks are war, hostilities (whether war be declared or not), invasion, act of foreign enemies, the nuclear and pressurewaves risk described in Clause 5.1-20 (B) hereof, or insofar as it relates to the country in

which the Works are being or are to be executed or maintained, rebellion, revolution, insurrection, military or usurped power, civil war, or, unless solely restricted to the employees of the Contractor or of his Sub Contractors and arising from the conduct of the Works, riot, commotion or disorder.

F. OUTBREAK OF WAR. If, during the currency of the Contract, there shall be an outbreak of war, whether war is declared or not, in any part of the world which, whether financially or otherwise, materially affects the execution of the Works, the Contractor shall, unless and until the Contract is terminated under the Provisions of this Clause, continue to use his best endeavours to complete the execution of the Works. Provided always that the Employer shall be entitled at any time after such outbreak of war to terminate the Contract by giving written notice to the Contractor and, upon such notice being given, this Contract shall, except as to the rights of the parties under this Clause and to the operation of Clause 5.1-67 hereof, terminate, but without prejudice to the rights of either party in respect of any antecedent breach thereof.

G. REMOVAL OF PLANT ON TERMINATION. If the Contract shall be terminated under the provisions of the last preceding sub-clause, the Contractor shall, with all reasonable despatch, remove from the Site all Constructional Plant and shall give similar facilities to his Sub-Contractors to do so.

H. PAYMENT IF CONTRACT TERMINATED. If the Contract shall be terminated as aforesaid; the Contractor shall be paid by the Employer, insofar as such amounts or items shall not have already been covered by payments on account made to the Contractor, for all work executed prior to the date of termination at the prices provided in the Contract and in addition:

1. The amount's payable in respect of any preliminary items; so far as the work or service comprised therein has been carried out or performed, and a proper proportion as certified by the ENGINEER of any such items, the work or service comprised in which has been partially carried out or performed.

2. The cost of materials or goods reasonably ordered for the Works which shall have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery, such materials or goods becoming the property of the Employer upon such payments being made by him.

3. A sum to be certified by the ENGINEER, being the amount of any expenditure reasonably incurred by the Contractor

in the expectation of completing the whole of the Works insofar as such expenditure shall not have been covered by the payments in this sub-clause before mentioned.

4. Any additional sum payable under the provisions of sub-clauses (A), (B) and (D) of this Clause.

5. The reasonable cost of removal of Constructional Plant under sub-clause (G) of this Clause and, if required by the Contractor, return thereof to the Contractor's main plant yard in his country of registration or to other destination, at no greater cost.

6. The reasonable cost of repatriation of all the Contractor's staff and workmen employed on or in connection with the Works at the time of such termination.

Provided always that against any payments due from the Employer under this sub-clause, the Employer shall be entitled to be credited with any outstanding balances due from the Contractor for advances in respect of Constructional Plant and materials and any other sums which at the date of termination were recoverable by the Employer from the Contractor under the terms of the Contract.

5.1-66 PAYMENT IN EVENT OF FRUSTRATION

If a war, or other circumstances outside the control of both parties, arises after the Contract is made so that either party is prevented from fulfilling his contractual obligations, or under the law governing the Contract, the parties are released from further performance, then the sum payable by the Employer to the Contractor in respect of the work executed shall be the same as that which would have been payable under Clause 5.1-65 hereof if the Contract had been terminated under the provisions of Clause 5.1-65 hereof.

5.1-67 SETTLEMENT OF DISPUTES . ARBITRATION

If any dispute or difference of any kind whatsoever shall arise between the Employer and the Contractor in connection with, or arising out of the Contract, or the execution of the Works, whether during the progress of the Works or after their completion and whether before or after the termination, abandonment or breach of the Contract, it shall, in the first place, be referred to and settled by the ENGINEER who shall, within a period of ninety days after being requested by either

party to do so, give written notice of his decision to the Employer and the Contractor. Subject to arbitration, as hereinafter provided, such decision in respect of every matter so referred shall be final and binding upon the Employer and by the Contractor, who shall proceed with the execution of the Works with all due diligence whether he or the Employer requires arbitration, as hereinafter provided, or not. If the ENGINEER has given written notice of his decision to the Employer and the Contractor and no claim to arbitration has been communicated to him by either the Employer or the Contractor within a period of ninety days from receipt of such notice, the said decision shall remain final and binding upon the Employer and the Contractor. If the ENGINEER shall fail to give notice of his decision, as aforesaid, within a period of ninety days after being requested as aforesaid, or if either the Employer or the Contractor be dissatisfied with any such decision, then and in any such case either the Employer or the Contractor may within ninety days after receiving notice of such decision, or within ninety days after the expiration of the first-named period of ninety days, as the case may be, require that the matter or matters in dispute be referred to arbitration as hereinafter provided. All disputes or differences in respect of which the decision, if any, of the ENGINEER has not become final and binding as aforesaid shall be finally settled under the Rules of Conciliation and Arbitration of the International Chamber of Commerce by one or more arbitrators appointed under such Rules. The said arbitrator/s shall have full power to open up, revise and review any decision, opinion, direction, certificate or valuation of the ENGINEER. Neither party shall be limited in the proceedings before such arbitrator/s to the evidence or arguments put before the ENGINEER for the purpose of obtaining his said decision. No decision given by the ENGINEER in accordance with the foregoing provisions shall disqualify him from being called as a witness and giving evidence before the arbitrator/s on any matter whatsoever relevant to the dispute or difference referred to the arbitrator/s as aforesaid. The reference to arbitration may proceed notwithstanding that the Works shall not then be or be alleged to be complete, provided always that the obligations of the Employer, the ENGINEER and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the Works.

5.1-68 NOTICES

A. SERVICE OF NOTICES ON CONTRACTOR. All certificates, notices or written orders to be given by the Employer or by the ENGINEER to the Contractor under the terms of the Contract shall be served by sending by post to or delivering the same to the

Contractor's principal place of business, or such other address as the Contractor shall nominate for this purpose.

B. SERVICE OF NOTICES ON EMPLOYER OR ENGINEER. All notices to be given to the Employer or to the ENGINEER under the terms of the Contract shall be served by sending by post or delivering the same to the respective addresses nominated for that purpose in Part 5.2 of these Conditions.

C. CHANGE OF ADDRESS. Either party may change a nominated address to another address in the country where the Works are being executed by prior written notice to the other party and the ENGINEER may do so by prior written notice to both parties.

5.1-69 DEFAULT OF EMPLOYER

A. DEFAULT OF EMPLOYER. In the event of the Employer:

1. failing to pay to the Contractor the amount due under any certificate of the ENGINEER within thirty days after the same shall have become due under the terms of the Contract, subject to any deduction that the Employer is entitled to make under the Contract, or

2. interfering with or obstructing or refusing any required approval to the issue of any such certificate, or

3. becoming bankrupt or, being a company, going into liquidation, other than for the purpose of a scheme of reconstruction or amalgamation, or

4. giving formal notice to the Contractor that for unforeseen reasons, due to economic dislocation, it is impossible for him to continue to meet his contractual obligations

the Contractor shall be entitled to terminate his employment under the Contract after giving fourteen days' prior written notice to the Employer, with a copy to the ENGINEER.

B. Upon the expiry of the fourteen days' notice referred to in sub-clause (A) of this Clause, the Contractor shall, notwithstanding the provisions of Clause 5.1-57(A) hereof, with all reasonable despatch, remove from the Site all Constructional Plant brought by him thereon.

C. In the event of such termination the Employer shall be under the same obligations to the Contractor in regard to payment as if the Contract had been terminated under the provisions of Clause 5.1-65 hereof, but, in addition to the payments specified in Clause 5.1-65 (H) hereof, the Employer shall pay to the Contractor the amount of any loss or damage to the Contractor arising out of or in connection with or by consequence of such termination.

5.1-70 CHANGES IN COSTS AND LEGISLATION

A. INCREASE OR DECREASE OF COSTS. Adjustments to the Contract Price shall be made in respect of rise or fall in the costs of labour and/or materials or any other matters affecting the cost of the execution of the Works, as set out in Part 5.2 in the Clause numbered 5.2-19.

B. SUBSEQUENT LEGISLATION. If, after the date thirty days prior to the latest date for submission of tenders for the Works there occur in the country in which the Works are being or are to be executed changes to any National or State Statute, Ordinance, Decree or other Law or any regulation or bye-law of any local or other duly constituted authority, or the introduction of any such State Statute, Ordinance, Decree, Law, regulation or bye-law which causes additional or reduced cost to the Contractor, other than under sub-clause (A) of this Clause, in the execution of the Works, such additional or reduced cost shall be certified by the ENGINEER and shall be paid by or credited to the Employer and the Contract Price adjusted accordingly.

5.1-71 CURRENCY RESTRICTIONS

If, after the date thirty days prior to the latest date for submission of tenders for the Works the Government or authorised agency of the Government of the country in which the Works are being or are to be executed imposes currency restrictions and/or transfer of currency restrictions in relation to the currency or currencies in which the Contract Price is to be paid, the Employer shall reimburse any loss or damage to the Contractor arising therefrom, without prejudice to the right of the Contractor to exercise any other rights or remedies to which he is entitled in such event.

5.1-72 RATES OF EXCHANGE

A. Where the Contract provides for payment in whole or in part to be made to the Contractor in foreign currency or currencies, such payment shall not be subject to variations in the rate or rates of exchange between such specified foreign currency or currencies and the currency of the country in which the Works are to be executed.

B. Where the Employer shall have required the Tender to be expressed in a single currency but with payment to be made in more than one currency and the Contractor has stated the proportions or amounts of other currency or currencies in which he requires payment to be made, the rate or rates of exchange applicable for calculating the payment of such proportions or amounts shall be those prevailing, as determined by the Central Bank of the country in which the Works are to be executed, on the date thirty days prior to the latest date for the submission of tenders for the Works, as shall have been notified to the Contractor by the Employer prior to the submission of tenders or as provided for in the tender documents.

C. Where the Contract provides for payment in more than one currency, the proportions, or amounts to be paid in foreign currencies in respect of Provisional Sum items shall be determined in accordance with the principles set forth in sub-clauses (A) and (B) of this Clause as and when these sums are utilised in whole or in part in accordance with the provisions of Clause 5.1-58 and 5.1-59 hereof.

PART V - GENERAL CONDITIONS

SECTION 2 - CONDITIONS OF PARTICULAR APPLICATION

5.2-01 FORM OF CONTRACT

The form of the Contract will be of the unit price type in which the units of measurement for the various items of work will be "quantities" for certain items and "lump sum" for others. All payments to the Contractor will be based on the items in Section 2.2-02 "Schedule of Prices", and the prices bid therein except for payments made under the provisions of 5.1-51, "Variations and Orders for Variations to be in Writing". The successful Bidder agrees to execute Part IV, "Bid Performance and Payment Bond Form", and Part II, "Bid Form".

5.2-02 CLARIFICATION

The clauses in this Part 5.2 are keyed to the number of the clauses in Part 5.1.

5.2-03 TERMINOLOGY

The FIDIC clauses in Part 5.1 use British terminology. Some of these terms and their american equivalents are:

British	American
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Employer	Contracting Agency or Owner
Tender	Bid
Tenderer	Bidder
Advances	Mobilization costs
Subletting	Subcontracting
Variations	Changes
Beacons	Monuments
Day Work	Force account work

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Hoardings	Billboards or signs
Building line	Right-of-way limits
Ploughed	Flowed
Disking	Discing
Stone Pitch	Rip rap
On costs	Direct Costs
Wayleaves	Right-of-way
Provisional and prime cost sums	Extra work and cost plus items

These terms may also be defined in Clause 5.2-4 of part (5.2), if appropriate.

5.2-04 MODIFICATION OF CLAUSE 5.1-01 "DEFINITIONS AND INTERPRETATIONS"

A. 30) "Eligible Countries" means a country designated by Geographic Code in clause 74, entitled "Nationality, Source, and Cargo Preference" from which goods and services may be obtained.

31) "Government" means the Government of the Dominican Republic.

32) "Host Country" means the country of the Government.

5.2-05 MODIFICATION OF CLAUSE 5.1-02 "ENGINEER AND ENGINEER'S REPRESENTATIVE"

A. The ENGINEER acts as the agent for the Employer in supervising the work of the Contractor by making decisions and providing approvals on behalf of the Employer. The ENGINEER's role shall specifically include:

(1) Interpreting the drawings and specifications, including the review and approval of shop drawings.

(2) Approving the quality of equipment and materials delivered to the site, which may require witnessing tests of manufactured equipment prior to overseas shipment and inspecting packaging of equipment for overseas shipment.

(3) Inspecting and accepting or rejecting work in place.

(4) Requiring replacement of defective work, equipment or material.

(5) Issuing change orders. Concurrence of the Employer will be necessary where their value exceeds \$50,000.

(6) Negotiating and (for Employer's approval) making recommendations regarding unit costs for work not specified in the document.

(7) Providing certifications of progress payments invoiced by the contractor as to correct quantities and conformity to plans and specifications.

(8) Making final inspections and giving recommendation regarding acceptance of the finished project by the Employer, including approving test procedure schedules and test results.

(9) Preparing "as built" drawings.

(10) As the Employer's agent, issuing the approvals called for in Clause 5.1-10 of part 5.1 of this contract. All other approvals of the Employer called for in Part 5.1 will be issued by the Employer.

5.2-06 MODIFICATION OF CLAUSE 5.1-03 "ASSIGNMENT"

AID's prior written consent to any assignment of obligations under this contract, in addition to the consent by the ENGINEER required in Clause 5.1-03 of Part 5.1 of the Conditions of Contract, is required.

5.2-07 MODIFICATION OF CLAUSE 5.1-04 "SUBLETTING"

A. Clause 5.1-04 in Part 5.1 is designated sub clause (A). The following subclauses (B) and (C) are added.

B. All subcontracts and purchase orders in excess of \$100,000 shall only be awarded with the prior written consent of the Employer and AID and such consent, if given, shall not relieve the Contractor from any liability or obligation under this contract.

C. The Contractor agrees to include the following provisions of this Part 5.2 in all subcontracts hereunder:

"Books and Records";

"Air Travel and Transportation";

"Nationality, Source, and Cargo Preference";

"Workmen's Compensation Insurance"; and

(Specify any additional provisions by clause title.)

5.2-08 MODIFICATION OF CLAUSE 5.1-05 (A) "LANGUAGE AND LAW"

A. (1) This Contract is drawn up in Spanish. The Spanish version of this Contract shall govern and shall be designated as the "Ruling Language." English courtesy translation will also be provided.

(?) This Contract shall be interpreted in accordance with the laws of Dominican Republic.

5.2-09 MODIFICATION OF CLAUSE 5.1 05 (B) "DOCUMENTS MUTUALLY EXPLANATORY"

Paragraph (B) of Clause 5.1-05 of Part 5.1 of the Conditions of Contract is deleted and the following substituted therefor:

(B) In the case of any inconsistency among the several parts of the contract, Part 5.2 of the Conditions of Contract shall prevail over Part 5.1 of the Conditions of Contract, and the Drawings shall prevail over the Specifications.

5.2-10 MODIFICATIONS OF CLAUSE 5.1-14 "PROGRAMME TO BE FURNISHED".

The Programme called for in Part 5.1 shall be submitted within 30 days after award of the contract. The Programme shall include a detailed construction schedule for approval of the ENGINEER showing starting dates, progress and completion dates for component parts of the work, a list of major equipment to be used in performance of the work, including the nature and extent of the construction plant and operations, and the extent of

subcontracting proposed.

5.2-11 MODIFICATION OF CLAUSE 5.1-21 "INSURANCE OF WORKS"

In addition to the insurance required by Clause 5.1-21 Part 5.1 of the Conditions of Contract, the Contractor shall insure all goods, equipment and materials financed hereunder or supplied to it by the Employer against risks incident to their transit to the point of their use in the performance of this contract, and to their storage, if any, prior to incorporation in the project. Such insurance shall insure the full value of the goods, equipment and materials and the insurance proceeds shall be payable in U.S. dollars or any fully convertible or acceptable currency. With respect to goods, equipment, and materials, the cost of which is reimbursable under this contract, the Contractor shall give prompt notice of payment to it of proceeds from insurance on any such item. Such proceeds shall be used to pay for the replacement of the items from any Code 935 country.

5.2-12 MODIFICATION OF CLAUSE 5.1-23 "THIRD PARTY INSURANCE"
MINIMUM AMOUNT OF THIRD PARTY INSURANCE AND PROVISION TO
INDEMNIFY EMPLOYER"

In addition to the insurance required by Clause 5.1-23 of Part 5.1 of the Conditions of Contract, if the Contractor or any of its employees or their dependents ship to (whether or not at contract expense), or purchase privately owned automobiles in, the host country, the Contractor will ensure that all such automobiles are covered by a paid insurance policy issued by a reliable company providing the following minimum coverages (or such other minimum coverages as the Employer may set) payable in United States dollars or local currency equivalent: injury to person, \$100,000/\$200,000; property damage, \$50,000. The premium costs for such insurance shall not be a reimbursable cost under this contract. Each insurance policy shall provide that the insurer agrees to investigate and defend the insured against all claims for damages.

5.2-13 MODIFICATION OF CLAUSE 5.1-34 "LABOUR"

I. (1) The Contractor shall comply with the existing local

labor laws, regulations, and labor standards.

(2) The Contractor shall formulate and enforce an adequate safety program with respect to all work under this Contract, whether performed by the Contractor or subcontractors. The Contractor has assurance from the Employer of cooperation where the implementation of these safety measures requires joint cooperation.

(3) Upon the written request of the Employer, the Contractor will remove or replace any of its employees employed under this contract.

(4) All Contractor and subcontractor employees shall at all times while in the host country conduct themselves within the laws of such country.

(5) The Contractor shall ensure that all employees (other than those hired in the host country) are physically fit for work under this contract and dependents authorized to accompany the employee to the host country are physically fit for residence in the host country.

5.2-14 MODIFICATION OF CLAUSE 5.1-13 "TIME FOR COMPLETION"

If the Contractor completes the work prior to the time fixed in the Contract, the ENGINEER or its representative shall so certify in writing, and the Contractor shall be paid a bonus not to exceed the amount stated in the Tender.

5.2-15 MODIFICATION OF CLAUSE 5.1 51 (B) "ORDERS FOR VARIATIONS TO BE IN WRITING"

All Orders for variations which are estimated to increase or decrease the contract amount by more than \$500,000 must have the written approval of AID.

5.2-16 MODIFICATION OF CLAUSE 5.1-53 "PLANT, TEMPORARY
WORKS AND MATERIALS"

If the Contractor determines that any part of the Constructional Plant which the Contractor shall have imported for the purposes of the Works, should not be reexported but shall be used for another Project in the host country, the Contractor shall be liable for all appropriate customs, duties, and other taxes.

5.2-17 MODIFICATION OF CLAUSE 5.1-60 "CERTIFICATES AND
PAYMENT"

The following clause is substituted for Clause 5.1-60 in Part 5.1 of the Conditions of Contract.

A. GENERAL. Payments under this Contract shall be made in U.S. dollars and local currency in accordance with the Schedule of Prices.

B. PAYMENT IN U.S. DOLLARS. For the cost in U.S. Dollars under the Schedule of Prices of this Contract, the Employer may request that AID, as soon as this Contract is signed, open a direct letter of commitment in favor of the Contractor.

C. PAYMENT OF LOCAL CURRENCY. For the local costs under the Schedule of Prices of the Contract, the Employer may request that AID pay the Contractor in Dominican pesos.

D. PAYMENT SCHEDULE. Within 15 days after signing of the Contract, the Contractor shall submit a proposed payment schedule indicating the estimated payments throughout the life of the Contract. This schedule shall be in form satisfactory to the Employer, shall be consistent with the general construction schedule, and shall be sufficient detail to permit the Employer to prepare cash flow projections.

E. PROGRESS PAYMENTS.

(1) Not later than the tenth day of every month the Contractor shall submit to the ENGINEER for review an interim statement in a form acceptable to the Employer, filled out and signed by the Contractor, covering the cumulative amount and value of work carried out as of the date of the statement and accompanied by such data, schedules, receipted bills, and affidavits as the ENGINEER may reasonably require as well as appropriate documentation as set forth in paragraph (F). The

statement shall be computed on the basis of the lump sums and unit prices of the contract in U.S. dollars and local currency.

(2) The ENGINEER shall within 10 working days after receipt of each interim statement, either indicate in writing its certification of payment due and present the statement to the Contractor or indicate in writing its reasons for refusing such certification of payment. In the latter case, the Contractor shall make the necessary corrections and resubmit the statement.

(3) The ENGINEER's certification of any payment requested in an interim statement will constitute a representation by it to the Employer, based on the ENGINEER's onsite observations of the work in progress and on its review of the interim statement and the accompanying data that the work has progressed to the point indicated and that, to the best of its knowledge, information and belief, the quality of the work is in accordance with the Contract. The ENGINEER may refuse to certify the whole of any part of any payment if, in its opinion, it would be incorrect to make such representations to the Employer.

(4) Within 10 working days of receipt of the ENGINEER's certification of the interim statement, the Employer shall act upon said statement by (A) approving for payment, (B) informing the Contractor of any objections to the statement, or payment withheld, or (C) informing the Contractor of its intent to withhold all or part of the progress payment and the contractual justification for withholding payment.

(5) Payments shall be made hereunder after the billings, duly certified by the Contractor, have been received, approved and submitted by the Employer to USAID for payment. Upon receipt of this document, administratively approved by A.I.D. Project Officer, the controller will arrange for payment to be made by the U.S. Treasury check payable to the Contractor, to be issued and mailed to the Contractor by the Regional Finance Center.

F. DOCUMENTATION FOR PAYMENT. Each interim statement and the final statement must be accompanied by the following documentation whether payment is to be made in U.S. dollars or local currency.

(1) The Contractor's invoice (one copy) describing the services performed and identifying the section in the Contract which contains the terms of payment. When commodities are procured by the Contractor on a cost reimbursement basis, the Contractor shall obtain from the supplier and submit with its invoice a completed form AID 1450-4, "Supplier's Certificate and Agreement with the Agency for International Development for

Project Commodities/Invoice and Contract Abstract," for each individual transaction which exceeds \$2,500 in value.

(2) For each shipment of equipment, materials, and commodities during the period covered by the request for payment:

a. A copy or photostat of the bill of lading (ocean, charter party, airway, barge, or truck) or parcel post receipt evidencing shipment from the source country or a free port or bonded warehouse to the host country. The bill of lading shall indicate the carrier's complete statement of charges including all relevant weights, cubic measurements, rates, and additional charges whether or not freight is financed by AID.

b. Where shipment is effected from a free port or bonded warehouse, a copy of the bill of lading, bearing a notation of the freight costs, covering shipment from the source to the free port or bonded warehouse and, if the free port or bonded warehouse is located within the host country, accompanied by a delivery receipt evidencing release from the free port or bonded warehouse to the Contractor. The date of the delivery receipt will be considered as the shipment date for the transaction and therefore must be dated within such delivery period as may be specified in the letter of commitment.

(3) The Contractor's Certificate and agreement with the Agency for International Development, Contractor's Invoice and Contract Abstract, Form AID 1440-3, shall be prepared in accordance with instructions thereon.

(4) A certificate, signed, and dated by the CONTRACTING AGENCY or ENGINEER (if formally authorized), as follows:

a. For progress payments: "The Borrower/Grantee certifies that (i) the services (or equipment and materials) for which payment is requested have been satisfactorily performed (delivered) and (ii) the payment requested is in accordance with the terms of the Contract."

b. For final payments: "The Borrower/Grantee certifies that the services (or equipment and materials) for which final payment is invoiced meets in all respects the specification prescribed in the covering Contract, and the amount invoiced is properly due and payable under the terms of the Contract."

(5) If the Contract has been terminated pursuant to the provisions herein, the claim for termination costs shall be accompanied by:

a. Written justification by the Contractor supporting in detail the claimed charge.

b. Either written concurrence by the Employer to the Contractor's claim or a certified copy of an arbitration award.

G. RETENTIONS. The Employer shall deduct and retain an amount equal to 5 percent of the total amount certified by the ENGINEER on each interim statement. The retained amounts shall be paid upon final acceptance of the work.

In addition to the amount retained as stated in 5.2-17(E) Progress Payments, the CONTRACTING AGENCY may withhold the whole or part of any certificate for payment to such extent as may be necessary to protect itself account of:

- (1) Defective work not remedied or guarantees not met.
- (2) A reasonable doubt that the Contract can be completed for the balance then unpaid.
- (3) Amounts due as liquidated damages.

When the grounds for withholding payment are removed, payment will be made for the amount due because of them.

H. FINAL PAYMENT. Final payment of all amounts due the Contractor (including retentions) will be made upon submission of the documentation required by paragraph (F) above and after the Certificate of Completion has been issued by the ENGINEER.

I. MONIES OR CREDITS DUE THE EMPLOYER. Whenever throughout the life of the Contract and before final payment, certain monies become due by the Contractor to the Employer, the Employer shall have the right to recover such costs by either of the following methods or a combination thereof:

- (1) Deduction from monies due the Contractor, or to later become due the Contractor, or being retained by the Employer pending final acceptance of the work, or
- (2) Recovery from the Contractor's surety.

5.2-18 MODIFICATION OF CLAUSE 5.1-68 "NOTICES"

Employer's address is:
 Corporacion Dominicana de Electricidad
 Ave. Independencia Esq. Fray Cipriano de Utrera
 Centro de los Heroes, Apartado Postal 1428-TLXHIDRCDE 3460581
 Santo Domingo, Dominican Republic
 Attention: Direccion de Desarrollo Hidroelectrico

5.2-19 MODIFICATION OF CLAUSE 5.1-70 (A) "INCREASE OR DECREASE OF COSTS"

Price Adjustment Formula for Local Currency Costs

(1) The prices quoted by the bidder should not include any amount to cover the contingency of a rise in the cost of labor and materials to the extent that compensation for such rise is covered by the provisions of this clause.

(2) Account will be taken of the increase or decrease in labor rates and costs of materials by multiplying the local currency portion of each monthly payment to the Contractor by an adjustment factor (K) computed according to the following formula:

$$K = 0.19 + 0.27 LL/LLo + 0.06 FU/FUo + 0.06 FG/FGo + 0.01 FL/FLo + 0.18 CE/CEo + 0.14 RS/RSo + 0.09 MA/MAo$$

where LL represents the summary of the minimum payments for the Works in the month of their execution; FG, official price for a gallon of gasoline; FU, official price for a gallon of gasoil; FL, average of the bid prices of a lubricant gallon; CE, official price for a ton of bulk cement; RS, official price for a metric ton of reinforcing steel; MA, official price for a square foot of wood pine for planking; all these previous prices corresponding to the month of execution of the Works, while LLo, FGo, FUo, etc. represent respectively the same previous prices or indices in the day when the contractor presented his bid.

(3) The weights given above to local labor, fuel, etc. may be reviewed and modified by the Employer if requested by the Contractor provided the Employer is satisfied that such modification is justified by the method of execution of the project proposed by the Contractor. However, the Contract price is based on the application of the formula indicated above and as specified hereafter.

(4) The basic indices or prices shall be those ruling on the day 30 days before the closing date for the submission of Tenders and the current indices or prices shall be those ruling on the day 30 days prior to the last day of the period to which the payment certificate refers. If at any time the officially published relevant indices are not available, provisional indices will be used subject to the correction of the amounts paid in respect of price adjustment based on provisional indices when such official indices become available.

(5) Application of this clause will not apply as long as the value of the adjustment factor (K) remains between 0.97 and 1.03. Further, the adjustment of prices to current indices shall be applied only during the Contract time or its approved extension. Payments for the work carried out after the approved Contract time will be adjusted using the last adjustment factor for the approved contract time, provided the factors based on the current prices at the time of such payments are not lower than the last adjustment factor in such case the lower adjustment factor shall be applied.

(6) The indices mentioned above are as follows:

LL, LLo = Wages Prices or indices of the Construction Industry published in the official publication (Direccion Gral. del Comité Nacional de Salarios "Resolucion #2, 1985) of the "Secretaria de Estado de Trabajo".

FU, FUo, FG, FGo, FL, FLo = Price per liter. of diesel fuel, gasoline and lubricant FOB distributor in the site.

MA, MAo = Official Price for one (1) square foot of wood pine for planking.

CE, CEo = Price per metric ton of artificial Portland cement 250/315 from any source, in paper bags or bulk, CIF at port of entry; price fixed by the "Secretaria de Estado de Industria y Comercio".

RS, RSo = Price per metric ton of 6 to 36 mm. diameter concrete reinforcing steel bars in site.

(7) Maximum Percentage of Contract Price Revision by Means of the Price Adjustment Factor: The increase of the original local currency portion of the Contract price by means of the Price Adjustment Factor shall not exceed fifteen percent (15%). It is, however, specified that if during construction it appears that the total amount of revisions calculated with the

adjustment factor "K" is likely to exceed fifteen percent (15%), the Contractor may request from Employer, by registered letter with acknowledgement of delivery, a corresponding increase of the fifteen percent (15%) limit of price increase.

5.2-20 CLAUSE 5.1-73 "LEGAL EFFECT OF AID APPROVALS AND DECISIONS."

The parties hereto understand that the Contract has reserved to AID certain rights such as, but not limited to, the right to approve the terms of this Contract, the Contractor, and any or all plans, reports, specifications, subcontracts, bid documents, drawings, or other documents related to this contract and the Project of which it is part. The parties hereto further understand and agree that AID, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure that proper use of United State Government funds, and that any decision by AID to exercise or refrain from exercising these approval rights shall be made as financier in the course of financing this Project and shall not be construed as making AID a party to the contract. The parties hereto understand and agree that AID may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the Project with the parties jointly or separately, without thereby incurring any responsibilities or liability to the parties jointly or to any of them. Any approval (or failure to disapprove) by AID shall not bar the Employer or AID from asserting any right, or relieve the Contractor of any liability which the Contractor might otherwise have to the Employer or AID.

5.2-21 CLAUSE 5.1-74 "NATIONALITY, SOURCE, AND CARGO PREFERENCE"

A. Unless otherwise specified in paragraph (D), (E), (F), or (G) below or in the clause entitled "Air Travel and Transportation," in order to be eligible for AID financing all goods and services provided by the Contractor or any subcontractor under this contract shall have their nationality, source, and origin in those countries listed in AID Geographic Code 941 in effect on the date of acquisition and/or in the Dominican Republic. However the source rule does not apply to goods owned by the Contractor to bid opening. Citizens of firms of any country not included in AID Geographic Code 935 are ineligible as suppliers, contractor, subcontractors, or agents in connection with AID-financed contracts for goods or services. However, non-U.S. citizens lawfully admitted for permanent residence in the United States are eligible.

B. DEFINITIONS.

(1) SOURCE. "Source" means the country from which a commodity is shipped to the Cooperating Country or the Cooperating Country itself if the commodity is located therein at the time of purchase. However, where a commodity is shipped from a free port or bonded warehouse in the form in which received therein, "source" means the country from which the commodity was shipped to the free port or bonded warehouse.

(2) ORIGIN. The "origin" of a commodity is the country or area in which a commodity is mined, grown, or produced. A commodity is produced when through manufacturing, processing, or substantial and major assembling of components a commercially recognized new commodity results that is substantially different in basic characteristics or in purpose or utility from its components.

(3) COMPONENTRY. "Components" are the goods that go directly into the production of a produced commodity. AID componentry rules for commodities produced in eligible countries are as follows:

a. If the commodity contains no imported component, it is eligible for financing under the Contract.

b. Unless otherwise specified, components from the U.S., other countries included in AID Geographic Code 941, and the cooperating country may be utilized in unlimited amounts regardless of the geographic code authorized.

c. Unless procurement is authorized from countries included in AID Geographic Code 899, components from free world countries not included in AID Geographic Code 941 are limited according to the following rules.

(i) They are limited only if they are acquired by the producer in the form in which they were imported.

(ii) The total cost of such components to the producer of the commodity (delivered at the point of production of the commodity) may not exceed 50 percent of the lowest price (excluding the cost of ocean transportation and marine insurance) at which the supplier makes the commodity available for export sale (whether or not financed by AID).

(iii) AID may prescribe percentages other than 50 percent for specific commodities.

C. NATIONALITY.

(1) Suppliers of Commodities. A supplier providing goods must fit one of the following categories to be eligible for AID financing:

a. An individual who is a citizen or, except as provided in paragraph (A) above, a legal resident of a country or area included in the authorized geographic code;

b. A corporation or partnership organized under the laws of a country or area included in the authorized geographic code;

c. A controlled foreign corporation; i.e., any foreign corporation of which more than 50 percent of the total combined voting power of all classes of stock is owned by United States shareholders within the meaning of Section 957 et seq. of the Internal Revenue Code, 26 U.S.C. 957; or

d. A joint venture or unincorporated association consisting entirely of individuals, corporations, or partnerships which fit any of the foregoing categories.

(2) Suppliers of Services.

a. Privately Owned Commercial Suppliers. An individual or a privately owned commercial firm is eligible for financing by AID as a subcontractor providing services only if the criteria in subparagraphs (i), (ii), or (iii) below are met and, in the case of the categories described in (ii) and (iii), the certification requirements in subparagraph (iiii) are met.

(i). The Supplier is an individual who is a citizen of and whose principal place of business is in a country or area included in the authorized geographic code or a non-U.S. citizen lawfully admitted for permanent residence in the United States whose principal place of business is in the United States;

(ii). The Supplier is a privately owned commercial (i.e., for profit) corporation or partnership that is incorporated or legally organized under the laws of a country or area included in the authorized geographic code, has its principal place of business in a country or area included in the authorized geographic code, and meets the criteria set forth in either subparagraph (u) or (v) below:

(u) The corporation or partnership is more than

50% beneficially owned by individuals who are citizens of a country or area included in the authorized geographic code and non-U.S. citizens lawfully admitted for permanent residence in the United States. In the case of corporations, "more than 50% beneficially owned" means that more than 50% of each class of stock is owned by such individuals; in the case of partnerships, "more than 50% beneficially owned" means that more than 50% of each category of partnership interest (e.g. general, limited) is owned by such individuals. (With respect to stock or interest held by companies, funds or institutions, the ultimate beneficial ownership by individuals is controlling.)

(v) The Corporation or partnership:

I. has been incorporated or legally organized in the United States for more than 3 years prior to the issuance date of the invitation for bids or request for proposal; and

II. has performed within the United States similar administrative and technical, professional, or construction services under a contract or contracts for services and derived revenue therefrom in each of the 3 years prior to the date described in the preceding paragraph, and

III. employs United States citizens and non-U.S. citizens lawfully admitted for permanent residence in the United States in more than half its permanent full-time positions in the United States, and

IV. has the existing capability in the United States to perform the contract.

(iii) A supplier is a joint venture or unincorporated association consisting entirely of individuals, corporations, partnerships, or nonprofit organizations which are eligible under a(i) or a(ii) above, or (b) below.

(iiii) A duly authorized officer of a firm or nonprofit organization shall certify that the participating firm or nonprofit organization meets either the requirements of subparagraphs ii(u) or ii(v), or (b). In the case of corporations the certifying officer shall be the corporate secretary. With respect to the requirements of subparagraph ii(v), the certifying officer may presume citizenship on the basis of the stockholder's record address, provided the certifying officer certifies, regarding any stockholder (including any corporate fund or

institutional stockholder) whose holdings are material to the corporation's eligibility, that the certifying officer knows of no fact which might rebut that presumption.

b. Nonprofit Organizations. Nonprofit organizations, such as educational institutions, foundations, and associations, are eligible for financing by AID as contractors or subcontractors for services if they meet all of the criteria listed in subparagraphs (i), (ii), and (iii) below, and the certification requirement in a(iv) above is met.

Any such institution must:

i. Be organized under the laws of a country or area included in the authorized geographic code; and

ii. Be controlled and managed by a governing body, a majority of whose members are citizens of countries or areas included in the authorized geographic code; and

iii. Have its principal facilities and offices in a country or area included in the authorized geographic code.

(c) Nationality of Employers Relating Contract and Subcontract Services. The rule relative to nationality exposed in Clause 5.2-21 (C) (2) (a) (ii) (v) (II) above doesn't apply to Contractor's and subcontractors's employees, but all contractor and subcontractors employees who works for AID financed contracts must be citizens of countries included in the 935 AID geographic code or U.S. non-citizen but legally admitted for permanent residence in the U.S.

(D) MOTOR VEHICLES. Motor vehicles must be manufactured in the United States, i.e., the source, origin, and componentry as defined in paragraph (E) must be the United States. A vehicle which was assembled in the United States but then subjected to minor disassembly to reduce shipping costs is considered a U.S.-manufactured vehicle. However, so called "knocked-down vehicles" consisting of parts of subassemblies of vehicles shipped from the United States for final assembly into completed vehicles and, therefore, may have their source and origin in any eligible country.

(E) Source of Delivery Services.

1. With respect to ocean or air freight, "source" means the flag of the carrier vessel or aircraft.

2. Ocean Freight.

a. No less than fifty percent of the gross tonnage of all goods transported to the host country on ocean vessels for use in connection with this Contract shall be transported on privately owned United States flag commercial vessel, computed separately for dry Bulk carriers, dry cargo liners, and tankers, to the extent such vessels are available at fair and reasonable rates for United States flag commercial vessels. In addition, at least fifty percent of the gross freight revenue generated by all shipments and transported to the host country on dry cargo liners shall be paid to or for the benefit of privately owned United States flag commercial vessels. The equipment and materials to which this requirement applies do not include (a) goods which were owned or leased by the Contractor prior to award of Contract, (b) any other goods the procurement of which was not directly or indirectly financed by AID, or (c) shelf items or consumables purchased in the host country. This requirement applies whether or not AID finances transportation.

b. Goods which are not required to be transported on U.S. flag commercial vessels shall be transported on cooperating country flag carriers when Code 941 is the authorized source. If the host country does not have its own flag carrier or access to U.S. flag service, AID will authorize, in advance, the use of all Code 941 carriers.

c. The Contractor shall mail a copy of the Ocean Bill of Lading the Maritime Administration, Cargo Preference Control Center, Commerce Building, Washington, D.C. 20235.

3. Air Freight. The Contractor will use U.S. flag air carriers to the extent they are available as set forth in the clause of this contract entitled "Air Travel and Transportation."

4. The Contractor shall not ship equipment, material, or other goods procured for the performance of this Contract on any ocean or air carrier which has been chartered for the carriage of such items until the Contractor has received written notice from the CONTRACTING AGENCY that the charter has been approved by AID.

(F) SOURCE OF MARINE INSURANCE.

(1) In the case of insurance, "source" means the

country in which such insurance is placed. Insurance is placed in a country if payment of the insurance premium is made to and the insurance policy is issued by, an office located in the country.

(2) Insurers of any Eligible Country and the host country if the authorized Geographic Code is other than Code 000, may be used if the government of the country in which the insurance is placed does not discriminate against United States marine insurance carriers by statute, decree, or regulation.

(3) If at any time AID determines that the Government of the host country by statute, decree, rule or regulation discriminates, with respect to AID-financed procurement, against any marine insurance company authorized to do business in the United States, then AID shall require that any AID-financed goods thereafter shipped to the host country shall be insured against marine risks, and that such insurance shall be placed in the United States with a company or companies authorized to do insurance business in the United States.

G. Local Currency Procurement.

(1) Indigenous Goods. Goods which have been mined, grown, or produced in the cooperating country through manufacture, processing, or assembly are eligible for financing under this Contract. Goods produced with imported components must result in a commercially recognized new commodity that is substantially different in basic characteristics or in purpose or utility from its components in order to qualify as indigenous.

(2) Shelf Item Procurement. Goods which are normally imported into the host country and kept in stock in the form in which imported for commercial resale to meet a general demand in the host country shall be deemed of host country source for purposes of financing under this Contract, subject to the following:

a. Shelf Items Imported from Code 941 Sources. Shelf items are eligible for financing under this Contract if they have been produced in and imported from a country included in Code 941.

b. Shelf Items Imported from Other Free World Sources. Shelf items having their source and origin in countries in Geographic Code 899 but not in Geographic Code 941 are eligible for financing if the price of one unit doesn't exceed \$5,000. For goods sold by units of quantity, e.g., tons, barrels, etc., the unit to which the local currency equivalent of 5,000.

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is applied is that which is customarily used in quoting price. The total amount of imported shelf item purchases from free world countries other than Code 941 may not exceed 10% of total costs financed by AID or \$25,000, whichever is higher.

c. Shelf Items Imported from Non-Free World Sources. Imported shelf items produced in or imported from countries not included in Geographic Code 899 are ineligible for AID financing.

5.2-22 CLAUSE 5.1-75 "AUDIT AND RECORDS"

A. The Contractor shall maintain books, records, documents, and other evidence and shall apply consistent accounting procedures and practices sufficient to reflect properly all transactions under or in connection with the Contract. The foregoing constitute "records" for the purpose of this clause.

B. The Contractor shall maintain such records during the Contract term and for a period of 3 years after final payment. However, records which relate to disputes under the "Settlement of Disputes" clause or litigation or settlement of claims arising out of the performance of this Contract shall be retained until such disputes litigation, or claims have been finally settled.

C. All records shall be subject to inspection and audit by the Employer and/or AID (or its authorized agents) at all reasonable times. The Contractor shall afford the Employer and/or AID proper facilities for such inspection and audit.

D. The Contractor further agrees to include in all its subcontractors hereunder a provision that the subcontractor agrees that the Employer and/or AID or any of its authorized agents, shall, until the expiration of 3 years after final payment under the subcontract, have access to and the right to examine any records of such subcontractor involving transactions related to the subcontract.

5.2-23 CLAUSE 5.1-76 "AIR TRAVEL AND TRANSPORTATION"

A. The Contractor shall utilize U.S. flag air carriers for international air transportation of personnel (and their personal effects) or property to the extent service by such carrier is available, in accordance with the following criteria:

(1) Passenger or freight service by a U.S. flag air carrier is considered available even though:

a. Comparable or a different kind of service by a non-U.S. flag air carrier costs less, or

b. Service by a non-U.S. flag air carrier can be paid for in excess foreign currency, or

c. Service by a non-U.S. flag air carrier is preferred by the Contractor or traveler needing air transportation, or

d. Service by a non-U.S. flag air carrier is more convenient for the Contractor or traveler needing air transportation.

(2) Passenger service by a U.S. flag air carrier will be considered to be unavailable:

a. When U.S. flag air carriers offer only first class service, and less than first class service is available from non-U.S. flag air carriers, or

b. When the traveler, while en route, has to wait 6 hours or more to transfer to a U.S. flag air carrier to proceed to the intended destination, or

c. When any flight by a U.S. flag air carrier is interrupted by a stop anticipated to be 6 hours or more for refueling, reloading, repairs, etc., and no other flight by a U.S. flag air carrier is available during the 6 hours period, or

d. When by itself or in combination with other U.S. flag or non-U.S. flag air carriers (if U.S. flag air carriers are unavailable) it takes 12 or more hours longer from the origin airport to the destination airport to accomplish the mission than would service by a non-U.S. flag air carrier or carriers.

e. When the elapsed travel time on a scheduled flight from origin to destination airports by non-U.S. flag air carrier(s) is 3 hours or less, and service by U.S. flag air carrier(s) would involve twice such scheduled travel time.

B. In the event that the Contractor selects a carrier

other than a U.S. flag air carrier for international air transportation, it will include a certification on vouchers involving such transportation which is essentially as follows:

CERTIFICATION OF UNAVAILABILITY OF U.S. FLAG
AIR CARRIERS

"I hereby certify that transportation service for personnel (and their personal effects) or property by U.S. flag air carrier was unavailable for the following reasons:

(state reasons)"

C. The terms used in this clause have the following meanings:

1. "International air transportation" means transportation of persons (and their personal effects) or property by air between a place in the United States and a place outside thereof or between two places both of which are outside the United States.

2. "U.S. flag air carrier" means one of a class of air carriers holding a certificate of public convenience and necessity issued by the Civil Aeronautics Board, approved by the President, authorizing operations between the United States and/or its territories and one or more foreign countries.

D. The Contractor shall include the substance of this clause, including this paragraph (D), in each subcontract or purchase order hereunder, which may involve international air transportation.

5.2-24 CLAUSE 5.1 77 "WORKER'S COMPENSATION INSURANCE"

The insurance required by subclause (B) of clause 5.1-24 of Part 5.1 of the Conditions of Contract must comply with the following:

A. The Contractor shall provide and thereafter maintain Worker's Compensation insurance assuring payment of benefits provided under the Defense Base Act (42 U.S.C. 1651) with respect to and prior to the departure for overseas employment under this Contract of all employees who are hired in the United States or who are American citizens or bona fide residents of the United States. The Contractor shall obtain all Defense Base Act insurance required by this clause from the Insurance Company of North America through Wright & Company, 1001 Connecticut Avenue, N.W., Washington, D.C. 20036, U.S.A.

B. The Contractor shall provide and thereafter maintain for all employees under the Contract who are nationals or permanent residents of the country in which services are to be rendered, security for compensation benefits meeting at least the minimum requirements of the applicable law of such country for injury or death in the course of such employment or in the absence of such law, employer's liability insurance.

C. For all other employees under the Contract, the Contractor shall provide and thereafter maintain security for compensation benefits meeting at least the minimum requirements of the applicable law of the country in which the employee was hired and of the country in which services are to be rendered for injury or death in the course of such employment, or in the absence of such law, employer's liability insurance.

5.2-25 CLAUSE 5.1-78 "MARKING"

The Contractor shall insure that project construction sites and other Project locations are identified with display signs, suitably marked with the AID handclasp symbol, indicating participation by the United States in the Project. Temporary signs must be erected at the beginning of construction and be replaced by permanent signs, plates, or plaques, suitably marked with the AID handclasp symbol, upon completion of construction. The AID Mission in the host country or the Office of Commodity Management in AID/Washington will provide information on marking requirements for the Project.

5.2-26 CLAUSE 5.2-79 "HOST COUNTRY TAXES"

A. Pursuant to the bilateral agreement between the United States Government and the Dominican Republic (Host Country), the

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Contractor and those of its employees who are not citizens or permanent residents of the host country shall be free of all taxes, fees, levies, customs, or impositions imposed under laws in effect in the host country with respect to all work and services performed under this Contract. This exemption includes all customs, duties, and registrations fees.

B. With respect to shelf items, "identifiable" taxes, fees, customs, levies, or impositions of the Government or any subdivision thereof are those which are added to the price of goods or services and stated separately on invoices for same. These charges are subtracted from the price at the time of purchase. With respect to items imported for the Project, any such taxes, fees, customs, levies or impositions shall be paid by the Employer.

C. The personal effects (including vehicles) of the Contractor and those of its employees who are not citizens or permanent residents of host country shall be free of all taxes imposed under laws in effect in the host country with respect to such personal effects.

D. The Government will allow the Contractor to import free of customs and duties such materials and equipment as may be required for the services under this contract provided such items are either reexported or transferred to the Government at the conclusion of the contract.

F. Any taxes, fees, levies, customs, or impositions within the scope of paragraphs (A) through (C) above paid by the Contractor shall be reimbursed by the Employer.

5.2-27 CLAUSE 5.1-80 "TERMINATION OF CONTRACT FOR CONVENIENCE OF THE EMPLOYER"

A. If any time before completion of work under the Contract it shall be found by the Employer that reasons beyond the control of the parties render it impossible or against the interest of the Employer to complete the work, the Employer at any time, by written notice to the Contractor, may discontinue the work and terminate the Contract in whole or in part. Upon the service of such notice of termination the Contractor shall discontinue to work in such manner, sequence and at such times as the ENGINEER may direct, continuing and doing after said notice only such work and only until such time or times as the ENGINEER may direct. The Contractor shall have no claim for damages for such discontinuance or termination of the Contract but the Contractor shall receive compensation for reasonable expenses incurred in good faith for the performance of the Contract and for reasonable

expenses associated with termination of the Contract. The Employer will determine the reasonableness of such expenses. The Contractor shall have no claim for anticipated profits on the work thus terminated, nor any other claim, except for the work actually performed at the time of complete discontinuance, including any variations authorized by the ENGINEER to be done under the section dealing with variation, after the date of said order, and for any claims for variations accruing up to the date of said notice of termination.

B. In the event that the work shall be so discontinued and the Contract terminated, the satisfactory completion of such work as the ENGINEER may thereafter direct in satisfactory compliance with the terms of said order shall be deemed the completion of the work specified in this Contract, and the final statement shall be of the amount of work completed to the time of such discontinuance and termination together with such other items as may be due the Contractor in accordance with the provisions of this clause.

The CONTRACTING AGENCY may terminate the Contract at any time provided the Contractor is given a notice in writing which shall include the date on which the work is to be stopped. Payment for the work accomplished will be made as follows:

1. Payment at Contract unit prices for items of work completed.

2. A lesser prorated amount based on Contract unit prices for partially completed items of the work. This amount will be determined by mutual agreement between the CONTRACTING AGENCY and the Contractor, and if agreement is not reached the matter may be referred to arbitration in accordance with 5.1-67, "Settlement of Disputes - Arbitration".

3. The out-of-pocket cost of materials acquired for the work by the Contractor but not used in the work. The materials will become the property of the CONTRACTING AGENCY.

4. The cost of demobilization which shall include dismantling equipment, shipment of equipment to point of origin, and cost of termination and transportation of personnel to their home station. The amount will be determined by mutual agreement between the CONTRACTING AGENCY and the Contractor, and if agreement is not reached the matter may be referred to arbitration in accordance with 5.1-67, "Settlement of Disputes - Arbitration".

5. Five percent of the cost of the remaining work. The cost of the remaining work will be determined by the ENGINEER based on the prices in the Schedule of Prices.

PART VI - SPECIAL CONDITIONS

6-01 SCOPE OF WORK

A. The Contractor shall perform all the work as specified or indicated in these specifications for the Rio Yuba Hydroelectric Project.

B. The types of work to be performed for the accomplishment of this project include, but are not necessarily limited to, the following:

1. Mobilization, Demobilization, and Miscellaneous Work
2. Care and Removal of Water
3. Excavation, Fill and Backfill
4. Drilling and Anchoring
5. Concrete Work
6. Yardwork, Roadwork and River Crossings
7. Penstock
8. Metalwork
9. Architectural Work
10. Painting
11. Powerhouse Crane
12. Piping and Plumbing
13. Ventilation Fans and Louvers
14. Gates, Frames, Guides and Hoists
15. General Electrical Work
16. Transportation, Storage and Installation of CONTRACTING AGENCY Furnished Equipment
17. Sub-transmission and Distribution Lines

C. The above general outline of the work does not in any way limit the responsibility of the Contractor to perform all work and furnish all plant, labor, and materials required by the specifications. The work to be performed shall be carried on at such order of precedence as will meet the requirements of the specifications.

6-02 PHYSICAL DATA

The following data relating to the work are not intended as a representation or warranty but are furnished for information for bidding purposes only. It is expressly understood that the CONTRACTING AGENCY will not be responsible for any interpretation or conclusion drawn therefrom.

A. Climate Data. Data on average monthly temperatures, relative humidity and rainfall near the Project site is shown on the Drawings.

B. Geological Data. The location of drill holes and test pits are shown on the Drawings. The cores from the exploratory drilling program are available at the Job Site for inspection. The drill hole boring logs, field test results and laboratory test results are shown in Appendix I, "Subsurface Exploration Information".

6-03 PROGRESS REPORTS

A monthly progress report shall be prepared by the Contractor at the close of each calendar month in a form approved by the ENGINEER, and it shall be submitted by the Contractor together with the invoice required under 5.2-17(E) "Progress Payments". The report shall show the amount of the 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 percentages of completion.

6-04 DRAWING SCHEDULE

The Contractor shall, within 15 days after receiving the Notice to Proceed, prepare and submit for approval with the construction schedule, a schedule of Drawings which he proposes to submit in accordance with the requirements of 6-06, "Contractor's Submittals", together with the dates on which he proposes to submit such Drawings. The programming of Drawings to be supplied to the Contractor in accordance with 6-05, "Owner-Furnished Drawings", will be as agreed by the Contractor and the Owner's Representative and governed by the approved construction schedule. When Owner-Furnished Drawings depend on information supplied by Contractor's Drawings, a minimum of 60 days lead time shall be allowed by the Contractor in scheduling and submitting his Drawings and for completion of Owner-Furnished Drawings prior to the time such Drawings are needed for material procurement and for construction.

6-05 OWNER-FURNISHED DRAWINGS

A. Specification Drawings. The specification drawings show the permanent works to be constructed under these specifications. Additional details for construction purposes will be furnished to the Contractor. Parts of the work affected by equipment to be purchased by the Contractor or the Owner have been shown and dimensioned to the extent possible prior to the availability of the Drawings to be supplied by the contractor in accordance with the requirements of 6-06, "Contractors Submittals", and Drawings to be supplied by the manufacturers of Owner-Furnished equipment. The Contractor shall advise the Owner's Representative of any errors or omissions discovered on the Drawings or in the Specifications. The Specification Drawings are to be used for construction purposes.

B. Owner-Furnished Documents. Five copies of the Drawings and Specifications will be furnished to the Contractor without charge. Any additional copies, which the Contractor may request, will be furnished at the cost of reproduction. These Owner-Furnished Drawings and Specifications are to be used only in connection with the work specified herein and are to be returned upon request at the completion of the work.

6-06 CONTRACTOR'S SUBMITTALS

A. General. The Contractor shall furnish for approval his submittals as outlined herein and in the Technical Specifications. He shall submit general Drawings of his field offices, plant, roads, and construction facilities. The sequence of submission shall be such that information is available for review of each submittal when it is received. All submittals furnished formally shall bear an approval stamp or a certification. The stamp or certification shall be signed by an authorized representative of the Contractor. The Contractor's stamp or certification on any submittals shall constitute a representation to the Owner and the Owner's Representative that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, or that he assumes full responsibility for doing so, and that he has reviewed or coordinated each submittal with the requirements of the specifications.

B. Outline Drawings. The Contractor shall submit outline Drawings of the equipment to be furnished together with estimated weights, external forces, anchoring details, and sufficient overall dimensions, to facilitate preparation of final designs of the structures into which the equipment is to be incorporated.

C. Wiring Diagrams. The Contractor shall submit complete schematic and full-line wiring diagrams for all equipment furnished by him. The Contractor shall furnish Drawings of switch developments for all instrument and control switches and internal connection diagrams for all instruments, relays, regulators, and other devices. One print of each wiring diagram will be returned on which will be marked the wire notations and cable numbers for outgoing circuits where this information is not otherwise available to the Contractor. The Contractor shall add this information to his Drawings.

D. Detail Drawings and Erection Drawings. Before proceeding with fabrication or manufacture of the material and equipment designed and furnished by him, the Contractor shall submit the designs, design computations when requested, detailed specifications, general assembly Drawings, sufficient subassembly Drawings, details, and control and wiring diagrams to demonstrate fully that all parts will conform to the provisions and intent of the specifications and to the requirements of their installations, operation, and maintenance. These Drawings shall substantially conform to the Specification Drawings and shall show all necessary dimensions; all field joints and subassemblies in which the Contractor proposes to ship the equipment; locations

and sizes of auxiliary connections for oil, grease, water, and air; and the terminal boxes and wire sizes for electrical circuits. Before proceeding with fabrication or purchase, the Contractor shall submit shop Drawing and/or catalog cuts as appropriate of items designed but not detailed on the Owner-Furnished Drawings including but not limited to structural steel and metal frames, covers, and gratings.

E. Concrete, Reinforcing Bars, Piping, and Lighting. Concrete lift Drawings, reinforcing steel placing Drawings and bar lists, piping bills of material, and conduit layout Drawings for the lighting system shall be submitted. The Drawings shall be based on the Owner-furnished Drawings and shall contain sufficient detail for construction in the field.

F. Review of Drawings

1. Five print copies on durable paper with dark lines on a white background and one durable paper-type reproducible shall be furnished of each Drawing submitted. All Drawing submitted shall, insofar as practicable, be of one standard size, measuring approximately 70 x 100 cm. The Contractor's Drawings shall have a blank area of 10 x 10 cm. adjacent to the Drawing title block for the approval stamp of the Owner's Representative. The Contractor shall verify by inspection of sample reproductions that good legible reproductions can be obtained from the reproducible before submittal. One print copy will be returned to the Contractor marked "Approved", "Approved as Corrected", "Revise and Resubmit", or "Not Approved". Prints marked "Approved" or "Approved as Corrected" authorize the Contractor to proceed with construction or fabrication of equipment covered by such Drawings with corrections, if any, indicated thereon. Review will not relieve the Contractor of responsibility for conformity to the Specifications and correct detail and fit of parts when installed. If minor revisions are made after a Drawing has been returned to the Contractor marked "Approved", the Contractor shall furnish without delay one print copy and one reproducible copy subsequent to each revision. No major revision affecting the design shall be made after a Drawing has been "Approved" without resubmitting the Drawing.

2. When prints of Drawings have been marked "Approved as Corrected" or "Revise and Resubmit", the Contractor shall make the necessary corrections and submit 5 copies and one paper-type reproducible. Every revision shall be shown by number, date, and subject in a revision block, and in addition, each revised Drawing shall have its latest revision clearly indicated. Drawings submitted without these indications shall be considered non conforming.

3. The Applicable parts of the requirements of the above paragraphs with reference to the Drawings shall apply equally to design data, catalog cuts, illustrations, printed specifications, draft reports or any other submittal furnished for review.

4. The Contractor shall make any changes in the designs which are necessary to make the equipment conform to the provisions and intent of these Specifications, without additional cost to the Owner.

5. Should an error be found in a Contractor's Drawing during the erection of structures or installation of equipment, the correction, including any field changes found necessary, shall be noted on the Drawing, and it shall be resubmitted for review and record as outlined above.

G. Record Drawings. Prior to completion of the Work under these Specifications, the Contractor shall furnish one complete set of full size permanent reproducible cloth or film copies of approved quality and type and 3 full size set of prints of all Contractor's Drawings and equipment as finally built, including any field changes. In addition 12 bound sets of half-size prints of all Contractor's Drawings shall be furnished. Each set shall include an index showing the Drawing numbers and titles and shall be bound for permanent reference.

H. Operating and Maintenance Instructions. Six sets of detailed operating and maintenance instruction manuals which shall include reduced-size copies of applicable Drawings, applicable parts lists, and catalogs covering all equipment furnished and which may be needed or useful in operation, maintenance, repairs, dismantling or assembling, and for repair and identification of parts for ordering replacements, shall be furnished.

I. Language. All Drawings, design data, reports, instructions, catalogs, illustrations, or printed specifications shall be submitted in English, or in Spanish.

J. System of Units of Measurement. All units of measurement used shall be in the metric system.

G-07 ACCESS, COMMUNICATIONS, AND UTILITIES

A. Access. Maintenance of the construction roads shall be the Contractor's responsibility.

B. Communications (By Contractor). Any necessary telephone, radio, or telegraph communication system shall be the Contractor's responsibility.

C. Utilities.

1. Water. The Contractor shall furnish all plant, equipment, labor and materials necessary to supply his own water requirements.

2. Electric Power. Metered construction power will be available to the Contractor at the Site.

3. Illumination. The Contractor shall furnish all plant, equipment, labor, and materials to insure adequate illumination for all operations requiring lighting.

6-08 MEDICAL CARE

The Contractor shall provide and maintain adequate first-aid facilities for treatment in case of accidents. The facilities shall be at least equal to those required by applicable laws, regulations, and ordinances. No direct payment will be made for providing medical care, and the entire cost thereof shall be included in the prices bid for the various items in the Schedule of Prices.

6-09 STANDARDS

A. General. The standards under which the work is to be performed or tested are specified throughout the Specifications. Where such standards are specified, it shall be understood that the latest revision or edition at time of submission of Bids shall apply. Other standards may be substituted for those specified provided prior approval is obtained from the Owner's Representative. If it is desired to deviate from the specified or approved standards, a statement of the exact nature of the proposed deviation shall be submitted for approval. In referring to standards the following abbreviations have been used:

Name	Abbreviation
Air Moving & Conditioning Association 30 West University Drive Arlington Heights, IL 60004	AMCA
Aluminum Association 750 Third Avenue New York, NY 10017	AA
American Association of State Highway & Transportation Officials 341 National Press Building Washington, D.C. 20045	AASHTO
American Concrete Institute Box 19150, Redford Station Detroit, MI 48219	ACI
American Gear Manufacturers Association 1330 Massachusetts Avenue, N.W. Washington, D.C. 20005	AGMA
American Institute of Steel Construction, Inc. 400 N. Michigan Avenue Chicago, IL 60611	AISC
American Iron and Steel Institute 1000 16th Street, N.W. Washington, D.C. 20036	AISI
American National Standards Institute 1430 Broadway New York, NY 10018	ANSI
American Society of Civil Engineers 345 East 47th Street New York, NY 10017	ASCE
American Society of Heating, Refrigerating, & Air-Conditioning Engineers 345 East 47th Street New York, NY 10017	ASHRAE
American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017	ASME

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Name	Abbreviation
American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103	ASTM
American Petroleum Institute 2100 "L" Street, N.W. Washington, D.C. 20037	API
American Water Works Association 6666 West Quincy Avenue Denver, CO 80235	AWWA
American Welding Society 2501 Northwest 7th Street Miami, FL 33125	AWS
Anti-Friction Bearing Manufacturers Association 60 East 42nd Street New York, NY 10017	AFBMA
Associated General Contractors of America 1957 East Street, N.W. Washington, D.C. 20006	AGC
Concrete Plant Manufacturers Bureau 900 Spring Street Silver Springs, MD	CPMB
Crane Manufacturers Association of America 1320 Freeport Road Pittsburgh, PA 15238	CMAA
Federal Specification Board c/o Superintendent of Documents U.S. Government Printing Office Washington, D.C. 20402	U.S. Fed. Spec. Mil. Spec.
Hydraulic Institute 122 East 42nd Street New York, NY 10017	HI
Insulated Cable Engineers' Association 192 Washington Street Belmont, MA 02178	ICEA
Institute of Electrical & Electronics Engineers 345 East 47th Street New York, NY 10017	IEEE

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Name	Abbreviation
Metal Building Manufacturers' Association 2130 Keith Building Cleveland, OH 44115	MBMA
National Bureau of Standards c/o Superintendent of Documents U.S. Government Printing Office Washington, D.C. 20037	NBS
National Electrical Code National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210	NEC
National Electrical Manufacturers' Association 2101 "L" Street N.W. Washington, D.C. 20102	NEMA
National Electrical Safety Code National Bureau of Standards c/o Superintendent of Documents U.S. Government Printing Office Washington, D.C. 20102	NESC
National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210	NFPA
National Terrazzo and Mosaic Association 2-A West Loudon Leesburg, VA 22075	NTMA
Society Of Automotive Engineers 485 Lexington Avenue New York, NY 10017	SAE
Society of the Plastics Industry 250 Park Avenue New York, NY 10017	SPI
Steel Structures Painting Council 4400 Fifth Avenue Pittsburgh, PA 15213	SSPC

Name	Abbreviation
Underwriters Laboratories 333 Pfingsten Road Northbrook, IL 60062	UL

B. Or Equal. For convenience in designation in the Specifications, certain equipment, articles, materials, or processes are designated by trade name or catalog name and number. Except where noted on the Drawings or in the Specifications that no substitute is allowed, such designation shall be deemed to be followed by the words "or equal", and the Contractor may offer for approval any material or process which is equal to that so indicated or specified. The burden of proof as to comparative quality and suitability of alternatives shall be upon the Contractor.

C. Instruments. Instruments shall be calibrated in the customary metric system of units.

D. Pipe and Conduit Connections

1. External Pipe and Electrical Conduit Connections. On external connections for all equipment, all pipe shall be threaded and all flanges faced and drilled in accordance with the applicable ANSI Specifications. On external connections for all equipment, entrances for electrical conduits shall conform to the requirements of ANSI C80.1, "Specification for Rigid Steel Conduit, Zinc Coated".

2. Internal Pipe and Electrical Conduit Connections. On internal connections for all equipment, all pipes may be threaded, all flanges faced and drilled, and electrical conduits connected in accordance with standards selected by the Contractor.

6-10 PERMANENT WORKS EQUIPMENT

A. Materials and Workmanship. Unless otherwise specified, all materials incorporated in the work shall be new and both workmanship and materials shall be of first class quality and, where shown, of the classification and grades designated. Materials not specifically designated shall be subject to approval, shall be suitable for the purpose, and shall as far as practicable comply with the latest specifications of the ASTM.

All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance

with the instructions of the applicable manufacturer, fabricator, or processor, except as otherwise provided in the Specifications.

Workmanship shall be of first class quality and in accordance with best modern shop practice. Like parts and spare parts shall be interchangeable wherever possible. Machining of fits on renewable parts shall be accurate and to specified dimensions so that replacement parts may be readily installed.

B. Standard Products. All equipment shall be new and shall be essentially standard products of manufacturers regularly engaged in the production of the type of equipment specified herein. Like items shall be the product of a single manufacturer.

C. Oil and Grease.

1. The Contractor shall furnish all lubricating oil, hydraulic fluid and grease required for the initial filling and operation of all Permanent Work equipment plus an additional 20%. This amount is exclusive of any oil or grease required for flushing or otherwise preparing the equipment for operation.

2. The Contractor shall coordinate the type of lubricating oil, hydraulic fluid and grease used for the equipment furnished so that each will have the same specifications, where practicable.

3. The Contractor shall furnish a tabulation confirming the quantities of lubricating oil, hydraulic fluid and grease required for initial application for each item of equipment.

4. Oil and grease for Owner-furnished equipment will be supplied by the Owner.

D. Nameplates. Each item of manufactured equipment furnished under these Specifications shall have a permanent nameplate affixed thereto in a readily visible place, showing the serial number, the name and address of the manufacturer, rated capacity, speed, electrical characteristics and other pertinent data, as applicable. Nameplates of distributing agents only will not be acceptable.

C-11 WEIGHTS OF METALWORK AND MISCELLANEOUS ITEMS

A. Scales will not be required for actual weighing of all items. However, for measurement purposes, the Owner's Representative may approve any actual weighing the Contractor finds convenient to do at his own expense. If such scales are provided, they shall be tested in an approved manner. The weights of equipment, structural steel, reinforcing steel, pipe, metalwork and other miscellaneous items to be measured on a weight basis will be determined as established in the appropriate part of these Specifications or, if not so established, as directed or approved, using shipping weights less estimated dunnage, manufacturer's weights, catalog weights, etc.

B. Where any item is paid for by weight and an approved substitution for the specified item is used, per 6-09, B, "Or Equal", the weight for payment shall not exceed the weight of the specified item as stated in the catalogs.

C. Where not otherwise expressly stipulated, payment will be for the net weights installed.

6-12 OWNER-FURNISHED EQUIPMENT AND MATERIALS.

A: General

1. Owner-furnished equipment and materials which the Contractor shall install will be delivered CIF. The delivery dates shown in The Construction Schedule are estimated in part and will not be known completely until the contract for the equipment and materials is issued. If delivery of any of the equipment or materials is sufficiently late to prevent the completion of the work by the specified completion date, the completion time will be extended.

2. The Contractor will be furnished copies of shipping notices promptly on the receipt thereof by the Owner. He shall accept delivery when made, load, transport and place in Owner-furnished storage locations near the Job Site, remove from storage, load, transport, and unload at the Job Site. The Contractor will provide for proper covered storage and also protection as required by the manufacturer's instructions and in accordance with the requirements of 7.16 "Transportation, Storage and Installation of CONTRACTING AGENCY Furnished Equipment".

3. The Contractor shall check the quantity and condition of the equipment and materials when delivered to him, acknowledge receipt in writing to the ENGINEER, and include a report of any damages and shortages. He shall be responsible for any loss or damage to the equipment and materials from then on until the completion of the work. All instruction books, spare parts lists, instructions, and marking tags shall be preserved for delivery to the ENGINEER.

B. Repair of Owner-Furnished Equipment

1. If any part of the Owner-furnished equipment is found to be defective through no fault of the Contractor, he may be required to repair or otherwise correct the defects and payment therefore will be made as extra work or if it is considered that the Contractor does not have adequate facilities and/or personnel for such repair work, the Owner will require that the defective equipment either be returned to the manufacturer's shop for alterations or be altered by the manufacturer's personnel at the Job Site.

2. Additional cost to the Contractor in disassembling, handling, shipping, unloading, restoring, or reassembling, due to defects which are not the fault of the Contractor, will be paid for under the provisions of the General Conditions, 5.1-51 and 5.1-52. In the event of damage to Owner furnished equipment caused by the fault or negligence of the contractor in handling, storage, or erection, the Owner reserves the right to have such damage repaired by the manufacturer or the Contractor, at the expense of the Contractor.

C. Services of Supervising Erectors and Test Engineers. Where so indicated in these Specifications, the Contractor, shall install and test certain items of Owner-furnished equipment in the order and manner satisfactory to supervising erectors and test Engineers representing the manufacturers who will be paid by the CONTRACTING AGENCY. The installation work shall be done by the contractor who will be responsible for the progress of the work and the workmanship. The supervision erectors and test Engineers will advise the Contractor in matters of methods, procedures, and precautions to be followed and will be responsible for alignments, clearances, adjustments, test, and other matters pertaining to the quality of the installation. The Contractor shall give the Owner written notice 60 days prior to the need for supervising erectors and test Engineers.

6-13 OPERATIONS AND STORAGE AREAS

All operations and plants, storage of materials, temporary buildings, shops, sheds and roads upon Owner property shall be confined to areas authorized by the ENGINEER. Temporary buildings and utilities erected by the Contractor will remain the property of the Contractor and shall be removed by him upon completion of the work unless abandonment is authorized.

Traducción
de Cortesía

IFB No. PCH-2-85 LOT II

PART VII - TECHNICAL PROVISIONS

SECTION 1 - MOBILIZATION, DEMOBILIZATION, AND
MISCELLANEOUS WORK

7.1-01 SCOPE

In accordance with the specifications contained in this section and as shown on the Drawings or as directed, the Contractor shall:

- A. Mobilize and demobilize.
- B. Construct and maintain temporary construction roads.
- C. Maintain existing roads.

7.1-02 MOBILIZATION AND DEMOBILIZATION

Mobilization shall consist of moving construction equipment and personnel to the site of the work, setting up the Contractor's complete construction plant, and commencing full-scale construction operations at the site.

Prior to the initiation of this contract the CONTRACTING AGENCY shall acquire land at the work site for the Contractors use during the execution of the work. The land acquired shall be at the disposition of the Contractor for the erection of his construction plant, shops, offices, materials handling and storage facilities and equipment maintenance facilities. It will be the responsibility of the Contractor to provide adequate drainage and hardstand areas within this area to permit orderly and continuous use of his work area at the job site during the execution of the work.

Demobilization shall consist of moving off the Job Site all of the Contractor's plant, offices, equipment, and materials and leaving the Job Site in a clean and orderly condition satisfactory to the ENGINEER. The Contractor shall restore the work site to its original configuration where significant earthwork has been undertaken to obtain adequate drainage and hard stand areas unless otherwise directed by the ENGINEER.

7.1-03 ACCESS ROADS

A. The Contractor will be permitted the use of existing public roads and the CONTRACTING AGENCY owned project area access roads. The Contractor shall maintain these roads in good condition, return them after the completion of the work to their original condition, and shall keep these roads open to traffic at all times.

B. The Contractor may construct additional temporary roads within the Project as approved. Upon completion of the Contract the access roads will become property of the CONTRACTING AGENCY and shall be left in serviceable condition.

C. Other project access roads shall be constructed as specified in Section 6, "Yardwork, Roadwork and River Crossings". The Contractor will be permitted to use these roads and shall maintain these roads in their original condition.

7.1-04 PAYMENT

A. Mobilization. Payment for mobilizing the Contractor's construction plant, offices, and equipment as specified herein will be made at the lump sum price for Mobilization. Payment of 50% of the price will be made when the major portion of the plant and equipment have been moved onto the Job Site. The remainder will be paid 30 days later.

B. Access and Temporary Roads. No separate payment will be made for improvement and maintenance of existing access roads or maintenance of public roads or temporary roads for the Contractor's use, except for the work specified in Section 6, "Yardwork, Roadwork and River Crossings".

C. Demobilization. Payment for demobilizing the Contractor's construction plant, offices, and equipment as specified herein will be made at the lump sum price for Demobilization. Payment will be made upon completion of demobilization.

PART VII - TECHNICAL PROVISIONS

SECTION 2 - CARE AND REMOVAL OF WATER

7.2-01 SCOPE

In accordance with the Specifications contained in this Section, the Contractor shall plan, construct, operate, maintain in operating condition, and remove after use, a system to take care of water from all sources so that construction of all permanent work can be carried out in areas free of water, unless directed otherwise by the ENGINEER.

7.2-02 CARE AND REMOVAL OF WATER

The Contractor shall design, furnish and construct all necessary dikes, cofferdams, ditches, riprap protection, pipes, sumps and pumping facilities and other temporary facilities to prevent surface water from entering completed or partially completed permanent structures. The Contractor shall also collect and remove all surface and subsurface water and earth material entering the construction areas and shall provide all necessary labor, materials, equipment, transportation, power and supplies and operate all facilities so that all work areas are kept free of running and standing water and shall remove all temporary works required for care and removal of water after completion of the permanent works as directed or approved. Earth material will be disposed according to Section 3, "Excavation, Fill and Backfill".

7.2-03 MEASUREMENT AND PAYMENT

Payment for care of water will be made at the lump sum price for Care and Removal of Water. This price includes all payment for designing, furnishing, constructing, maintaining, operating and removal of all protective works, for repairing damaged permanent works, for removal of surface and subsurface water from construction areas, removal and disposal of earth material entering the construction areas and for other measures as specified in this section or as directed.

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PART VII - TECHNICAL PROVISIONS

SECTION 3 EXCAVATION, FILL, AND BACKFILL

7.3-01 SCOPE

In accordance with the specifications contained in this Section and as shown on the Drawings or as directed, the Contractor shall perform all clearing, grubbing, excavation and fill and backfill operations as shown on the Drawings and as described below. The work shall include disposal of excavated material, foundation preparation, treatment and stabilization of the natural or excavated slopes and surfaces where required.

7.3-02 CLEARING AND GRUBBING

A. Clearing

Clearing shall consist of removing, transporting, and disposing of all logs, trees, brush, fences, buildings, and debris. Trees and brush shall be cut off not more than ten (10) cm. above ground surface. The limits of clearing shall extend three (3) meters beyond the limits of excavation, toes of fill, and toes of disposal fills, except where otherwise directed or indicated on the Drawings. Clearing shall include the removal down to ground level of ruins, buildings, etc., encountered in the work areas.

B. Grubbing

Grubbing shall consist of the removing, transporting, and disposing of stumps and roots, buried logs, similar organic material, building foundations and in general, material foreign to the natural soil mass. All areas on which fill is to be placed and other areas shown on the Drawings shall be grubbed. No grubbing will be required in disposal areas. The limits of grubbing shall extend three (3) meters beyond the toes of fills.

7.3-03 SITE SURVEY AND SETTING-OUT OF WORKS

Before commencing work the Contractor shall set out the location and alignment of all project structures, excavations, fills, pipelines, canals and other structures according to the coordinates of the relevant points as provided by the ENGINEER. Existing triangulation points and bench marks will be indicated to the Contractor and shall be used as datum for the Works.

The survey made by the Contractor shall be presented in the form of drawings and shall be agreed and signed by the ENGINEER. It shall become for the purpose of this Contract the recorded survey which shall be used as the basis for measurement of the excavations. The Contractor shall be responsible for preserving all base lines, theodolite stations and bench marks for the whole duration of the Contract.

Notwithstanding the ENGINEER's checking and approval of the Site survey the Contractor remains solely responsible for the accuracy of his data.

The Contractor shall Set-out the Works, as shown on the Drawings and secure the ENGINEER's approval before proceeding with the work. If in the opinion of the ENGINEER modification of the line or grade is advisable before or after stake-out the ENGINEER will issue detailed instructions in writing to the Contractor for such modification and the Contractor shall revise the stake-out for further approval.

The Contractor shall be responsible for the true and proper setting-out of the Works in relation to original points, lines and levels of reference given on the Drawings and for the accuracy of the positions, levels, grades, dimensions and alignments of all parts of the Works. The Contractor shall set construction stakes, pegs, bench marks and any additional measures or control points required to establish horizontal and vertical control in the area of the work and by which he shall govern and execute the Work. The Contractor shall establish the control points in such a manner that they are not subject to damage or removal during the normal course of the work or passing of mobilized equipment. Setting-out shall be approved by the ENGINEER.

7.3-04 EXCAVATION CLASSIFICATION

A. General. Excavation will be classified as common or rock excavation.

B. Common Excavation. Common excavation shall consist of all stripping and excavation of material not classified as rock excavation as shown on the Drawings or as directed.

C. Rock Excavation. Rock excavation shall consist of the removal and satisfactory disposal of all material which cannot be removed by power shovel or bulldozer with ripper without continuous and systematic drilling, blasting, barring, or wedging. The removal of boulders or individual loose rock one cubic meter or more in volume will be classified as rock excavation. When material is encountered for which the Contractor may claim payment under the classification of rock excavation, such material shall be uncovered and exposed, and the Contractor shall notify the ENGINEER before proceeding further. Cross-sections shall then be taken of the material uncovered. The Contractor shall not proceed with the excavation of material claimed as rock excavation until this material has been cross-sectioned and the classification approved by the ENGINEER. The ENGINEER will classify the material as common excavation if the Contractor fails to uncover such material, notify the ENGINEER, and have cross-sections made of the undisturbed surface of such material.

D. Excavation for Contractor's Convenience. All excavation which is performed for the purpose of executing the Work, but not specifically shown on the Drawings or mentioned in the Specifications, shall be considered as being performed for the Contractor's convenience. All work of this nature shall only be performed with the prior approval of the ENGINEER.

7.3-05 EXCAVATION PROCEDURES

A. General. Excavation may be accomplished by any approved method and by use of any excavating and transporting equipment adaptable to the work.

B. Excavation. Excavation shall be performed to the lines and grades shown on the Drawings. The ENGINEER may modify excavation lines, grades, and slopes to fit conditions encountered during construction. If, through a fault or negligence of the Contractor, the established slopes of the excavation are undercut, they shall be re-formed as directed to the satisfaction of the ENGINEER, at no additional cost to the Owner. Rock or boulders encountered in the excavation may be drilled and blasted whenever other methods of loosening such as ripping, barring, or wedging, prove impractical and shall be

removed as required. Rock excavation shall be accomplished exclusively and systematically by drilling and blasting, and barring or wedging.

C. Rock Surface Preparation. Rock surfaces against or upon which concrete is to be placed shall be carefully cleaned to the satisfaction of the ENGINEER. On steep or vertical surfaces, no overhangs will be permitted, and any loose rock shall be scaled off. Surfaces shall be moistened prior to placement of concrete.

D. Earthwork Support. The Contractor shall be responsible to uphold the slopes and sides of excavations in any materials with whatever method he elects to adopt. In the event of any collapse the Contractor is to re-excavate and reinstate the excavation at his own expense.

E. Over Excavation. All excavation below the depth or beyond the lines and dimensions shown on the Drawings unless otherwise instructed by the ENGINEER shall be filled with suitable compacted earth, concrete or stone masonry to the lines and levels required and as specified under the respective item:

1. filling with selected earth or borrowed materials shall be compacted to a relative density of 90% as determined by ASTM D-1557-Method D to produce a firm bearing unless otherwise described.
2. filling with concrete as described in Section 5, "Concrete Work".
3. filling with stone masonry as described in this Section. The cost of such over excavation together with the cost of repair shall be at the Contractor's expense, except as specified in paragraph 1-3, "Canals in Soil Excavation", of this Section. The type of overexcavation repair shall be selected by the ENGINEER.

F. Reconditioning of Soil Foundation Areas. The Contractor shall initially compact all soil foundation areas prior to receiving concrete or fill material.

G. Inspection. Excavated foundations are to be inspected by the ENGINEER before new work is constructed. The ENGINEER shall be given 24 hours written notice prior to the excavation being ready for inspection. If after inspection surfaces become

unsuitable due to water or any other cause, the surfaces of excavations shall be repaired by the Contractor at his own expense and as directed by the ENGINEER.

H. Excavation for Structures. Excavation for foundation of structures shall be to elevations shown on the Drawings or established by the ENGINEER. In soil foundation, the bottom layer of excavation of a minimum of 200 mm in thickness shall be left undisturbed and subsequently removed manually. The final surface so prepared shall be moistened and compact just prior to concrete placement.

Where concrete is to be placed directly upon or against rock, the excavation shall be sufficient to provide for the specified thickness of concrete at all points.

I. Excavation for Canals

1. General

Canals shall be excavated to a subgrade and section as shown on the Drawings or as directed by the ENGINEER to provide the prescribed thickness of lining.

If, in the opinion of the ENGINEER, the Contractor is not adequately controlling the excavation lines in canals excavated in soil fill or soil deposits, a minimum of 50 mm in thickness inside the theoretical excavation line shall be left undisturbed and trimmed manually just prior to concrete placement.

All overexcavations shall be repaired in accordance with paragraph E, "Over Excavation", of this Section. No payment shall be made except as specified in I-3, "Canals in Soil Excavation".

2. Canals in Fill

The Contractor shall first construct the fill to the grade of the lateral berms as shown on the Drawings and then subsequently excavate through the fill for the canal section.

3. Canals in Soil Excavation

Special care shall be taken in sections containing boulders to minimize overexcavation and disturbance of adjacent soil materials. In the event of overexcavation due to boulders, the overexcavation will be repaired in accordance with paragraph 7.3-05, E, "Over Excavation", and both overexcavation and repair will be paid for provided special care was made by Contractor to minimize the overexcavation in the ENGINEERs opinion.

4. Canals in Rock Excavations

Special care shall be taken to prevent overbreakage or loosening of material on bottoms and side slopes upon which lining is to be placed.

J. Excavation for Pipe Lines. The Contractor shall erect all forms and bracing and make ready all excavations for trenches necessary to install pipe line to the lines and grades shown on the Drawings.

Grading shall be done as necessary to prevent surface water or rainwater from flowing into trenches and any water which may accumulate therein shall be removed immediately. Trenches shall be kept dry during the whole period until backfilling is completed and approved.

If soft or loose material is encountered at the bottom of the excavation it shall be removed or compacted to the depth ordered by the ENGINEER and refilled when necessary with suitable material compacted to 90% of the maximum dry density as determined by ASTM D-1557-Method D "Standard Method of Test for Moisture-Density Relation of Soils".

Overexcavation shall be filled and compacted as described above.

No pipes shall be placed prior to filling and compacting the work to the levels required.

The width of the trench, up to a minimum of 300 mm above the top of the pipe, shall be limited to the following ranges:

Trench Width

	Minimum	Maximum
Pipes smaller than 600 mm	External diameter plus 200 mm	External diameter plus 400 mm
Pipes larger than 600 mm	External diameter plus 300 mm	External diameter plus 600 mm

If the trench width exceeds these maximum limits for any

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reason other than by direction of the ENGINEER, the Contractor shall install at no additional cost, such general fill material, concrete encasement and/or other protection as may be required by the ENGINEER to satisfactorily support the added loads.

K. Excavation from Borrow Pits. It shall be the responsibility of the Contractor to locate approved sources of borrow material wherever needed which shall comply with the specified requirements of fill material and approved by the ENGINEER.

7.3-06 DRILLING AND BLASTING

A. In determining depth and spacing of drill holes, due consideration shall be given to the nature of the rock fragmentation so that elevations and contours indicated on the Drawings can be attained without excessive overbreak.

B. The Contractor shall supply a blaster who is experienced and competent and who holds all necessary licenses required for using explosives. The Contractor shall provide all necessary permits for the storage, handling, and use of explosives, and shall comply with government regulations governing the use of explosives. All on-site storage facilities for explosives, caps, and fuses shall be in accordance with applicable government regulations and shall be located where selected by the Contractor and approved by the ENGINEER. No storage of explosives will be permitted in the work area.

C. When the use of explosives is necessary for the execution of the work, the Contractor shall use utmost care, so as not to endanger life or property. Blasting shall be done only during daylight hours. Warning signals shall be sounded 5 minutes and again 1 minute prior to each shot. An "all clear" signal shall be sounded after each shot. All shots shall be sufficiently covered with blasting mats to protect personnel, adjacent structures, etc.

D. Prior to any blasting, the Contractor shall call a blasting conference at which the ENGINEER and all other affected parties shall be represented. The scope of operations, the procedures to be used, and the protection required to insure the utmost safety during blasting operations shall be established, subject to approval of the ENGINEER and other affected parties. Approval of methods and protective measures by the ENGINEER shall in no way relieve the Contractor of his responsibility and liability for injury to persons or damage to property and/or

equipment or other responsibilities under these Specifications. The Contractor will be held liable for all claims resulting from personal injury and damage to property or equipment that results from his blasting operations. Damage done to existing work by the Contractor's blasting operations shall be repaired at the Contractor's expense.

7.3-07 DISPOSAL

A. All debris, brush, roots, logs, trees and other materials removed in clearing and grubbing shall be disposed of off-site in the Contractor's disposal areas. Logs from clearing and grubbing may be sold, used or retained, provided that they are removed from the site prior to completion of the work.

B. Excess excavated materials may be disposed of directly downhill from the canal excavation in the areas and to the dimensions and slopes as shown on the Drawings or as approved by the ENGINEER. These disposal fills shall be protected against surface erosion and shall be constructed in such a manner as to insure their long term stability. To insure use of area for farming, all debris, brush, roots, logs, trees and rock should be buried and adequate soil cover provided. No payment shall be made for construction or protection of these fills.

C. Excess excavated materials may be disposed of in other disposal areas shown on the Drawings or designated by the ENGINEER, or alternatively disposed of off-site in Contractor's disposal areas.

D. All disposal areas shall be properly drained to avoid accumulated water.

E. The Contractor shall reserve a sufficient volume of required excavation materials which meet the fill specifications requirements to allow required fill construction. If excavation of this material is made before fill areas are ready, it shall be stockpiled in areas approved by the ENGINEER, at no additional cost to the CONTRACTING AGENCY.

7.3-08 FILL CLASSIFICATION AND MATERIALS

A. General. Materials for the various fills shall be obtained from required excavation or from borrow areas as

approved. The material from required excavations shall be used to the maximum extent possible consistent with specification acceptability. The material shall be well graded where so specified and shall be free of organic matter. Mechanical processing may be required, to produce the materials specified. All grain size percentages referred to herein are by weight. The grain size shall be determined in accordance with ASTM-D421 and D422. The suitability of all materials and their place in the fills shall be subject to approval of the ENGINEER.

B. General Fill Material. This will consist of selected gravelly, sandy clay placed in layers and compacted with proper compaction equipment to form strong impervious fills. Unless otherwise approved, the material shall be CL in accordance with the Unified Soil Classification System, shall have between 25% and 70% of the material passing the No.200 Standard U.S. sieve and shall have maximum size stones of 15 centimeters.

C. Backfill for Structures. This will consist of General Fill Material placed in layers and compacted with proper compaction equipment as backfill for the Project structures.

D. Disposal Fill Material. This will consist of all excess material excavated from the Project required excavations and placed without lift thickness, moisture or compaction requirements within the areas, lines and grades approved by the ENGINEER.

E. Filler Material. This will consist of processed hard durable sand and gravel from approved borrow areas placed where indicated on the Drawings, and shall be graded as follows:

Sieve Size	Percent Passing U.S. Standard Sieve
3/4"	100.
No. 4	95-100.
No. 8	80-100.
No. 16	50-85
No. 30	25-60
No. 50	10-30
No.100	2-10
No.200	0-5

The fines shall be noncohesive.

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F. Riprap. Riprap shall consist of quarried rock or river gravels and boulders, of approved quality. Any stone which is free from incipient fractures and seams and has given evidence of ability to withstand weathering after long exposure to the elements shall be considered suitable for this purpose with the approval of the ENGINEER. The classifications of riprap are defined below. Fifty percent of the stone shall be well graded between the nominal diameter and 5 cm, and Fifty percent of the stones shall have approximately the nominal diameter. The shortest dimension of any stone shall not be less than 1/3 the longest dimension.

Riprap Class	Nominal Diameter
-----	-----
A	50 cm.
B	50 cm.
C	30 cm.
D	30 cm.

G. Riprap Bedding. This material shall consist of processed durable quarried rock, clean natural gravels or processed rock from approved sources. This material shall meet the following gradation requirements:

Diameter or Sieve Size	Percent Smaller
-----	-----
6 inch	100
3 inch	70 - 95
1 inch	30 - 65
#4	0 - 25
#8	0 - 10

The fines shall be noncohesive.

H. Switchyard Surfacing. This material shall consist of processed durable quarried rock, clean natural gravels or processed rock from approved sources. The material shall meet the following gradation requirements:

Sieve Size	Percent Passing Individual Sieves
3 in.	100
3/4 in.	0-10

I. Grass Cover

1. Fertilizer. The fertilizer used shall be agricultural limestone and commercial fertilizer of approved fineness and quality. Chemical analysis of the fertilizer shall be 12-6-6, 10-6-4 or 20-10-5 in terms of available nitrogen, phosphoric acid, and potash, or as approved.

2. Seed. The seed shall be a domestic type and shall be of a grade satisfactory to the ENGINEER.

J. Stone Masonry. Stone masonry shall be placed where specified herein and where shown on the Drawings. It shall contain hard, durable rock from approved quarries, of angular form with one surface approximately flat. It shall be approximately 20 cm. thick and between 20 cm. and 50 cm. in size. The smallest dimension of any stone shall not be less than 1/3 of the largest dimension. The mortar for stone masonry construction is specified in 7.3-09,B-8, "Stone Masonry", of this section.

K. Access Road and Yard Fill. This shall conform to the requirements of General Fill Material.

7.3-09 FILL PROCEDURES

A. Foundation Preparation

1. General. No fill shall be placed on any foundation until the foundation or its surface has been unwatered and suitably prepared and has been inspected and approved. Surface preparation of all foundations shall be completed just prior to placement of fill materials thereon. All excavations which extend below the lines of required excavation, shall be filled with the same material to be placed in the area and compacted as specified for this material. All loose and objectionable material shall be removed from the foundation.

2. Earth Foundation. The earth foundations for all fill except disposal area fills shall be prepared by leveling, wetting

or drying as directed and scarifying to a depth of 20 cm. The scarified surface materials of the foundation shall be compacted as herein specified for the subsequent layers of the fill. The first layer of the fill shall be placed on the scarified and recompacted foundation to one half the thickness herein specified for the subsequent layers of the fill.

3. Rock Foundations. Rock foundations for fill shall be prepared by removing all loose soil material, rock blocks and fragments by hand methods which will not further fracture the rock.

4. Concrete Foundation. All debris and standing or running water shall be removed from concrete surfaces against or on which fill is to be placed. Prior to placement of fill, such surfaces shall be dampened and the initial fill shall be placed and compacted as specified.

B. Placement and Compaction

1. Filling Around Foundations and Structures. Backfilling may start after concrete curing, testing and approval of the structures and the different embedded items. Fill shall be deposited in such a manner as not to endanger the partly finished structure or sub-structure either by direct pressure or indirectly by overloading banks contiguous to the operation or in any other manner.

Filling shall be carried in horizontal layers of 200 mm compacted thickness each until the required level is reached.

Fill material shall be examined and approved at the borrow source prior to its transport to the fill site. Fill moisture conditioning shall be performed at the borrow source and not at the fill site. Only minor adjustments in moisture content shall be permitted at the fill site.

Each layer shall be moistened or dried to reach within 2% of the optimum moisture content then spread and compacted to at least 95% of the maximum dry density as determined by ASTM D698, "Methods of Test for Moisture Density Relations of Soils Using 5.5 lb. Rammer and 12-inch Drop".

2. Fill for Embankments

a. Method. Prior to the operation of filling the Contractor shall clear and grub the Site and perform all required excavations, including stripping of organic and loose material.

The material shall be neatly and evenly spread over

the area of embankment to such an extent that the embankment is composed of fully compacted material for the full widths required in uniform horizontal layers of not more than 200 mm in thickness after compaction.

The layers shall be kept shaped, trimmed and levelled by approved equipment. The surfaces of the layers shall at all times be maintained to such camber or cross slope as will shed water and prevent ponding. No subsequent layers may be applied until each layer has been properly shaped and compacted. Embankments shall be formed according to the Drawings or as directed by the ENGINEER. Side slopes shown on the Drawings are indicative only of the expected slope required for the material used and may be altered by the ENGINEER to suit the requirements of the material.

b. Compaction. Compaction shall not proceed until the moisture content of the material has been adjusted to within 2% of optimum. Any adjustments involving the incorporation of additional moisture shall be effected at the material source by approved equipment and shall be so arranged that the required moisture content shall be uniform throughout the layer to be compacted and shall remain uniform during compaction. Should circumstances arise when the removal of excess moisture cannot be achieved all work on the compaction of the material shall be suspended until conditions of weather and drainage are such as permit the required moisture content to be attained. All soft areas which may develop during compaction shall be removed and replaced with suitable material by the Contractor at his own expense. The materials shall be compacted to 95% of the maximum dry density as determined by ASTM D-698.

3. Filling Trenches for Pipelines. The foundation of the trenches shall be compacted and shaped to fit the lower part of the pipe for at least 25% of its overall height. Care shall be taken to ensure that the pipe will be uniformly supported on the bedding material. Trench fill shall be General Fill Material as specified.

The pipe backfill shall contain no stones greater than 7 cm. in diameter and shall be moistened and compacted to provide a stable and firm medium all around the pipe, all to the satisfaction of the ENGINEER. The backfill shall be laid in layers not more than 100 mm up to 300 mm above the top of the pipe and compacted around the pipe and couplings with approved hand or mechanical tampers. The fill shall be placed evenly on both sides of the pipe at the same time. Above this level, the fill shall be placed and compacted in accordance with 7.3-09, B.2, "Fill for Embankment".

4. Riprap. Riprap shall be placed in a manner that will distribute the larger rock fragments uniformly over the surface with the smaller fragments filling the spaces between so that a dense uniform layer will result. Riprap may be placed by dumping and shall be placed to its full course thickness in one operation, providing that a dense uniform layer is obtained. If a dense, uniform layer is not obtained, the riprap shall be reworked by manual methods until a suitable layer is obtained. Care shall be taken in the placing operation to avoid displacement of the underlying bedding material. No compaction of riprap is necessary.

5. Switchyard Surfacing. The surfacing material shall be placed in a single lift. The lift shall be placed on a foundation free of vegetation and roots in a continuous layer approximately following the contours of the foundation.

6. Grass Cover.

a. Fertilization. Fertilizer shall be applied to the required surfaces by an approved method just prior to seeding in the following amounts:

Agricultural limestone	2000 kg/ha
Commercial fertilizer	1500 kg/ha

Fertilizer shall be evenly distributed and mixed thoroughly with the top 5 cm of the soil.

b. Seeding. Methods of preparation of seed beds, fertilizing, mulching, seeding, sprinkling, maintaining, repair, and reseeding as required will be selected by the Contractor and shall be as approved by the ENGINEER.

c. Maintenance. The Contractor shall maintain all seeded areas until a uniform and dense stand of healthy grass has been produced free of bare spots and gullies formed by erosion. Maintenance shall consist of the necessary protection of seeded and grassed areas including mulching, watering, mowing, and repair of all areas damaged by erosion and shall include regrading, refertilizing, and reseeding if for any reason whatsoever a uniform stand of grass is not obtained.

7. Stone Masonry

a. Materials

i. General. All stone shall be obtained from approved sources. Samples of stone proposed for use as provided

herein shall be submitted to the ENGINEER for approval 10 days in advance of the time when the placing of the material is expected to begin.

ii. Quality

1. Stone. Any stone which is free from incipient fractures and seams and has given evidence of ability to withstand weathering after a long exposure to the elements will be considered suitable. The stone shall be clean, and free of dirt or other foreign matter.

2. Cement and Sand for Grouting and Mortar. Cement and sand for grouting and mortar shall conform to the requirements of Section 5, "Concrete Work", relative to fine aggregate for concrete and to cement for concrete.

b. Foundation Preparation

Areas on which stone masonry is to be placed shall be prepared in accordance with the foundation requirements specified in Section 5, "Concrete Work".

c. Construction

Stone masonry shall be composed of approved stone laid in cement mortar beds where shown on the Drawings or as directed. Stones shall be chosen to be reasonably close fitting to keep the mortar joint of even thickness on exposed faces of the work. In Stone masonry Structures, large size stones shall be placed at the bottom of the structure, with the size of the stones gradually decreasing as the item is brought to grade. All stones shall be saturated with water and the surface water allowed to drain before placement in the mortar bed. Stones shall be placed in complete contact with the mortar. The mortar shall consist of one part by volume of cement to 3 parts of sand. Stone masonry walls shall be cured in the manner specified for concrete in Section 5, "Concrete Work".

C. Quality Control of Fills

The Contractor shall make all necessary tests for moisture content, composition and compaction to ensure compliance with the Specifications. All tests shall be made in accordance with the latest ASTM Standard Methods. The ENGINEER will have the right to observe all testing for compliance with the specified standards. In addition, the Contractor shall provide the necessary labor to assist the ENGINEER in making the verification tests judged necessary by the ENGINEER. The Contractor shall remove the top layer of compacted material in local areas for each test of

in place density of the fill, and after completion of the test shall refill and recompact the area at no extra cost.

7.3-10 MEASUREMENT AND PAYMENT

A. Common Excavation. Measurement for payment for common excavation will be based on the number of cubic meters excavated as determined by a survey made prior to excavation and the lines and grades shown on the Drawings or as directed. Payment will be made at the unit price for Common Excavation, which price shall include all costs of clearing, grubbing, stripping, ripping, excavating, loading, hauling, and disposing of excess excavated materials, including stockpiling whenever necessary. No separate payment will be made for removal from stockpiles of any materials used for fill. Any excavation beyond the lines and grades shown on the Drawings and not directed will be considered over-excavation, and no payment will be made therefor, except as specified herein.

B. Rock Excavation. Measurement for payment for rock excavation will be based on the number of cubic meters excavated as determined by a survey made after removal of common excavation and the lines and grades shown on the Drawings or as directed. Payment will be made at the unit price for Rock Excavation, which price shall include all costs of drilling, blasting, barring, wedging, excavating, loading, hauling, and disposing of excavated materials, including stockpiling whenever necessary. Any excavation beyond the lines and grades shown on the Drawings and not directed will be considered over-excavation, and no payment will be made therefore.

C. Excavation for Contractor's Convenience. No separate payment will be made for excavation for the Contractor's convenience and the cost thereof shall be included in the prices for other items.

D. Disposal. No separate payment will be made for disposal of excavated material, and the cost thereof shall be included in the prices for the various excavation items.

E. Fill and Backfill. Measurement for payment for fill and backfill furnished by the Contractor will be based on the number of cubic meters furnished, placed, and compacted as determined by a survey and the lines and grades shown on the Drawings or as directed.

Payment will be made at the unit price for the following

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fill and backfill items:

General Fill Material

Filter Material

Riprap Class A

Riprap Class B

Riprap Class C

Riprap Class D

Riprap Bedding

Powerhouse Yard Surfacing

Access Road and Yard Fill

These prices shall apply regardless of the source of material and shall include the cost of all work in connection with the excavation from borrow or quarry areas, including clearing, grubbing, and stripping of borrow or quarry areas; all processing where required; hauling; stockpiling as necessary; rehandling; moisture conditioning; transporting to fill site; initial placing; spreading; harrowing; wetting; drying; rolling; compacting; removal of objectionable material; and all other work required for the construction, protection, and maintenance of the fills, including removal, refill, and compaction required for field density tests. No separate payment will be made for any additional cost incidental to placing backfill on or around concrete structures and the cost thereof shall be included in the prices for the fill material. No separate payment will be made for Disposal Fill Material, nor for any equipment, labor or materials necessary for its hauling, stockpiling, placing or any other work necessary for construction of disposal fills.

F. Grass Cover. Measurement for payment for grass cover will be based on the number of square meters of grassed area measured in place. Payment will be made at the unit price for Grass Cover.

The prices shall include the cost of all work in connection with furnishing and placing the fertilizer; furnishing and placing the seed; and all other materials and work required for the protection, maintenance, and procurement of a uniform stand

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of grass. No payment will be made until the seeding of an area is completed. Payment will be made as follows:

-50% when seeding is completed.

-50% when, in the opinion of the ENGINEER, a uniform stand of grass has been obtained.

G. Stone Masonry. Measurement for payment for Stone Masonry will be based on the number of cubic meters acceptably placed as computed from the neat lines and grades shown on the Drawings or as directed. Payment will be made at the unit price for Stone Masonry, which price shall include all costs, including cement, sand and rock, for furnishing, hauling, handling and placing the stone masonry as required.

PART VII - TECHNICAL PROVISIONS

SECTION 4 - DRILLING AND ANCHORING

7.4-01 SCOPE

In accordance with the specifications contained in this Section and as shown on the Drawing or as directed, the Contractor shall furnish and install anchor bars, rock anchors and drain holes.

7.4-02 EQUIPMENT

A. Drilling Equipment

Drilling of anchor bar, rock anchor and drain holes may be performed with either rotary or percussion equipment. The equipment shall be of suitable size and type to adequately perform the necessary work.

B. Grout Equipment

The grout equipment shall be of suitable type and size to be able to thoroughly mix an adequate volume of grout and to be able to adequately place the grout in holes of any inclination.

7.4-03 MATERIALS

A. Anchor Bars

Anchor bars shall be reinforcing bars meeting the requirements contained in Section 5, "Concrete Work".

B. Rock Anchors and Appurtenances

1. General. All rock anchors shall be 1-inch nominal diameter and straight. The lengths shall be as specified by the ENGINEER. The rock anchor shall be furnished and installed complete with bearing plates, mortar pads, hardened washers, 2 beveled washers per rock anchors, nuts, and anchorages. All rock

anchors shall be fabricated from standard steel reinforcing bars conforming to ASTM-A615, Grade 60, "Specification for Deformed Billet-Steel Bars for Concrete Reinforcement." One end of the Rock Anchor bar will be threaded for a minimum length of 8 inches with 8 threads per inch in accordance with ANSI B1.1-1974 Unified Standard Series - UNC/UNRC. Prior to threading the bar all protruding deformations in the area to be threaded will be removed by grinding. Grinding must be done in such a manner that the bar is not weakened locally either by notching or by excess heating of the bar. They may be secured by grout or by polyester resin. Holes for rock anchors shall be at least 2 7/8 inches in diameter.

2. Bearing Plates. Steel bearing plates shall conform to the requirements of ASTM-A36, "Specification for Structural Steel". The plates shall be not less than 3/8 in. thick and 6 in. square.

3. Nuts. Nuts shall be hexagon head of the heavy duty bearing type conforming to the requirements of ASTM-A325, "Specification for High-Strength Bolt for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers".

4. Washers. Washers may be beveled or flat. Beveled washers shall be steel or malleable iron. Flat steel washers shall conform to the requirements of ASTM-A325, "Specification for High-Strength Bolts for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers", quenched and tempered.

5. Resin. Resin where used shall be manufactured in cartridges of a size recommended by the manufacturer. The cartridges shall have a casing constructed of a saturated polyester providing an optimum resistance to moisture. The cartridge shall contain 2 distinct fractions of unsaturated polyester resin and catalyst. Both quick-set and slow-set resin are required. The resin should be a high-strength polyester, filled with nonreactive inorganic filler. The compressive strength of a mixed and cured resin shall be 14,000 psi when tested in accordance with ASTM-C39, "Method of Test for Compressive Strength of Cylindrical Concrete Specimens". The gel and cure time at 77 degrees Fahrenheit shall be between one minute gel time with a 10-minute cure and a 60-minute gel time with a 4-hour cure.

6. Grout. Grout for anchor bars and rock anchors shall consist of a thoroughly mixed, thick sand-cement grout having a water/cement ratio of less than 0.7 by volume (0.45 by weight) and a sand-cement ratio of 2 to 3 by weight.

C. Drain Holes.

The casing for drain holes shall be 2 inch nominal diameter schedule 40 PVC pipe conforming to ASTM-D1785, "Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120". The pipe shall be slotted. The slots shall be between 1.0 and 2.0 mm wide by 30 mm long, spaced at 2.0 mm apart, and placed perpendicular to the pipe centerline in three rows at 120 degrees apart.

7.4-04 INSTALLATION AND GROUTING OF ANCHOR BARS AND ROCK ANCHORS

A. General. Holes for anchor bars shall be drilled to a minimum diameter 25 mm larger than the bar diameter. After drilling, holes shall be washed and blown out with an air jet until no water or dirt remains in the holes. If anchor bars are not to be grouted in place immediately, the holes shall be tightly plugged and again washed and cleaned immediately prior to placing and grouting of bars.

B. Anchor Bars. At the time of placing the anchor bar, the hole shall be partially filled with grout. The anchor bar shall be forced into place while being vibrated by a concrete vibrating machine. After which any remaining void shall be filled with grout. The entire grouting procedure shall be as approved. Grouting of bars shall be done not less than six (6) days in advance of their embedment in concrete. Any bars which are found to be loose after the grout has set up shall be reset at no additional cost to the Owner. Holes into which water is seeping or running shall be grouted upward from the bottom by means of a tremie pipe to prevent dilution of the grout.

C. Rock Anchors. The Contractor shall detail, furnish, and install rock anchors where shown on the Drawings or as directed. The holes shall be drilled at designated locations and shall have slopes and depths as shown or directed. The method of installing and details of the equipment necessary to effectively seat and tighten the anchorage in the hole, stress the rock anchor to the required tension and grout the rock anchor after installation shall be subject to review and approval. The nut shall be free running on the threads of the projected end of the rock anchors and shall be tightened by a controlled torque impact wrench. In general, rock anchors shall be torqued to 35 kg-m. The rock anchor shall be grouted as soon as possible and no blasting may take place within 15 m of a grouted rock anchor until 5 days

after grouting of the rock anchor. The Contractor shall insure that grout completely fills the space around the rock anchor from the bearing plate up to and including the anchorage of the bar and that all air is vented out of the drill hole. If, during the grouting of any anchor, grout is found to flow from points in the rock surface adjacent to the rock anchor, such leaks shall be plugged or caulked, so that no further grout leaking takes place.

7.4-05 INSTALLATION OF DRAIN HOLES

Holes for drains shall be NX size. After drilling, holes shall be cleaned by an approved method to remove all loose material. Immediately after drilling, the drain hole casing shall be inserted into the hole. If the casing cannot reach the bottom of the hole because of blockage, the hole shall be reamed, recleaned and the casing reinserted. The casing at the top of the hole shall be protected by a 30 cm by 30 cm block of concrete, poured flush with the top of casing which shall be at foundation or top of ground level.

7.4-06 MEASUREMENT AND PAYMENT

A. Rock Anchors. Measurement for payment for rock anchors will be based on the number of lineal meters of rock anchors furnished, installed and approved. Payment will be made at the unit price for Rock Anchors, which price shall include all costs of drilling holes for the rock anchors; of furnishing, installing and tensioning the rock anchors complete with all appurtenances; all resin and/or grouting of the rock anchors, including all grout materials.

B. Anchor Bars. Measurement for payment for anchor bars will be based on the number of lineal meters of anchor bars furnished, installed and approved. Payment will be made at the unit price for Anchor Bars, which price shall include all costs of drilling holes for the anchor bars; of furnishing and installing the anchor bars; and grouting of the anchor bars including all grout materials.

C. Drain Holes. Measurement for payment for drain holes will be based on the number of lineal meters of drain holes furnished, installed and approved. Payment will be made at the unit price for Drain Holes, which price shall include all costs of drilling holes for the drain holes; of furnishing and installing the drain hole casing; and furnishing and installing the concrete block protection.

Traducción
de Cortesía

PART VII - TECHNICAL PROVISIONS

SECTION 5 - CONCRETE WORK

7.5-01 SCOPE

In accordance with the specifications contained in this Section, as shown on the Drawings, or as directed, the Contractor shall:

A. Manufacture, transport, place, finish, protect, repair and cure concrete, including the furnishing of all material and equipment necessary to execute the work.

B. Construct, erect, and dismantle forms.

C. Detail, furnish, handle, bend and place steel reinforcement.

D. Furnish and place culvert and underdrain pipe.

7.5-02 COMPOSITION AND SOURCE

Concrete shall be composed of Portland cement, water, fine and coarse aggregate, boulders (only where specifically allowed), water reducing admixture and air-entraining admixture. Uniformity of color of the exposed surfaces, including areas in which imperfections in the new concrete have been repaired, will be required. Only such materials or blends of materials as will result in uniform color of exposed surfaces shall be used.

The Contractor may manufacture the concrete or purchase ready-mix concrete. If the latter is used, it shall conform to the specifications herein and to ASTM-C94, "Specification for Ready-Mix Concrete".

7.5-03 CEMENT

A. Types. Cement shall be of Type I conforming to ASTM-C150, "Specification for Portland Cement", unless otherwise approved.

B. Storage. Sacked cement which may be stored at the site shall not be stacked higher than 14 sacks for short storage, a period of not longer than 30 days, and not higher than seven sacks for longer periods. Immediately upon receipt at the site of the Work, cement shall be stored in the dry with adequate provisions for the prevention of absorption of moisture.

7.5-04 ADMIXTURES

A. Air-Entraining Admixtures. The air-entraining admixture shall conform to the requirements of ASTM-C260, "Specification for Air-Entraining Admixtures for Concrete". The air-entraining admixture shall be added at the mixer. The amount of air-entraining agent used in each concrete mix shall be such as will effect the entrainment of the percent of air shown in the following tabulation in the concrete as discharged from the mixer:

Coarse Aggregate Maximum Size Inches -----	Total Air, Percent by Volume of Concrete (Unless Otherwise Directed) -----
1 1/2	5.0 (plus-minus 1)
3/4	6.0 (plus-minus 1)

Field tests for air entrained in concrete shall be made by the Contractor and checked by the ENGINEER in accordance with ASTM-C213, "Test for Air Content of Freshly Mixed Concrete by the Pressure Method".

B. Water-Reducing Admixture. Water-reducing admixtures shall conform to ASTM-C494, "Specification for Chemical Admixtures of Concrete", Type A or B. The amount of water reducing admixture used shall be in accordance with the manufacturer's instructions.

C. Other Admixtures. Other admixtures to remedy deficiencies in aggregate grading may be used only with written approval.

D. Approval. The type and brand of admixtures shall be submitted for approval no later than 30 days prior to the start of concrete work.

7.5-05 WATER

Water used in mixing concrete shall be fresh, clean, and free from injurious amounts of sewage, oil, acid, alkalis, salts, or organic matter. Filtered and uncontaminated water from the Rio Yuboa will be acceptable.

7.5-06 AGGREGATES

A. General. Fine and coarse aggregates shall conform to the general grading and technical characteristics required by ASTM-C33, "Specifications for Concrete Aggregates". The aggregates shall consist of clean hard tough, durable, uncoated particles and shall be separated into the following ASTM nominal size group gradations:

ASTM Size Number -----	Aggregate Nominal Size -----
Fine aggregate (sand)	3/8 in. to No. 100
Coarse aggregate	
No. 67	3/4 in. to No. 4
No. 4	1 1/2 in. to 3/4 in.

The particle shape of the fine and coarse aggregate shall generally be rounded or cubical and reasonably free from thin flat, and elongated particles.

Boulders for use in the spillway concrete shall conform to the technical requirements for coarse aggregate.

B. Point of Acceptance. The point of acceptance of aggregate will be at the batch plant or ready mix plant.

C. Sources. The Contractor shall furnish certified test results that the coarse and fine aggregates comply with ASTM-C33, "Specification for Concrete Aggregates".

D. General Use. The maximum size of coarse aggregates to be used in the various parts of the Work shall be 1 1/2 in. in the spillway and 3/4 in. in all other concrete work, unless otherwise specified or directed. Boulders shall be added to the concrete during placement in the spillway where shown on the Drawings.

7.5-07 SAMPLING AND TESTING

A. Aggregate. Tests for gradation and moisture content will be made in accordance with the applicable ASTM Standards.

B. Concrete. Compressive strengths will be determined by testing standard six-inch by twelve-inch cylinders made and cured in accordance with ASTM C31, "Making and Curing Concrete Compressive and Flexure Specimens in the Field". Specimens will be tested by the ENGINEER, in accordance with current ASTM Standards. A sufficient number of specimens will be taken to give a comprehensive record of the strength of the concrete. The ENGINEER will maintain constant concrete control inspection relative to procedures and/or quality. The Contractor shall furnish the concrete and other materials for all test samples without cost.

7.5-08 PROPORTIONING OF CONCRETE

A. Mix Designs. The proportions of all material entering into the concrete shall be designated by the Contractor in accordance with the procedures of ACI 211.1-70, "Recommended Practice for Selecting Proportions for Normal Weight and Heavyweight Concrete". Concrete shall be proportioned to secure a uniform, plastic, workable mixture suitable for the specific conditions at placement. When properly placed, finished and cured, the concrete shall have durability, impermeability and strength in accordance with the requirements of the structures covered by these Specifications. The proportions of each ingredient used in all mixes, compressive strengths at seven and 28 days, slump, air content, and other characteristics of all mixes designed by the Contractor shall be submitted to the ENGINEER for approval 30 days in advance of the start of any concrete work. The approval will be given in writing. The compressive strength at 28 days of normal concrete shall be 3,000psi (210 kg/square centimeters), and of lean concrete shall

be 2,000 psi (140 Kg/square centimeters unless otherwise noted on the Drawings.)

B. Slump. The slump of concrete as delivered to the forms shall be between two and four in. measured in accordance with ASTM-C143, "Slump of Portland Cement Concrete", unless otherwise approved by the ENGINEER. The amount of water used in the concrete shall be regulated as required to secure concrete of the proper consistency and to adjust for any variation in the moisture content of the aggregate. The addition of water to compensate for stiffening of the concrete before placing will not be permitted. Uniformity in concrete consistency from batch to batch will be required. The use of buckets, chutes, hoppers, or other equipment which will not readily handle and place concrete within the specified slump range will not be permitted.

C. Concrete Strength. Specimens shall be tested by the ENGINEER in accordance with ASTM-C39, "Compressive Strength of Molded Concrete Cylinders".

7.5-09 BATCHING AND MIXING

Concrete shall be batched, mixed, and transported in accordance with the applicable portions of ASTM-C94, "Standard Specification for Ready Mixed Concrete", and ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete". The equipment shall be capable of combining the aggregate, cement, admixture, and water into a uniform mixture within the time limit specified and of discharging this mixture without segregation.

7.5-10 CONVEYING

Concrete shall be conveyed from mixer to forms as rapidly as practicable by methods which will prevent segregation or loss of ingredients. There shall be no drop greater than two meters, except where suitable equipment is provided to prevent segregation.

7.5-11 PLACING

A. Approval. Approval of the ENGINEER shall be obtained before starting any concrete placement. Concrete placement will not be permitted when, in the opinion of the ENGINEER, conditions prevent proper placement and consolidation.

B. General. The concrete shall be placed in accordance with the ACI 304, "Recommended Practice for Measuring, Mixing and Placing Concrete", and ACI 305, "Recommended Practice for Hot Weather Concreting". The consolidation of concrete placed shall be in accordance with ACI 309, "Consolidation of Concrete". Concrete shall be worked readily into the corners of the forms and around all reinforcement and embedded items without permitting the component concrete materials to segregate.

C. Concrete on Earth or Rock Foundations or on Concrete. All concrete placed on earth shall be placed upon clean, compacted, damp surfaces, free from standing or running water. Other surfaces upon which concrete is to be placed shall be clean and free from oil, standing or running water, mud, objectionable coating, debris, and loose or unsound fragments. Immediately before concrete is placed on or against rock or concrete, all surfaces shall be cleaned thoroughly by the use of high velocity, air-water jets, brooming, sandblasting, or other satisfactory means including combinations of the above. All surfaces shall be wetted before placing concrete.

D. Lift of Concrete. The depth of concrete placed in one lift or course shall be to construction joints as shown on the Drawings or as directed.

E. Placing Concrete Through Reinforcement. In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs.

F. Cyclopean Concrete. Washed and surface damp boulders up to 30 cm. in diameter shall be placed within the spillway ogee concrete where shown in the Drawings while it is being poured, such that the boulders are floating within the concrete matrix with no unfilled voids between or under the boulders. The procedure for placing boulders shall be as approved by the ENGINEER.

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7.5-12 CONSTRUCTION JOINT TREATMENT

Horizontal construction joints shall be prepared for receiving the next lift by either sandblasting or by light bush hammering or other approved methods. Construction joint preparation shall be performed immediately before placing the following lift. All laitance, loose or defective concrete coating, stains, and other foreign materials shall be removed. The surface of the concrete shall then be washed thoroughly to remove all loose material.

7.5-13 FORMS

A. General. Formwork shall be in accordance with ACI 347, "Recommended Practice for Concrete Formwork". Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall be maintained rigidly in correct position. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. At the time concrete is placed in the forms, the surfaces of the forms shall be free from encrustations of mortar, grout, or other foreign materials that would contaminate the concrete or interfere with the fulfillment of the specification requirements relative to the finish of formed surfaces.

B. Form Ties. Embedded metal rods used for holding forms shall remain embedded and shall terminate not less than five cm. inside the formed faces of the concrete. Embedded fasteners on the ends of rods shall be such that their removal can be accomplished without causing spalling and will leave holes of regular shape.

C. Removal of Forms. Forms shall be removed with care so as to avoid injury to the concrete and as soon as practicable in order to avoid delay in curing and repair of surface imperfections; but in no case shall they be removed before approval.

D. Tolerances. The forms shall be constructed true to line and grade. The Contractor shall check the forms before, during, and after concreting to produce structures within the specified tolerances as given by ACI 347, "Standard Recommended Practice for Concrete Formwork".

7.5-14 CURING AND PROTECTION

A. General. All concrete shall be cured in accordance with ACI 308, "Curing Concrete", or by an approved method of combination of methods. The Contractor shall have on hand and ready to install all equipment needed for adequate curing and protection of the concrete before each concrete pour begins.

B. Water Curing. Concrete curing shall be by maintaining all surfaces continuously wet (not periodically) for the duration of the entire curing period or until covered with fresh concrete. Water for curing shall be clean and free from any elements which will cause staining or discoloration of the concrete.

C. Membrane Curing. The membrane curing shall be by application of a sealing compound which forms a water-retaining membrane on the surface of the concrete. The sealing compound shall not be used on concrete surfaces to which additional concrete or other material is to be bonded. All compounds used shall conform to the requirements of ASTM-C309, "Specifications for Liquid Membrane-Forming Compounds for Curing Concrete". The compound shall be of uniform consistency and quality. When a sealing compound is to be used on formed concrete surfaces, the surfaces shall be moistened with a light spray of water immediately after the forms are removed and shall be kept wet until the surfaces will not absorb more moisture. As soon as the surface film of moisture disappears but while the surface still has a damp appearance, the sealing compound shall be applied. Special care shall be taken to insure ample coverage with the compound at edges, corners, and rough spots or formed surfaces. Equipment for applying the sealing compound and the method of application shall meet with the approval of the ENGINEER.

7.5-15 FINISHES AND FINISHING

A. General. The types of finishes to be given the various surfaces shall be as specified herein or as shown on the Drawings. Surface irregularities are classified as "abrupt" or "gradual". Offsets caused by displaced or misplaced form sheathing or lining or form sections or by loose knots in forms or otherwise defective form lumber, will be considered as abrupt irregularities and will be tested by direct measurement. All other irregularities will be considered as gradual irregularities

and will be tested by template. The length of the template will be five ft. Honeycomb is not considered an irregularity and shall be repaired in accordance with "Repair of Concrete", whenever it occurs. The Contractor shall remove unsightly encrustations and stains from all exposed surfaces.

B. Formed Surfaces. After form removal, no treatment is required except repair of honeycomb, irregularities, defective concrete and the specified curing. Formed surfaces over which water will pass shall have no abrupt irregularities and may have gradual irregularities not exceeding 6 mm.

C: Unformed Surfaces

1. General. The types of finish for unformed concrete surfaces are designated as screed, float, and trowel. Finishing shall be performed by skilled workmen. All surfaces which would normally be level shall be sloped approximately three per cent for drainage.

2. Screed Finish. A screed finish shall be applied to unformed surfaces that will be covered by backfill. A screed finish shall also be used as the first stage of float and trowel finishes. Finishing operations shall consist of sufficient leveling to the required grade and screeding to produce an even uniform surface. Gradual surface irregularities shall be such as not to impair the structural properties of the work. No abrupt irregularities will be allowed.

3. Float Finish. A float finish shall be applied to unformed surfaces. A float finish shall also be used as the second stage of trowel finishes. Floating may be performed by use of hand or power-driven equipment. Floating shall be started as soon as the screeded surface has stiffened sufficiently, and it shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. If a trowel finish is to be applied, floating shall be continued until a small amount of mortar without excess water is brought to the surface, so as to permit effective troweling. Joints and edges shall be tooled where shown on the Drawings or as directed. Gradual surface irregularities shall not exceed 1/4 in. (6 mm). No abrupt surface irregularities will be allowed.

4. Trowel Finish. A steel trowel finish shall be applied to unformed surfaces over which water will pass where shown on the Drawings or as directed by the ENGINEER. When the floated surface has hardened sufficiently to prevent excess fine materials from being drawn to the surface, steel troweling shall be started. Steel troweling shall be performed with firm pressure, such as will flatten the sandy texture of the floated

surface and produce a dense uniform surface, free from blemishes and trowel marks. All troweled surfaces shall be protected from damage throughout construction. Gradual surface irregularities shall not exceed 1/4 in. (6 mm). No abrupt surface irregularities will be allowed.

7.5-16 REPAIR OF CONCRETE

Repair of imperfections in formed concrete shall be completed within 24 hours after removal of forms. Fins shall be neatly removed from exposed surfaces. Concrete that is damaged or honeycombed shall be removed to sound concrete by chipping and replaced with mortar or concrete as directed. Protrusions shall be reduced by bush hammering and grinding. No repair of imperfections shall be undertaken until the imperfections have been inspected by the ENGINEER.

7.5-17 FURNISHING AND PLACING STEEL REINFORCEMENT

A. General. The Contractor shall detail, furnish, cut, bend, and place all reinforcing steel and wire fabric as shown on the Drawings, and furnish and install necessary supports, spacers, or ties. All reinforcement shall be free from loose, flaky rust and scale and from oil, grease, or other coating which might destroy or reduce its bond with concrete.

B. Cutting and Bending. Steel reinforcement may be mill or field bent. All bending will be in accordance with standard approved practice and performed by approved machine methods. Heating of reinforcement for bending will not be permitted. Bars with kinks or bends not shown on the Drawings shall not be used.

C. Type. The steel reinforcement shall be deformed bars and shall conform to ASTM-A615, Grade 60, "Specification for Deformed Billet-Steel Bars for Concrete Reinforcement". Wire fabric shall be welded and conform to ASTM-A185, "Specifications for Welded Steel Wire Fabric for Concrete Reinforcement".

D. Concrete Cover of Reinforcement. The Drawings indicate clear distances from the edge of the main reinforcement to the concrete surface. The concrete covering the ties, space bars, and similar secondary reinforcement may be reduced by the diameter of such bars.

E. Splicing. Unless otherwise shown or specified, all splices, lengths of laps, locations, placement and embedment of

reinforcement shall conform to the appropriate requirements of ACI 318, "Building Code Requirements for Reinforced Concrete".

F. Supports. All reinforcement shall be secured in place by use of approved metal or concrete supports, spacers, or ties. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operation. The supports shall be used in such manner that they will not be exposed or contribute in any way to the deterioration of the concrete. No tack welding for reinforcement shall be allowed.

7.5-18 EMBEDDED ITEMS

Before placing concrete, care shall be taken to insure that all embedded items are firmly and securely fastened in place as shown on the Drawings or otherwise directed. All embedded items shall be thoroughly cleaned and free of oil and other foreign matter such as loose coatings of rust, paint, scale, etc. The embedding of wood in concrete will be prohibited unless specifically authorized.

7.5-19 CONCRETE CANAL LINING

A. General. The Contractor shall construct the concrete lining at such time, and according to such method as will, in the opinion of the ENGINEER, provide for the best quality or work.

Concrete lining shall be constructed only after all the required excavation and trimming have been completed at and up to the section at which the lining is to be poured.

B. Requirements of Trapezoidal canal Concrete Lining. The trapezoidal canal concrete lining shall be of concrete reinforced with steel wire mesh. The thickness of the concrete shall be 100 mm. The materials and construction shall be in accordance with the requirements this Section of the Specifications and with all other Sections where the various items forming part of the lining are specified. The concrete lining shall be cast in place either by applying slip form equipment or in slabs. The finished canal lining shall in no case exceed the following tolerances:

- departure from established alignment, 50 mm on tangents and 10 cm on curves;

- departure from established profile grade: 10 mm;
- reduction in thickness: 10%;
- variation in bottom width: 0.25%;
- variation in height: 0.5%.

C. Construction by Slip Form. If the Contractor selects to construct the trapezoidal canal concrete lining by means of a slip form the following provisions shall apply:

Concrete for canal lining shall be held in position for vibration and shaped to the required lines and grades by means of a weighted, steel-faced, moving slipform of suitable depth and conforming to canal cross-section in width. The form shall move continuously at a steady and uniform rate. The rate shall be adjusted to the rate of concrete placement.

Application of the slip form method will not be approved by the ENGINEER unless satisfactory vibration equipment is included and the results thereof are proven acceptable.

D. Construction by Slabs. If the Contractor elects to construct the trapezoidal canal concrete lining in slabs, the sizes of the slabs shall be as shown in the Drawings.

The Contractor in proposing the method of construction shall fully consider the system of the concrete vibration, which is essential for the acceptance and approval of the lining together with sufficient and effective curing as specified.

E. Joints

1. If the Contractor selects to construct the concrete lining by means of a slip form the following provisions shall apply:

A control joint shall be constructed every three meters. In this joint, every second horizontal mesh bar shall be cut, and 8 hours to 48 hours after construction, a joint shall be sawed. The saw cuts shall be made with a special concrete saw using either a reinforced abrasive blade or a steel blade edged with diamonds. The blade shall be cooled and lubricated abundantly with cold water. The concrete saw shall be properly supported to yield a sawed joint 30 mm deep and true to line and grade.

An expansion joint shall be constructed every thirty

meters. No steel shall pass through this joint. It shall be filled with preformed expansion joint filler meeting the requirements of ASTM-D1752, "Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction", Type II, and hot poured joint sealing compound conforming to ASTM D1190 "Specification for Concrete Joint Sealer, Hot Poured, Elastic Type" as shown on the drawings.

2. If the Contractor selects to construct the concrete lining by slabs, the following provisions shall apply:

Every second slab shall be constructed first, then the intervening slabs shall be constructed. Slabs shall be three meters long. Between each slab a groove shall be formed as shown on the drawings. The steel wire mesh shall be reduced in effectiveness at the joint by cutting every second horizontal mesh bar. After the concrete has set, the groove shall be filled with preformed expansion joint filler and hot poured joint sealing compound as shown on the Drawings.

To insure the adhesion of the sealing compound to the concrete, the joint must be clean and free of dirt and debris.

An expansion joint shall be constructed every thirty meters. No steel shall pass through this joint. It shall be filled with preformed expansion joint filler, and joint sealing compound as shown on the drawings.

7.5-20 CULVERT AND UNDERDRAIN PIPE

A. Materials

1. Reinforced Concrete Culvert Pipe. Reinforced concrete culvert pipe shall conform to ASTM-C76, "Specification for Reinforced Concrete Culvert Pipe" and shall be tested in accordance with AASHTO-T33, "Standard Methods of Testing Culvert Pipe, Storm Drain and Sewer Pipe", Class IV.

2. Underdrain Pipe. Underdrain pipe shall be 4 inch nominal diameter Schedule 19 PVC pipe conforming to ASTM-D1785, "Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120". The pipe shall be slotted. The slots shall be between 1.0 and 2.0 mm wide by 60 mm long, spaced at 20 mm apart, and placed perpendicular to the pipe centerline in two rows at 180 degrees apart.

B. Installation

1. Laying. Culvert pipes shall be laid at the depth and grade shown on the Drawings or as directed. Pipes shall be installed in trenches excavated in the foundation or through the embankments in accordance with Section 3, "Excavation, Fill and Backfill". The laying of concrete pipe on the prepared foundation shall be started at the outlet end with the spigot ends pointing in the direction of flow. All joints shall be sealed with an approved sand-cement mortar and wiped clean on the inside. Pipe shall not be laid in water, and pipe shall not be laid when the trench conditions or the weather is unsuitable for such work.

C. Damage to the Pipe. Any damage to pipe in shipment, during installation, or prior to final acceptance shall be repaired to the satisfaction of the ENGINEER or the pipe shall be replaced at no additional cost to the Owner.

7.5-21 MEASUREMENT AND PAYMENT

A. Concrete other than Canal Lining Concrete. Measurement for payment for all concrete will be based on the number of cubic meters, placed within the lines and grades shown on the Drawings, or as directed. No payment will be made for concrete placed to replace material excavated beyond the lines and grades shown on the Drawings or as directed. No deduction will be made for rounded edges or space occupied by metalwork. No deduction will be made for approved temporary openings, drains, embedded pipes, or recesses created by the Contractor for his own convenience during construction, provided they are filled as directed. No measurement or payment will be made for repair of imperfections or for concrete wasted.

Payment will be made at the unit price for the following items:

- Diversion Dam Concrete
- Structures Concrete (Low Level Outlet, Intake, Desilting Basin, Exit Channel, Forebay)

- Drainage Structures Concrete (Overchutes, Box Culverts, Pipe Culvert Structure Canal Crossings)
- Penstock Support Concrete
- Powerhouse Concrete
- Lean Concrete (River Crossings, Forebay Outlet Pipe Bedding)
- Miscellaneous Concrete

Miscellaneous concrete includes all concrete except canal lining concrete not specifically included in the other concrete payment items.

These prices shall include the cost of all work and materials required to complete the concrete work for the above items except for items of work which are specified to be paid for separately.

B. Canal Lining Concrete. Measurement for payment for both trapezoidal and rectangular canal lining concrete will be based on the number of square meters of concrete canal lining placed in the work. Payment will be made at the unit price for Canal Lining Concrete, which price shall include the cost of sawed, construction and expansion joints and of furnishing all material, including membrane curing compound and forms; and performing all work including slipforming as shown on the Drawings and included in these Contract Documents.

C. Steel Reinforcement. Measurement for payment for steel reinforcement will be based on the number of kilograms detailed, bent, furnished, and placed as shown on the Drawings or as otherwise directed. Measurement for payment will be made for steel in laps as shown on the Drawings. No measurement for payment will be made for steel in laps which are solely for the convenience of the Contractor or for steel reinforcement supports, including bracing. Payment will be made at the unit price for Steel Reinforcement.

D. Welded Wire Fabric. Measurement for payment for welded wire fabric will be based on the number of kilograms furnished and placed as shown on the Drawings or as otherwise directed. Measurement for payment will be made for welded wire fabric in laps as shown on the Drawings. No measurement for payment will be made for welded wire fabric in laps which are solely for the convenience of the Contractor or for welded wire fabric supports, including bracing. Payment will be made at the unit price for Welded Wire Fabric.

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E. Culvert Pipe. Measurement for payment for culvert pipe will be based on the number of lineal meters of pipe furnished and installed as shown on the Drawings or as directed. Payment will be made at the unit prices for the following items:

- Culvert Pipe, 12 inch Diameter
- Culvert Pipe, 24 inch Diameter
- Culvert Pipe, 36 inch Diameter
- Culvert Pipe, 48 inch Diameter
- Culvert Pipe, 60 inch Diameter

These prices shall include the cost of excavating trenches for the pipes and the cost of furnishing, placing, and compacting backfill material in trenches.

F. Underdrain Pipe. Measurement for payment for underdrain pipe will be based on the number of meters furnished and installed. Payment will be made at the unit price for Underdrain Pipe.

PART VII - TECHNICAL PROVISIONS

SECTION 6 - YARDWORK, ROADWORK AND RIVER CROSSINGS

7.6-01 SCOPE

In accordance with the specifications contained in this section and as shown on the Drawings or as directed, the Contractor shall construct and maintain until final acceptance of the work, the permanent access roads shown on the drawings and the yardwork at the powerhouse area. The Contractor shall also construct and maintain until final acceptance of the work, the river crossings at the Rio Yuboa and Rio Ceibita.

7.6-02 ALIGNMENT, GRADES, AND SECTIONS

The access roads, the yard and the river crossings shall be constructed to the alignments, dimensions, grades, and slopes shown on the Drawings or as directed. The surfacing and the geometry shall be as shown on the Drawings or as directed.

7.6-03 CONTRACTOR'S USE OF ACCESS ROADS AND YARD

The Contractor may use the access roads and yard during the construction period. However, at the end of the construction period, the Contractor shall repair any damage and correct any defects in the roads and yard at his own expense, so that these works comply with the requirements contained herein.

7.6-04 CONSTRUCTION

A. Clearing, Grubbing, and Stripping. The areas involved in access road and yard construction shall be cleared, grubbed, and stripped as necessary to the limits indicated in the specifications or as directed. Materials shall be disposed of as specified in Section 3, "Excavation, Fill and Backfill". No material shall be disposed of in the river.

B. Excavation. Excavation for the access road and yard shall be done to the lines, grades, and slopes shown on the Drawings or as directed. All excavation, shall be done in accordance with Section 3, "Excavation, Fill and Backfill". The Contractor shall excavate and dispose of the material as approved by the ENGINEER.

C. Fill. The fills shall be constructed to the lines and grades as shown on the Drawings or as approved and in accordance with Section 3, "Excavation, Fill, and Backfill".

D. Road Surfacing. A 20 cm thick layer of gravel shall be constructed as surfacing for the access roads and shall be in accordance with the type C gradation of base course material as given in ASTM-D1241, "Materials for Soil-Aggregate Subbase, Base and Surface Course".

E. Compaction. The gravel layer shall be compacted with 3 passes of an approved roller. During the grading and/or compaction operations, water shall be sprinkled by mechanical equipment.

F. Drainage

1. Ditches. Drainage ditches adjacent to the roadway shall be constructed to the lines and slopes shown on the Drawings or as directed. In addition, drop structures and turn-out ditches shall be constructed, to protect the roadway from a heavy accumulation of rainwater runoff; as shown on the Drawings and in the location and to lines and grades designated in the field by the ENGINEER. Drop structures shall be constructed of stone masonry as shown on the Drawings or as directed, in accordance with Section 3, "Excavation Fill and Backfill".

2. Culverts. Culverts shall be installed in approximate locations shown on the Drawings or as directed. The exact locations and grades shall be established in the field by the ENGINEER. The culvert pipe shall be furnished and installed in accordance with Section 5, "Concrete Work". The culvert headwalls shall be constructed of stone masonry as shown on the Drawings or as directed, in accordance with Section 3, "Excavation, Fill and Backfill".

G. River Crossing. The river crossings shall be constructed in accordance with the sections and details shown on the Drawings. Culvert Pipe and Concrete shall be furnished and installed in accordance with Section 5, "Concrete Work". Stone Masonry and Riprap shall be furnished and installed in accordance with Section 3, "Excavation, Fill and Backfill".

All work shall be constructed in the dry in accordance with Section 2, "Care and Removal of Water". The Contractor shall determine the exact scheme for care of water, for approval of the ENGINEER, prior to construction initiation.

H. Maintenance. The roads and yard shall be maintained by the Contractor throughout the construction period. The roads shall be maintained in a workmanlike manner and shall be adequate for vehicular equipment and traffic at all seasons during the execution of the work. At the end of the construction period, the road and yard shall be left in such condition that the thickness and shape of the surfacing is as shown on the Drawings or as originally constructed or as directed.

7.6-05 MEASUREMENT AND PAYMENT

A. Road Surfacing. Measurement for payment for road surfacing will be based on the number of square meters placed within the area shown on the Drawings or as directed. Payment will be made at the unit price for Road Surfacing, which price shall include the cost of foundation preparation and furnishing, placing, and compacting the material as required.

B. Road Maintenance. No separate payment shall be made for road maintenance, and the cost thereof shall be included in other items.

PART VII - TECHNICAL PROVISIONS

SECTION 7 - PENSTOCK

7.7-01 SCOPE

A. In accordance with the specifications contained in this section and as shown on the Drawings, the Contractor shall:

1. Detail, furnish, install, test, and paint the penstock. The penstock consists of a main penstock, a bifurcation, branch penstocks, and appurtenances, all hereinafter called penstock, the main penstock, bifurcation, and branch penstocks shall be tested for possible leakage. Penstock plate thicknesses shall be as shown on the Drawings. Reinforcement of the bifurcation will be provided with steel concrete reinforcing arranged around the steel pipe bifurcation to resist the unbalanced forces not carried by the steel plate.

2. Design, detail, and furnish all erection supports, bracing, and temporary connections necessary for assembling, bracing, supporting, and holding penstock sections during transporting, erecting, welding, concreting and testing.

3. Detail, furnish and construct the concrete anchor blocks and saddle supports for the penstock.

4. Check penstock profile and cross sections.

B. All clearing and grading, excavation, grouting, fill, and concrete work related to the installation of the penstock is covered under the following sections:

1. All clearing, grading and excavation work including backfill

Section 3, "Excavation, Fill and Backfill"

2. All Concrete Work

Section 5, "Concrete Work"

7.7-02 MATERIALS

A. Penstock

1. Steel for the penstock shall conform to fine grain practice with adequate ductility for operation down to 40 degrees Fahrenheit (5 degrees centigrade) and shall conform to the following standards:

ASTM-A36, "Standard Specification for Structural Steel", limited for use in structural steel shapes only.

ASTM A516, "Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate and Lower Temperature Service", all grades.

2. The Contractor can make substitution of other steels suitable for penstock construction subject to ENGINEER's approval. Such substitutions shall be indicated on Bid Drawings indicating steel chemistry, minimum guaranteed yield strength according to the offset method and the minimum ultimate strength, and be accompanied with quality test procedures, all in the English and Spanish language.

3. All material for the main penstock, bifurcation and branch pipe shall have Charpy V-notch impact strength of 30 ft-lb longitudinal and 15 ft-lb transverse at 40 degrees Fahrenheit. Impact test procedure shall be as described in ASTM-A370, "Standard Methods and Definitions for Mechanical Testing of Steel Products".

4. Material for parts permanently welded to penstock plates shall be of at least equal strength and shall be compatible for welding.

B. Welding Electrodes. Welding electrodes shall conform to AWS A5.1, "Specification for Mild Steel-Covered Arc-Welding Electrodes", and AWS A5.5, "Specification for Low-Alloy Steel Covered Arc-Welding Electrodes". The electrodes shall be low hydrogen, suitable for the current characteristics, materials, and welding positions. The quality of the weld metal in submerged arc process shall be equivalent to that obtained with the electrodes specified above.

C. Penstock Drain Pipe Flanges. Penstock drain pipe flanges shall conform to ASTM-A105, "Specification for Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for General Service", Grade 1.

D. Flexible Couplings. Flexible couplings shall be of

"Dresser" type. All material for "Dresser" type couplings shall be equivalent to material used in "Dresser" type couplings as manufactured by Dresser Manufacturing Division, Bradford, Pennsylvania, U.S.A., or equal.

E. ASBESTOS GRAPHITE SHEET PACKING. Asbestos graphite sheet packing shall be provided in sheets each having a thickness of 1/32". The sheeting shall be of durable construction which will retain its thickness and lubrication quality under the expected operating conditions and exposure to ambient temperatures. The Contractor shall provide the ENGINEER with technical specifications and test reports supporting the quality of the asbestos graphite sheet packing for the ENGINEERs review and approval.

7.7-03 TESTS OF MATERIALS

A. General. Materials, parts, and assemblies thereof entering into the work shall be tested, unless otherwise directed, according to the best generally accepted method for the particular type and class of work. Where the Contractor desires to use stock material not manufactured specifically for the equipment furnished, satisfactory evidence that such material conforms to the requirements herein stated shall be furnished to the ENGINEER, in which case tests on these materials may be waived. Certified mill test reports of plates will be acceptable.

B. Test Reports. Certified copies of test reports shall be furnished to the ENGINEER in triplicate as soon as possible after the tests are made and shall be in the Contractor's possession prior to incorporating the material in the work. The reports shall identify the component for which the material is to be used and shall be in such form as to enable determining compliance with the applicable specifications. When requested, tests shall be made in the presence of the ENGINEER.

7.7-04 CHECKING PENSTOCK PROFILE

The profile and cross-sections along the centerline of the penstock shall be independently checked with level and transit by the Contractor, and any differences from that indicated on the Drawings shall be reported to the ENGINEER before commencing any design or fabrication. The Contractor shall bear all costs resulting from differences obtained by such survey.

7.7-05 DETAILING PENSTOCK

A. General. Detailing shall be in accordance with the information shown on the Drawings and with the applicable provision of Section VIII, "Rules for Construction of Unfired Pressure Vessel", of the ASME "Boiler and Pressure Vessel Code", except where these specifications differ from the Code.

B. Details and Drawings. Drawings showing materials, plate thicknesses, anchor blocks, saddle supports, thrust rings, installation tolerances at joints, and other essential details shall be submitted. An outline of the proposed fabricating, transporting, and erecting procedure with time schedule shall be included. After award of the Contract, detail shop and erection Drawings of all components shall be submitted within 60 days. The Drawings shall be accompanied by the Contractor's specifications for fabrication and erection including welding procedure and stress relief by heat treatment, if recommended.

7.7-06 FABRICATION AND ERECTION

A. General. Fabrication, assembly, and erection shall be in accordance with this Section and the applicable requirements of Section VIII, "Rules for Construction of Unfired Pressure Vessels", of the ASME "Boiler and Vessel Code", except that stamping with the code symbol and reports will not be required. Where provisions of the ASME Code conflict with provisions of these specifications, the latter shall govern.

B. Cutting and Bending. All plates shall be cut and rolled accurately to the dimensions shown on the Drawings, with allowance provided for weld shrinkage and weld throat thickness. All edges shall be flame-cut or machined to suit the required type of welding. All edges shall be examined for laminations, surface cracks, and other injurious defects. Welded repairs on plate edges or on surfaces shall be inspected by radiographic or magnaflux methods. All examination and repairs shall be carried out before shipment to the Site. Plates with serious defects such as cracks, laminate splitting, or honeycombed properties that cannot be repaired by welding with certainty, or other defects that could be detrimental to the type of pressure vessel construction specified, shall be rejected and replaced. Segments of cylindrical and conical sections may be rolled or bent by any process that does not impair the strength of the plates and by which the curvature continues to the edges of the plate.

C. Welding .

1. General. All welding shall be fusion welding by the electric shielded or submerged arc process. In welding high strength quenched and tempered steels, heat input shall not exceed that recommended by steel plate manufacturer.

2. Qualification of Welders and Welding Operators. Qualification shall be in accordance with the applicable provisions of Section IX, "Welding Qualification", of the ASME "Boiler and Pressure Vessel Code".

3. Welding Procedure. Welding procedure shall be qualified as required by paragraph UW-28 of the ASME Code. The qualified procedures shall be submitted to the ENGINEER for review, before any welding is done on any part. Welding procedures shall include conditions for preheating requirements.

4. Material for Qualification Tests. All performance and procedure qualification tests shall be performed on plate samples of steel to be actually used. Where steel is supplied by more than one mill, procedure qualification tests shall be performed on samples from each mill. All qualification and requalification shall be at the expense of the Contractor.

5. Temperature and Weather Condition. Recommendations of paragraph UW-30 of the ASME Code shall be observed for temperature and weather conditions.

6. Preheating. Preheating will be required for highly restrained welds. Local preheating shall be only used for repairs on welds or for welding attachments.

7. Electrodes. Electrodes and fluxes shall be stored to prevent moisture pickup. The electrodes and fluxes shall be baked and stored in an oven in accordance with the recommendations of the steel manufacturer prior to using them.

8. Thermal Stress Relief. Stress relieving by heat treatment of the completed bifurcation at the powerhouse may be required. Recommendation regarding stress relief shall be submitted with the bid.

9. Weld Inspection

a. Longitudinal joints in the penstock shall be radiographed throughout their entire length. Circumferential joints shall be spot radiographed. Standards of acceptance of welded joints and the procedure, for radiographic examination

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shall be that of the ASME "Code for unfired Pressure Vessels" except for the extent of spot radiographic examination. Not less than 2 spots in each circumferential joint shall be examined. In addition, one spot shall be examined at each joint intersection. Ultrasonic inspection may be substituted for radiographic inspection; the defects found, however, shall be radiographed, and repairs made shall be reradiographed.

b. Circumferential joints between the turbine inlet valve extensions and the branch penstocks shall be radiographed throughout their entire length.

c. Correlation between ultrasonic and radiographic inspection shall be established to the satisfaction of the ENGINEER. All weld examination shall be made in the presence of the ENGINEER. The ENGINEER will select the location at which circumferential welds shall be inspected. All radiographs shall become the property of the Owner.

d. Every precaution shall be taken for the protection of authorized personnel from the harmful effects of radiation.

e. All equipment and materials required for testing shall be furnished, including a suitable laboratory at the welding site. All labor required for testing shall be furnished.

f. A qualified weld inspector trained in operating test equipment shall be provided.

D. Shop Assembly. Prior to welding, all bends and the bifurcation shall be fully shop assembled and checked for fit and tolerances in the presence of the ENGINEER.

E. Tolerances. The completed penstock shall conform to the dimensions shown on the Drawings and to the tolerances specified below. In addition, the cylindrical sections shall be sufficiently true to round so that the difference between maximum and minimum diameters, with temporary bracing in place and measured inside and outside, at any cross sections along the length, shall not exceed 1% of diameter. The lengths of all completed sections shall conform to the lengths shown on the Drawings with a tolerance of plus or minus 3 mm. Any point on the ends of a cylindrical section shall be within a tolerance of plus or minus 1.5 mm with respect to a plane normal to the longitudinal axis of a section. Angles of bends shown on the Drawings shall be within a tolerance of plus or minus 5 minutes of angle. Edges of adjoining plates to be welded shall match with a maximum allowable offset at any point of 1.5 mm. The

tolerances listed are exclusive of any allowance by the Contractor for shrinkage or distortion. Tolerances for ends of sections connected with flexible couplings shall be those recommended by the coupling manufacturer. The pipe shall be free from indentations, projections, or roll marks for a distance of 12" from the end of the pipe to make a tight joint with the rubber-gasket type of coupling. The outside diameter of the pipe shall not be more than 1/32" smaller than the nominal outside diameter for a distance of 12" from the end of the pipe and shall permit the passing for a distance of 12" of a ring gauge which has a bore 3/32" larger than the nominal outside diameter of the pipe. The minimum outside pipe diameter shall be determined by the use of a steel tape circumferentially applied to prevent the shipment of undersize, out-of-round pipe.

F. Erection Provisions. Attachment to shell of brackets clip angles, eyebolts, etc., will be permitted for use in erection, provided that such attachments do not impair the strength of the penstock. All bracing, supports, anchorages, and any fixtures that may be required for accurately holding, setting, adjusting, and aligning the penstock during transporting, placing, testing, or concreting shall be designed, furnished, and installed. Drawings of such attachments showing all details, including welding, shall be submitted for review before fabrication. All such attachments shall be removed after erection, and welds ground flush, except where they will be embedded in concrete. Spiders for maintaining the shape of the penstock during concrete placement shall be furnished.

G. Erection and Installation. All segments or sections shall be individually assembled and held together by temporary fastenings and bracings. When assembled and ready for welding, the adjoining segments or sections shall be rigidly held with end spacing as required for full penetration welds. Dimensions and tolerances will be checked by the ENGINEER prior to final welding and/or placement of concrete. The ends of the penstock branch pipes shall be trimmed and welded to the valve extensions.

H. Grouting. After concrete encasement, the ENGINEER will check for voids by tapping the penstock. If voids are discovered, the Contractor shall drill through the penstock and grout between the penstock plate and the encasement concrete at the location of the voids. The penstock shall be completely repaired after grouting to the satisfaction of the ENGINEER.

I. Field Tests

1. General. The main penstock, the bifurcation, and the branch penstocks shall be filled and checked for leakage and later pressure tested in the field under operating conditions in

accordance with Section 16, "Transportation, Storage and Installation of Owner Furnished Equipment". The operating pressure test shall be made after completion of all welding and weld inspection and repairs subsequent to the leakage test.

2. Leakage Test. With the forebay filled to its maximum operating level and the penstock filled with water, the entire length of the main penstock, bifurcation and branch pipes shall be inspected for leakage. The flexible joints shall be examined around their entire circumference. All leaks found shall be repaired and welds reexamined as specified in 7.7-06, C, 9, "Weld Inspection".

3. Operating Pressure Test. With the turbines operating at full gate design discharge and output, full load rejection will be made in the normal turbine gate closure time. The entire length of the main penstock, bifurcation and branch pipes shall be inspected for leakage. The flexible joints shall be examined around the entire circumference. All leaks found shall be repaired and welds reexamined as specified in 7.7-06, C, 9, "Weld Inspection".

J. Cleaning of Interior. Immediately prior to the start-up and testing of the units, the interior of the main penstock, bifurcations, and the branch penstocks, all foreign objects shall be removed. Sand and grit shall be removed by sweeping or vacuuming in a manner that prevents injury to the painted surface.

7.7-07 PAINTING

Painting will be done in accordance with the applicable provisions of Section 10, "Painting".

7.7-08 MEASUREMENT AND PAYMENT

A. Penstock. Payment for detailing, furnishing, installing, testing and painting the penstock; designing, detailing and furnishing all erection supports, bracing and temporary connections necessary for assembling, bracing, supporting and holding penstock sections during transporting, erecting, welding, concreting and testing; detailing and constructing the concrete anchor blocks and saddle supports for the penstock, will be made at the lump sum price for penstock which price shall include the

cost of performing all the work except for the items listed under B and C below. No separate payment will be made for grouting behind concrete encased portions of penstock, for temporary fabricating or erection accessories required such as anti-friction pads on saddles, flexible joints, drain flange and ring stiffeners, and the cost thereof shall be included in the lump sum price for penstock.

B. Clearing, Grading and Excavation. Measurement and Payment for Clearing, grading and excavation is covered in Section 3, "Excavation, Fill and Backfill".

C. Concrete Work. Measurement and payment for all concrete work is covered in Section 5, "Concrete Work".

PART VII - TECHNICAL PROVISIONS

SECTION 8 - METALWORK

7.8-01 SCOPE

In accordance with the specifications contained in this section and as shown on the Drawings or as directed, the Contractor shall furnish all plant, equipment, labor, and materials and shall detail, fabricate, furnish, install, and paint or galvanize (when shown on the Drawings and/or as specified) structural steel, and miscellaneous metalwork, including but not limited to the following items:

A. All structural steel complete with anchor bolts, bolts, and fastenings, including but not limited to the following:

1. Trashrack, supporting frame and guides at intake.
2. Trashrack, supporting frame and guides at penstock forebay
3. Sealing frame and guides for bulkhead at intake
4. Sealing frame and guides for bulkhead in low level outlet sluice
5. Sealing frame and guides for bulkhead at forebay

B. Power house crane rails, mounting hardware, and accessories.

C. Cast iron frames, covers and gratings.

D. Miscellaneous metalwork complete with anchors, bolts and fastenings, including but not limited to the following:

1. Structural steel for precast concrete covers, hatch frames, plate covers, gratings and grating frames.
2. Metal ladders and embedded rungs.
3. Guard angles, eye bolts, U-hooks, inserts, and

expansion anchors and anchor bolts, including those required for mounting of precast concrete and of electrical and mechanical equipment. (Anchor bolts to be furnished with the electrical and mechanical equipment are excluded from miscellaneous metalwork). Tops of all exposed anchor bolts shall be galvanized to a point 2 in. below the concrete surface.

- 4. Metal staff gauges.
- 5. Stainless steel weir plate at the desilting basin
- 6. Steel pipe railing.
- 7. Structural steel supports for attachment of electrical duct supports.

All bolts, nuts, washers, weldment, and other items necessary for the permanent installation of the above items of work shall be furnished. Shop connections shall be welded unless otherwise approved. Erection or fabrication in the field shall be by bolting, arc welding, brazing, or by any combination thereof, as directed, and the Contractor shall be prepared to perform all these classes of work.

E. Chain Link Fence and Gates

7.8-02 MATERIALS

Materials shall be new and of first class quality, suitable for the purpose, free from defects and imperfections. Defective material shall not be repaired and used in the construction without the pr or approval of the ENGINEER. Defects in welds shall be repaired by chipping out to sound metal and rewelding.

The materials furnished under this section shall conform to the following standards:

Material	Standards
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Structural Steel (shapes, plates, bars, steel bolts, nuts, and washers)	ASTM-A36, "Specification for Structural Steel".

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Crane Rail	ASTM-A1, "Specification for Carbon-Steel Rails".
Cast Iron Frames, Covers, Gratings, and Yard Drains	ASTM-A48, "Specification for Gray Iron Castings".
Metal Staff Gages	Gages shall be style M25 as manufactured by Leopold and Stevens Instruments, Portland, OR, or equal, Gages shall be divided into centimeters, with every five centimeters numbered as a decimal portion of a meter; .05, .10, .15, etc.
Corrosion-Resisting Steel Plate	ASTM-A242, "Specification For High Strength, Low Alloy, Structural Steel"
Corrosion-Resisting Steel Bars	ASTM-A276, "Specification for Hot-Rolled and Cold-Finished Stainless and Heat-Resisting Steel Bars", Type 300 and Type 316.
Corrosion-Resisting Steel Nuts	ASTM-A194, "Specification for Carbon and Alloy Steel Nuts for Bolts and for High-Pressure and High-Temperature Service", Type 416.
Corrosion-Resisting Steel Bolts	ASTM-A193, "Specifications for Alloy-Steel Bolting Materials for High Temperature Service", Type 410.
High-Strength Steel Bolts	ASTM-A325, "Specification for High-Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers". ASTM-A449, "Specification for Quenched and Tempered Steel Bolts and Studs Including Suitable Nuts and

Plain Hardened Washers".

Other Steel Bolts, Nuts, Washers,
and Tension Anchor Rods

ASTM-A307, "Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners". Bolt heads to be embedded in concrete shall be square, unless otherwise indicated.

Zinc Coating for Bolts, Nuts,
and Washers

ASTM-A153, "Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware".

Welding Electrodes

AWS, A5.1, "Specifications for Mild Steel-Covered Arc-Welding Electrodes" and AWS, A5.5, "Specification for Low-Alloy Steel-Covered Arc-Welding Electrodes".

Lock Washers

Spring Steel, SAE proportions, regular series.

Expansion Anchors

Standard WEJ-IT expansion anchors as manufactured by WEJ-IT Expansion Products, Inc., Industrial Park, Broomfield, CO, or equal.

Chain Link Fence and Gates

Chain link fabric shall be galvanized (zinc coated) steel fabric No.9 gauge wire, helically wound and interwoven continuous chain link fabric having 2-in (50.8 mm) square mesh. The fabric shall be zinc coated by the hot dipping process after weaving. The weight of the coating per square foot (0.09 square meters) of wire surface shall be not less than 1.202 (34 g).

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fence posts, top rails and braces shall be galvanized (zinc coated) standard steel pipes having the minimum diameters given below:
Corner and line posts
3" (76.2 mm)
Top rail and Braces
1 5/8" (41.3 mm)

Barbed wire shall be 12 guage, 2-strand double-galvanized steel wire with 4-point aluminum alloy barbs spaced 4 in (101.6 mm) on centers or less.

Chain link accessories shall be in accordance with Federal Specification RR-F 191/4A or approved equal.

7.8-03 WORKMANSHIP

A. General. Design, fabrication, and erection of metalwork shall conform to the applicable provisions of the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", and the AISC "Code of Standard Practice for Steel Buildings and Bridges". Only qualified welders shall be employed on the work, and upon request, they shall be required to submit satisfactory evidence of their ability before being allowed to perform work. The technique of welding employed, the appearance and quality of the welds made, and the methods used in correcting defective work shall conform to AWS D1.1, "Structural Welding Code". All Welds on handrailing shall be ground smooth and flush.

B. Welding

1. General. All welding shall be performed by the electric-arc method, by a process that excludes the atmosphere from the molten metal, and where practicable, by automatic

machines. Machined surfaces of parts affected by welding shall be machined to final dimensions after welding.

2. Minimum Weld Requirements. All welds shall be made continuous. The minimum size of fillet welds shall be 1/4 in. All butt welds shall be full penetration, welded from both sides.

3. Preparation of Base Material. Members to be joined by welding shall be cut to shape and size by mechanical means such as shearing, machining, grinding, or by gas or arc cutting, to suit the conditions. The edges of surfaces to be welded shall be of sound metal free of visible defects, such as laminations or defects caused by cutting operations, and free from rust, oil, grease, and other foreign matter.

4. Technique of Welding. The technique of welding; the appearance and quality of the welds, and the methods used in correcting defective work shall conform to the AWS D1.1, "Structural Welding Code". Special care shall be taken to avoid undercuts along the seams or warping of the structure. If undercuts appear along the welds, they shall be filled using a small diameter electrode of the same composition as the original electrode.

5. Welding Qualifications. The qualification of welding procedures, welders, welding operators, and tackers shall conform to standards at least equal to Part 5, "Qualification", of AWS D1.1, "Structural Welding Code". The Contractor shall furnish the facilities and all equipment materials and other articles required to perform qualification tests of his welders and welding operators. Certificates of welders' qualifications shall be submitted when requested.

6. Weld Finish. Welds shall in general be treated so that they will display good appearance and a surface suitable for painting. Structural welds shall be ground and blended to avoid stress raisers. All welds which required nondestructive examinations shall be dressed by chipping and grinding as required for good interpretation by weld examination.

7. Examination of Welds. All welds shall be given complete nondestructive examination by ultrasonic, dye penetrant or magnetic particle methods.

C. Trashracks

1. General. Trashracks shall be provided with the rack bar spacing as shown on the drawings.

2. Tolerances. The assembled trashracks shall be square and free of warpage. Overall dimensions shall not vary more than 1/8 in. The rack bars shall be straight and parallel to each other within a tolerance of 1/8 in. in their length. The distance from the centerline of one rack bar to that of any other shall be a multiple of their nominal spacing in inches (+/-) 1/8 in.

D. Embedded Frames and Guides. Embedded frames shall be square and straight when they are placed in the works a check will be made to establish that the frame is in a true planar surface without distortion due to warping prior to placing the embedment concrete. This is necessary to insure that a bulkhead or trashrack will have a tight and even bearing on the embedded frame. Embedded guides shall be checked to see that their alignment is true and continuous with the plane of the embedded frame.

E. Chain Link Fencing

1. General. In erecting the permanent fencing, care shall be taken not to damage the galvanizing on the fencing materials, and any damaged areas shall be repaired by coating with an approved zinc spray. The fences shall conform to the alignment and finish grade indicated, with posts plumb and fabric stretched taut.

2. Post Setting. Posts shall be either anchored to concrete or set in concrete footings to the depths shown on the Drawings. The posts shall be set vertically in the excavated holes to the required depth, braced, and held in this position while the concrete is tamped around the posts filling the entire hole and until the concrete has set 7 days. All posts shall extend 1 m into footings and the footings shall extend 0.1 m below the post bottom. The concrete footings shall have a diameter of not less than 0.4 m for all posts.

3. Fabric shall be attached to the line posts at intervals of not more than 300 mm on centers with fabric bands or 8 gage steel wire. Care shall be exercised to equalize the tension or pull on each side of the posts. Chain link shall be stretched taut and fastened to each post as described herein, as shown on the Drawings, or as required.

F. Barbed Wire Fencing.

1. General. In erecting the permanent fencing, care shall be taken not to damage the galvanizing on the fencing materials, and any damaged areas shall be repaired by coating

with an approved zinc spray. The fences shall conform to the alignment and finish grade indicated, with posts plumb and fabric stretched taut.

2. Post Setting. Posts shall be either anchored to concrete or set in concrete footings to the depths shown on the Drawings. The posts shall be set vertically in the excavated holes to the required depth, braced, and held in this position while the concrete is tamped around the posts filling the entire hole and until the concrete has set 7 days. All posts shall extend 1 m into footings and the footings shall extend 0.1 m below the post bottom. The concrete footings shall have a diameter of not less than 0.4 m for all posts.

3. Fabric shall be attached to the line posts at intervals of not more than 300 mm on centers with fabric bands or 3 gage steel wire. Care shall be exercised to equalize the tension or pull on each side of the posts. Barbed wire shall be stretched taut and fastened to each post as described herein, as shown on the Drawings, or as required.

G. Materials used during Construction.

All Welding rod required for field welds and all anchors, temporary bracing, tie rods, shims, clamps, erection bolts, and other miscellaneous materials required to place metalwork in position and hold it in proper alignment during concrete or grout placing shall be furnished.

7.8-04 PAINTING AND GALVANIZING.

Painting and galvanizing shall conform to the applicable requirements of Section 10, "Painting".

7.8-05 MEASUREMENT AND PAYMENT

A. Trashrack, Supporting Frame and Guides at Intake and Penstock Forebay. Payment for detailing, fabricating, furnishing, installing and painting structural steel complete with anchor bolts, bolts and fastenings for the trashrack, supporting frame and guides at the intake and the penstock forebay will be

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made at the lump sum price for trashrack, supporting frame and guides at intake and penstock forebay.

B. Sealing Frame and Guides for Bulkhead at Intake, Forebay and Low Level Outlet Sluice. Payment for detailing fabricating, furnishing, installing, and painting structural steel complete with anchor bolts, bolts and fastenings for the sealing frame and guides for bulkhead at intake, forebay and low level sluice will be made at the lump sum price for sealing frame and guides for bulkhead at intake, forebay and low level sluice.

C. Metalwork. Measurement for payment for metalwork other than that for trashracks, sealing frames and architectural metalwork will be based on the number of Kilograms detailed, furnished, installed, tested and painted or galvanized (or both) as specified and as shown on the Drawings or as directed. Determination of weight shall be made, where applicable, according to the provisions of Section 9 or the AISC "Code of Standards Practice for Steel Buildings and Bridges". Measurement for payment will be made for anchor bolts, bolts, anchors, tie rods, base plates, and shims shown on the Drawings. No measurement for payment will be made for temporary bracing, clamps, erection bolts, weld metal, and other miscellaneous materials required to place metalwork in position and hold it in proper alignment during concrete or grout placing, and the entire cost thereof shall be included in the prices for the various metalwork items. Payment will be made at the unit prices for the following items:

Powerhouse Crane Rails, Mounting Hardware, and Accessories

Cast Iron Frames, Covers and Gratings

Miscellaneous Metalwork

D. Chain Link Fence. Measurement for payment for chain-link fence will be based on the number of linear meters furnished, installed, and galvanized as specified and as shown on the Drawings or as directed. Payment will be made at the unit price for Chain-link Fence, which prices shall include all costs except concrete and cement. Separate payment will be made for concrete and cement used in the fence footings, anchor blocks, stops, etc., in accordance with the applicable provisions of Section 5, "Concrete Work".

E. Barbed Wire Fence. Measurement for payment for barbed

wire fence will be based on the number of linear meters furnished, installed, and galvanized as specified and as shown on the Drawings or as directed. Payment will be made at the unit price for barbed wire fence, which prices shall include all costs except concrete and cement. Separate payment will be made for concrete and cement used in the fence footings, anchor blocks, stops, etc., in accordance with the applicable provisions of Section 5, "Concrete Work".

F. Architectural Metalwork.. Architectural metalwork shall be paid for in accordance with Section 9, "Architectural Work".

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PART VII - TECHNICAL PROVISIONS

SECTION 9 - ARCHITECTURAL WORK

7.9-01 SCOPE

In accordance with the specifications contained in this Section and as shown on the Drawings or as otherwise directed, the Contractor shall detail, furnish, and install the architectural work specified herein.

7.9-02 CONCRETE BLOCK MASONRY

A. Materials

1. Concrete Block. Concrete block for partitions or walls shall be hollow load-bearing concrete masonry units meeting the requirements of ASTM-C90, "Specification for Hollow Load-Bearing Concrete Masonry Units". Units shall have a shell thickness not less than 1-1/4 in., a nominal face size of 8 in. x 16 in., and shall be 8 in. deep. Concrete block units shall have a minimum compressive strength of 700 psi and shall be air dried at least 28 days prior to shipment. The Contractor shall furnish such stretcher, corner, jamb, and solid top units as are necessary to execute the work to the lines shown on the Drawings.

2. Portland Cement. Portland cement shall be as specified in Section 5, "Concrete Work."

3. Hydrated Lime. Hydrated lime shall be at least 92% hydrated and shall be machine-mixed with water to form a putty which shall be allowed to stand at least 15 minutes before using. Lime shall conform to ASTM C207, "Specification for Hydrated Lime for Masonry Purposes".

4. Sand. Sand shall be clean, sharp, and well graded between the following limits:

Sieve Size

Percent Passing

No. 8

95 - 100

No. 16	60 - 100
No. 30	25 - 70
No. 50	20 - 40
No. 100	10 - 25
No. 200	0 - 10

5. Water. Water shall be fresh, clean, and free from injurious amounts of sewage, oils, acids, alkalies, salts, and organic impurities as described in ASTM-C94, "Specification for Ready-Mix Concrete".

6. Mortar. All mortar for concrete block shall conform to ASTM-C476, "Specification for Mortar and Grout for Reinforced Masonry", and shall consist of 1 part portland cement by volume, 1/4 part hydrated lime, and 3-1/2 parts of damp loose sand, plus enough water to make a workable mixture.

7. Masonry Reinforcement. Reinforcement for masonry partitions shall be truss type "Dur-o-Wal" as manufactured by Cedar Rapids Block Company, Cedar Rapids, IA, "Block Truss, Partition-Lok" as manufactured by AA Wire Products Company, Chicago, IL, or equal. Reinforcement shall have deformed side rods and out-to-out spacing of side rods approximately 2 in. less than the nominal thickness of the partition. Material requirements shall be in accordance with ASTM A82, "Specification for Cold-Drawn Steel Wire for Concrete Reinforcement". Prefabricated corner sections shall be furnished for corners of partitions.

8. Anchors. Anchorage of masonry partition units to adjacent concrete shall be with dovetail anchors. Anchor slots shall be 1 in. wide x 1 in. deep with 5/8 in. throat and with lengths as necessary. Dovetail anchors shall be 1 1/2 in. wide corrugated 16 gauge galvanized steel and 12 in. long. Dovetail slots and anchors shall be as manufactured by Heckmann Building Products, Inc., Chicago, IL, by AA Wire Products Company, Chicago, IL, or equal.

B. Reinforced Lintels. Openings in masonry partitions over 16 in. wide shall be provided with precast concrete lintels, using reinforcement of not less than two #5 reinforcing rods, or as shown on the Drawings, for the full length of the lintel. Lintels shall extend at least 8 in. each side of the opening.

C. Erection

1. Mixing Mortar. A mechanical mixer of one sack minimum capacity shall be used. Mortar shall be mixed for at least 3 minutes after all materials have been added. The amount of mortar to be mixed in each batch shall be only as much as can be

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used in 1 hour after water has been first mixed into the batch.

2. Installation.

a. Partition walls shall be laid plumb and true to the lines and dimensions indicated on the drawings. Concrete blocks shall be dampened, not saturated, immediately before installation. Vertical joints shall be staggered so that the joints of one course are an equal distance from the joints of the adjacent course. All units shall be laid in a divided bed of mortar, with all head and running joints filled, except that control joints shall be raked back and caulked.

b. Reinforcement shall be installed in the first and second bed joints, 8 in. apart immediately above lintels and below sills, at openings and in every third bed joint elsewhere. Reinforcement in the second bed joint above or below openings shall extend 2 ft. beyond the jambs. All other reinforcement shall be continuous except that it shall not pass through vertical masonry control joints. Side rods shall be lapped at least 6 in. at splices to insure continuity of reinforcement. Corners of partitions shall be reinforced with prefabricated corner sections.

c. Anchorage of masonry partition units to adjacent concrete shall be with dovetail anchors, for which slots shall be set into the concrete during forming. The spacing of the dovetail anchors shall be at every third horizontal joint.

7.9-03 WATERPROOFING TOP COAT FOR ROOF

A. General. The Contractor shall furnish and apply a top coating to the exterior surface of the powerhouse roof which renders the surface impermeable to the entrance of water.

B. Materials. The topcoat shall be a two component, high tensile strength aliphatic polyurethane elastomer coating such as ELASTUFF 200 FR as manufactured by United Coatings, P.O. Box 4158, Spokane Washington, 99202. The topcoat shall be a permanently flexible "breathing" membrane, which allows moisture and vapor pressure from the building interior to escape through the coating and is impervious to mass water penetration from the exterior. It must be resistant to accelerated weathering from ultraviolet radiation (no deleterious effects, no surface checking or cracking, no chalking or color fade should be observed after 3000 hours of continuous exposure).

C. Application

1. Surface Preparation. The roof surface must be dry, clean, free of pollution fall out, dirt, grease, surface chemicals, or other foreign contaminants which will interfere with proper adhesion. Cleaning of surfaces can be accomplished using a non-phosphate, biodegradable chemical cleaner and water. The surface should then be thoroughly rinsed with clean, fresh water to remove all traces of the chemical cleaner.

2. Mixing Coating. ELASTUFF 200 FR is a two component material available in 1 gallon (3.8 liters) and 5 gallon pails (19 liters). One component is the Duscynate resin. The other component is the curative resin. Equal proportions of the two components should be thoroughly mixed prior to application in an air operated or other explosion proof mixer with a blade capable of uniformly mixing the entire container (1/3 horsepower for 5 gallon pail). The manufacturers recommended mixing and set times should be carefully followed. The mixed, sprayable potlife of a mixture will depend upon the temperature and humidity and should be carefully monitored in accordance with the manufacturers instructions.

3. Coating Application. ELASTUFF 200 FR may be applied by brush, roller or airless spray. Airless spray equipment capable of 2000 psi (13,780 kPa) and 1 gallon per minute (3.8 l/minute) delivery can be used. The filter in the pump manifold should be 100 mesh. A reversible self cleaning spray tip with orifice size of .015" to .019" (.381 to .483 mm) and minimum 40 degree fan angle should be used.

A base coat of material equal to Elastuff 800 shall be applied in one coat at a minimum rate of 1 gallon per 150 sq. ft. Allow Elastuff 800 to cure at least overnight but not more than 72 hours before applying the top coat of Elastuff 200 FR. The application rate for the Elastuff 200 FR top coat shall be in accordance with the manufacturers recommendations.

7.9-04 DOORS AND FRAMES

A. General. The Contractor shall furnish and install all doors, frames, or bucks, trims, and finish hardware as specified herein and as shown on the Drawings. All bolts, clips, anchors, sleeves, and connecting members shall be provided for proper anchorage and support of all work. Anchors shall be heavily coated with a bituminous material. Machine screws and bolts in concealed locations shall be galvanized or cadmium-plate steel.

Doors and frames shall be fitted and reinforced for all finish hardware from templates furnished by the hardware manufacturer.

B. Submittals. Shop Drawings for aluminum doors, and the roll-up service door shall be furnished by the Contractor and shall show all dimensions, gauges, reinforcements, cutouts, attachment to adjacent construction, and other pertinent data.

C. Aluminum Doors

1. Aluminum doors as shown on the Drawings shall be "Kawneer Flush Door" as manufactured by Kawneer Company, Niles, MI, "Flush Panel Door" as manufactured by Cronstroms Manufacturing Inc., Minneapolis, MN, or equal. Door, door frame, glazing moldings, and trim shall be extruded of 6063-T5 aluminum alloy and temper (ASTM-B221, "Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes" G.S. 10A-T5). Sandwich core panels shall consist of #10 pattern architectural quality 5005 aluminum alloy face sheets, 1/8-in. thick tempered hardboard impact reinforcement for the face sheets, and a foamed-in-place polyurethane foam core. All screws and miscellaneous fasteners shall be aluminum, stainless steel, or zinc-plated steel in accordance with ASTM-A164, "Specification for Electrodeposited Coatings of Zinc on Steel". Hardware shall be furnished and installed by the door manufacturer as a shop operation.

2. All exposed surfaces of aluminum door and framing shall be free of scratches and other serious surface blemishes. Finish of aluminum shall be anodized white.

3. Glass panel shall be furnished by the door manufacturer as a factory operation and shall be 1/4-in. thick, square-pattern wire glass.

D. Installation of Aluminum Doors. Frames shall be set plumb, square, level, and in alignment, and securely anchored. Aluminum surfaces that will contact concrete, masonry, or steel shall be back-painted before erection with alkali-resistant bituminous paint. Metal-to-metal joints between members shall be caulked and excess material removed. Caulking of joints between metal and masonry or concrete is included in 7.9-07, "Caulking." Doors shall be accurately hung with proper clearances, and the specified hardware shall be installed. After erection, hardware shall be adjusted. Joints shall be milled to a hairline, water-tight fit and formed with mechanically dovetailed or interlocking shapes and shall be reinforced and either welded along concealed lines of contact or secured mechanically and by concealed welding.

E. Steel Rolling Door

1. Rolling door shall be a steel rolling door operated by chain and reduction gears, such as manufactured by Atlas Door Corp., Edison, NJ or by Apton Door-Div. of the Union Corp., Old Forge, PA, or equal. The curtain shall be composed of interlocking flat slats formed of 22 gage galvanized steel with galvanized steel backing to safely resist a wind load of 30 psf. Ends of slats shall be provided with endlocks with integral slat lugs as windlocks, which engage bars and lock the curtain in the guides. The curtain shall be reinforced with bottom bar of 2 angles placed back to back. The curtain bottom bar shall be provided with neoprene loop astragal to act as a seal at the sill.

2. Counterbalance assembly shall consist of tempered helical torsion springs with 25% safety factor, mounted on shaped cast anchors, supported by a continuous solid torsion rod. This mechanism shall be permanently lubricated and enclosed within a steel pipe shaft of sufficient diameter to allow not more than 0.03 in. deflection per foot of barrel length when under full load. The spring tension adjusting wheel shall be readily accessible from outside of end bracket plate.

3. End bracket plates which shall house ends of the door coil and carry the pipe counterbalancing shaft shall be of steel plate no less than 3/16 in. thickness. The drive end bracket plate shall be fitted with a ball bearing.

4. Guides shall be built of structural steel angles to form a slot of sufficient depth to retain curtain in guides against specified windload and shall have guide weatherstripping on each guide.

5. Hood, to house the coil, shall be galvanized sheet metal of not less than 24 gauge, and shall be continuous between door supporting brackets. Hood shall be provided with intermediate brackets spaced not more than 10 ft. apart and shall be furnished with neoprene air baffle.

F. Installation of Rolling Steel Door. The door shall be set plumb and true in the opening. The joints between exterior door frames and walls shall be carefully caulked. Adequate protection shall be provided during erection to prevent damage to finished work. After erection, all work shall be cleaned of protective materials and surface blemishes and then painted in accordance with Section 10, "Painting".

G. Thresholds. Thresholds shall be carefully fitted to jambs and shall be secured to the floor as recommended by the

manufacturer. Thresholds shall be extruded aluminum alloy 6063T5 with mill finish and shall be "PG649 Series" as manufactured by Reese Enterprises, Inc., Rosemount, MN, "#560" as manufactured by Zero Weather Stripping Co., Inc., Bronx, NY, or equal.

7.9-05 WINDOWS

A. General. The Contractor shall furnish and install all windows, frames, and finish hardware as specified herein and as shown on the Drawings. All bolts and anchors shall be provided for proper anchorage and support of all work.

B. Submittals. Shop drawings for aluminum windows shall be furnished by the Contractor and shall show all dimensions, gauges, reinforcements, attachment to adjacent construction and other pertinent data.

C. Aluminum Windows

1. Aluminum windows as shown on the Drawings shall be as manufactured by Kawneer Company, Niles, Maine, or equal. Window, window frame, glazing mouldings, and trim shall be extruded of 6063-T5 aluminum alloy and temper (ASTM-B211, "Specification for Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes" G.S. 10A-T5). All screws and miscellaneous fasteners shall be aluminum, stainless steel, or zinc-plated steel in accordance with ASTM-A164, "Specification for Electrodeposited Coatings of Zinc on Steel". Hardware shall be furnished and installed by the window manufacturer as a shop operation.

2. All exposed surfaces of aluminum window and framing shall be free of scratches and other serious surface blemishes. Finish of all aluminum shall be anodized white.

3. Glass panel shall be furnished by the window manufacturer as a factory operation and shall be 1/4 in. thick square-pattern wire glass.

4. The windows may be furnished as single or multi-louvered panel windows which can be opened for ventilation. The opening apparatus shall be capable of supporting the windows in any open position without movement with an upward or downward force of 20 psf produced by wind turbulence. When closed, the adjacent panels must fit tightly against each other and the contiguous frame to prevent the entrance of dust and water.

D. Installation of Aluminum Windows. Frames shall be set

plumb, square, level and in alignment, and securely anchored. Aluminum surfaces in contact with concrete shall be back painted with alkali-resistant bituminous paint. Caulking of joints between metal and concrete is included in 7.9-07, "Caulking".

7.9-06 FINISH HARDWARE

A. General. Hardware for all doors and windows shall be furnished and installed. Doors and frames shall be prepared in the shop to receive all hardware. Where necessary, templates shall be used so that the work of the various parts will fit together in a proper manner. Padlocks shall be furnished as specified.

B. Materials. All hinges shall be manufactured by C. Hager and Sons, St. Louis, MO, Stanley Hardware, New Britain, CT, or equal. All other hardware shall be as manufactured by P & F Corbin, New Britain, CT, Yale Lock and Hardware Division, Rye, NY, or equal, except that hardware for aluminum doors shall be as manufactured by the door manufacturer. All butts, lockfronts, knobs, escutheons, stops, strikes, holders, and closers shall be of bronze with dull nickel finish. No items of hardware, except where required, shall be made of or contain any steel parts.

C. Keying. All cylinder locks included herein shall be keyed alike. Three keys shall be furnished for each lock.

7.9-07 CAULKING

A. General. Caulking shall be installed in joints around metal frames built into masonry and/or concrete and at all contraction joints. This shall include joints at all doors and panels, around sills, under weather-proof thresholds, at flashing, and all other places indicated on the Drawings or required for the weatherproofing of the building.

B. Material

1. Caulking Compound. Caulking compound, unless otherwise specified, shall be off-white "Mono Liquid Polymer" as manufactured by Tremco Co., Cleveland, OH, "Flexiseal One Part Polysulfide" as manufactured by Dap Inc., Dayton, OH, or equal.

2. Rope Yarn. Rope yarn shall be raveled strands of rope

fiber, free from oil or other staining element.

3. Sealer. Sealer shall be as recommended by the manufacturer of the caulking compound.

C. Application. All particles of mortar, dust, and other foreign matter shall be brushed out and just prior to caulking the joints grooves shall be coated with an application of sealer. Where a suitable backstop has not been provided, the back of the joint shall be packed tightly with rope yarn. Caulking in joints shall be a minimum of 3/4 in. in depth and 1/4 in. in width unless otherwise indicated on the Drawings. Caulking shall be applied by gun method, driven into the joints with sufficient pressure to force out all air and to solidly fill the joint groove. Caulking where exposed, shall be free of wrinkles, and be uniformly smooth. Joints shall be filled slightly convex to obtain a flush joint when dry. Caulking around all openings in concrete and masonry shall include the entire perimeter of each opening. Upon completion of the caulking, any caulked joints not entirely filled shall be roughened, filled as specified, and the exposed surface tooled smooth.

D. Cleaning. The surfaces of all materials adjoining caulking joints shall be cleaned of smears of compound or other soiling resulting from the caulking application.

7.9-08 MEASUREMENT AND PAYMENT

A. Architectural Work. Measurement for payment for architectural work will be based on the number of units of measurement, tabulated below, furnished and installed as specified and as shown on the Drawings or as otherwise approved or directed. Payment will be made at the price for the following items:

Item	Unit of Measurement	How Measured
Concrete Block Masonry (includes reinforcing, mortar, dove nail anchor, anchor slot, and lintels)	Square Meters	Total wall area (single face) less holes larger than 1 sq/m.

Water proofing Topcoat for roof	Square Meters	Total area installed
Aluminum Windows	Square Meters	Total area installed
Aluminum Doors	each	Total number installed(2)
Rolling Steel Door	each	Total number installed(1)

B. Other Items

1. Cement, Sand, Lime, Formwork, and Reinforcing. No separate payment will be made for cement, sand, lime, formwork, or reinforcing used in masonry, and the entire cost thereof shall be included in the prices of masonry.

2. Caulking. No separate payment will be made for caulking, and the entire cost thereof shall be included in the prices for doors and windows, or other applicable items which required caulking.

3. Louvers in Windows and Doors, Frames, Anchors, Trim, and Thresholds. No separate payment shall be made for louvers in windows and doors, frames, anchors, trim and thresholds, and the entire cost thereof shall be included in the prices of doors and windows.

4. Finish Hardware. No separate payment will be made for finish hardware (excluding padlocks - specified above), and the entire cost thereof shall be included in the prices of doors and windows.

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PART VII - TECHNICAL PROVISIONS

SECTION 10 - PAINTING

7.10-01 SCOPE

In accordance with the specifications contained in this Section and as shown on the Drawings, the Contractor shall furnish and apply all paint. Surface to be painted shall received the preparatory treatment and number of coats prescribed in 7.10-09, "Painting Schedule", unless specifically exempted elsewhere. The applicable provisions of the SSPC "Steel Structures Painting Manual", Volumes 1 and 2, shall apply for all metalwork unless specifically covered otherwise.

7.10-02 STANDARD PRODUCTS

All materials, supplies, and articles shall be the standard products of recognized reputable manufacturers.

7.10-03 CLEANING AND PREPARATION OF SURFACES

A. General. Cleaning and preparation of surfaces shall be as specified in 7.10-09, "Painting Schedule".

B. Protection of Adjacent Surfaces. Machinery components, such as gate mechanisms, shall be blast-cleaned with care to prevent blasting materials from entering or damaging bearings, machined surfaces, and similar precision parts.

7.10-04 PAINT APPLICATION

Paint application shall be in accordance with Specification SSPC-PA1, "Shop, Field and Maintenance Painting".

7.10-05 DRYING TIME PRIOR TO IMMERSION.

Surface to be immersed in water or oil shall be dried a minimum of 5 to 9 days prior to immersion, depending on the type of weather prevailing; the lesser drying time shall apply to periods when rapid drying conditions prevail. Regardless of the type of coatings, the longest drying time practicable shall be allowed for the last coat prior to immersion.

7.10-06 COLORS

Colors shall be as shown on the Drawings or as otherwise directed.

7.10-07 CODE MARKING OF PIPING SYSTEMS

All exposed piping shall be code marked by colored bands and arrows of an approved adhesive material to indicate the type of service and the direction of flow. Bands shall be approximately 2 in. wide around the full circumference and shall be applied at the points of entering and leaving a space, at all valves, and at sufficient intermediate locations as will conveniently show the type of service. A framed and glazed colored chart showing the indicating colors and the system which they represent shall be furnished and installed where directed. The indicating colors for the various pipe systems shall be as shown on the Finish Schedule of the Drawings.

7.10-08 SHOP AND FIELD PAINTING

Painting of ferrous metal surfaces may be done either in the shop or in the field, except as specifically covered otherwise. Shop painting may consist of the specified surface preparation and prime coats with the remainder of the finish coats applied in the field or may consist of the specified surface preparation and the specified total number of coats except that coal tar epoxy paint systems and/or the catalyzed epoxy resin systems shall be applied in the field. Surfaces requiring protection during shipment shall be painted in the shop with the necessary shop coats. The prime coats and the finish coats shall be touched-up

as necessary in the field. Manufacturers' stock items subject to atmospheric exposure which are normally cleaned and primed or painted in accordance with the manufacturer's standard practice may be exempted from the specified requirements for surface preparation and first coat. The interior of pipes 24 in. or smaller need not be painted except as specifically covered otherwise. Surfaces shop-painted with the manufacturer's standard finish shall be field painted with finish coats compatible with the shop coats, and the paints used on ferrous metal subject to atmospheric exposure shall be compatible for later application or either alkyd or oil base paints if so directed in the future. Owner-furnished equipment shall be touched-up as required with paint supplied by the respective equipment manufacturers.

7.10-09 PAINTING SCHEDULE

Surfaces/Items to be Painted	Method of Surface Preparation	Number of Coats
A. Gate Equipment. Gate equipment furnished under these Specifications shall be shop painted in accordance with 7.14-08, "Shop Painting"		
B. Penstock Interior and All Ferrous Metal Subject to Continuous Immersion in Water, Oil, or Compressed Air. These surfaces shall be painted in accordance with SSPC-PS-11.01, Coal Tar Epoxy-Polyamide Black Paint System. Surfaces subject in part to continuous immersion and in part to continuous atmospheric exposure shall be painted as if subject to continuous immersion.	SSPC-SP10, Near White Blast Cleaning	Shop or field prime with one coat and paint with 2 coats of Coal Tar Epoxy Polyamide Black Paint

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|---|---|--|
| <p>C. Penstock Exterior and All Ferrous Metal Subject to Intermittent Immersion and Splash. These surfaces shall be painted in accordance with SSPC-PS-13, Epoxy Paint System except as otherwise specified.</p> | <p>SSPC-SP10,
Near-White
Blast
Cleaning</p> | <p>Three coats of pigmented epoxy paint, final total thickness as per paint manufacturer's instructions</p> |
| <p>D. Ferrous Metal Subject to Atmospheric Exposure.</p> | | |
| <p>1. Painted Surfaces.
Ferrous metal subject to atmospheric exposure shall be painted in accordance with SSPC Oil Base Paint System No. 1.06, with Red Lead Linseed Oil Primer (For Weather - Exposed Wire - Brushed Steel) or with the manufacturer's standard paint. All Structural steel work shall be painted with a white finish coat complying with specification SSPC - Paint 104-64 White or Tinted Alkyd Paint, Type I.</p> | <p>SSPC-SP6,
Commercial
Blast Cleaning</p> | <p>3 coats:
linseed oil primer, intermediate and finish. Finish coat shall be the same as intermediate coat or latex base paint for interior work or machinery enamel for equipment as shown on the drawings or as directed.</p> |
| <p>2. Galvanized Surfaces.
Rolled steel shapes, bars, and plates, anchor bolts, frames covers, gratings, roadway drains, guard angles, chain link fences miscellaneous metal where indicated, and steel pipe handrails.</p> | <p>ASTM Specifications A123 and A153</p> | <p>Galvanize in accordance with ASTM-A123 and A153.</p> |

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3. Previously Galvanized Surfaces. Sheet metal ductwork, and exposed pipe and conduit	Solvent cleaning and hand or power tool cleaning (SSPC-SP1, 2 and 3)	Zinc dust-zinc oxide primer, and 2 coats of alkyd-base paint or interior latex base paint.
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Those surfaces shall be painted in accordance with SSPC-PS 2.05, "Alkyd Paint System for Unrusted Galvanized Steel".

E. Ferrous Metal in Contact with Earth or Soil. These surfaces shall be painted in accordance with SSPC Coal Tar Coating System No. 10-01, "Hot-Applied Coal Tar Enamel".	Commercial blast cleaning	1 prime coat and 2 finish coats
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F. Ferrous Metal Embedded in Concrete.	Clean	None
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G. Aluminum or Copper Alloy Surfaces coming in Contact with Concrete, Masonry, or Metals of Different Composition.	Clean	1 coat of zinc-chromate priming paint or Alkali-resistant bituminous paint.
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H. Interior Walls and Wainscots.

1. Concrete and Masonry as shown on the Finish Schedule of the Drawing.	Allow to age 30 days minimum Clean and treat wall with filler and primer.	2 coats of alkyd-base paint, interior latex base paint, or epoxy-base paint whichever is directed.
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I. Wood Surfaces. Framing lumber	Clean	1 coat of creosote
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J. Insulation or Piping.	None	2 coats of interior latex-base paint.
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K. Paint Materials.

1. Coal Tar Epoxy-Polyamide. Coal tar epoxy-polyamide shall conform to SSPC-Paint 16, Coal Tar Epoxy Polyamide Black Paint.

2. Pigmented Epoxy Paint. Pigmented epoxy paint shall be equivalent to 2-component Epoxy Coating in accordance with Federal Specifications TT-C-535b, Type II.

3. PS 1.06 Linseed Oil Primer. Linseed oil primer shall conform to U.S. Federal Specification TT-P-86C, "Paint, Red Lead Base, Ready-Mixed", Type I, Red Lead Linseed Oil Paint.

4. PS 1.06 Intermediate Coat. Intermediate coat shall conform to SSPC-Paint 104-64, "White or Tinted Alkyd Paint", Type I, II, III, or IV.

5. White or Tinted Alkyd Paint. White or tinted alkyd paint shall conform to SSPC-Paint 104, "White or Tinted Alkyd Paint", Type I, II, III, or IV.

6. Machinery Enamel. Machinery enamel shall conform to U.S. Federal Specification TT-E-489, "Enamel, Alkyd, Gloss, (For Exterior & Interior Surfaces)", Class A, Air Drying.

7. Galvanizing for Structural Steel Shapes, Plates, and Bars. Galvanizing for Structural Steel shapes, plates, and bars shall conform to ASTM-A123, "Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip", and for bolts, nuts, washers, and locknuts shall conform to ASTM-A153 "Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware". Defective or damaged galvanized coatings shall be repaired with "AMCO Galvanizing Stick #332" as manufactured by American Solder & Flux Company, 1903 Willard Street, Philadelphia, PA 19140, or equal, in accordance with the manufacturer's instructions.

8. Solvent Cleaner for Galvanized Surfaces. Solvent cleaner for galvanized surfaces shall consist of dilute (about 5% strength) muriatic (hydrochlorid), phosphoric, or acetic acid. An approved proprietary treating agent, applied in accordance with the manufacturer's instructions, may also be used.

9. Zinc Dust-Zinc Oxide Primer. Zinc dust-zinc oxide primer shall conform to U.S. Fed. Spec. TT-P-00641, "Primer Coating, Zinc Dust-Zinc Oxide", Type II, Phthalic Alkyd Resin Paint.

K. Paint Materials.

1. Coal Tar Epoxy-Polyamide. Coal tar epoxy-polyamide shall conform to SSPC-Paint 16, Coal Tar Epoxy Polyamide Black Paint.

2. Pigmented Epoxy Paint. Pigmented epoxy paint shall be equivalent to 2-component Epoxy Coating in accordance with Federal Specifications TT-C-535b, Type II.

3. PS 1.06 Linseed Oil Primer. Linseed oil primer shall conform to U.S. Federal Specification TT-P-86C, "Paint, Red Lead Base, Ready-Mixed", Type I, Red Lead Linseed Oil Paint.

4. PS 1.06 Intermediate Coat. Intermediate coat shall conform to SSPC-Paint 104-64, "White or Tinted Alkyd Paint", Type I, II, III, or IV.

5. White or Tinted Alkyd Paint. White or tinted alkyd paint shall conform to SSPC-Paint 104, "White or Tinted Alkyd Paint", Type I, II, III, or IV.

6. Machinery Enamel. Machinery enamel shall conform to U.S. Federal Specification TT-E-489, "Enamel, Alkyd, Gloss, (For Exterior & Interior Surfaces)", Class A, Air Drying.

7. Galvanizing for Structural Steel Shapes, Plates, and Bars. Galvanizing for Structural Steel shapes, plates, and bars shall conform to ASTM-A123, "Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip", and for bolts, nuts, washers, and locknuts shall conform to ASTM-A153 "Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware". Defective or damaged galvanized coatings shall be repaired with "AMCO Galvanizing Stick #332" as manufactured by American Solder & Flux Company, 1903 Willard Street, Philadelphia, PA 19140, or equal, in accordance with the manufacturer's instructions.

8. Solvent Cleaner for Galvanized Surfaces. Solvent cleaner for galvanized surfaces shall consist of dilute (about 5% strength) muriatic (hydrochlorid), phosphoric, or acetic acid. An approved proprietary treating agent, applied in accordance with the manufacturer's instructions, may also be used.

9. Zinc Dust-Zinc Oxide Primer. Zinc dust-zinc oxide primer shall conform to U.S. Fed. Spec. TT-P-00641, "Primer Coating, Zinc Dust-Zinc Oxide", Type II, Phthalic Alkyd Resin Paint.

10. Alkyd-Base Paint. Alkyd-Base paint shall be Interior Orderless Alkyd Enamel, Semi-Gloss Tints, and Whites, in accordance with Federal Specification TT-E-509b.

11. Interior Latex-Base Paint. Interior latex-base paint shall be in accordance with Federal Specification TT-P-29g, Latex Base Interior Flat White and Tints.

12. Zinc-Chromate Priming Paint. Zinc-chromate priming paint shall conform to U.S. Fed. Spec. TT-P-645, "Primer, Paint; Zinc-Chromate, Alkyd Type".

13. Solvent Cleaner for Other Than Galvanized Surfaces. Solvent Cleaner for other than galvanized surfaces shall be in accordance with the recommendations of the paint manufacturer.

14. High-Heat Resisting Paint. High-heat resisting paint shall conform to U.S. Fed. Spec. TT-E-496, "Enamel, Heat Resisting Black".

15. Filler. Filler shall be "Block-Tex" B42WI concrete and concrete block filler as manufactured by Sherwin Williams, or equal.

16. Interior Wall Primer. Primer for concrete surfaces to receive latex-, alkyd-, or epoxy-base paint shall be in accordance with Federal Specification TT-S-179a, "Sealer, Surface: Pigmented Oil-Type, Plaster and Wallboard".

17. Epoxy-Base Paint, Interior. Epoxy-base paint for interior concrete shall be in accordance with Federal Specifications TT-C-550a, "Glaze Coating System for Interior Masonry".

18. Color Pigments. Color pigments for latex base paint shall conform to the applicable ASTM Specifications.

19. Alkali-Resistant Bituminous Paint. Alkali-resistant bituminous paint shall meet the requirements of Department of Interior, Bureau of Reclamation Specification CTP-1 (Coal Tar Paint), as is, without the addition of thinner.

20. Aluminum Pigmented Varnish. Aluminum pigmented varnish shall contain 2 lb of aluminum paste pigment (ASTM Specification D962, Type 2, Class B) per gallon of varnish meeting Federal Specification TT-V-81, Type II.

21. Waterproofing Membrane. Rubber-base liquid sealer for concrete surfaces shall be as manufactured by Carlisle Tire

and Rubber Division, Carlisle Corporation, Carlisle, PA or equal.

22. Creosote. Creosote shall conform to U.S. Federal Specification TT-C-655, "Creosote, Technical, Wood Preservative (for) Brush, "Spray or Open-Tank Treatment".

7.10-10 MEASUREMENT AND PAYMENT

A. General. Except as specified below for interior walls of the powerhouse, no separate payment will be made for preparing surfaces for painting or galvanizing or for furnishing and applying paint or zinc, and the entire cost thereof shall be included in the prices for the various items of work for which painting or galvanizing is specified.

B. Painting Interior Walls of the Powerhouse. Measurement for payment for painting interior walls of the powerhouse will be based on the number of square meters of surface area prepared and painted with the number of coats required as specified or as otherwise directed. Payment will be made at the unit price for Painting Interior Walls of the Powerhouse.

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PART VII - TECHNICAL PROVISIONS

SECTION 11 - POWERHOUSE CRANE

7.11-01 SCOPE

A. In accordance with the specifications contained in this part and as shown on the Drawings, the Contractor shall design, detail, install, test and paint the powerhouse bridge crane.

B. General Description. The powerhouse bridge crane shall be a double girder, trolley type, top running manual chain operated bridge crane with a capacity of 5 tons. Independent chain actuated mechanisms will be provided for the hoist, to move the trolley along the girders and to move the bridge crane along the supporting rails over the length of the powerhouse. All of the chains shall be conveniently available to an operator standing on the powerhouse floor with the penstock distributor or the assembled generator suspended from the hoist. A lifting beam and cable sling will be provided for lifting those elements which require more than one support during installation and removal. The bridge crane shall travel on steel rails supported on a continuous reinforced concrete runway at the upstream and downstream walls of the powerhouse. Each chain operated drive mechanism shall be provided with a load holding locking brake, that will hold the associated element in a fixed position while other elements are moved, such as:

1. Hoist held, Trolley held, Bridge moves
2. Hoist held, Bridge held, Trolley moves
3. Trolley held, Bridge held, Hoist raised or lowered.

The load holding hoist brake shall have a capacity to hold 150 percent of the rated hoist load. The bridge shall be held by locking wheel brakes at both ends of bridge, simultaneously

7.11-02 STRUCTURE FEATURES

The bridge girders and trolley structure shall be so designed and constructed that under normal operating conditions of maximum loading, the unit stresses in any part shall not exceed the permissible stresses. The bridge girder and trolley

unit shall be of welded structural steel construction. The girders shall be designed to have a maximum vertical deflection caused by the rated load not exceeding $1/100$ of the span with the trolley and hoist in the center of the bridge girder span. Horizontal loading will be due to the impact of the crane bridge or the trolley with its rail end stop when moving horizontally, at their rated speeds.

The chain operated drive mechanism to move the crane bridge along the supporting rails will be designed to move both sides simultaneously to prevent racking and locking of the crane bridge on the rails.

7.11-03 ALLOWABLE STRESSES

1. The allowable stresses for structural steel under normal loading conditions shall be those given in the AISC "Specifications for the Design, Fabrication and Erection of Structural Steels for Buildings" but shall not be higher than the following percentages of the yield strength of the respective material used:

Tension (on net section at holes)	45 percent
Bending (tension and compression on extreme fibers of unsymmetrical members)	60 percent
Bending (tension and compression on extreme fibers of symmetrical members)	60 percent
Shear (on gross section of beam and plate girder webs)	40 percent
Bearing on contact area of machined surfaces	80 percent

7.11-04 MATERIALS

Materials shall be new and of first-class quality, suitable for the purpose, free from defects and imperfections, and of the classifications and grades listed herein, or their equivalents.

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Materials

Specification

Structural Steel

ASTM-A36, "Specification for Structural Steel"; or ASTM-A441, "Specification for High-Strength Low-Alloy Structural Manganese Vanadium Steel".

Steel Bolts and Nuts

ASTM-A307, "Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners", and ASTM-A325, "Specification for High-Strength Bolts for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers", and ASTM-A490, "Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints".

Lock Washers

Spring steel, SAE proportions, regular series.

Chains and Fittings

Taylor Made Alloy Chain as manufactured by Joseph T. Ryerson, Inc., USA., or equal.

Welding Electrodes

AWS, A5.1, "Specification for Mild Steel-Covered Arc-Welding Electrodes and AWS, A5.5, Specification for Low-Alloy Steel Covered Arc-Welding Electrodes".

7.11-05 WORKMANSHIP

Workmanship shall conform to the applicable requirements of Section 8, "Metalwork".

7.11-06 PAINTING

All exposed unfinished surfaces shall be thoroughly cleaned of all rust, oil, dirt, mill scale and foreign matter, and shall be painted according to manufacturer's standard painting schedule in the manufacturer's factory. Final cleaning and a fresh finish paint shall be applied after the crane has been installed and used for erection work, in accordance with the applicable provisions of Section 10, "Painting". All powerhouse crane elements shall be painted safety yellow.

7.11-07 MAINTENANCE AND LUBRICATION

The Contractor shall provide instructions for the maintenance and lubrication of the powerhouse crane and shall properly maintain and lubricate the crane during erection and installation of the generating units.

7.11-08 MEASUREMENT AND PAYMENT

Payment for designing, detailing, installing, testing, painting and maintaining the powerhouse crane during erection shall be made at the lump sum price for powerhouse crane.

PART VII - TECHNICAL PROVISIONS
SECTION 12 - PIPING AND PLUMBING

7.12-01 SCOPE

In accordance with the specifications contained in this Section and as shown on the Drawings, the Contractor shall furnish, install and test the following:

1. Piping (which includes all pipe, pipe fittings, valves, drains, pressure reducers, supports, and related items).
2. Plumbing fixtures and accessories.
3. Sanitary sewer line, septic tank and septic field lines.

7.12-02 GENERAL REQUIREMENTS

A. For general requirements for manufactured equipment, refer to G-10, "Permanent Works Equipment".

B. The Contractor shall furnish operating and maintenance instructions and parts lists in accordance with required Contractor's Submittals.

7.12-03 PIPING MATERIALS AND STANDARDS

A. Materials. All materials shall conform to the applicable specifications listed below and shall be equal to the products listed below by brand name and catalog number:

Identification
Symbol

Pipe and Fittings

P1	ASTM-B43, "Specification for Seamless Red Brass Pipe, Standard Sizes".
P2	ANSI-B16.15, "Cast Bronze Threaded Fittings, 125 lb. rating.
P3	ANSI-A21.51, "Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water and Other Liquids". 150 psi working pressure. Mechanical joint shall be in accordance with ANSI-A21.11, "Rubber Gasket joints for Cast-Iron and Ductile Iron Pressure Pipe and Fittings".
P4	ANSI-A21-10, "Gray Iron and Ductile Iron Fittings, 2 inch through 48-inch for Water and Other Liquids," 150 psi working pressure. Mechanical joint shall be in accordance with ANSI-A 21.11 "Rubber Gasket Joints for Cast-Iron and Ductile Iron Pressure Pipe and Fittings.
P5	ASTM-A74, "Cast Iron Soil Pipe and Fittings". Joints for cast-iron soil pipe and fittings with hubs and plain-end spigots shall be made with positive double seal compression-type gaskets conforming to ASTM-C564.
P6	ANSI-B16.12, "Cast-Iron Threaded Drainage Fittings", galvanized.
P7	ASTM-A53, "Specification for Welded and Seamless Steel Pipe," welded grade, black and galvanized.
P8	ASTM-A120, "Specification for Welded and Seamless Steel Pipe" seamless, Grade A or B, black and galvanized.

Traducción
de Cortesia

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- P9 ANSI-B16.3, "Malleable-Iron Threaded Fittings, Class 150 and 300 Black and Galvanized", Class 150 Rating.
- P10 ANSI-B16.5, "Steel Pipe Flanges and Flanged Fittings".
- P11 ANSI-B16.9, "Wrought Steel Buttwelding Fittings".
- P12 ANSI-B16.11, "Forged Steel Fittings, Socket-Welding and Threaded".
- P13 ANSI-B16.1, "Cast-Iron Pipe Flanges and Flanged Fittings", Class 125.

Identification
Symbol

Valves

-
- V1 Gate Valves, 3 in. and larger: 125 lb cast iron body, bronze trimmed, outside screw and yoke, standard flanged gate valve, Crane No.465 1/2, or equal with bypass and gearing on valves 12 in. and larger.
 - V2 Gate Valves, 2 in. and smaller: 600 lb forged steel body, outside screw and yoke, flanged gate valve, Vogt Series 373 as manufactured by Henry Vogt Machine Company, Louisville, KY 40201, or equal .
 - V3 Gate Valves, 2-1/2 in. and smaller: 150 lb bronze body, rising stem, screwed gate valves, Crane No. 431, or equal.
 - V4 Check Valves, 3 in. and larger: 125 lb cast iron body, bronze trimmed, flanged, swing check valves, Crane No.373, or equal.
 - V5 Check Valves, 2-1/2.in. and smaller: 125 lb bronze body, screwed swing check valve, Crane No..37, or equal.

V6 Flap Valves, 3 in. and larger: cast iron body, bronze seating and pins, Circular Flap Gates, as manufactured by Coldwell-Wilcox Company, Fairfield, Ct 06430, or equal.

Identification
Symbol

Pressure
Regulators

PR1

Pressure regulator, 3/4 inch bronze alloy body, 40-100 psi operating pressure range, Masoncilan Pressure Reducing Model 227 as manufactured by the Masoneilan Division of the McGraw Edison Company, 63 Nahatan Street, Norwood, Massachusetts 02062.

Drains

Floor Drains: Zurn Figures Z-180, Z-185, Z-550, Z-552, Z-105 ERC, or equal figures, all with "Dura Coated" cast iron body, bronze trimmed, or equal.

Pipe Hangers and
Supports

Hangers and supports shall be standard products of ITT Grinnel Corporation, Providence, RI, 02901, or Crane Company, or equal, in combination with fabricated steel brackets as required to meet job conditions.

Bolts and Gaskets

ASTM-A307, "Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners", Grade B, (steel bolts and nuts). ASTM-B21, "Specification for Naval Brass Rod, Bar, and Shapes", Alloy A, (bronze nuts). ANSI-B17.21, "Nonmetallic Gaskets for Pipe Flanges".

Hub and Spigot Pipe

U.S. Fed. Spec. QQ-L-156, "Lead;

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Joint Materials

Caulking". U.S. Fed. Spec. HH-P-117, "Packing; Jute Twisted, Type II". ASTM-C564, "Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings".

B. Codes, Standards, and Specifications. All mechanical work shall conform to the applicable provisions of the following codes, standards, or specifications:

1. ANSI-B31.1, "Code for Pressure Piping".
2. AWS "Standard Qualification Procedure".
3. U.S. Department of Commerce, "Report BM566 Plumbing Manual, Building Materials and Structures".
4. ASME "Boiler and Pressure Vessel Code", Section VIII.

C. Piping Material Schedule. Piping material used in the various piping systems shall be as shown on the Drawings.

7.12-04 PIPING WORKMANSHIP

A. General. The Contractor shall furnish and install all permanent piping, embedded, buried or exposed, including pipe and fittings, valves, hangers, insulation, expansion joints, anchors and guides where required, and special supports, not otherwise specifically provided for in these Specifications, but necessary to complete the various systems, The work shall conform to the applicable codes and standards listed in 7.12-03, B, "Codes, Standards, and Specifications"; to the applicable local codes; and to the requirements specified herein. Pipe shall be cut accurately to dimensions established at the Job Site and shall be worked into place without springing or forcing. Where location is not exactly shown by detailed dimensions, pipe shall be installed as closely as possible to walls, ceilings, columns, etc., so as to occupy the minimum of space. Piping shall be run parallel with the lines of the building, unless otherwise distinctly shown or noted on the Drawings. All embedded piping shall be installed true to line and grade. Proper allowance shall be made for expansion and contraction of pipe, whether or not such provision is shown on the Drawings.

B. Screwed Pipe. All pipe, after cutting and before threading, shall be reamed and all burrs removed. Pipe threads

shall be cut and shall be free from torn or ragged surfaces, and not more than 3 threads on the pipe shall remain exposed after installation. Screwed joints shall be made with lubricant applied to the male thread only.

C. Flanged and Welded Pipe. Flanged joints shall be made up with undamaged gaskets, and all bolts shall be drawn tight. Welded joints shall be fabricated in accordance with the applicable sections of ANSI-B31.1, "Code for Pressure Piping". Intersections and changes in direction shall be made with welding fittings unless bends or mitered joints are specifically shown on the Drawings. Welders shall be certified for the work they are performing.

D. Cast Iron Soil Pipe. Elastomeric gasket joints shall be installed in accordance with the manufacturer's recommendations. Where steel pipe is joined together with cast iron soil pipe, the ends of the pipe and fittings shall be concentrically placed in the hubs, and all joints shall be packed with the appropriate packing materials hereinbefore specified and thoroughly caulked with suitable caulking tools so as to leave 1-in. in the hub for lead. Joints shall be poured full of molten lead in one operation. On horizontal pipe, the lead shall be retained in the joint by a suitable joint runner. After the lead is cooled sufficiently it shall be tightly caulked.

E. Mechanical Joint Cast Iron Pipe. Mechanical joint pipe shall be assembled by washing the socket and plain end of the joining section of pipe with soapy water. The gland and gasket shall be slipped over the plain end of the pipe with the small side of the gasket and lip side of the gland facing the socket. The plain end of the pipe shall be slipped into the socket of the pipe to be joined. The gasket shall be painted with soapy water and pushed into position by fingers, making certain that it is evenly seated. The gland shall be pushed into place and after bolts are in place the nuts shall be initially tightened by hand and finally with a tightened ratchet wrench.

F. Victaulic-Type Coupling Joints. Victaulic-type coupling joints shall be assembled by engaging and locking in place the grooved pipe ends in a positive watertight connection. The grooving shall be in accordance with the Victaulic coupling manufacturer's instructions. Before the coupling are assembled, pipe ends and outsides of gaskets shall be lightly coated with lubricant recommended by the coupling manufacturer to facilitate installation.

G. Plumbing Fixture Supports. All plumbing fixtures shall be supported and fastened in a satisfactory manner. Where secured to concrete or brickwork, they shall be fastened with brass bolts

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or machine screws in lead sleeve-type anchorage units or with brass expansion bolts. Inserts shall be installed flush with the finished wall or floor line and shall be completely concealed when the fixtures are installed. Bolt heads and nuts shall be hexagon. Exposed bolts, nuts, cap nuts, washers, and screws for fixtures shall be chromium-plated.

H. Identification Tags. Identification tags shall be provided for all valves that require designations. The tags shall be approximately 2-in. circular plates made of 1/16-in. sheet aluminum with a punched hole and shall have stamp depressed letters easily legible. The tags shall be provided with an approved fastener and shall be placed on the valves as shown on the Drawings or as directed.

I. Coordination with Other Work. All plumbing and piping work shall be coordinated with other work in the building so that all items may be installed in the most direct and workmanlike manner and so that interference between piping, ducts, equipment, and architectural and structural features will be avoided. Cutting or construction shall be done only with the written permission of the Owner's Representative and shall be done in such a manner as not to weaken the structural portions of the building. Damage to building, piping, wiring, or equipment as a result of cutting for installation shall be repaired by workmen skilled in the trade involved, at no additional cost to the Owner.

7.12-05 PROTECTION OF PIPING

Metal, pipe, and fittings shall be inspected, tested and approved before being embedded in concrete and shall be held firmly in position and protected from damage while the concrete is being placed. Care shall be taken to keep all pipe and fittings clean during the progress of the work. Should any pipe become either partially or wholly clogged before final acceptance of the work, it shall be cleaned in a manner satisfactory to the Owner's Representative, or replaced by the Contractor at his own expense. To prevent clogging of drains and embedded pipes during the construction work, open ends of pipe shall be protected by cast iron plugs or other suitable closures, welded closures will not be permitted. Such closures shall be removed only when additional piping is added to the system and shall be immediately reinstalled at the end of the newly installed piping. Removal of closures on completed systems shall be done only with the approval of the Owner's Representative. Such approval will be given only after danger of contamination of systems caused by

construction operations is past.

7.12-06 HANGERS AND SUPPORTS

The type and spacing of hangers, pipe rollers, and supports with inserts and expansion anchors and all anchor bolts necessary for properly securing all piping, machinery, and equipment shall be as shown on the Drawings or otherwise required for proper fastening. No perforated band hangers will be permitted. Horizontal cast iron soil pipe shall be supported at not greater than 5 ft. intervals. Horizontal copper water tube shall be supported at not more than 6 ft. intervals for sizes 1-1/2 in. and smaller and 10 ft. intervals for sizes 2-in. and larger. Horizontal steel pipe shall be supported as tabulated below:

Pipe Size in.	Maximum Span ft.	Pipe Size in.	Maximum Span ft.
Up to 3/4	5	10	20
1	6	12	22
1 1/2	8	14	24
2	10	16	26
3	12	18	28
4	14	20	30
6	16	24	32
8	18		

Vertical piping shall be supported at not more than every 15 ft. for cast iron soil pipe, 30 ft. for steel pipe, and 4 ft. for copper tubing. Concrete pads and supports shall be installed as indicated on the Drawings, under the provisions of Section 7.5, "Concrete Work".

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7.12-07 UNIONS AND NIPPLES

Except as otherwise shown, all piping shall be installed with unions located so that piping can be removed for repair or replacement without removing an excessive amount of pipe. Union on screwed steel pipe shall be malleable iron. Nipples shall be of the same material, type, and grade as the pipe in the system where used.

7.12-08 ELECTRIC WELDING

A. Preparation for Welding. Members to be joined by welding shall be cut accurately to size and, where required shall be rolled or pressed to the proper curvature. The edges of the members shall be sheared, flame-cut, or machined to suit the required type of welding and to allow thorough penetration. The cut surfaces shall expose sound metal free from laminations surface defects caused by shearing or flame-cutting operations or other injurious defects. The surfaces to be welded shall be free from rust, oil, grease, and other foreign matter.

B. Welding. All electric arc welding shall be performed under procedure control using automatic machines where practicable. All welds shall indicate good fusion with the base metal. Particular care shall be taken in aligning and separating the edges of members joined by butt welding, so that complete penetration and fusion at the bottom of the joint will be assured. All pinholes, cracks, and other defects shall be repaired by chipping or grinding the defects to sound metal and rewelding.

C. Welding Procedure. The Contractor shall have established and recorded a specification of the welding procedure that he follows and, if required, shall furnish the Owner's Representative a copy of such procedure specification together with certified copies of reports of results of tests made in accordance therewith. The welding procedure shall be qualified in accordance with the AWS "Standard Qualification Procedures".

D. Qualification of Welders and Welding Operators. All welders and welding operators assigned to the work shall have passed a qualification test conforming to the AWS "Standard Qualification Procedure". If, at any time, in the opinion of the Owner's Representative, the work of any operator appears questionable, such operator shall be requalified. The Contractor shall furnish all test plates and all welding electrodes required for making the qualification tests. The test plates shall be of

the same material as that to be used in the work; the edge preparation and the position and technique of welding shall also be the same as to be used in the work. The welding electrodes shall be of the same size, type, and brand as those to be used in the work. Upon request, the Contractor shall furnish to the Owner's Representative a certified copy of reports of the results of physical tests of specimens welded in the qualification tests. All expenses in connection with qualification and requalification of welding operators shall be borne by the Contractor.

7.12-09 TESTS OF PIPING

A. General. In general, all piping shall be tested at not less than 150% of design working pressure, unless otherwise stated herein, by the Contractor and the tests witnessed by the Owner's Representative. Tests shall be applied to an entire system or to sections of a system. The tests shall be made with blank flanges or suitable caps on ends of the pipe sections to be tested. Tests shall be made before piping is encased in concrete or concealed in any way. Sections which have been found satisfactory need not be retested after completion of the entire system unless there is reason to suspect that the previously tested work has been altered or damaged. Should the tests indicate leakage or any other defect, the Contractor shall make acceptable repairs or replacement. All lines shall be blown free of pipe cuttings and other loose materials prior to testing.

C. Drainage and Vent Piping. Drainage and vent piping shall be tested with water for a length of time sufficient to determine tightness, but in no case less than one hour. The maximum test pressure shall be equal to the maximum static head on any section of piping with a stoppage at the outlet of the system of which the section is a part, but in no case shall be less than 5 psi.

D. Water Piping Test. All water piping shall be tested at the directed pressure for a length of time sufficient, to determine tightness, but in no case less than one hour.

E. Compressed Air Medium Test. All piping tested with compressed air as the medium shall be tested at the directed pressures for a length of time sufficient in the opinion of the Owner's Representative, to determine tightness, but in no case less than one hour. Each joint shall be tested with a soap solution and shall show no sign of leakage.

F. Defective Work. If inspections or tests show defects,

such defective work or material shall be replaced and inspected and tests repeated. All repairs to piping shall be made with new material. No caulking of screwed joints or holes will be accepted.

7.12-10 CLEANING, ADJUSTMENT, AND STERILIZATION

A. General. At the completion of the work, all parts of the installations shall be thoroughly cleaned. All equipment, pipe, valves, and fittings shall be cleaned of grease, welding metal, metal cuttings, and sludge which may have accumulated by operation of the system for testing. Any stoppage or discoloration or other damage to parts of the buildings, their finish, or furnishings because of the Contractor's failure to properly clean the piping systems shall be repaired by the Contractor without cost to the Owner.

7.12-11 PLUMBING FIXTURES

A. General. The plumbing fixtures specified below shall be furnished and installed as shown on the Drawings.

B. Service Sink. Acid-resisting, porcelain enameled cast iron, with rim guard, overall size approximately 22 in. wide x 18 in. deep, concealed hanger, 4230.074 single cold water faucet with hose spout end, complete with 7782.105 "S" trap and strainer. The fixture shall be American Standard "Lakewell" 7692.023, or equal.

C. Water Closet. Wall-hung, white glazed vitreous china, with exposed flush valve, siphon jet whirlpool action, elongated rim, with hard rubber or solid plastic open seat and check hinge, complete with adjustable combined fitting and chair carrier. The fixture shall be "Placidus" 3 446 as manufactured by Crane Co., Chicago, Illinois 60632, U.S.A., or similar. Flush valve shall be "Royal" 110FV as manufactured by Sloan Valve Co., Franklin Park, Illinois 60131, U.S.A., or similar.

D. Lavatory. White glazed vitreous china with back, rectangular basin, two soap depressions, splash lip, front overflow, Standard trim including lift waste fitting, 3/8-in. angle stops, flexible risers, and an adjustable "P" trap with cleanout, and drilled for and supplied with built-in chair carrier with concealed brackets. Overall size approximately 500

mm x 450 mm. The fixture shall be Crane "Norwich" 1-194 with 8-2179A trim, or similar.

7.12-12 SANITARY SEWER LINE, SEPTIC TANK AND SEPTIC FIELD LINE.

In accordance with the specifications contained in this Section the contractor will design, detail, furnish, and install the necessary sanitary sewer line, septic tank and septic field lines to treat all sewage and waste water emanating from the toilet, wash basins and floor drain to be installed in the powerhouse. The installation will be done in accordance with the "Recomendaciones Provisionales Para Instalaciones Sanitarias en Edificaciones" del Departamento de Normas, Reglamentos y Sistemas de Secretaria de Estado de Obras Publicas y Comunicaciones. The Contractor will make the necessary percolation rate measurement tests to determine the required absorption area in the field tile absorption system trenches. A maximum occupancy of six persons during maintenance operations will be assumed for dimensioning the system. Cast iron soil pipe will be used to carry the effluent from the powerhouse to the septic tank which will also function as a distribution box for the pipes leading to the individual absorption trenches. The septic tank shall be constructed of reinforced concrete of either precast or cast in place construction. The absorption trench field tile shall be either perforated concrete pipe or vitreous tile. Excavation and backfill will be done in accordance with the applicable provisions of Section 7.3, "Excavation, Fill and Backfill". Care and removal of water will be done in accordance with the applicable provisions of Section 7.2, "Care and Removal of Water". Concrete work will be done in accordance with the applicable provisions of Section 7.5, "Concrete Work". Perforated field tile shall be provided in accordance with the prevailing norms of the country. Prior to starting construction of the Sewer Line, Septic Tank and Septic field Lines, the Contractor shall submit the results of this field tests, calculations and design to the ENGINEER for review and approval.

7.12-13 PAINTING

Piping shall be painted in accordance with Section 10, "Painting". All equipment specified in this Section shall be shop-painted and may be painted with the manufacturer's standard finish and field-painted with 2 finish coats in accordance with Section 10, "Painting".

7.12-14 MEASUREMENT AND PAYMENT

A. Piping, which includes all Pipe, Pipe Fittings, Tubing, valves, floor drains, pressure reducers, supports and related items. Measurement for payment for piping which includes all pipe fittings, tubing, valves, floor drains, pressure reducers, supports and related items, will be based on the number of kilograms furnished, installed, and tested as specified and as shown on the Drawings or as directed. Measurement for payment will include the weight of bolts, nuts, washers, and lead. No measurement for payment will be made for oakum, gaskets, sealing compounds, solder, coatings, fastenings for holding pipe in place during embedment, wall plates, identification tags or other items required, and the cost thereof shall be included in the unit price for the various pipe and tubing items. Payment will be made at the unit price per kilogram for "Piping" which includes all pipes, pipe fittings, tubing, valves, floor drains, pressure reducers, supports and related items. Payment will be made at the unit price for Pipe Hangers and Supports.

B. Plumbing Fixtures. Payment for furnishing and installing plumbing fixtures, complete with all trimmings, mixing valves, traps, compression stops, supports, chair carriers, anchors, escutcheons, wall plates and connections to supply the waste lines, and other accessories, as specified and as shown on the Drawings or as otherwise approved or directed, will be made at the unit prices for the following plumbing fixtures:

Service Sink;
Water Closet;
Lavatory

C. Sanitary Sewer Line, Septic Tank and Septic Field Lines. Payment for all work and materials associated with the design, detailing furnishing and installation of the necessary sanitary sewer line, septic tank and septic field lines will be made at the lump sum price for sanitary sewer line, septic tank and septic field lines.

D. Testing, Identification Tags, and Painting. No separate payment will be made for testing, furnishing and installing identification tags, and painting, and the cost thereof shall be included in the prices for the various items of work for which testing, furnishing and installing identification tags, and painting are required.

PART VII - TECHNICAL PROVISIONS

SECTION 13 - VENTILATION FANS AND LOUVERS

7.13-01 SCOPE

A. In accordance with the specifications contained in this section and as shown on the Drawings, the Contractor shall furnish, install, and test all portions of the following systems and equipment:

1. Adjustable louvers
2. Fans and accessories
3. Ventilation controls and accessories

B. Interconnecting conduit and cable for the equipment shall be provided under Section 15, "General Electrical Work".

7.13-02 GENERAL REQUIREMENTS

The Contractor shall furnish Drawings, operating and maintenance instructions and parts lists in accordance with required Contractor's Submittals, for fans, louvers and ventilation controls.

7.13-03 MATERIALS AND STANDARDS

All products shall be equal to the products listed by brand name and catalog number in these Specifications.

7.13-04 ADJUSTABLE LOUVERS

All louvers shall be constructed of 2 mm thick extruded aluminum sections with all joints welded and corners mitered.

Louver frame width shall be approximately 100 mm. Mounting details shall consist of a continuous aluminum flange or angle sections at head, jams, and sill. Louvers shall be equipped with aluminum bird screens with removable extruded aluminum frames. Louvers shall be of the leak-proof, multiblade type, with blades on approximately 125 mm centers. Motors for adjustable louvers shall be as specified in 7.13-06, B, "Adjustable Louver and Automatic Damper Motors". Adjustable louvers shall be Type No. T645, as manufactured by the Airolite Company, Marietta, OHIO or equal.

7.13-05 FANS AND ACCESSORIES

A. General

1. Two propeller fans shall be furnished, installed and tested in accordance with these Specifications:

2. Each fan shall be furnished with motor, motor starter, anchor bolts, and accessories as specified herein.

3. All fan arrangements and ratings specified hereinafter shall be in accordance with AMCA Standards, Bulletins No. 210 and No. 99.

4. The fan shall be of the propeller type, direct motor driven and mounted in a square pressed steel panel with pressed or spun orifice ring. The propeller shall be of cast aluminum with airfoil shaped blades, adjusted for proper pitch and securely mounted in the hub. A back mounted guard shall be provided on the fan. The fan shall have a rated capacity of not less than 55 m³/min at a static pressure of 6.35 mm w.g. Fan performance shall be certified by the manufacturer and the fan shall bear the certified rating label of AMCA. The fan shall be Catalog No. 18L419 DDP 1750 1/6 as manufactured by Aerovent Inc., Pigua, OHIO, or equal.

5. Electric Motors. Electric motors shall be totally enclosed and shall be suitable of operation on 208-V, 3-phase, 60 Hz or 120-V, 1-phase, 60 Hz.

7.13-06 VENTILATION CONTROLS AND ACCESSORIES

A. General. A complete electrically-operated automatic temperature control system for the ventilating system shall be furnished and installed as shown on the Drawings, including thermostat, louver motor operators, low voltage transformers, relays and other accessories needed for a complete system. The setting and degree of movement of all automatically controlled equipment shall be determined in the field.

B. Adjustable Louver Motors. Louver and damper motors of the proper size, type and quantity for the adjustable louvers and automatic dampers shown on the Drawings shall be furnished and installed. They shall positively control the louvers and dampers as required. Motors shall be furnished complete with mounting brackets and linkages for connection to louver or damper operating bars.

C. Thermostat. A remote-bulb two-position, single-stage thermostat shall be furnished and installed as required for sensing outdoor air temperature for the control of the power house ventilating system. The thermostat shall be of the heating type which closes the circuit on temperature drop. The thermostat shall have SPDT snap acting switch rated 10 A at 120 V with screw type terminals and external adjusting knob. Differential shall be adjustable between 1 degree and 8 degrees Centigrade. The thermostat shall be Model No. TC-4111-020 as manufactured by Barber-Colman Company, Rockford, ILLINOIS or equal.

7.13-07 INSTALLATION AND TESTING

The equipment shall be installed as shown on the Drawings and in accordance with the manufacturer's instructions and recommended practices. All necessary shims, grout, lubricating oil, anchor bolts, and other items required for installation and testing shall be furnished. Upon completion and prior to acceptance of the installation, the Contractor shall subject the completed system to such operating tests as may be required by and in the presence of the CONTRACTING AGENCY Representative to demonstrate satisfactory system operation.

7.13-08 PAINTING

All equipment specified in this Section shall be shop painted with the manufacturer's standard finish and field-painted with 2 finish coats in accordance with Section 10, "Painting".

7.13-09 PAYMENT

Payment for furnishing, installing, and testing the ventilating system complete with accessories as specified and as shown on the Drawings will be made at the lump sum price for Ventilating Work.

PART VII - TECHNICAL CONDITIONS

SECTION 14 - GATES, FRAMES, GUIDES, AND HOISTS

7.14-01 SCOPE

In accordance with the specification contained in this Section and as shown on the Drawings, the Contractor shall:

A. Design, where applicable, detail, furnish, install, paint, and test the following:

1. Six wall mounted, upstream sealing vertical sluice gates with wall thimbles, as manufactured by the Rodney Hunt Company or equal having flush bottom closure seals.

2. Six sets of operating stems, floor stands and other appurtenances or accessories as required.

3. Six manually operated gate lifting hoists with provisions for easily attaching and using a portable gasoline power operated gate hoist actuator.

4. Two portable, gasoline powered, gate hoist actuators for rapid opening and closing of gates.

B. Furnish spare parts consisting of five percent of all bolts, nuts, and washers.

C. The Contractor shall furnish operating and maintenance instructions and parts lists for all equipment specified in this Section.

7.14-02 DESIGN CRITERIA FOR SLUICE GATES, FRAMES, AND HOISTS

A. Liberal safety factors shall be used in the design of all the equipment. Working stresses shall not exceed the lower value of: one third of the yield strength, or one fifth of the ultimate strength of the material. The sluice gates and appurtenances shall be designed for installation in the structures shown on the Drawings.

B. Sluice gates shall be cast iron, fully bronze mounted and will have side wedges for seating head conditions and side, top and bottom wedges for unseating head conditions. All gate

components will be designed to safely withstand 1.5 times the unseating heads listed in the sluice gate schedule.

SLUICE GATE SCHEDULE

Location	Unseating Design Head	Nominal Dimensions of Opening
1. Low Level Outlet Sluice Gate at Spillway	7.0 m	30" Wide x 24" High
2. Intake Control Sluice Gate	6.0 m	54" Wide x 54" High
3. Sediment Sluice Gate near Intake	6.0 m	24" Wide x 24" High
4. Sediment Sluice Gate in Desilting Basin	6.0 m	48" Wide x 48" High
5. Sediment Sluice Gate at Penstock Forebay	6.0 m	30" Wide x 30" High
6. Control Sluice Gate at Penstock Forebay	6.0 m	36" Wide x 36" High

C. The frame shall be of cast iron, one-piece construction of flanged or flat type with rectangular opening as indicated on the Drawings. All contact surfaces of the frame will be machined. The frame will have machined dovetailed grooves on the front face into which bronze seat facings shall be driven and machined to a 63 micro-inch finish. The back flange on the frame shall be machined to bolt directly to the machined face of a wall thimble, or for mounting on the concrete. Frames for the sluice gates subject to unseating heads shall have integrally cast pads machined with keyways to receive top and bottom wedge seats.

D. The disc shall be of cast iron, one-piece construction, rectangular with integrally cast vertical and horizontal ribs. The disc will have machined dovetailed grooves on the seating face into which bronze seat facings shall be driven and machined to a 63 micro-inch finish. A tongue on each side, extending the full length of the disc, shall be machined on all sides with a 1/16" clearance maintained between the disc tongue and the gate guide groove. Wedge pads for side wedges and for top and bottom wedges, when required, will be cast integrally on the disc and machined to receive the adjustable bronze wedges. A heavily reinforced nut pocket shall be cast integrally on the vertical centerline and above the horizontal center and be of such shape as to receive the square-backed bronze thrust nut.

E. The guides shall be cast iron, one piece, designed to withstand the total thrust due to the water pressure and the wedging action. The guides shall be machined on all contact surfaces and a groove shall be machined the entire length of the guide to allow 1/16 inch clearance between the disc tongue and guide groove. The guides shall be such length as to retain and support at least one half the disc in the full open position. The guides shall be attached to the frame with silicon bronze or stainless steel studs and nuts and shall be doweled to prevent any relative motion between the guides and the frame. Bronze wedge seats shall be securely attached to machined pads on the guides.

F. The operating stem shall be of a size to safely withstand, without buckling or permanent distortion, the stresses induced by normal operating forces. The stem will be designed to transmit, in compression at least 2 times the rated output of the floor stand or bench stand with a 40-lb. effort on the crank handle. The threaded portion of the stem shall have machined cut threads of the Acme type. Stems of more than one section shall be joined by bronze couplings threaded and keyed or bored and pinned to the stems. All threaded and keyed couplings of the same size shall be interchangeable. Manually operated, rising stem gates will be provided with an adjustable bronze stop collar on the stem above the floor stand lift nut.

G. Stem guides shall be cast iron, bronze bushed, mounted on cast iron brackets. They shall be adjustable in two directions and will be spaced at sufficient intervals to adequately support the stem. When structure and gate travel permit, stem guide spacing shall not exceed 3 m.

H. Manual operation of the gates will be by crank-operated floor stands as indicated on the plans, and will have either a single or double gear reduction depending upon the manufacturers recommendation or availability for the lifting capacity required. The crank-operated floor stand shall be provided with a threaded cast bronze lift nut to engage the operating stem.

Tapered roller bearing will be provided above and below a flange on the operating nut to support both opening and closing thrusts.

Floor stands shall operate the gates under the specified operating head with not greater than a 40-pound pull on the crank handle. Gears, where required, shall be steel or cast iron with machine cut teeth designed for smooth operation. The pinion shafts on crank operated floor stands, either single or double, shall be supported on tapered roller bearings or needle

bearings. All components shall be totally enclosed in a cast iron case and cover. Positive mechanical seals will be provided on the operating nut and the pinion shafts where they extend from the cast iron case or gear box to retain lubricant and to exclude moisture and dirt. Lubricating fittings shall be provided for the lubrication of all gears and bearings.

The removable crank shall be cast iron with a revolving brass grip and designed for rough treatment. Floor stands shall include a cast iron pedestal designed to position the input shaft or handwheel approximately 36" above the operating platform.

An arrow with the work "open" will be permanently attached or cast on the floor stand or handwheel indicating the direction of rotation to open the gate. The operating mechanism shall be equal in all respects to the Rodney Hunt floor stand.

I. Motor operation of the gates will be accomplished by removing the crank handle from the floor stand gear box and inserting the drive spline of a portable gasoline engine driven, hydraulic type hoist actuator. The portable, gasoline engine driven, hydraulic type hoist actuators shall be equal to the portable unit provided by the Rodney Hunt Company.

J. The flush-bottom closure type of gate shall have a compressible resilient seal attached to the bottom of the disc (sliding member), with a bronze or stainless steel bar and bronze or stainless steel fasteners. The seal shall be a specially molded shape designed to fit a lip machined on the bottom rib of the disc. The seal will be shaped to produce a wide sealing area on a machined cast iron stop bar bolted and keyed to the gate frame and forming a flush invert. The differential sealing pressure of the resilient seal on the stop bar shall be variable by adjustment of the side wedges on the gate. The flush-bottom closure gates will be the Hy-Q design as manufactured by Rodney Hunt Company or equal.

K. Wall thimbles will be furnished for all sluice gates. Wall thimbles shall be of the E-type section, of cast iron, one-piece construction, of adequate section to withstand all operational and reasonable installing stresses. Wall thimbles will be internally braced during concrete placement. A center ring or water stop will be cast around the periphery of the thimble. The front flange shall be machined and have tapped holes for the sluice gate attaching studs and metal stamped vertical centerlines with the work "top" for correct alignment. The opposite end of the wall thimbles shall be machined to provide the exact depth specified. Thimbles will be provided with holes in the thimble. A permanent gasket of uniform thickness shall be provided between the sluice gate and the wall

- 7. Cast Steel ASTM-A27, "Specification for Mild-to-Medium-Strength Carbon-Steel Castings for General Application," Grade 65-35.
- 8. Steel Bolts and Nuts ASTM-A307, "Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners,"
- 9. Round Wire Rope U.S. Fed. Spec. RR-W-410a, "Wire Rope and Strand."
- 10. Lock Washers Spring steel, SAE proportions, regular series.
- 11. Rubber Seals The rubber gate seals shall be molded and the material shall be compounded of natural rubber or copolymer of butadiene and styrene or a blend of both. The compound shall contain not less than 70% by volume of the basic polymer, and the remainder shall consist of reinforcing carbon black, zinc oxide, accelerators, antioxidants, vulcanizing agents, and plasticizers. The compound shall have the following characteristics:

Physical Properties	Tests
Tensile Strength Minimum 3,000 psi	ASTM-D412, "Method of Tension Testing of Vulcanized Rubber."
Elongation at Break Minimum 450%	ASTM-D412, "Method of Tension Testing of Vulcanized Rubber."
300% Modulus, 900 psi (Minimum)	ASTM-D412, "Method of Tension Testing of Vulcanized Rubber."
Shore Durometer (Type A) 50	ASTM-D2240, "Method of Test for Indentation Hardness of Rubber and Plastics by Means of a Durometer."
Specific Gravity 1.15 (+/-) 0.03	
Absorption of Water by Weight, Maximum 5%	ASTM-D471, "Method of Test for Change in Properties of Elastomeric Vulcanizates Resulting from Immersion in Liquids."

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Compression Set (Constant Deflection) of Original Deflection Maximum 30% ASTM-D395, "Method of Test for Compression Set of Vulcanized Rubber," Method B Revision.

Tensile Strength After Oxygen Bomb Aging (48 Hr, 70 Degrees Centigrades, 300 psi) of Tensile Strength Before Aging, Minimum 80 ASTM-D572, "Method of Test for Accelerated Aging of Vulcanized Rubber by the Oxygen-Pressure Method."

B. The names of the manufacturers of materials, articles, and equipment contemplated for incorporation in the Permanent Works, together with performance, capacities and other significant information pertaining to the equipment, shall be furnished for approval to the ENGINEER. Equipment, materials, and articles installed or used without such approval are at the risk of subsequent rejection.

7.14-04 INSTALLATION AND TESTING OF SLUICE GATES

A. Assembly and Erection of Frames and Guides. Each set of frames and guides shall be assembled in its blockout in accordance with the Drawings, brought to line and grade within the erection tolerances specified and firmly secured in place on the alignment bolts. The alignment bolts shall be spotted with care so no subsequent bending or forcing of bolts is required to match them with the corresponding holes in the frame and guide members. Connections to bolts shall be adjusted and firmly tightened to hold the frames and guides securely in position while concrete is being placed in the blockouts. Additional bracing shall be provided where necessary to assure the required alignment. Extreme care shall be taken to insure that the guiding, bearing, and sealing surfaces are within the tolerances specified throughout their entire length. Placement of concrete in blockouts shall not proceed until the frames and guides have been completely assembled, cleaned of dirt, aligned, and secured at least throughout the height of the openings. The use of the gates as a support or brace for the guides during placement of concrete will not be permitted. Caution shall be exercised in placing the concrete to avoid distortion and displacement of the frames and guides. Before placing the concrete in any one lift and between placement of successive lifts, alignment tolerances shall be checked and remedial action taken if readings indicate that displacement has occurred. Suitable windows shall be provided in the form to facilitate placement and inspection.

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Tensile Strength After Oxygen Bomb Aging (48 Hr, 70 Degrees Centigrades, 300 psi) of Tensile Strength Before Aging, Minimum 80 ASTM-D572, "Method of Test for Accelerated Aging of Vulcanized Rubber by the Oxygen-Pressure Method."

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After all blackout concrete has been placed and forms removed, the blackout concrete will be inspected and the embedded parts will be sounded to detect any voids. All voids shall be filled by pressure grouting as directed without additional cost. No grout holes shall be drilled in the seal or track surfaces.

B. Assembly, Erection, and Testing of Gates.

1. Assembly and Erection. Each gate shall be assembled and erected in accordance with the details shown on the Drawings and in accordance with the manufacturer's instructions. Joints shall be watertight where required. The bottom of the gates when erected shall be in true alignment to insure a tight even bearing of the seals on the embedded sill beams. The sides of the gates shall be in true alignment so that the seals when installed will have a tight and even bearing on the side sealing surfaces embedded in the piers. The seals shall be installed after the gate has been painted. Detailed descriptions and sketches of proposed methods of erection shall be submitted for review. However, such review does not relieve the Contractor from the sole responsibility of attaining the above tolerances.

2. Tests. Each of the gates shall be operated in their respective slots through a sufficient number of complete cycles by both manual operation and by a motor operated actuator, to insure that they meet the requirements in all aspects and are suitable for performing the work intended. Minor adjustments necessary to achieve the above shall be made where required. All joints and connections in the gates and sealing surfaces, which are field welded and where leakage may occur shall be tested for watertightness using high pressure air and a soap solution prior to field painting. The gates and their embedded parts shall be thoroughly cleaned of all foreign material, with particular attention being paid to bearing and sealing surfaces, and the paint repaired where necessary.

7.14-05 SHOP PAINTING

All ferrous parts of the sluice gate and stem guides shall be painted with a prime coat and one shop coat of asphalt varnish suitable for potable water. Surfaces shall be blast-cleaned to base metal before painting. A prime coat shall be applied to the castings after cleaning and prior to machining. The shop coat shall be applied after assembly. All machined iron surfaces, including drilled and tapped holes, shall be coated with a protective grease. The surface of the wall thimble in contact with the concrete shall not be painted.

The sluice gates and all hoist equipment for the sluice gates shall be fieldpainted with two finish coats following installation, in accordance with Section 10 "Painting".

7.14-06 PAYMENT

Payment for designing, where applicable, detailing, manufacturing, furnishing, installing, painting, and testing the equipment specified under this Section, including temporary bracing, clamps, erection bolts, weld metal and other miscellaneous materials required to place metal work in position and hold it in proper alignment during concrete and grout placing, will be made at the lump sum prices for the following items:

Low Level Outlet Sluice Gate at Spillway, Frame,
Crank Operated Floor Stand and Appurtenances.

Intake Control Sluice Gate, Frame, Crank
Operated Floor Stand and Appurtenances.

Sediment Sluice Gate near Intake, Frame,
Crank Operated Floor Stand and Appurtenances.

Sediment Sluice Gate in Desilting Basin, Frame,
Crank Operated Floor Stand and Appurtenances.

Sediment Sluice Gate at Penstock Forebay, Frame,
Crank Operated Floor Stand and Appurtenances.

Control Sluice Gate at Penstock Forebay, Frame,
Crank Operated Floor stand and Appurtenances.

Portable, Gasoline Powered Gate Hoist Actuators.

PART VII - TECHNICAL PROVISIONS

SECTION 15 - GENERAL ELECTRICAL WORK

7.15-01 SCOPE

The following items of electrical material and equipment shall be designed, furnished, installed, and tested:

1. Electrical metallic conduits, boxes, fittings, and hardware.
2. Insulated wire and cable, including connecting and terminal equipment.
3. Cable trays and supports.
4. Grounding system.
5. Lighting system.

Detail Shop Drawings shall be prepared and shall include lighting, grounding, conduit layouts, cable tray layouts and cable trench layouts. Shop Drawings shall be adequate for construction and shall be submitted for review in accordance with Part VI, "Special Conditions". Cables shall be installed in cable trays, conduits, or cable trenches. The proposed cable tray and conduit installation shall be pleasing in appearance and shall not interfere with other equipment.

7.15-02 CONDUIT

A. General. The conduit system shall include conduits, boxes, fittings, and all necessary hardware such as screws, bolts, hangers, clamps, locknuts, bushings, couplings, pulling irons, identification tags, etc.

B. Rigid Metal Conduit. Rigid metal conduit shall be hot-dip galvanized steel conforming to ANSI C80.1, "Specification for Rigid Metallic Conduit." Conduits shall be heavy wall type with boxes, fittings, and covers appropriate to the conduit, location, and the NEC.

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C. Flexible Steel Conduit. Flexible steel conduit shall be hot-dip galvanized conforming to UL-1, "Flexible Steel Conduit," or liquid-tight flexible conduit such as "Sealtite Type UA" as manufactured by The American Brass Company, Waterbury, Connecticut, U.S.A., or equal.

D. Conduit Installation

1. General

a. Installation of all conduits, boxes, fittings, and hardware shall conform to the requirements of the NEC and local codes insofar as these are applicable.

b. Conduits shall be identified at each end and at junction and pull boxes by means of permanent, non-ferrous tags bearing the conduit designation number. Samples of the proposed tags shall be submitted for approval.

2. Installation of Metal Conduit

a. Each run of conduit between boxes or equipment shall be electrically continuous. Threads shall conform to the requirements of ANSI-B2.1 for taper pipe threads.

b. In outdoor and wet areas, all joints between lengths of conduits and threaded connections to boxes, fittings, and equipment enclosures shall be made watertight by use of red lead and oil, white lead and oil, or other approved compound applied to the male threads only.

c. Exposed conduits shall be run in straight lines parallel to walls, beams, or columns. Required offsets shall be accomplished by use of uniform offsets, bends, conduit fittings, or boxes. Where conduits are grouped, the offset shall be made in a manner which will present a uniform and symmetrical appearance. Conduit runs shall be supported every 2.5 m or less and within 0.3 m of each outlet or junction box.

d. Conduits embedded in concrete shall be sloped toward drain points and shall be rigidly supported and braced to avoid shifting during placement of concrete. Conduits extending out of floors, walls, or beams shall be at right angles to the surfaces.

e. Conduits terminating at the surface of concrete for extension as exposed runs shall be terminated with plugged couplings set flush with the surface. Brass plugs shall be provided for the conduits to be extended in the future. Where it is not practicable to employ flush couplings, the conduit ends shall be suitably boxed, or otherwise protected, and sealed.

f. Conduits shall have long-seep field bends, wherever possible, but in no case shall have a radius smaller than recommended by the manufacturer.

3. Installation of Flexible Steel Conduit. Short lengths of flexible conduit shall be used for connecting to conduit boxes of motors, etc., where vibration may occur and at other locations where rigid conduit cannot conveniently be used. Standard fittings for flexible conduit shall be used for connecting to rigid conduit and to boxes. Liquid-tight flexible conduit shall be used in wet locations and where exposed to the weather. Liquid-tight fittings and connectors shall be used in conjunction with liquid-tight flexible conduit installation.

7.15-03 INSULATED WIRE AND CABLE

A. General. All insulated wire and cable required for the component parts of the power, control, annunciation, instrumentation, and lighting systems shall be furnished, installed, and connected, including plugs and terminals, terminal blocks, stress cone material, potheads, cable joints, splicing materials, cable grips and wedges, cable terminators, identification tags, and other miscellaneous equipment required to make a complete installation ready for operation.

B. Standards. All wire and cable shall conform to applicable ICEA and NEMA standards for the specified stranding and construction.

C. Conductors

1. Conductors shall be annealed copper wire and shall be solid or stranded as required.

2. Power conductors rated 600 V shall have Class B stranding. No wire smaller than No. 12 AWG for 600-V conductors shall be used.

3. Control, annunciation, and temperature detector conductors shall be Class B stranding. No wire smaller than No. 14 AWG for control and No. 16 AWG for annunciation and temperature detector shall be used.

4. Lighting conductors shall be Class B stranding, and no wire smaller than No. 12 AWG shall be used for lighting circuits.

5. Fixture wire shall conform to ANSI-C1, "National Electrical Code", Type SF-2, 600 V, not smaller than No. 14 AWG.

6. Communications, transducer, and other low level signal conductors shall not be smaller than No. 18 AWG.

7. Current transformer secondary conductors shall be Class B stranding No. 10 AWG.

D. Insulation and Jackets

1. Insulation of conductors rated 600 V for power, control, annunciation, and instrument transformer secondary circuits shall be of cross-linked thermosetting polyethylene material suitable for a conductor temperature of not less than 90 degrees centigrades. An overall outlet jacket of polyvinylchloride shall be provided over multi-conductor cables. Individual conductors of multi-conductor cables shall be color-coded in accordance with methods of ICEA Standard S-19-81.

2. Insulation of conductors rated 600 V for lighting shall be of polyvinylchloride material suitable for a conductor temperature of not less than 75 degrees centigrades. No jacket shall be provided over the conductor insulation. Insulation shall be uniformly colored with the following wire colors: Black, White, Red, Orange, Blue, Yellow.

3. Fixture wire shall consist of a silicone rubber insulation with a protective woven fiber glass braid.

4. Indoor communication and low level signal cables shall have polyvinylchloride insulated conductors, suitable for conductor temperature of 75 degrees centigrades, with a polyvinylchloride jacket. The individual conductors shall be color-coded.

5. Construction features of all cable and wire shall be submitted for approval.

E. Installation of Insulated Wire and Cable

1. Cable runs shall be continuous from terminal to terminal to the extent permitted by available commercial lengths. Conduits shall be clean inside before wires are pulled.

2. All lugs, terminals, and terminal blocks required which are not part of the equipment shall be furnished and all connections required to provide a complete installation ready to operate shall be made. Cable identification tags of a permanent type shall be provided and installed on all cables used for power, control, annunciation, instrumentation, relaying, and lighting (except branch lighting conductors) for easy identification of the cables. Splices made in boxes shall also be permanently and prominently tagged.

7.15-04 CABLE TRAYS AND SUPPORTS

A. Trays. Trays shall be made of galvanized steel and conform to requirements of NEMA Pub. No. VE-1, "Ventilated Cable Trays", Class II. Trays and fittings shall be hot-dip galvanized after fabrication. Covers will not be required. Trays shall be as manufactured by Husky Burndy, 5300 Vine Street Cincinnati, OH, or equal.

B. Supports

1. Tray support brackets shall be mounted on steel supporting structure anchored to the wall, floor, or ceiling. Supporting structures shall permit a certain degree of flexibility for adjustment in position of the trays. All steel, fittings, bolts and nuts shall be hot-dip galvanized.

2. Cable brackets shall be furnished and anchored to the trench wall. All brackets, bolts and nuts shall be hot-dip galvanized.

7.15-05 GROUNDING SYSTEM

A. General. The complete grounding system described herein shall be designed, furnished, installed, and tested. The grounding system shall include ground mats and driven ground rods

which shall permanently and effectively ground neutral points of generators, switchgear, transformers, electrical equipment, frames, conduit, lightning arresters, and all non current carrying metal parts including structural steel.

B: Material

1. Ground conductors shall be bare soft drawn, Class C stranded copper cables for size No.2/0 AWG and Class B stranded for size No.8 AWG.

2. All embedded or buried joints, splices or taps to grounding cables shall be welded by the "Cadweld" process as manufactured by Erico Products, Inc., 2070 East 61st Place, Cleveland, Ohio, U.S.A., or by the "Thermoweld" process as manufactured by Burndy Engineering Co., Inc., Norwalk, Connecticut, U.S.A., or equal. The cables shall be cleaned of all dirt, grease, moisture, and oxidation before connections are made. Soldered connections will not be accepted.

3. Frames of major electrical equipment shall have 2 connections to the ground system.

4. Connections to equipment which may be removed for maintenance shall be made with clamp type connectors.

5. Connections to building steel, embedded metal, crane and crane rails, and other metal work shall be welded, except connections to galvanized equipment which shall be bolted.

6. Ground connections shall be protected during concreting operation to avoid breaking at the connections.

7. Ground cable embedded in concrete shall cross expansion or construction joints at right angles to the joint and shall be installed in such a manner that movement will not damage the cable.

8. All metal conduit shall be grounded, either by being connected to equipment which is grounded or by means of independent copper connections to the ground system. Grounding bushings may be used to establish ground connection to the conduit.

9. Where ground taps emerge from concrete, grounding inserts or pads shall be furnished and installed flush with the finished concrete as shown on the Drawings. Grounding inserts shall be equal to Burndy Type GFG Ground Connectors. Inserts shall be finished for future equipment and extensions of the ground system.

10. Grounding shall conform to requirements of the NEC.

11. Ground system resistance shall not exceed 2 ohms at any point.

7.15-06 LIGHTING SYSTEM

A. General. The complete lighting system described herein shall be designed, detailed, furnished, installed, connected, wired, and tested. Lighting fixtures shall be switched by circuit breakers located within the distribution panel.

B. Fixtures. Fixtures shall be furnished complete with mounting structures as required.

C. Outlet Boxes. Each fixture and all receptacles, and other wiring devices shall be provided with suitable outlet boxes as herein specified and of the size and type as required. All boxes exposed to the weather shall be suitable for wet locations and shall be of galvanized cast iron.

D. Switches. All switches shall be of the heavy-duty toggle type rated at least 20 A at 250 V ac for tungsten filament and/or flourescent lamp load, They shall be single-pole or double-pole as required, and of specification grade.

E. Convenience Outlets. Convenience outlets shall be grounding type, first quality, duplex type designed for flush mounting in metal outlet boxes. The outlets shall be rated 15 A at 250 V. All outlet circuits shall be protected by ground fault interrupter branch circuit breakers.

F. Junction Boxes. If junction boxes are necessary or desirable in conduit runs, they shall be gasketed "Hoffman" type, connected using O-ring connectors.

G. Lighting Levels. Lighting levels shall be approximately as follows:

Powerhouse	400 lux
Outdoors	30 lux

H. Emergency Lighting. Portable emergency lighting units shall be provided within the powerhouse to maintain an illumination level of 20 lux. They shall be EXIDE Cat. No. FSS-25-V with bracket MBF, or equal.

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1. Tests. The equipment, material, and devices shall have been factory tested. In addition insulated wire and cable shall be given continuity, insulation resistance, and high potential field tests according to the applicable standards. The grounding system shall be tested for compliance with the specified ground resistance requirement and for continuity of all connections. The lighting system shall be given adequate field test to demonstrate that performance of the system satisfies these Specifications. The control circuits of the equipment shall be tested for proper operation under these Specifications. Other electrical equipment furnished shall be tested to demonstrate conformance with the specified requirements.

7-15-07 PAYMENT

Payment for designing, furnishing, installing, and testing the following items of electrical equipment as specified and as shown on the Drawings or as directed will be made at the lump sum price for the following items:

Electric metallic conduits, boxes, fittings, and hardware.

Insulated wire and cable, including connecting and terminal equipment.

Cable trays and supports.

Grounding system.

Lightning system.

Payment for furnishing and installing materials not specified to be furnished with this equipment will be made at the appropriate prices for work covered by other items.

PART VII - TECHNICAL PROVISIONS

SECTION 16 - TRANSPORTATION, STORAGE AND INSTALLATION
OF CONTRACTING AGENCY FURNISHED EQUIPMENT

7.16-01 SCOPE

A. In accordance with the specifications contained in this Section and as shown on the Drawings, the Contractor shall transport, storage, install, test, and place in operation the following equipment and its associated auxiliaries:

Two hydraulic turbines

Two turbine governor systems

Two inlet valves including operators

Steel spiral case extension pipe and valve extension pipe to meet penstock.

Two speed increasers (if required)

Two synchronous generators

Two excitation systems

One generator switchgear assembly including protection, control, and metering equipment for two generators

Station service equipment

Power transformer

Circuit reclosers, disconnecting, switches, power fuses, etc.

12.47 Kv Sub - Transmission and Distribution lines Equipment and Accesories.

Tools and Spare Parts

Radio Equipment

B. The work shall be done under the technical direction of the manufacturer's supervising erectors, whose services will be paid for by the CONTRACTING AGENCY.

7.16-02 DELIVERY

Contracts have not yet been awarded for the CONTRACTING AGENCY furnished equipment. However, documents issued for bids specify the following delivery date: MARCH 18, 1987.

7.16-03 TRANSPORTATION

CONTRACTING AGENCY furnished equipment and material which the Contractor shall install with the delivered CIF to Port of Haina or Santo Domingo.

The Contractor shall accept delivery of all cited equipment and auxiliaries when made, load, transport and unload at the Job Site.

The Contractor shall also comply with the requirements of 6-12, Special Conditions, "CONTRACTING AGENCY furnished Equipment and Material."

7.16-04 STORAGE

Parts on which the final alignment and running clearances of the equipment depend are machined to close tolerances. Consequently, adequate blocking shall be provided when storing such parts to prevent distortion of their machined surfaces. Runners, wheel pit covers, and guide bearing supports shall be stored with their axes vertical to maintain roundness. Shafts and runners and other attached equipment shall be supported to distribute their weight uniformly and thus avoid any permanent deformation. Supports shall not be placed under the bearing surfaces. Wood supports shall not be in direct contact

with the machined surfaces for extended periods of time. Shafts shall be rotated periodically through 180 degrees and lifted so that additional rust preventive material can be applied to prevent pitting at the points of support.

7.16-05 INSTALLATION

A. General Installation Instructions

1. All CONTRACTING AGENCY furnished equipment shall be assembled and installed in accordance with the applicable Drawings and written instructions of the manufacturers and the applicable codes, standards, and specifications contained herein. The manufacturer's written instructions are to be used as a general guide and are subject to augmentation or modification by the manufacturer's supervising erectors to suit the actual conditions during installation.

2. The Contractor shall furnish all labor, tools, supplies, bracing, spiders, shims, and supports not furnished with the equipment and all other items or materials necessary to assemble, erect, and install, test and prepare the equipment in a thorough workmanlike manner following the best modern practices in the installation of hydroelectric equipment. The equipment and all its components shall be placed with great care and accuracy and shall be correctly aligned to provide an installation consistent with the close tolerances used in the manufacture of modern hydroelectric equipment. The proper grades and centerlines to which equipment is to be set shall be established by the Contractor. Equipment shall be checked for alignment, clearances, and fit embedment of parts in concrete and grouting.

3. All oil piping, oil sumps, and pressure tanks shall be thoroughly cleaned and flushed to the satisfaction of the equipment manufacturer's supervising erector before the oil is placed in the system. When installing the oil, the Contractor shall filter the oil through a filter press.

4. The equipment enumerated above will be delivered shop painted but shall be touched up, repainted and/or painted in accordance with the applicable provisions of Section 10, "Painting". Welding shall be performed in accordance with Section 8, "Metalwork", except where requirements differing therefrom are specified herein; electrical work shall be performed in accordance with Section 15, "General Electrical Work;" and grouting shall be done in accordance with Section 5, "Concrete

Work."

B. Descriptions. The description of equipment given herein and shown on the Drawings is general in scope. After the ENGINEER's final review of the manufacturer's Drawings, copies of them will be furnished.

C. Welding. All field welding required on the parts to joint the shipping sections and to attached anchorage, jackplates, base plates, jacks, piping, test heads, and any welding required for proper erection and installation of the equipment shall be done by the Contractor. All welding rod shall be provided by the Contractor to specifications established by the manufacturer. Qualification of welding procedures, welding operators, and welders shall be in accordance with the applicable manufacturer's instructions. Final selection of welding procedure, special requirements for operator qualification, sequence of welding, requirements for weld backing, chipping, preheating, peening, and similar details shall be as determined by the equipment manufacturer.

D. Embedded Items and Items Bearing on Concrete. Before concrete is placed, the Contractor shall determine that all embedded items are firmly and securely fastened in place. All embedded items shall be thoroughly clean and free of oil and other foreign matters such as loose coatings or rust, paint, scale, mortar, etc. The embedding of wood in concrete will be prohibited unless specifically authorized.

E. Installation Measurements and Records. In the course of erection, repeated careful checks of alignments and levels, concentricity, and trueness shall be made. The Contractor shall provide illustrated check sheets and record all installation measurements. Such records shall be signed by the applicable manufacturer's supervising erector, and copies shall be furnished to the ENGINEER.

F. Oil and Grease. Oil and grease for the equipment will be supplied by the equipment manufacturers. After installation has been completed, the initial installation of oil and application of grease shall be made by the Contractor. Reserve quantities of oil and grease shall be properly stored by the Contractor as directed.

G. Piping. All piping and turbing required for gauges and thermometers and all other piping furnished with the equipment shall be installed by the Contractor in accordance with the requirements of Section 12, "Piping and Plumbing."

H. Special Installation Instructions

1. General. Concrete supports and any other supporting structures not furnished with the equipment shall be provided in the first stage concrete to suit the equipment design and structural considerations. The Contractor shall install all supporting columns, jack base plates and base plate bolts, jacks, leveling screws, tie rods, turnbuckles, anchor loops to which the tie rods for the various embedded parts will be attached, and anchors furnished with the equipment. All parts shall be firmly secured in position to ensure that no movement takes place during placing of concrete and grout. All metal surfaces that are to be embedded in concrete shall be free from loose rust, loose mill scale, oil, or any other foreign matter.

2. Placing Concrete and Grout. Concrete and grout around the embedded parts shall conform to the requirements of Section 5, "Concrete Work", and shall be placed as specified in that Section.

3. Erection of Distributor Cases. The Contractor shall assemble and bolt together the shipping sections of the distributors as required.

4. Installation of Removable Parts. Before installing the removable parts, all parts shall be thoroughly cleaned of rust and protective coatings, and all burrs and nicks shall be removed. Sub-assemblies shall be carefully fitted together. When required, certain parts shall be placed temporarily, then removed for further fitting or correction before final placing. Some sub-assemblies may have to be dismantled and checked for cleanliness, lubrication, proper functioning, etc., as part of normal erection procedure. Before final assembly, all mating machined surfaces which will be subject to contact with the river water shall be cleaned and coated with a rust preventative compound as directed by the equipment manufacturer's supervising erector.

I. Installation of Governing Equipment. The Contractor shall place, level, and grout the governor accumulators, oil pressure set, and another auxiliary equipment. Interconnecting piping between the equipment, such as between the governor accumulators, oil pressure set, servomotors, and the restoring mechanisms between the governor cabinets and the servomotors, including supports and hangers, all furnished with the equipment, shall be installed by the Contractor. All rust preventive compounds shall be removed from the equipment before initial operation, and any rust which may have formed on the parts shall be carefully removed.

7.16-06 PRELIMINARY TESTING AND START-UP

A. Test of Piping. The Contractor shall test all pipe joints and the entire pressure piping system for the turbines, governors, and valves under hydrostatic pressures 50% in excess of the maximum operating pressures. The entire grease piping system (if furnished) shall be tested at a pressure 50% greater than the system operating pressure. Any components which fail to withstand these tests or which fail to meet the requirements of the specification will be replaced by their supplier. The Contractor shall reinstall and retest any such replacements required.

B. Operating Functions. The Contractor shall provide all necessary personnel to perform all operating functions during start-up and initial operation. The Contractor shall also provide the necessary personnel to instruct the CONTRACTING AGENCY's operating staff in matters regarding the operation and maintenance of the generating units. The City's operating staff will participate in performing all operating functions during start-up and initial operation.

C. Preparation for Starting the Unit

1. All equipment including gauges, instruments, controls, valves, lubricating devices, flow indicators, filters, pumps, etc. shall be carefully checked for proper operation before starting the unit. All gages, instruments, controls, temperature devices, relays, contactors, meters, and associated electrical and mechanical devices shall be calibrated. Oil pumps and piping shall undergo a 24-hr period of operation and inspection to be sure of correct performance and the absence of leaks. The intake, drains, runner, discharge ring, wicket gates, inlet cone (if applicable) draft tube, speed increaser (if applicable) and generator shall be carefully inspected to be certain that all foreign matter has been removed.

2. All water supply lines, including strainers, shall be checked to be sure of proper flow to the various parts of the unit.

3. The lubrication systems shall be checked for proper operation.

4. Before watering the unit, a final checkout shall be made of the operational readiness of the generator, turbine, and associated auxiliaries.

5. An operation test shall be performed on all thermal relays, indicator, thermometers, speed switches, resistance temperature detectors, and flow switches to verify correct calibration, adjustment, and operational readiness.

6. The Contractor will establish a check-off list procedure in preparation for starting the unit. All parties involved in final check-out of equipment and systems will be required to sign off the list indicating that their equipment is ready for start-up and initial operation.

7. The generators, switchgears, transformers, other electrical equipment, and cables shall be given megger insulation resistance tests and higher voltage cables shall be given high potential tests after installation.

8. The intake gate will be operated by the Civil Contractor.

D. Initial No-Load Run

1. The first operation after watering the unit will be a no-load run to check the shaft run-outs and bearing temperatures and to run-in the bearings. The Contractor shall shut down the unit in order to make any desired adjustments or at the request of the CONTRACTING AGENCY. In some cases, unwatering and inspecting of internal turbine parts or water passages may be required.

2. During the no-load run, the following checks and adjustments shall be made:

a. Adjustment for operation of gate control system timing at rated speed.

b. Operation of starting and stopping controls including emergency shut-down devices.

c. Operation of speed switches.

d. Setting of all devices such as tachometers, thermometers, pressure gauges, electric indicating instruments, and other similar devices.

e. Strainers shall be checked frequently and kept clean.

f. Generator rotor balancing.

g. Automatic start-stop control sequencing.

E. Initial Load Run

1. After the unit has been synchronized and connected to the electrical system, incremental load tests shall be performed with load increased in small steps and with observations of temperature rise and of the operation of the equipment. When full load has been reached, it shall be maintained for 8 hours to allow a careful check of temperature rise of bearings and generator windings, observations of general unit operation, and make any adjustments necessary to assure continued successful operation.

2. The generation scheduler controls shall be tested and adjusted for proper operation.

7.16 07 FIELD TESTING

A. General. After the turbines, governors, and inlet valves have been installed and placed in satisfactory operation, they shall be tested by the Contractor under the direction of test engineers representing the manufacturers. The manufacturers will prepare a written test procedure for the ENGINEER's review. After the ENGINEER's review, 2 copies will be furnished to the Contractor.

B. Initial Operation Tests. No-load stability tests and incremental load rejection tests up to 100 percent load and load pick-up tests up to 50 percent load shall be made to adjust the governor timing elements and settings of speed switches and other protective devices. All such adjustments and related parameters shall be recorded and included in the field test report. All provisions in the turbine required for attaching transducers or strain gauges to measure and record the desired data will be selected and furnished by the equipment manufacturer.

C. Turbine Capacity and Index Tests

1. Turbine capacity and index tests shall be performed on each turbine to verify that the power output guarantee has been fulfilled and to determine the shape of the efficiency power curve of each turbine. Unless other wise mutually agreed upon by the turbine manufacturer and the ENGINEER, the tests shall be conducted in accordance with the ASME PTE 18 "Performance Test Code for Hydraulic Prime Movers", including its supplement on "Index Method of Testing". All instruments and equipment for measuring head on the turbine and determining the relative

discharge will be furnished for the tests by the turbine manufacturer.

2. Tests Requirements. The power output and index tests on the turbine shall be made at the rated net head. The turbine capacity shall be determined from electrical measurements of generator output and generator losses. The turbine test engineer shall supervise any subsequent adjustments in the turbine working parts as may prove necessary or desirable to secure optimum turbine performance.

3. Turbine Runaway Speed Test. Within the guaranteed period, the CONTRACTING AGENCY may elect to have a runaway speed test performed on one or both of the units to determine whether the guarantee with respect to runaway speed has been fulfilled. If such test is undertaken it shall be performed at the highest head available at the time of the tests with the wicket gates fully open and no load on the generator. The tests will be of not more than 3 min duration from the time the maximum speed has been attained.

D. Valves. All tests which may be necessary to determine the proper functioning of the valves, their operating mechanisms and controls shall be performed. Measurements shall be made of full stroke opening and closing times. Any adjustments required on the valves or their operating mechanisms and controls shall be made by the Contractor under the supervision of the manufacturers test engineer.

7.16-08 PAYMENT

Payment for transporting, storing, installing and testing the CONTRACTING AGENCY furnished equipment complete as specified, will be made at the lump sum price for transportation, storage and installation of CONTRACTING AGENCY furnished equipment.

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PART VII - TECHNICAL PROVISIONS

SECTION 17 - SUB-TRANSMISSION AND DISTRIBUTION LINES

7.17-01 SCOPE

A. These specifications cover supply of materials, except as indicated, transport from port, delivery to warehouse, delivery to the site from warehouses, complete erection and commissioning of subtransmission and distribution systems including, but not limited to 12.47 kV primary lines, 120/210-V secondary lines, distribution transformers, street lights, lightning arresters, cutout, fuses, switches, reclosers, sectionalizers and all other equipment required to build a complete electrical subtransmission and distribution system. This work shall be for:

1. CONTRACTING AGENCY furnished 12.47 kV sub-transmission and distribution lines, equipment and accessories, as listed in "Lot I, Bill of Materials"
2. Contractor furnished poles, crossarm, crossarm accessories, guying materials, hardware, grounding materials and miscellaneous materials.

B. Details, accessories, etc., required for the complete installation of the subtransmission and distribution systems even if they are not specifically mentioned in the technical specifications, shall be furnished and installed. The CONTRACTING AGENCY will furnish major material items as per attached "Lot I, Bill of Materials".

7.17-02 GENERAL REQUIREMENTS AND LOCAL CONDITIONS

A. General Requirements. The Contractor shall comply with the requirements of these technical specifications, the requirement of Appendix II, "Normas de Sistemas Aereos de Distribucion", published by Corporacion Dominicana de Electricidad, (All of the structure types to be used are shown in this publication except for the reclosers structure which is

shown in Figure XVII-1 at the end of this Section), and the work shall be in accordance with the most modern construction techniques. The 1924 Edition of the National Electrical Safety Code of the U.S.A. shall be followed except where otherwise noted in these specifications. The materials and equipment shall be carefully studied in such a way that the erection and maintenance can be done in an easy and secure manner.

B. Local Conditions

1. Meteorology. In the region where the lines are to be built, the following temperatures, rain and humidity exist:

- a. Altitude above sea level does not exceed 600 m.
- b. 10 degrees centigrades minimum temperature
- c. 34 degrees centigrades maximum temperature

2. Access Roads. Certain information on the roads are given on the drawings that are part of these Contract Documents. Such information is indicative only. The Contractor shall obtain more complete information from the Secretaria de Estado de Obras Publicas, Roadway Department, of the Dominican Republic, or by site inspection, on the actual conditions of the roads and shall assume all responsibility regarding the best means of transportation.

7.17-03 STORAGE AND HANDLING OF MATERIALS AND EQUIPMENT

A. Scope

1. All material to be used in construction of the sub-transmission and distribution line shall be stored so as to be protected from deteriorating effects of the elements. In general, all metallic pieces of hardware and connectors shall be protected from rain by being stored under a roof; poles, crossarms, crossarm braces, transformers and bare and insulated wire and cable reels may be stored in the open; and special equipment and materials may be stored under roof or in the open but covered with a tarpaulin.

2. Storage of any equipment or material items directly on the ground, even for short periods of time, will not be permitted. Equipment or materials stored in the open shall be stacked on boards or timbers and shall be at least 300 mm above

the surface of the earth at all times. Storage of equipment and materials in areas subject to flooding or accumulation of water will not be permitted.

3. Storage yards shall be kept free of vegetation to prevent deterioration of wooden materials and corrosion of metallic parts.

B. Storage of Materials and Equipment

1. Poles, Crossarms and Crossarm Braces. Poles, crossarms and crossarm braces shall be stored on suitable supports, each group being stacked separately. They shall be laid and stacked as flat and evenly as possible in order to prevent sagging or undue stress of any of the components. These items may be stored in the open, uncovered.

2. Bare and Insulated Conductor, Guy Wire, Ground Wire and Tie Wire Reels. Bare and insulated conductor, guy wire, ground wire and tie wire reels may be stored in the open but shall be stored with the lagging in place and on wooden planks or timber at least 300 mm above the ground. The reels shall not be laid on their sides and may not be stacked on top of each other. An acceptable alternative to the above is that if adequate drainage is provided, wire and cable reels may be stored on a clean concrete surface.

3. Transformers, Reclosers, Lightning Arresters, Cutouts and Insulators. Equipment items and insulators that are manufactured for outdoor service and/or installation may be stored in the open if suitably crated, uncovered on wooden planks or timbers at least 300 mm above the ground or, if adequate drainage is provided, may be stored on a clean concrete surface. Equipment items may not be stacked on top of each other unless suitably crated for stacking.

4. Anchor Rods and Anchors, Ground Rods and Structural Steel. Anchor rods and anchors, ground rods and structural steel may be stored in the open, uncovered, on wooden planks or timbers at least 300 mm above the ground.

5. Air Break Switches. Air break switches may be stored in the open, on wooden planks or timbers at least 300 mm above the ground provided they are protected from rain and moisture by being covered with a tarpaulin or other waterproof cover.

6. Connectors, Pole Line Hardware, Conductor and Cable Splicing Equipment, Indoor Switchgear and Equipment and Test Equipment. Connectors, pole line hardware such as bolts, nuts, washers, clamps, armor rod, grips, etc., and conductor and cable

splicing equipment shall be stored under roof and suitably protected from effects of the weather. Indoor switchgear and switchgear accessories and test equipment shall be stored indoors in a clean, dry, well protected area.

C. Handling of Materials and Equipment

1. All equipment and materials shall be handled with care in order to minimize damage. Damaged equipment and material shall not be used. In the event of damage to equipment or materials, the damage shall be repaired or replaced to the satisfaction of the ENGINEER.

2. The handling of specific equipment and materials shall be in accordance with manufacturer's instructions and the methods or instructions described in the appropriate construction and installation specifications below.

3. Payment. There will be no separate payment for storage and handling of materials and equipment nor for repair and/or replacement of parts and materials damaged by the Contractor, and the entire cost for this work shall be included in the various prices of the bid.

7.17-04 RIGHT OF WAY AND RIGHT OF WAY CLEARING

A. Right of Way

1. Portions of the lines will be constructed along the edge of public roads and streets. However, the line between La Ceibita and Juan Adrian (as shown on the drawings) and some sections or branches of lines will be on private properties. The CONTRACTING AGENCY will obtain the necessary permission to build the lines at all locations shown on the drawings.

2. The Contractor shall make all necessary arrangements (other than acquisition of right of way) with the owners, in a friendly way, before going onto private land, but if any difficulty arises the Contractor shall inform the ENGINEER immediately. The Contractor shall not be entitled to separate payment for the activities relating to these arrangements.

B. Right of Way Clearing

1. The line routes and structure locations have been carefully selected in such a way that the minimum damage is done to forest, cultivation and trees. However, some trimming to trees and shrubs may be required.

2. Clearing of the line route of all trees and tall shrubs shall be carried out to a distance of 2 m on both sides of the 12.47 KV line. Trimmed trees and bushes shall not project more than 2 m above ground level. Clearing over fruit trees are special cases and shall be consulted with the ENGINEER. The area within a radius of 3 m from each pole shall be completely clear for construction purposes. In addition, danger trees outside the cleared area, of such height that they could fall and damage the line, shall be trimmed or cut by the Contractor after consultation with the ENGINEER and obtaining the necessary permission from owners. A danger tree is one that if it falls to the side of the line it will touch the conductors or the pole structure. For this classification the trees will be considered 3 m higher than their height. In special cases above rules may be varied with approval of the ENGINEER.

3. Trees to be trimmed or removed shall be designated by the Contractor. No tree shall be cut or trimmed without consultation and approval by the ENGINEER.

4. Fruit and ornamental trees shall not be cut without the complete agreement in writing of the property owner.

5. The Contractor shall remove and dispose of all broken, hanging or other unsightly limbs. He shall clean up all felled trees, tree branches, brush and debris before his departure from the work area.

6. It is essential that the Contractor keep good relations with the property owners at all times. There will be no separate payment for right of way cleaning. The entire cost for this work shall be included in the various prices of the bid.

7.17-05 CONTRACTOR FURNISHED MATERIALS AND EQUIPMENT.

A. Scope. Under this contract, the contractor shall furnish all equipment and materials except those items furnished by the CONTRACTING AGENCY as per "Lot I Bill of Materials" shown at the end of this section. The materials to be supplied by the Contractor include but are not limited to the following items:

1. Wood and concrete poles as indicated in the drawings.

2. Crossarms and all other materials required for the complete assembly of the structures including bolts, nuts,

locknuts, anchor shackles, washers, etc.

3. Guys, anchors and related materials for guying the structures.

4. Conductor fittings including splices, connectors, tie wire, repair sleeves and joint compounds.

5. Grounding materials including, ground wire, staples, molding to protect the ground wire (when required), staples, ground rods and clamps.

6. Compounds to treat cuts and holes in wood poles and crossarms.

7. Concrete and other materials to repair sidewalks, streets, driveways, etc., if required.

8. Special backfilling materials, crushed stone, concrete, etc., if required.

9. All materials required for repairing fences or for repairing any other damage to third party properties.

10. All other materials required for the construction work, whether expendable or not, including temporary supports, barriers, fuel and all tools and construction equipment including maintenance of the same.

Materials and tools supplied by the Contractor that are left over after completion of the work, will remain the property of the Contractor.

B. Wood Poles and Wood Crossarms. All wood poles shall be as per the latest ANSI 05.1 "Specifications and Dimensions for Wood Poles. Wood poles shall be class C minimum for poles up to 40 ft. long and class 5 minimum for 45 ft. poles. Southern yellow pine or Douglas fir, treated as per REA specifications DT 5C. Length of poles: 25', 30', 35', 40', and 45' as indicated in drawings. Wood crossarm and brace shall be treated and shall conform to the requirements of REA specifications No. DT 5B. Crossarm dimensions shall be 3 1/2" x 1 1/2" x 5'7" and 3 1/2" x 4 1/2" x 8' as indicated on the drawings.

C. Concrete poles shall be of centrifugal type fabrication and as per CDE "Especificaciones para la Fabricacion de Estructuras de Postes de Concreto" (Specifications for the Fabrication of Structures of Concrete Poles).

Concrete poles shall have a minimum breaking strength

equivalent to the breaking strength of the class 6 wood poles. Concrete poles shall be used for all lines except for the section of line across country between La Ceiba and Juan Adrian where the use of wood poles has been assumed. This exception is because of difficulties that could be found for the transportation of concrete poles to these areas. However, if the Contractor select to install concrete poles in some of these locations, this will be acceptable, when approved by the ENGINEER. Poles shall include the internally installed down ground wire, the required holes for the attachment of crossarms, secondary conductor racks, transformers, luminaries, etc.

D. Bolts, Washers, anchor shackles and miscellaneous hardware shall be hot-dip galvanized conforming with ANSI and ASTM specifications and as per REA standards.

E. Guy cable shall be grade B, galvanized steel, Siemens Martin, 1/4" diameter, 7 strand. Cable shall meet latest applicable ASTM A475 specifications and REA electrical approved.

F. Anchor rods shall be steel galvanized 5/8" x 8" Joslyn J7418 for one eye and J7.18 for 2 eyes.

G. Deadending materials for guy cable should be as per CDE standards. However, other REA approved, deadending materials, like 3-bolt galvanized clamps, may be used.

H. Anchors should be concrete as per CDE standards.

I. Conductor fittings, including splices, repair sleeves and compounds, should be as manufactured by Alcoa or equal approved by REA.

J. Grounding materials shall be copper and copperweld. Ground wire shall be hard drawn Class B copper No. 6 HDB. Ground rods shall be copperweld 5/8" x 7' Joslyn catalog J8337 or equal. Ground rod clamps shall be of copperweld type for 5/8" rods Joslyn catalog J8392AB or equal. Staples to hold the ground wire to the wood poles shall be copperweld type, adequate for the number 6 HDB copper conductor Joslyn J6652 or equal.

K. Tie wire shall be of aluminum wire No.4, meeting the requirements of CDE and the REA standards.

L. Payment. No separate payment will be made for the Contractor-furnished materials. The cost of these items shall be included with the costs of the constructions and installation of distribution lines and payment will be made as per 7.17, paragraph L.

BILL OF MATERIALS - LOT-1
SUBTRANSMISSION AND DISTRIBUTION LINES

Item No.	Description	Unit	Quantity
1	Single phase transformer, 15 kVA	ea	5
2	Single phase transformer, 25 kVA	ea	3
3	Lightning arrester	ea	15
4	Cutout with 5 amps fuse	ea	3
5	Cutout with 3 amps fuse	ea	5
6	Complete luminary assembly	assembly	45
7	ACSR conductor No. 4	m	53,500
8	Spool insulators	ea	350
9	13.2 kv pin insulators	ea	550
10	Distribution suspension insulators	ea	250
11	Pole top steel pin 18"	ea	100
12	Steel pin for crossarm mounting	ea	450
13	Clevis for spool insulator	ea	50
14	Secondary racks for three conductors	ea	100
15	Deadend clamp for No. 4. ACSR conductor	ea	80
16	Suspension clamp for No.4 ACSR conductor	ea	50
17	Single support preformed armor rod	ea	440
18	Double support preformed armor rod	ea	130
19	Preformed distribution grip deadend for secondary spool deadend	ea	210

7.17-06 CONSTRUCTION AND INSTALLATION OF SUBTRANSMISSION AND DISTRIBUTION LINES

A. Scope. The construction and installation of sub-transmission and distribution lines consists of placing, stringing, installing and/or mounting all poles, conductors, cables, equipment and accessories as shown on the drawings, or as otherwise directed by the ENGINEER for the 12.47 kV primary lines and distribution systems.

B. General

1. All construction and installation work shall be done in a thorough and workmanlike manner in accordance with the Contract Documents and shall be subject to acceptance by the ENGINEER. Deviations from the Contract Documents will not be permitted except upon written permission of the ENGINEER.

2. For the preparation of the Construction Schedule, and considering the partial acceptance and energizing of sections of feeders, the Contractor shall take into account the following factors:

- a. The 12.17 kV feeders shall be completely constructed in its total length and with the priority established by the CONTRACTING AGENCY.
- b. The primary branch lines and secondary distribution systems of the individual towns shall be constructed and complete considering the priority and program established by the CONTRACTING AGENCY.
- c. For safety reasons, and as partial acceptance of primary lines and secondary distribution systems of towns are granted, the CONTRACTING AGENCY will be responsible for the operation and maintenance and connection of customers on those lines that are energized.

3. When it is necessary to keep pole holes, anchor holes or other excavation open over night, the holes shall be properly covered or barricaded to protect passers-by and livestock.

4. If blasting is necessary for any type of excavation, every precaution shall be taken in the handling of explosives and in protecting the surface against flying pieces of rock and dirt.

5. When it is necessary to string wires or ropes across highways, streets or pedestrian crossing or place materials or equipment at locations that may endanger lives or property, the Contractor shall take necessary steps to reduce hazards to a minimum.

C. Erecting and Setting Poles

1. Distributing Poles. In distributing poles to their respective locations, the largest and straightest poles shall be used for deadend, corner and angle poles. Poles shall be handled carefully, and damaged poles shall not be used.

2. Pole Setting

- a. The pole hole diameter shall be approximately 20

cm larger than the diameter of the pole butt to permit the pole to settle freely to the bottom of the hole without trimming the butt and still have sufficient space between the pole and the sides of the hole to permit proper tramping of the backfill at every point around the pole and throughout the entire depth of the hole.

b. The setting depth for poles of various length shall be according to Appendix II "Normas de Sistemas Aereos de Distribucion".

c. "Setting in Soil" Specification shall apply:

- i. Where poles are to be set in soil.
- ii. Where there is layer of soil more than 600 mm in depth over solid rock.
- iii. Where the hole in solid rock is not substantially vertical or the diameter of the hole at the surface of the rock exceeds approximately twice the diameter of the pole at the same level.

d. "Setting in Solid Rock" specifications shall apply where solid rock is encountered at the ground line where the hole is substantially vertical, approximately uniform in diameter, and large enough to permit the use of tamping bars in the full depth of the hole.

e. Where there is a layer of soil 600 mm or less in depth over solid rock, the depth of the hole shall be the depth of the soil plus the depth specified under "Setting in Solid Rock", provided however that such depth does not exceed the depth specified under "Setting in Soil".

f. On sloping ground the depth of the hole shall be measured from the low side of the hole. Where a pole is to be set on the side of a steep grade where soil erosion appears to be a consideration, the hole shall be 300 mm deeper than specified under "Setting in Soil".

g. When an earth boring machine is employed for holes, the bottom of the hole shall be thoroughly tamped to compact any loose earth that may be present.

h. All holes shall be backfilled with soil or small

rock, and all pole holes in rock shall be inspected and approved in writing by the ENGINEER before being backfilled. Organic material shall not be used for backfill. When organic material is encountered, it shall be replaced with clean backfill material approved by the ENGINEER.

i. Backfill shall be thoroughly tamped during the backfilling of the pole hole. Earth shall be banked around the pole to a minimum height of 150 mm above ground level. Excess earth shall be disposed of in a manner approved by the ENGINEER.

D. Mounting Crossarms and Insulators

1. Pole through-bolts, crossarms double arming bolts and all other pole equipment and hardware mounting bolts shall be long enough to fully engage the nut but shall not extend more than 50 mm beyond the nut after the nut is tightened. The ends of bolts may not be cut off to meet this requirements except as directed by the ENGINEER. The cut ends shall be painted with an approved rust-inhibiting paint.

2. All crossarms shall be pre drilled in accordance with the construction drawings. If special mounting holes, insulator pin or equipment mounting holes are required, the Contractor shall bore them in the field. These field drilled holes shall be treated by painting with an approved preservative.

3. Care shall be taken in handling and installing all insulators. In assembling suspension insulators and insulators on secondary elevizes, care shall be taken to insure that all cotter pins and bolts are in place. Pin-type insulators shall be tight on the pins. On tangent construction the top groove shall be in line with the conductor after tying in.

E. Installing Overhead Primary Line Conductors

1. Phase conductors for distribution lines shall be installed and connected so that phases are arranged on the structure or crossarm in the order required by the CDE. The neutral conductor shall be located as shown on the drawings.

2. Conductors may be strung by either conventional or tension stringing methods.

3. Loading and unloading of the conductors will be the responsibility of the Contractor. Therefore, repair of damages to the conductors during handling will be at the Contractor's expense.

4. The Contractor shall submit in writing to the

ENGINEER for review and comment his method for handling, installing and stringing conductors. The Contractor shall not start the handling of conductor before receiving the ENGINEER's approval of the method.

5. Care shall be exercised to avoid kinking, twisting or abrading the conductor in any manner. Conductors shall not be tramped on, run over by vehicles or dragged on the ground. The conductor on each reel shall be inspected for cuts, kinks or other damages. Damaged portions or imperfect splices in the conductor shall be cut out and the wire respliced.

6. Conductors shall be pulled over suitable rollers or stringing blocks properly mounted on the pole or crossarm, to prevent binding while stringing.

7. Installation of conductors and accessories shall be done in accordance with the manufacturer's recommendations.

8. With pin-type insulators, the conductors shall be tied in the top groove of the insulator on tangent poles and on the side of the insulator away from the strain at angles. Pin-type insulators shall be right on the pins, and on tangent construction the top groove must be in line with the conductor after tying in.

9. There shall not be more than one splice per conductor in any span, and no splice shall be located within 3 m of the conductor support. Before splicing, the conductor ends shall be thoroughly cleaned with a wire brush and coated with an approved oxide inhibitor.

10. Utmost care shall be exercised in installing parallel groove clamps and split bolt connectors. The contact surface of the clamp and the conductor shall be clean and bright. An approved oxide inhibitor shall be used as recommended by the manufacturer. A steel brush shall be the principal cleaning medium. Bolts shall be tightened down hard, but the threads shall not be overstressed. The same precautions for cleaning shall apply to the conductor before splicing.

11. Conductors shall be sagged in accordance with sag and tension charts or tables furnished by the ENGINEER. A maximum increase of 75 mm of the specified sag in any span will be acceptable, provided the required clearances are maintained. Under no circumstances will a decrease in the specified sag be allowed. Sagging shall be by sighting between targets unless otherwise approved by the ENGINEER.

12. The air temperature at the time and place of

stringing shall be determined by a certified etched glass thermometer (or approved equal). The temperature at which the conductor is sagged in and the spans in which sags are measured shall be recorded and the information given to the ENGINEER.

13. Conductors may be strung by controlled tension method using neoprene lined (or approved equal) double bull-wheel type tension stringing equipment. The equipment shall have groove sizes that will in no way damage the conductor. It shall be of a type capable of maintaining preset tensions and pulling speed. Sufficient continuous tension shall be maintained to keep conductors clear of ground or obstructions that could damage conductor. Sheaves shall be designed and used so that the pulling line does not damage the sheaves or deposit foreign matter in the liner which may damage the conductor or cause foreign matter to be deposited on the conductor. Complete manufacturer's data on tension equipment shall be furnished to the ENGINEER for approval prior to beginning of stringing.

14. The maximum pulling tension shall not exceed 100% of the final unloaded conductor tension at 15.5 degrees centigrades for the ruling span being used. The cable pullers, tensioners and pulling machines shall be located preferably as near the midspan as possible, but in no case shall the slope of the conductor between the machine and the stringing block at the first structure be steeper than 3 horizontal to 1 vertical. The length of conductor sagged in one operation shall be limited to the length that can be sagged satisfactorily as approved by the ENGINEER.

15. The time lapse between stringing and sagging conductors shall not be greater than 72 hours unless otherwise permitted or directed by the ENGINEER.

F. Installing Guys and Anchors

1. Guys shall be installed in the direction of the bisection of the angle or in line with conductor for deadend structures and in accordance with the drawings. Points of attachment to poles shall be as shown on the drawings. Guys and anchors shall be installed before conductors are strung. Guys shall be approximately at a 15 degree angle with the vertical line unless otherwise instructed or approved by the ENGINEER.

2. All anchors and rods shall be in line with the load and shall be so installed that the eye of the rod is above grade. Under no circumstances shall the eye of the rod be covered. Not more than 150 mm of the rod shall remain out of the ground after the load is applied. In cultivated fields or other locations as deemed necessary, the projection of the anchor rod

above the ground may be increased to a maximum of 300 mm to prevent burial of the rod eye.

3. Packfill shall be thoroughly tamped the full depth of all anchor holes.

4. Rock anchors shall be placed in accordance with the detailed instructions of the ENGINEER. Where rock is encountered below the surface of the ground, instructions from the ENGINEER shall be obtained before placing an anchor at that point.

5. Guy guards shall be installed only at special locations indicated on the drawings or as directed by the ENGINEER.

6. The setting of each anchor in regard to depth and position will be inspected by the ENGINEER, and his approval shall be obtained before the anchor hole is backfilled.

G. Installing Ground Rods and Ground Wire

1. Copperweld ground rods 5/8" in diameter and 7 ft. long shall be driven into the ground and connected to No. 6, HDB copper, downlead that will be supported on the wood pole by spaced staples and internally installed ground wire for concrete poles. The ground rods shall be installed in undisturbed ground. Grounds shall be installed on poles with transformer, lightning arresters and other equipment and for rural lines on poles, at a minimum of 400 meters apart, neutral.

2. The Contractor shall perform ground resistance (megger) measurements. All ground resistance measurements shall be recorded and submitted to the ENGINEER. The ground resistance reading should not be more than 20 ohms. If additional ground rods are required, Contractor shall install two or more ground rods at a separation of no less than 2 meters.

3. Ground rods shall be driven full length in undisturbed earth. The ground wire shall be attached to the rod with a clamp and secured to the pole with staples for wood poles or inside the pole for concrete poles. Staples on the ground wire shall be spaced 150 mm apart.

4. All equipment shall have at least 2 connections from the frame, case or tank to the multi-grounded neutral conductor as indicated on the drawings.

5. All equipment and lightning arrester grounds shall be connected to a driven ground. All grounds used on the pole shall be interconnected and attached to a common ground wire.

H. Installing Equipment and protective Devices

1. Transformers, reclosers, and other equipment and protective devices shall be handled carefully to avoid damage to insulators, protective finish or operating parts. Equipment and protective devices shall be located in accordance with the ENGINEER's instructions and drawings and shall be positioned in accordance with the drawings. Equipment shall be installed in accordance with the manufacturer's instructions. Only qualified and experienced personnel shall be allowed to make equipment installations and conductor and cable connections.

2. Care shall be taken to insure that the correct size and rating of equipment and protective devices, including fuses, are installed in their proper locations as indicated on the staking sheets and construction standards or as otherwise directed by the ENGINEER.

I. Mounting and Connecting Street Lights

Installation of new street lighting fixtures and complete new lighting systems shall be as per the CDE Standards.

J. Installing Secondaries and Services

1. Secondary conductors will be No.4 ACSR 6/1 installed on spool insulators supported by secondary racks as shown on the CDE drawings, or as per the ENGINEER's instructions. Tie wire shall be provided by the Contractor.

2. Services will be by the CONTRACTING AGENCY.

3. Secondaries shall be installed so as not to obstruct climbing space. There shall not be more than one splice per conductor in any span, and splices shall be located at least 3 m from the conductor support.

4. All requirements for handling and installing primary conductors as outlined in E, "Installing Overhead Primary Line Conductors", shall apply to the installation of secondaries, where applicable.

K. Working on or Near Energized Lines

1. During construction of new or working on existing lines, the Contractor shall work closely with and the CONTRACTING AGENCY to coordinate the proper timing of switching circuits for outages. The Contractor shall not operate any circuit breakers, switches or other types of sectionalizing devices either on

existing primary or on existing secondary distribution systems. All such switching operations will be performed by CONTRACTING AGENCY. When the Contractor anticipates that circuits near his work must be de-energized, he shall notify the ENGINEER by letter at least 7 days in advance of the required outage. He shall describe the area and lines that he requires de energized with an estimate of the length of time he needs the outage for each line involved. The ENGINEER will coordinate all required switching activities between CONTRACTING AGENCY and the Contractor.

2. Primary circuits shall not be approached nor grounding attempted until the Contractor has obtained clearance from an authorized representative or CONTRACTING AGENCY that the line to be worked on or near has been de-energized from all sources. All conductors shall be considered energized until they are adequately grounded.

L. Measurement and Payment. Measurement for payment for Contractor furnished materials, construction and installation of the 12.47 kV lines, 120/240-V distribution systems and equipment including materials furnished under Lot I as per Section 17.7-05 will be based on a lump sum prices. The lump sum price shall be based on the designs shown on the contract drawings. A list of estimated construction units is included for reference only.

LIST OF ESTIMATED CONSTRUCTION UNITS FOR
SUB-TRANSMISSION AND DISTRIBUTION SYSTEM

LOT II

UNIT NO.	DESCRIPTION	UNIT	QUANTITY
1	25' Concrete Pole	ea	7
2	30' Concrete Pole	ea	23
3	35' Concrete Pole (1)	ea	78
4	35' Wood Pole	ea	27
5	40' Wood Pole	ea	13

UNIT NO.	DESCRIPTION	UNIT	QUANTITY
6	45' Wood Pole	ea	4
7	A-1 Type Structure	ea	13
8	A-2 Type Structure	ea	7
9	A-3 Type Structure	ea	2
10	A-4 Type Structure	ea	1
11	A-6 Type Structure	ea	3
12	C-1 Type Structure	ea	28
13	C-2 Type Structure	ea	4
14	C-3 Type Structure	ea	5
15	C-4 Type Structure	ea	5
16	C-6 Type Structure	ea	2
17	C-7 Type Structure	ea	2
18	C1-a6 Type Structure	ea	1
19	C4-c6 Type Structure	ea	1
20	F-1 Type Structure	ea	25
21	F-2 Type Structure	ea	5
22	S-1 Type Structure	ea	29
23	S-3 Type Structure	ea	14
24	S-4 Type Structure	ea	2
25	S-6 Type Structure	ea	22
26	S-7 Type Structure	ea	--
27	S-16 Type Structure	ea	--
28	S-44 Type Structure	ea	--

UNIT NO.	DESCRIPTION	UNIT	QUANTITY
29	S-46 Type Structure	ea	3
30	DV-101 Type Structure	ea	50
31	DV-111 Type Structure	ea	7
32	DV-201 Type Structure (2)	ea	30
33	DV-212 Type Structure	ea	1
34	DV-16 Type Structure	ea	4
35	DT-1 Type Structure (25 KVA)	ea	3
36	DT-1 Type Structure (15 KVA)	ea	5
37	Luminaire Installation	ea	39
38	Pole Wood Grounding	ea	9
39	Pole Concrete Grounding	ea	12
40	A-1xC-1 Modification	ea	30
41	A-2XC-2 Modification	ea	24
42	A-3xC-3 Modification	ea	11
43	A-4xC-4 Modification	ea	2
44	A-6xC-1 Modification	ea	1
45	B-1xC-1 Modification	ea	12
46	B-2xC-2 Modification	ea	6
47	B-3xC-3 Modification	ea	2
48	B4 a6 x C1-b6 Modification	ea	1
49	C1-b6 x C1-c6 Modification	ea	1
50	M3-30 Structure	ea	2

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UNIT No.	DESCRIPTION	UNIT	QUANTITY
51	Install #4 ACSR Conductor (3)	100 lin.m	552

(1) This quantity includes 13 existing poles of CDE single circuit line to be changed to 35' foot poles.

(2) This quantity includes 14 DV-212 Type Structures to be used in existing CDE single line.

(3) Conductor lengths are by measurement of horizontal distances for each section of line times the number of conductors, regardless of its is primary, secondary or neutral.

M. Changes in Quantities. The quantities called for in this Proposal may be changed because of changes in design, or for unexpected reasons. Any addition or reduction on the works as per present designs will be paid or deducted as the case may be by an amount computed using the unit prices as listed in the "Schedule of Unit Prices". If there is no unit price for the work involved, the prices will be negotiated and computed using the unit prices of similar units.

N. Unit Prices. The following unit price will be applied for each unit of work added or reduced from the base design. Prices are for furnishing materials and for the complete installation including transportation taxes, insurance and all other related costs. Materials listed in Lot I "Bill of Materials" will be furnished by the CONTRACTING AGENCY.

Schedule of Unit Prices

Unit No.	Description	Price Each	
		RD\$	US\$
1	25' Concrete Pole	-----	-----
2	30' Concrete Pole	-----	-----
3	35' Concrete Pole	-----	-----

7/26/7

UNIT No.	DESCRIPTION	PRICE EACH	
		\$RD	\$US
4	35' Wood Pole	-----	-----
5	40' Wood Pole	-----	-----
6	45' Wood Pole	-----	-----
7	A-1 Type Structure	-----	-----
8	A-2 Type Structure	-----	-----
9	A-3 Type Structure	-----	-----
10	A-4 Type Structure	-----	-----
11	A-6 Type Structure	-----	-----
12	C-1 Type Structure	-----	-----
13	C-2 Type Structure	-----	-----
14	C-3 Type Structure	-----	-----
15	C-4 Type Structure	-----	-----
16	C-6 Type Structure	-----	-----
17	C-7 Type Structure	-----	-----
18	C1-a6 Type Structure	-----	-----
19	C4-c6 Type Structure	-----	-----
20	F-1 Type Structure	-----	-----
21	F-2 Type Structure	-----	-----
22	S-1 Type Structure	-----	-----
23	S-3 Type Structure	-----	-----
24	S-4 Type Structure	-----	-----
25	S-6 Type Structure	-----	-----

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UNIT No.	DESCRIPTION	PRICE EACH	
		\$RD	\$US
26	S-7 Type Structure	-----	-----
27	S-16 Type Structure	-----	-----
28	S-44 Type Structure	-----	-----
29	S-46 Type Structure	-----	-----
30	DV-101 Type Structure	-----	-----
31	DV-111 Type Structure	-----	-----
32	DV-201 Type Structure	-----	-----
33	DV-212 Type Structure	-----	-----
34	DV-1a Type Structure	-----	-----
35	DT-1 Type Structure (25 KVA)	-----	-----
36	DT-1 Type Structure (15 KVA)	-----	-----
37	Luminaire Installation	-----	-----
38	Pole Wood Grounding	-----	-----
39	Pole Concrete Grounding	-----	-----
40	A-1xC-1 Modification	-----	-----
41	A-2xC-2 Modification	-----	-----
42	A-3xC-3 Modification	-----	-----
43	A-4xC-4 Modification	-----	-----
44	A-6xC-1 Modification	-----	-----
45	B-1xC-1 Modification	-----	-----
46	B-2xC-2 Modification	-----	-----
47	B-3xC-3 Modification	-----	-----

UNIT No.	DESCRIPTION	PRICE EACH	
		\$RD	\$US
48	B1-a6 x C1-b6 Modification	-----	-----
49	C1-b6 x C1 C6 Modification	-----	-----
50	M3-30 Structure	-----	-----
51	Install #4 ACSR Conductor	-----	-----

7.17-07 ACCEPTANCE TESTING, ENERGIZING, AND TURNING OVER TO CONTRACTING AGENCY

A. Acceptance Testing

1. General. After installation of conductors, conductor accessories, cables, cables accessories and equipment and prior to final acceptance by the ENGINEER, tests performed by the Contractor and witnessed by CONTRACTING AGENCY and the ENGINEER shall be made as described below. If any piece of equipment or material shall fail to meet the prescribed tests, the Contractor shall correct any deficiencies and the test shall be repeated until all equipment and materials pass the tests.

2. Distribution Transformers. No-load voltage measurements shall be made at the secondary terminal of all distribution transformers to insure that the transformers have been connected properly. The magnitude of all voltage measurements and the location, time and date shall be recorded.

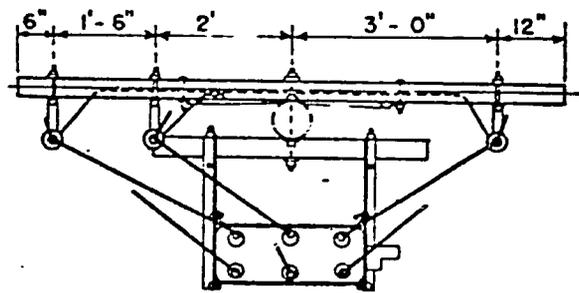
3. Switches and Cutouts. All switches and cutouts shall be operated with lines and components de-energized to test the switch parts for alignment and smoothness of operation. If switches drag and do not open and close freely, corrections shall be made by the Contractor until all components operated freely. Load break switching devices shall be tested energized after having been operated satisfactorily de-energized.

B. Energizing primary and Secondary Lines. Primary and secondary lines shall be energized or de-energized only by CONTRACTING AGENCY. Until the time the distribution systems are placed in service, primary and secondary lines will be energized only for test purposes. When working near new or existing lines,

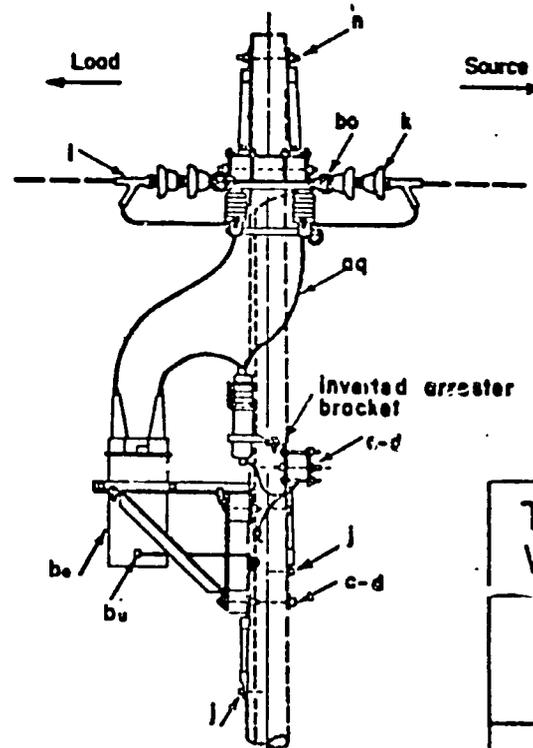
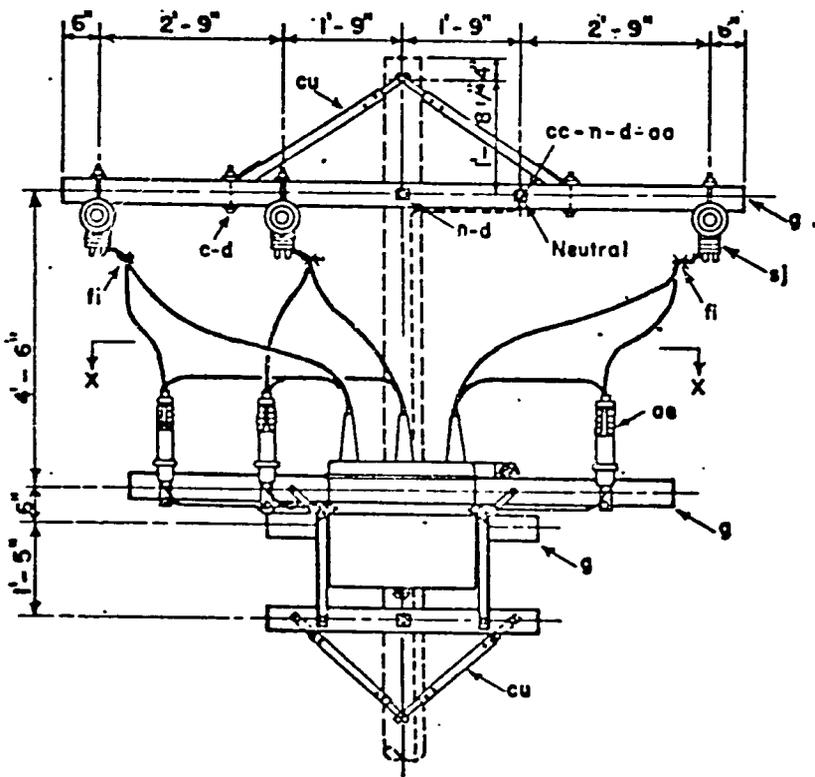
the Contractor shall take safety precautions for working on or near energized lines.

C. Turning Over to CONTRACTING AGENCY. The Contractor shall turn over completed lines and distribution systems to CONTRACTING AGENCY immediately after the facilities have been approved by the ENGINEER. Final acceptance by CONTRACTING AGENCY will be made after the subtransmission and distribution facilities have passed the applicable acceptance tests to the satisfaction of the ENGINEER.

D. Payment. There will be no separate payment for any acceptance testing performed by the Contractor, and the entire cost for this work shall be included in the various prices of the bid.



SECTION XX



ITEM NO.	MATERIAL
CF c 15	Bolt, machine, 5/8" x req'd length
CF c 4	Bolt, machine, 1/2" x req'd length
CF d 12	Washer, 2 1/4" square
CF d 4	Washer, round, 1 3/8" diameter
CF g 2	Crossarm, 3 3/4" x 4 3/4" x 10'-0"
CF g 1	Crossarm, 3 1/2" x 4 1/2" x 8'-0"
CF g 2	Crossarm, 3 1/2" x 4 1/2" x 4'-0"
k 12	Insulator, suspension
l 6	Clamps, deadend
CF i 2	Screw, lag, 5/8" x req'd length
CF n 3	Bolt, double circling, 5/8" x req'd length
CF p	Connectors, as required
CF aa 2	Eye, 5/8"
aa 3	Lig. ring arrester
CF aq	Jumper, as required
be 1	Recloser, oil circuit - 3 phase
*	Mounting bracket for 3 phase recloser
CF bo 6	Shackle, anchor
CF bu 1	Connector, solderless
cc 2	Deadend assembly, neutral
CF cu 2	Brace, crossarm, wood, 60" span
CF cu 4	Brace, crossarm, wood, 28"
CF ek	Locknuts
CF fi 6	Connector, hot line
sj 3	Switch, recloser by-pass

* Specify this item to be furnished by recloser manufacturer
 CF=Contractor Furnished

THREE PHASE OIL CIRCUIT RECLOSER WITH BY-PASS SWITCHES (M3-30)

IFB No. PCH-2-85

LOT II - VOLUME I
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FIG. XVII - I