TENDER FOR FABRICATION, INSTALLATION, TESTING AND COMMISSIONING OF CIRCULATING WATER CHANNEL

TENDER NO: IMUV/2014-2015/CWC/005/RP-008
Dated 23rd August 2014

INDIAN MARITIME UNIVERSITY
VISAKHAPATNAM CAMPUS - GANDHIGRAM
VISAKHAPATNAM - 530005
ANDHRA PRADESH

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Email: it@nsdrc.res.in

SECTION 1
NOTICE INVITING TENDER

1.1 Indian Maritime University, Visakhapatnam Campus invites open Tender for "Fabrication, Installation and Commissioning of Circulating Water Channel"

1.2 The Cost of Tender document is 500-00 (Rupees Five Hundred Only) payable by way of Demand Draft drawn on any Scheduled Commercial Bank in favour of Indian Maritime University, Visakhapatnam Campus Payable at Visakhapatnam. The tender document can also be downloaded from the web site www.nsdrc.com. In such case the cost of tender document shall be submitted along with the Tender. The Micro and Small Enterprises (MSEs) registered with National Small Industries Corporation (NSIC) are exempted from payment of Cost of Tender Document subject to submission of valid NSIC registration certificate along with the bid.

1.3 Tenderers are advised to study the Tender Document (including all Sections, Schedules and Annexure(s) etc) carefully. Submission of Tender shall deem to have been done after careful study and examination of the Tender Document with full understanding of its implications.

1.4 Sealed tender prepared in accordance with the conditions enumerated in **Section-3** should be submitted to the Director, Indian Maritime University, Visakhapatnam Campus, Gandhigram, Visakhapatnam 530005, not later than the date and time mentioned, at the address given in this section.

1.5 All tenders must be accompanied by an Earnest Money Deposit (EMD) of **Rs.30000-00 (Rupees Thirty Thousand only)**

1.6 This Tender Document is not transferable.

1.7 Schedule for Invitation to Tender

a) **Name of the Purchaser**

Indian Maritime University
Visakhapatnam Campus
Gandhigram
Visakhapatnam-530005
Andhra Pradesh
Phone : 0891-2578360-64
Fax : 0891-2577754

b) **Location where the circulating water channel to be Fabricated, Installed and Commissioned**

Indian Maritime University
Visakhapatnam Campus
Gandhigram, Visakhapatnam-530005
Andhra Pradesh

c) **Addressee and Address at which Tenders are to be submitted**

Director
Indian Maritime University
Visakhapatnam Campus
Gandhigram, Visakhapatnam-530005
Andhra Pradesh

d) **Date from which the Tender document is issued**

From **23rd August 2014** onwards on all working days till the due date of submission of the sealed tender.

e) **Place of issue of Tender document**

Indian Maritime University
Visakhapatnam Campus
Gandhigram, Visakhapatnam-530005
Andhra Pradesh

f) **Last Date for submission of the Tender**

On or before 1500 Hours on **12th September 2014**

g) **Place of submission of Tender (Technical and Price Bid)**

Indian Maritime University
Visakhapatnam Campus
Gandhigram, Visakhapatnam-530005
Andhra Pradesh

h) **Date of opening of Technical Bid**

At 1600 Hours on **12th September 2014**

i) **Place of opening of Technical Bid**

Indian Maritime University
Visakhapatnam Campus
Gandhigram, Visakhapatnam-530005
Andhra Pradesh

j) **Validity of Tender**

90 days from the date of opening of the Technical Bid.

k) The date of opening of price bid will be intimated after technical evaluation of the tenders.

l) **Date by which the supply and installation to be completed**

Within Eight (8) weeks from the date of placement of Order

1.8 **Pre-Bid meeting and Clarifications**

a) Pre-Bid meeting will be held at 1430 Hours on 2nd September 2014 at Indian Maritime University, Visakhapatnam Campus.

b) The queries of the Tenderers will be discussed and suitable responses will be given at the time of the pre-bid meeting.

c) Queries and IMUV replies will be uploaded in the website **www.nsdrc.res.in (or) www.nsdrc.com** within one week from the date of pre-bid meeting.

d) It is to be noted that no queries / requisition / clarifications will be entertained after the pre-bid meeting.

e) At any time prior to the last date for receipt of the bids, IMUV may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective tenderer, modify the Tender Document by an amendment.

f) The amendment will be notified by issuing a suitable corrigendum and will be uploaded on the website **www.nsdrc.res.in (or) www.nsdrc.com**.

g) In order to afford prospective Tenderers, reasonable time in which to take the amendment into account in preparing their bids, IMUV may or at its own discretion, extend the last date for receipt of bids.

SECTION 2
DEFINITIONS

2.1 Tenderer: Refers to the Person or the Firm or the Company to whom this Tender is issued.

2.2 Vendor: Refers to the person or the firm or the Company with whom the order for the Fabrication, Installation and Commissioning of the Circulating Water Channel is placed and shall be deemed to include the Vendor's successors, their representatives (approved by the Purchaser), heirs, executors, administrators and permitted assigns, as the case may be, unless excluded by the terms of the Contract. Also referred to as the successful Tenderer.

2.3. Purchaser: Refers to IMU, Visakhapatnam Campus

2.4. The Consignee of all the items shall be IMU, Visakhapatnam Campus

2.5. IMUV: Refers to Indian Maritime University, Visakhapatnam Campus.

2.6. Goods: Refers to all equipment, other accessories, which the successful Tenderer is required to supply to IMUV under the Contract as indicated in this Tender.

2.7 Services: Refers to various Services indicated in this Tender and shall include services ancillary to the supply of the Goods, transportation, insurance and any other incidental services, such as installation, warranty, maintainence for one year. Service as specified in this tender including the provision of technical assistance for ingegration of the supplied items and training and any other such obligations of the Tenderer as covered under the tender.

2.8 Items: Refers to all Goods and Services indicated in this Tender and shall include all accessories which are essential to meet the requirements specified.

2.9 Start Date: Refers the date on which the order is placed on the successful tenderer and accepted by the successful tenderer.

2.10 Acceptance/Completion Date: Refers to the date on which all the items along with accessories of the equipment/material are (as specified in the tender) supplied, installed and commissioned and accepted by IMUV.

2.11 The warranty period: For items other than steel used in the fabrication for CWC , the comprehensive warranty shall be available from date of successful commissioning of the required item whereever applicable for a period of one year.

2.12 RST, RSP: RST referes to Respons Sheet Technical (RST) and RSP refers to Response Sheet Price (RSP)

SECTION - 3
GENERAL CONDITIONS AND DIRECTIONS FOR THE GUIDANCE OF TENDERER

3.1 Tenders in sealed cover should be submitted as per the 'Schedule of Requirements' as indicated in **Section-6** in this tender and in accordance with instructions to Tenderers i.e. as per general conditions and directions for the guidance of Tenderer are to be submitted to The Director, Indian Maritime University, Visakhapatnam Campus, Visakhapatnam .

3.2 Tender must be submitted in one sealed main cover containing **Cover-1** and **Cover-2** separately and the main cover shall be super scribed as Tender for **"Fabrication, Installation and Commissioning of Circulating Water Channel"**. All the covers shall be addressed to the Director, Indian Maritime University, Visakhapatnam Campus, Visakhapatnam-530005. Name and address of the Tenderer shall also be written on all covers.

3.3 The Tenderer shall clearly write on **Cover - 1** as **"Technical Bid - "Fabrication, Installation and Commissioning of Circulating Water Channel"** and on **Cover - 2** as **"Price Bid-"Fabrication, Installation and Commissioning of Circulating Water Channel"**.

3.4 The contents of Technical bid are specified in **Annexure-1** and contents of Price bid are specified in **Annexure-2**

3.5 On the date of opening of technical bid, only the Main Cover and **Cover-1** (Technical Bid) alone will be opened. **Cover-2** of various Tenderers will be put in a sealed cover in the presence of the Tenderers or their authorized representatives, who are present on the date of opening of Technical bid.

3.6 The price information should only be furnished in Price Bid **(Cover-2)**.

3.7 Tender documents are not transferable.

3.8 The Tenderer shall offer and quote for all items and services indicated in the Tender. Tender responses that do not cover all items shall be summarily rejected.

3.9 The Tenderer should enclose in the technical bid, full details of the items offered with full documentation, descriptive literature/leaflets supplementing the description to meet the specification as indicated in the tender. Models and Brands offered shall be clearly indicated including all accessories. All documentation required is to be in English Language. The Tenderer shall clearly indicate identification numbers for all the equipment and services supplied inclusive of warranty in technical response sheet.

3.10 The Tender should be complete in all respects and if the Tender is incomplete the same may be rejected.

3.11 The Tenderer shall sign and affix stamp on all pages of the tender documents and a person, holding a power of attorney authorizing him to do so, shall make such signature. The letter of authorization is to be enclosed along with the covering letter of the technical and price bids.

3.12 The Tenderer shall offer the items specified in the Tender document, as the sole agency.

3.13 Amendment to Tender Document

3.13.1 At any time prior to the last date for receipt of the bids, IMUV, may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Tenderer, modify the Tender Document by an amendment.

3.13.2 The amendment will be notified by Post or Fax or E-mail to all the Tenderers who have received the Tender Document and will be binding on them. An amendment notice sent by Fax or a signed confirmation copy through Post will follow E-mail.

3.13.3 In order to afford prospective Tenderers, reasonable time in which to take the amendment into account in preparing their bids, IMUV may or at its own discretion, extend the last date for receipt of bids.

3.14 The amount of Earnest Money Deposit (EMD) is **Rs.30000-00 (Rupees Thirty Thousand only)** and shall deposit in the form of Demand Draft drawn on any Scheduled Commercial Bank in favour of Indian Maritime University, Visakhapatnam Campus payable at Visakhapatnam. The Demand Draft should be enclosed to the Technical Bid and should not be sent separately. The Micro and Small Enterprises (MSEs) registered with National Small Industries Corporation (NSIC) are exempted from payment of EMD subject to submission of valid NSIC registration certificate along with the bid.

3.15 The EMD by the unsuccessful Tenderer will be refunded without any interest on placement of Order on the successful Tenderer. The EMD for the successful Tenderer shall be refunded on submission of Security Deposit equivalent to 10% of the order value (final accepted tender value) in the form of Bank Guarantee.

3.16 All the taxes and duties, etc., applicable shall be indicated clearly in price bid. The offers that contain the prices in the technical bid will be invalid and such Tenders will be summarily rejected.

3.17 The prices quoted should be on Indian Rupee basis and should include the base price (inclusive of freight, forwarding, Insurance coverage till acceptance and delivery at IMUV), installation and testing along with applicable taxes and duties. The taxes and duties, if any, shall be indicated clearly in the Tender and the same shall be taken into account to arrive at the total price for delivery at IMUV at Visakhapatnam. IMUV does not bind itself to accept claims for extra payment for items not included in the Tender. Any revision in Statutory levies during the period between placement of Order and successful commissioning of the equipment would be paid by IMUV on receiving documentary evidence for such revisions against the information furnished in the Tender.

3.18 The Tenderer shall abide by the specifications and terms and conditions as mentioned in this tender.

3.19 The successful Tenderer on receipt of the Order shall furnish Security Deposit for 10% of the total value of the order (Final accepted tender value) by way of unconditional irrevocable Bank Guarantee from a Nationalized/Scheduled Bank in the form hereto annexed **(Annexure-3)** within 7(Seven) days from the date of issue of the Order, failing which the Order may be cancelled. Under such event the purchaser shall have the right to procure the items at his discretion. On receipt and acceptance of the Bank Guarantee by IMUV, Earnest Money Deposit submitted with the Tender will be refunded. No interest will be allowed on the Earnest Money Deposit from the date of its receipt until it is refunded. The MSEs registered with NSIC are exempted from payment of Security Deposit up to their monetary limit as specified in their NSIC certificate

3.20 EMD of the Tenderer would be forfeited if -

a) The tenderer is not willing to abide by the terms of conditions after submission of tender.
b) The tenderer does not honour the clarifications provided to IMUV.
c) Withdraws or amends or impairs or derogates from the tender in any respect within the period of validity of its tender before receipt of final acceptance.
d) Fails to submit Bank Guarantee as indicated in this tender within the stipulated time. (This is applicable to tenderer whose tender has been accepted)

3.21 Tenders will be opened on the day and time as indicated in this document. Eligible Tenderers as above should send letter of authorization with attested specimen signatures of their representatives who are deputed to attend at the time of opening of Tenders. Representative without such authorization letters may not be permitted to be present to witness the opening. (Only one person is authorized to attend on behalf of each Tenderer for Bid Opening).

3.22 Offers received through Telegraphic/Fax/E-Mail will be treated as defective, invalid and rejected.

3.23 The Specifications of equipment to be supplied refer to the minimum requirements that the Tenderer is required to meet. Tenders in non-compliance of the minimum specifications would be summarily rejected. The tenderer is required to quote for any accessories etc., which are required to make the Equipment fully operational and functional.

3.24 Only detailed complete offers received prior to closing time and date of the Tenders will be taken as valid.

3.25 Eligibility Criteria for Tenderers

3.25.1 The Tenderer should have minimum of 3 Years of experience in carrying out Fabrication Works.

3.25.2 The Tenderer should submit the copies of the orders in respect of Fabrication Works for the Financial Years 2011-2012, 2012-2013 and 2013-2014 and up to date.

3.25.3 The Tenderer should have a turnover of Rs.20.00 Lakhs for the last three years. The annual reports including audited reports shall be enclosed with the technical bid of the tender.

3.25.4 The Tenderer should submit copies of the Audited Balance Sheet and Profit and Loss Account and Income Tax Returns for the Financial Years 2010-2011, 2011-2012 and 2012-2013.

3.25.5 The Tenderer should submit copy of the PAN Card issued by the Income Tax Department

3.25.6 The Tender should submit copies of registration certificates like VAT/Service Tax.

3.25.7 The Tenderer shall be operating in the field of sales and service of similar items. He shall have an office with sufficient service engineers trained to provide support services and shall carry out all the works at his site. The Tenderer shall also have sufficient spares on hand for providing the uptime as indicated in this tender. (**RST- 02**).

3.26 Methodology: **(RST- 03)**

3.27.1 The Tenderer shall furnish a clear methodology in meeting various requirements of this tender including -

- Fabrication of Circulating Water Channel
- Installation, Testing and Acceptance

3.27 Placement of Order:

3.28.1 After evaluation and finalization of bids received, IMUV would place the Order on the successful Tenderer. The tender will be awarded to the tenderer who is technically qualified and whose value is the lowest.

3.28.2 The date on which the order is placed on the successful tenderer and accepted and accepted by the successful tenderer would be treated as the start date. Prior to issue of the Order, IMUV reserves the right to include/modify/exclude specific terms and conditions of Tender.

3.28.3 The successful tenderer is required to submit a Bank Guarantee within stipulated period as per the pro-forma attached in **Annexure - 3**, for 10% of the Order value (Final accepted value) towards Security Deposit / Performance guarantee. The Bank Guarantee should remain valid for a period of 60 days beyond the date of completion of all obligation of the Supplier, including warranty obligations.

3.28.4 IMUV reserves right to modify the terms and conditions to the Order, so as to meet contingency situations, which can arise from time to time. Such modifications would be discussed and agreed upon by the successful Tenderer taking into consideration the cost, time and other implications. After finalization of modification, the Order may be suitably amended, if required.

3.28.5 IMUV reserves right to change quantities or withdraw some of the items from bill of materials before issuing the order.

3.28 IMUV reserves the right to amend any of the requirements, terms and conditions of this Tender.

3.29 Terms of Payment

3.29.1 25% of the Order Value (Final accepted Tender Value) on submission of proof of procurement of materials.

3.29.2 50% of the Order Value (Final accepted Tender Value) shall be released upon Supply and Installation of the CWC at IMUV.

3.29.3 Balance 25% of the Order Value (Final accepted Tender Value) shall be released upon conducting tests to the satisfaction of IMU.

SECTION - 4
SPECIAL CONDITIONS OF TENDER

4.1 Successful Tenderer shall be responsible for the insurance, safe delivery, installation and commissioning of the goods at IMUV. The successful Tenderer is responsible for all the supplies of goods and services till the acceptance date after which the ownership is transferred to IMUV.

4.2 In the event of the placement of the Order, the consignment shall be booked in the name of Indian Maritime University, Visakhapatnam Campus, Visakhapatnam-530005. Any demurrage charges that may become payable on account of the Successful Tenderers failure to consign the materials duly, shall be to the successful Tenderer Account.

4.3 The prices offered for the goods and services offered, except for any statutory duties and levies, shall be firm and not subject to any variation at any stage till the completion of the contract in all respects. This must be clearly stated in the covering letter for Technical and price bids.

4.4 The time of delivery is important and must be clearly stated in the Tender and strictly adhered to in the event of a tender being awarded. The delivery time would commence from the start date.

4.5 In case of delay in the supply, IMUV shall issue to the successful Tenderer; a memo in writing, pointing out the delay in the supply and calling upon the successful Tenderer to explain the cause for the delay within 3 days of the receipt of the memo.

4.6 If IMUV is not satisfied with the explanation offered, the successful Tenderers security deposit may be forfeited and or IMUV may withhold payment of pending bills in whole or in part. If the security deposit or any part thereof is forfeited by an order of IMUV and such order becomes final, the successful Tenderer shall make good the security deposit or part of such deposit so forfeited within a fortnight thereafter.

4.7 If the successful tenderer fails to execute the Supply/Works in all respects within the period specified or within such extended period as may be allowed, the successful tenderer shall pay a sum equivalent to 1% of the value of the total tender price per week (Seven days) or part thereof subject to a maximum limit of 10% of the value of the each of the item tender as liquidated and ascertained damages.

4.8 The supply shall be subject to inspection by IMUV and IMUV's decision as to the acceptance or rejection of any goods as not conforming to specification, shall be final and binding on the successful tenderer. Such of the goods which

are rejected shall be removed by the successful tenderer their own expense and replaced by fresh ones within a reasonable time.

4.9 Bank guarantee will be returned only after successful completion of warranty period of one year from the date of acceptance of the equipment.

4.10 It must be clearly understood that the prices quoted in the tender are to include everything required to be done as per the specification and the conditions of tender and supply for the proper execution of supply/works although special mention thereof may have been omitted in the specification. The specifications indicated are for maximum and shall include accessories etc required to make the system fully operational.

4.11 The purchaser has the right to change/ withdraw the quantities of any items in the tender prior to signing of contract. The successful tenderer shall agree to supply the additional quantities for the same price and comprehensive warranty in the event the purchaser places a repeat order for some of the items within next six months.

SECTION - 5
OTHER GENERAL CONDITIONS

5.1 The Goods/Services to be supplied by the tenderer shall be of the quality or sort specified and in every respect equal and answerable to the specifications sent with the tender and shall be subject to the approval of the IMUV.

5.2 The Goods/Services are to be delivered at specified place in IMUV premises in Visakhapatnam, free of delivery charges as per specified time.

5.3 Delivery of Goods/Services will not be considered complete until such goods or materials have been inspected and passed at the place specified for delivery by IMUV. The detailed list of components (Equipment and Service) supplied by the tenderer and Bill of Materials shall be provided well in advance for facilitating inspection by IMUV.

5.4 Rejected Goods/Services shall be removed by and at the expenses of the tenderer within seven days after notice. If not so taken away, the IMUV may seize the goods or materials to be removed and charge the tenderer with all expenses incurred in such removal.

5.5 The tender or any part share or interest in it shall not be transferred directly or indirectly to any person whomsoever without the written consent of IMUV.

5.6 It shall be lawful for IMUV, without giving any notice to the contractor, to purchase in the open market any goods or materials covered by the tender and if such goods or materials are not available to purchase suitable substitute, as to which, the decision of the IMUV shall be final and binding on the Contractor, in the event of the Contractor;

(a) Having delivered goods or materials not of the contracted quality.

(b) Having failed to supply goods or materials within the time specified.

(c) Having refused or being unable to supply goods or materials covered by tender either in whole or in part.

5.7 In the event of the breach of any of the provisions of contract by the contractor, IMUV shall have the right to terminate the tender summarily.

5.8 In the event of IMUV terminating the contract for breach by the contractor of any of the provisions thereof, the contractor shall be liable for any loss suffered by IMUV up to the time of the termination of the contract and for any further loss which the IMUV may suffer during the remainder of the period originally covered by the contract.

5.9 In the event of the death, insanity or insolvency of the contractor, IMUV shall have the right to terminate the contract summarily and to purchase in the open market any Goods/ Services covered by the contract. In this case, the contractor shall not be liable for any excess in the price paid, for any such purchases over the tender price. In case of consortium the lead partner should nominate any other consortium member to bear the liabilities, and in case of individual organization the responsibility shall be taken up by the organization itself or by the legal successor.

5.10 With every delivery of goods or materials under this contract, invoices in triplicate shall be sent by the contractor to the IMUV receiving officer who will retain the original and duplicate copy with him, and return the triplicate copy to the contractor with the actual quantities weights and/or number duly acknowledged thereon after the goods or materials have been inspected and passed as per clause therein before mentioned.

5.11 Any notice to the tenderer shall deemed to be sufficiently served, if given or left in writing at his usual or latest known place of abode or business.

5.12 Upon the complete fulfilment of the contract by the contractor to the satisfaction of IMUV the amount deposited by the contractor, as security for the due fulfilment of the contract will be returned to him less the amount if any due by the contractor, not later than a month.

5.13 If however, the security is made up by a Bank Guarantee executed by a Bank, on behalf of the contractor it will be discharged and returned to the Bank, after collecting amount if any due by the contractor, not later than a month.

5.14 In these conditions unless there is something in the subject or context inconsistent there with words importing the singular shall include the plural and vice-versa words importing the masculine gender shall include the feminine and the words importing persons shall include bodies corporate.

SECTION - 6
SCHEDULE OF MINIMUVM REQUIREMENTS

6.1 Scope of the Tender:

6.1.1 This specification covers the requirements regarding procurement of material, fabrication, assembly, installation and commissioning of Circulating Water Channel (CWC).

6.1.2 The vendor shall be responsible for supplying all equipment/accessories and properly installing them as described in this specification. Other details and requirements which are not covered under this specification, but may be necessary to complete the Circulating Water Channel and/or to fulfill the operation/performance requirement shall be provided by the vendor, who will be responsible for the construction of the complete appliance to the full satisfaction of the owner.

6.2 General

6.2.1 The CWC including all accessories shall be fabricated, tested etc. as per relevant Indian, International Standards, and these specifications wherever applicable and as per sound engineering practice.

6.2.2 All the equipment and accessories shall be fixed on the appliance in a compact and neat manner and shall be so placed that each part is easily and readily accessible for use and maintenance.

6.3 Circulating Water Channel

6.3.1 Description of Circulating Water Channel

a) IMU Visakhapatnam Campus has put up a study proposal for conducting studies on flow around ships in a Hydrodynamic test facility to the Ministry of Shipping. The basic purpose of this project is to setup an experimental facility comprising of a Circulating Water Channel (CWC) and associated instrumentation and data recording devices.

b) Referring to Fig1, the working section, 1, is 2.25m long x 0.5m wide x 0.5m deep. The sides and bottom of the working section are of toughened glass plate. The glass plates are supported by steel frames of spacing such that it suits the sizes of toughened glass plates available.

c) There are steel bars running above the side glass plates for protection. The steel bars have holes at suitable intervals for fitting instruments over the working section.

d) Between glass plates and the supporting steel structure, there is a layer of a suitable polymer compound to prevent direct contact between glass and steel and also to make the joints watertight.

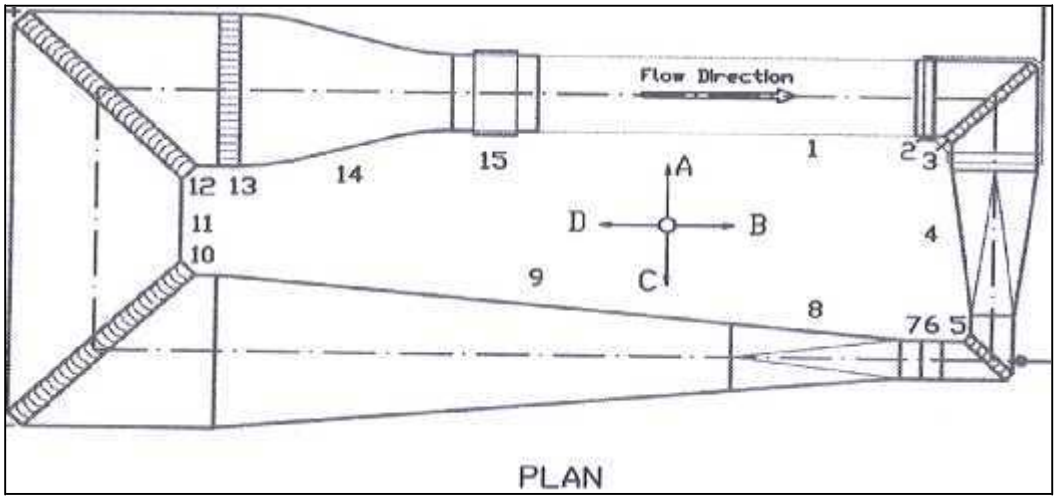


Fig 1 Layout of CWC Facility – Plan view (concept)

e) Downstream of the working section is the first bend, 3. This is in three parts bolted together: an entrance, the guide vanes and the exit. The guide vanes may be made by bending steel plates through a 90 degree arc. In the entrance, there is an opening in the bottom leading to the sand trap, 2. This opening is normally kept closed and opened only when sedimentation studies need to be carried out. There is a corresponding opening in the exit section of the first bend for the flow from the sand trap to return to the main circuit.

f) The sand water mixture flows down from the first bend entrance section into the sand trap and is made to undergo several up and down movements past vertical plates in the sand trap before flowing up in to the first bend exit section.

g) The first bend is followed by first transition, 4, to change the flow cross section from rectangular at the working section to circular at the impeller. This transition also serves to lower the level of the impeller below the bottom of the working section so that the impeller is completely submerged.

h) The first transition leads to the second bend,5. This is in three parts: an entrance section, a guide vane section to turn the flow through 90 degrees and an exit section. The entrance section has a water lubricated bearing and a stuffing box for the impeller shaft.

i) The impeller section, 6, houses the impeller mounted on the impeller shaft. The shaft is supported on the bearing with three struts connected to the inside of the impeller section.

j) Immediately following the impeller section is an adjustment piece, 7, to ensure length of the working section side of the CWC is equal to length on the impeller side.

k) The second transition, 8, and the diffuser section,9, changes the cross section of the flow from circular at the impeller to rectangular, gradually raising the top the cross-section to the level of the top of the working section.

l) The third bend, 10, consists of an entrance section and a guide vane section to turn the flow through 90 degrees efficiently. The third bend is followed by the transverse section, 11, and the fourth bend, 12. The fourth bend has a guide vane section and exit section.

m) The third bend, the transverse bend and the fourth bend have the largest cross section and the bottom of these sections is the lowest part of the channel above the floor level.

n) A honeycomb section, 13, comes after the fourth bend followed by a contraction section, 14.

o) Between contraction and the working section, there is an accessories section, 15. It consists of the trough with increased breadth and depth to accommodate the accessories. Portions of this trough that are not in use for fitting accessories must be made flush with the working section by suitable portable plates.

p) The CWC is completely closed on top except for the working section, first bend and accessories section which have portable covers.

6.3.2 Detailed drawings of Circulating Water Channel

The detailed drawings of the CWC can be found in **Annexure 4.** In case of requirement soft copy of AutoCAD drawings will be provided on request to the successful Tenderer

Part 1: Working section	Part 11:Second Transition
Part 2: First Bend - Entrance Section	Part 12:Diffuser Section
Part 3: Guide Vanes Section	Part 13:Third Bend - Entrance Section
Part 4: Sand Trap	Part 14:Third Bend - Guide Vanes

Part 5: First Bend - Exit Section	Part 15: Transverse Section
Part 6: First Transition	Part 16: Fourth Bend - Guide Vanes
Part 7: Second Bend - Entrance Section	Part 17: Fourth Bend- Exit Section
Part 8: Second Bend - Exit Section	Part 18: Honey comb Section
Part 9: Extension	Part 19: Contraction Section
Part 10:Extension	Part 20: Accessories Section

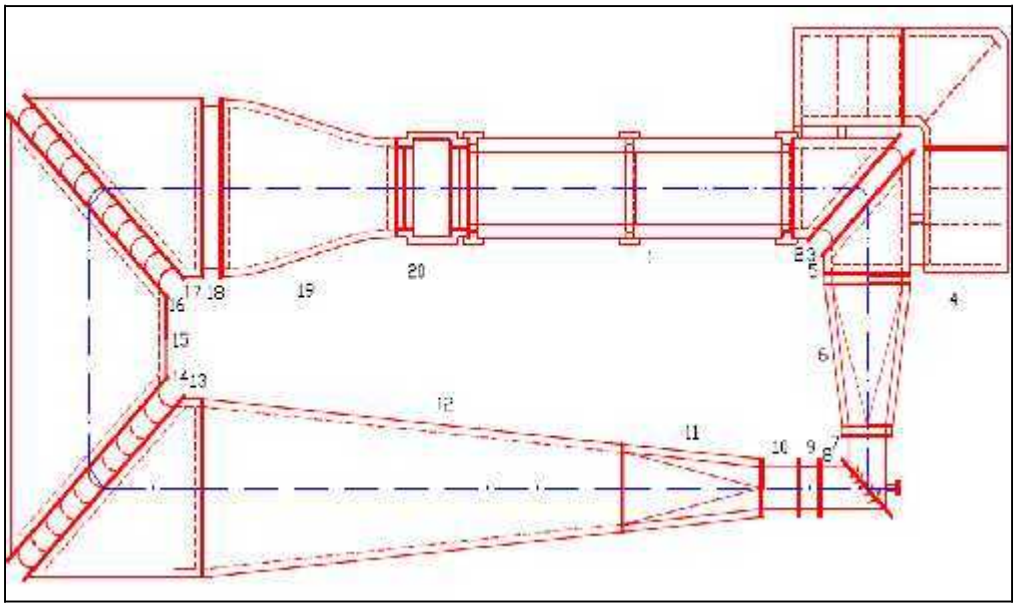


Fig 2 Layout of CWC Facility – Plan view (Detailed)

6.3.3 Other specifications

a) All plates are 6mm thick unless and otherwise indicated
b) On sizes of material, tolerances of (+/-) 3mm are acceptable.
c) Suitable gaskets and sealing materials are required for water-tightness.

6.4. Bill of Materials

Sl. No.	Description:	Quantity
1	Steel	1
2	Parallel flange channel section	9
3	Equal leg angles	4
4	Built up Tee section	4
5	Paint	1
6	Toughened glass	6
7	Sealing materials, gaskets	Wherever applicable

6.5 Technical Specifications

6.5.1 Steel

- Material for Steel - E250 – A of 6mm thickness in accordance with IS 2062-2011
- Dimensions for the rolled steel strip shall be in accordance with IS: 1730-1989
- Total amount of steel weighing is 3.5 tonnes
- Tolerances on width of strip shall be in accordance with IS 1852:1985

6.5.2 Parallel flange channel section

- The dimensions of parallel flange section shall be in accordance with IS: 808-1989 MCP 75
- Length 1294mm - 4Nos,
- Length 1258mm - 2Nos
- Length 540mm - 3Nos
- Dimensional tolerances of the section shall conform to appropriate value stipulated in IS 1852:1985

6.5.3 Equal leg angles section

- The dimensions of equal leg angles section shall be in accordance with IS: 808-1989 designated by ∟50 x 50 x 6
- Length 1085mm - 4Nos
- Dimensional tolerances of the section shall conform to appropriate value stipulated in IS 1852:1985

6.5.4 Built up Tee section

- The dimensions of built up tee section shall be similar with IS 1173-1978
- Section dimensions : 75 mm x 75mm x 6 mm
- Length 1085mm - 4Nos
- Dimensional tolerances of the section shall conform to appropriate value stipulated in IS 1852:1985

6.5.5 Paint schemes

- Estimated Area - about 10 square meters
- Code of practise for protection from atmospheric corrosion shall be in accordance with IS 8629-1 to 3 (1977)
- Pre-treatment to structure prior to application of protective schemes shall be in accordance with IS 8629-1 to 3 (1977)

- Both the internal & external surfaces of the Circulating Water Channel must be coated
- Recommended protective schemes
  Inner surfaces : 80DFT Zinc Rich, 60 DFT Chlorinated Rubber
  Outer surfaces: 50DFT Zinc Rich, 50 DFT Enamel

6.5.6 Toughened glass

- Dimensions : 1100mm x 500mm ; 6 mm thick
- Dimensional tolerances shall conform to any international standard

NOTE

All works shall be carried out by the vendor at his site. Raw materials, consumables, manpower, machineries pertaining to general fabrication, transportation for supply of manufactured material, erection of fabrication shall be arranged by the contractor at his own cost. The rates quoted shall be inclusive of the same.

Electricity, Water and lighting during final installation at IMUV shall be provided by IMUV

Steel: The contractor shall produce invoice of procurement along with MTC. The contractor shall be required to make necessary arrangement at his own cost for unloading and storage of steel in the open.

6.6 Comprehensive Warranty

6.6.1 Warranty support services: For items other than steel used in the fabrication for CWC, a comprehensive warranty for the supplied equipment shall be provided from the date of final acceptance of the equipment by IMUV. The contractor will be notified of any defect or claim arising under this warranty and the warranty support shall be provided at site.

6.6.2 If the contractor having been notified fails to remedy the defect within week days, IMUV may proceed to take such remedial action as may be necessary at the contractor's expense. The period that the equipment is out of commission as a result of contractor's failure to remedy the defects notified shall result in extension of the warranty period correspondingly and imposition of penalty.

6.7. Delivery and Installation

6.7.1 The tenderer is required to deliver and install the complete equipment within eight weeks from the date of placement of order.

6.7.2 The successful tenderer shall organize movement of supplied goods to respective locations within IMUV for installation.

6.7.3 Wherever installation is specified, it includes configuring the equipment and bringing it into working condition.

6.8 User Acceptance Testing

6.8.1 Inspection and Tests: The authorized representative of IMUV shall have the right to inspect the equipment supplied under this tender and to test the equipment to confirm its conformity to the specifications of the tender. The test shall be conducted on the premises of the contractor at the point of delivery and at the final destination. When conducted on the premises of the contractor, all reasonable facilities and assistance shall be furnished to the inspector at no extra charge. Should any tested equipment fail to confirm to the specifications, IMUV may reject them and the contractor shall make suitable alterations with prior approval of IMUV to meet the requirements of the specifications without any effect on cost or delivery Schedules. IMUV's right to inspect, test and wherever necessary, reject the equipment shall be in no way limited or waived by reason of the equipment having been tested and passed by IMUV or its representative prior to shipment of the equipment.

6.8.2 The acceptance tests for supplied & installed goods, shall be carried out at IMUV by the contractor with the participation of concerned personnel from IMUV.

6.8.3 In case of the acceptance tests are not concluded to the satisfaction of IMUV the contractor shall repair or replace, at the contractor's cost, the whole or any part of the equipment as may be necessary for conclusion of the acceptance tests to the satisfaction of IMUV within the reasonable period agreed by IMUV. Demonstration of performance of the equipment should be repeated in the acceptance test.

6.8.4 IMUV reserves the right to accept the delivered items with deviations, provided the contractor agrees to rectify the deviations within an acceptable time period. Regarding the acceptance date, decision of IMUV would be final.

6.8.5 The contractor shall provide necessary consumables till the completion of acceptance testing.

6.8.6 Other acceptance tests

6.8.6.1 Mild Steel

- Material for Steel - E250 – A of 6mm thickness in accordance with IS 2062-2011

- Review of mill test certificates and co-relation of raw materials before start of fabrication.
- Visual and dimensional check of all parts before and after assembly.

6.8.6.2 Channel piping and welding

- Procedures for inspection of welds before commencing fabrication, during fabrication and after welding shall be in accordance with IS 822-1970
- DP test of root of butt welds and final run.
- Packing materials, gaskets, etc. fitted at the joints are tested for water tightness
- The entire assembly is tested to check transmission of water at full propeller shaft torque, while allowing for disassembly.

NOTE: Since Circulating Water Channel requires machinery & instruments to be installed, hence vendors are required to provide their services whenever required and till complete installation of Circulating Water Channel in all respects.

6.8.6.3 Painting

- Both the internal & external surfaces of the Circulating Water Channel must be coated.
- Both surfaces are coated with zinc rich primer double coat ;and finishing with double coat chlorinated rubber paint to give a dry film thickness of upto 200 microns.
- Thinner & primer should be compatible with paints
- All painting materials including primers and thinners brought to the site by the Contractor for the application shall be directly procured by approved manufacturers as per specification and shall be accompanied by MTC.
- Calibrated inspection instrument shall be provided by the contractor at site.
- The contractor shall arrange expert technical support at site by paint manufacturer who will at cross verify independently regarding surface preparation, DFT and quality and will provide a report to IMU.

6.9 Documentation

6.9.1 The successful tenderer shall provide IMUV with necessary documents including the following:

a) Test Certificates, Licenses, MTC if any
b) Acceptance test results and acceptance status

6.9.2 Hardcopy of the above shall be handed over to nominated personnel of IMUV. Soft copy of the documents shall also be provided where applicable. Handing over of documents to IMUV by contractor is a pre-requisite for acceptance.

6.10 Acceptance/Completion

6.10.1 The activity shall deem to have been completed with the completion of fabrication, Installation and commissioning of the CWC.

6.11.2 Upon completion of Supply/Work and after successful completion of other prerequisites like acceptance testing, etc., as prescribed in this document, IMUV shall receive a written undertaking from the contractor that the works have been completed and accordingly a certificate of completion would be issued in respect of the supply/works. The warranty period for the supplied system would commence from the date of Acceptance/Completion.

ANNEXURE - 1

CONTENTS OF TECHNICAL BID

1. Covering letter containing

   a) Tenderer Name & Address
   b) Letter of authorisation to sign the tender document on behalf of the Firm
   c) Bid validity
   d) Confirmation to all clauses of the tender
   e) Adherence to Prices quoted throughout the tender.

2. EMD in the form of Demand Draft

3. Eligibility Criteria

   a) Bidders Particulars (**RST-01**)
   b) Methodology (**RST-02**)
   c) Copies of the Audited Balance Sheet and Profit and Loss Account and Income Tax Returns for the years 2010-2011, 2011-2012 and 2012-2013
   d) Copies of the orders in respect of Fabrication Works for the years 2011-2012, 2012-2013 and 2013-2014 and up to date
   e) Signed copy of the Tender Document

4. Compliance Statement to specifications (**RST-03**)

5. Specifications, Brochures, Model, Leaflets etc., of all the equipment supplied along with OEM's Compliance

6. Items quoted by the Tenderer (**RST-04**)

ANNEXURE - 2

CONTENTS OF PRICE BID

1. Covering Letter containing:

    a. Tenderer Name & Address
    b. Bid validity
    c. Letter of authorisation to sign the tender document on behalf of the Firm/Agency/Company
    d. Adherence to Prices quoted throughout the tender

2. Price Bid (**RSP-01**)

ANNEXURE - 3

FORM OF BANK GUARANTEE

Bank Guarantee No: _____ Date _____
Valid up to _____

To

Indian Maritime University
Visakhapatnam Campus
Gandhigram
Visakhapatnam - 530 005

Sir,

In consideration of Indian Maritime University, Visakhapatnam Campus, Gandhigram Visakhapatnam-53005 having its Registered Office at East Coast Road, Uthandi, Chennai-600119(hereinafter referred to as "IMUV") which expression shall mean and include its successors and assignees and having place an Order No._____ dated_____ for _____ (hereinafter called "The Contract") which expression shall include all the amendments thereto with _____ having its Registered Office at _____(hereinafter referred to as "The Contractor"), which expression shall unless repugnant to the context or meaning thereof, shall include all its successors, administrators, executors and assignees and IMUV, having agreed that The Contractor shall furnish the IMUV a Bank Guarantee for `_____(Rupees _____ _____ only) as per the terms of Tender document No_____ dated _____ and Order dated _____.

We, _____ registered under the laws of India having its registered / head office at _____ , (hereinafter referred to as the Bank) which expression shall unless repugnant to the context of meaning thereof, include all its successors, administrators, executors and permitted assignees do hereby guarantee and undertake to pay immediately on first demand in writing and any/all monies to the extent of Rs._____ _____(Rupees _____ only) without any demur, reservation, contest or protest and/or without any reference to the Contractor. Any such demand made by the IMUV on the Bank by serving return notice shall be conclusive and binding, without any proof, on the bank as regards the amount due and payable, notwithstanding any dispute pending before any Court, Tribunal, Arbitrators or any other Authority and/or any other matter or things whatsoever, as liability under these presents being absolute and unequivocal. We agree that Guarantee herein contained

shall be irrevocable and shall continue to been enforceable until it is discharged by IMUV in writing. This guarantee shall not be determined, discharged or affected by liquidation, winding up, dissolution or insolvency of the Contractor and shall remain valid, binding and operating against the Bank.

The Bank also agrees that IMUV of its option shall be entitled to enforce this Guarantee against the bank as a principal debtor, in the first instance, without proceeding against the Contractor and notwithstanding any security or other guarantee that IMUV may have in relation to the Contractor's liabilities.

The Bank, further agrees that IMUV shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extent time of performance by the said Contractor from time to time or to postpone for any time or from time to time exercise of any of the powers vested in IMUV against the said the Contractor and forebear or enforce any of the terms and conditions relating to the said contract and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor or for any forbearance, act or omission on the part of IMUV or any indulgence by IMUV to the said Contractor or any such matter or thing whatsoever which under the laws relating to the sureties would, but for this provision have effect of so relieving us.

The Bank further agrees that the guarantee herein contained shall remain in full force until _____ and all dues of IMUV under or by virtue of this contract have been fully paid and its claim satisfied or discharged or till IMUV discharges the guarantee in writing, whichever is earlier.

This guarantee shall not be discharged by any change in our constitution, in the constitution of IMUV of that of the Contractor.

The Bank confirms that this Guarantee has been issued with observance of the appropriate laws of the country of issue.

The Bank also agrees that this Guarantee shall be governed and construed in accordance with Indian Laws and subject to the exclusive jurisdiction of Indian Court of the place from where tenders have been invited.

We further agree that as between us and IMUV for the purpose of this Guarantee any notice given to us by IMUV that the money is payable by the Contractor and any amount claimed in such notice by IMUV shall be conclusive and binding on us notwithstanding any difference between IMUV and the Contractor or any dispute pending before any Court, Tribunal Arbitrator or any other authority. We further agree that this Guarantee shall not be affected by any change in our constitution or that of Contractor. We also undertake not to revoke this Guarantee during its currency.

Notwithstanding anything contained herein above, our liability under this Guarantee is limited to Rs._____/- (Rupees _____ only) and Guarantee shall remain in force until _____.

We must receive any claim under this Guarantee before the expiry of this Bank Guarantee. If we have received no such claim by the said date, the rights of IMUV under this Guarantee will cease. However, if such a claim has been received by us within the said date, all the IMUV's right under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

In witness whereof, the Bank through its authorized officer has set its hand and stamp on this _____ Day of _____ 2014 at _____

Date: Authorized Signatory of the bank

(With Bank Seal)

Place:

Witness No.1

Witness No.2

RST- 01: RESPONSE SHEET FOR TECHNICAL BID

BID PARTICULARS FOR TENDER No:

1. Name of the Bidder _____

2. Address of the Bidder _____

_____

_____

3. Bidder's proposal number and date _____

Signature of the Tenderer with Seal

Date :

Place :

RST- 02: **METHODOLOGY**

Tender for Fabrication, Installation and Commissioning of Circulating Water Channel		
Sl. No	Item Description	Methodology Adopted along with time plan
1	Fabrication, Installation and Commissioning of Circulating Water Channel	
2	Painting	
3	Test and inspection before and after assembly	

Signature of the Tenderer with Seal

Date :

Place :

RST-03: **COMPLIANCE STATEMENT**

Sl. No	Item Description	Compliance to Specification Yes/No
1	**Steel**	
	Material : E250-Grade A (IS 2062-2011)	
	Rolled steel strip of 6mm thick Dimensions in accordance with IS 1730-1989	
	Weight : 3.5 tonnes	
2	**Parallel flange channel section**	
	In accordance with IS: 808-1989; MCP 75	
	Length 1294mm - 4Nos	
	Length 1258mm - 2Nos	
	Length 540mm - 3Nos	
3	**Equal leg angles section**	
	In accordance with IS: 808-1989; ∟ 50 x 50 x 6	
	Length 1085mm - 4Nos	
4	**Built up Tee section**	
	In accordance with IS: 1173-1978; 75mm x 75mm x 6mm	
	Length 1085mm - 4Nos	
5	**Pre-treatment as per IS 8629**	
	Estimated Area- about 10 square meters	
	Inner surfaces : 80DFT Zinc Rich, 60 DFT Chlorinated Rubber	
	Outer surfaces: 50DFT Zinc Rich, 50 DFT Enamel	
6	**Toughened glass**	
	Dimensions : 1100mm x 500mm ; 6 mm thick	
	In accordance with any international standard	
7	**Weld tests**	
	Inspection in accordance with IS 822-1970	
8	**Paint tests**	
	Inspection in accordance with IS 8629-1977	

Signature of the Tenderer with Seal

Date :

Place :

RST-04: **ITEMS QUOTED BY THE TENDERER (Item wise Details)**

Sl. No	Item Description	Specifications	Qty quoted for
1	Fabrication, Installation and Commissioning of Circulating Water Channel	As per Scope defined in the Tender Documents	

Signature of the Tenderer with Seal

Date :

Place :

RSP-01 **RESPONSE SHEET FOR PRICE BID**

Sl. No	Item Description	Qty	Rate per unit	All applicable Taxes and Duties in %	Amount of all applicable taxes	Total Amount inclusive of all taxes and duties
1	Steel					
2	Paints					
3	Toughened glass					
4	Packing material, gaskets, sealing materials, bolts,etc.					
5	Fabrication, installation and commissioning of Circulating Water Channel					
Total Amount in Words						

Note: The taxes and duties applicable should be clearly specified by the Tenderer in the Price Bid and charges such as Insurance, Freight and forwarding shall be borne by the Tenderer.

Signature of the Tenderer with Seal

Date :

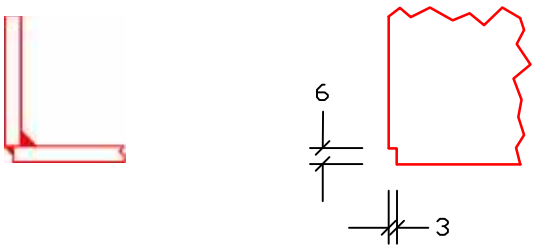
Place :

IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
GENERAL NOTES

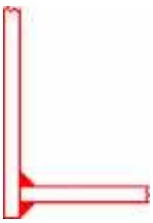
1. ALL PLATES ARE 6 MM THICK, UNLESS INDICATED OTHERWISE.

2. BOLT HOLES IN FLANGES ARE NOT SHOWN. 6 MM BOLTS AT 50 MM SPACING ARE TO BE PROVIDED.

3. PLATES ARE TO BE JOINED TO FLANGES AS SHOWN BELOW. SIDE PLATES ARE TO BE



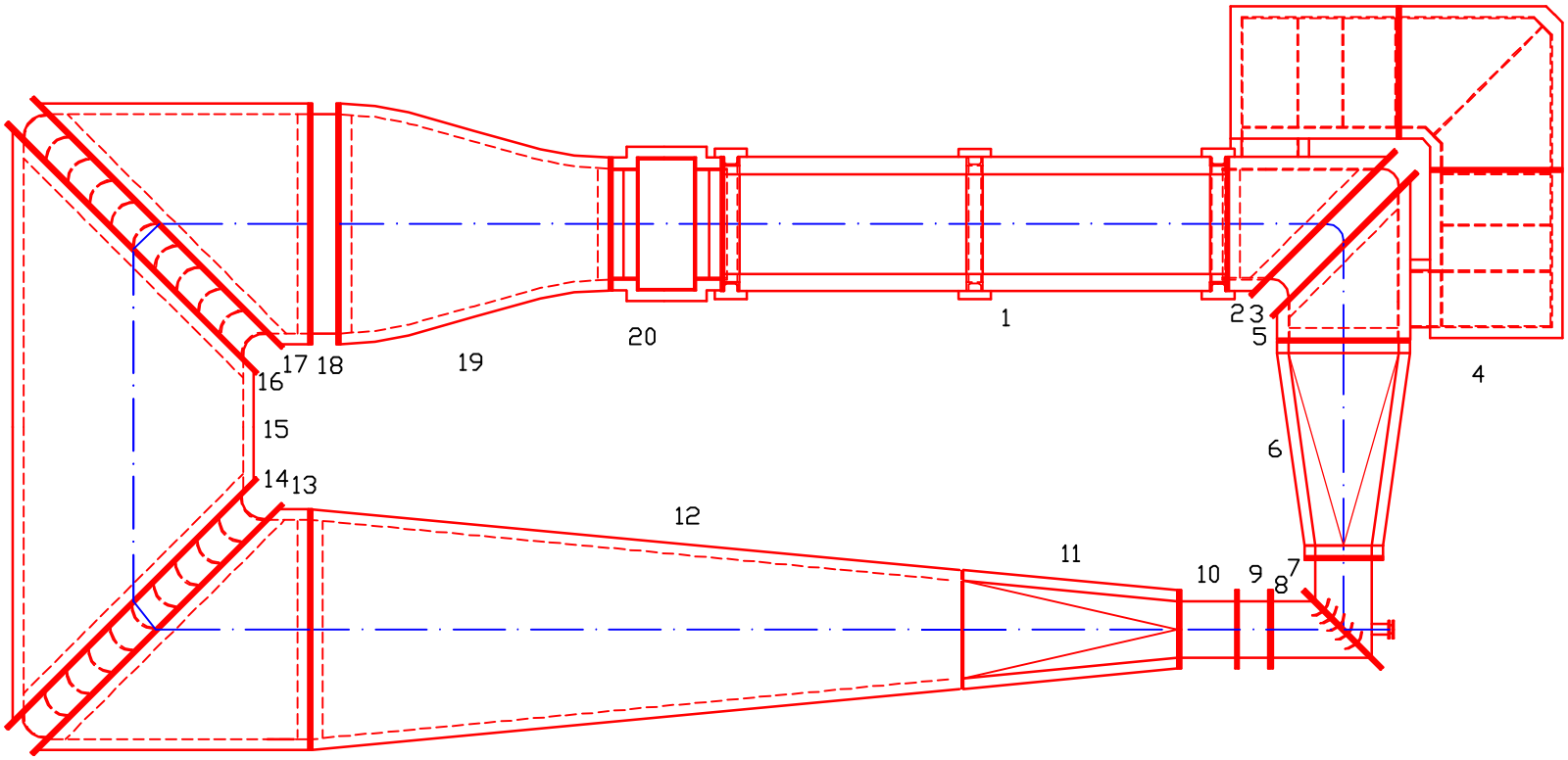
4. SIDE PLATES AND BOTTOM PLATES ARE TO BE JOINED AS FOLLOWS.



5. COVER PLATES NEED NOT BE FITTED WATERTIGHT, EXCEPT FOR PARTS 4, 6 and 7 WHERE THE INNER FLANGES MUST BE FITTED WITH STUDS.

6. DIMENSIONS ARE GIVEN TO THE NEAREST MM< BUT TOLERANCES OF ±3 MM ARE GENERALLY ACCEPTABLE.

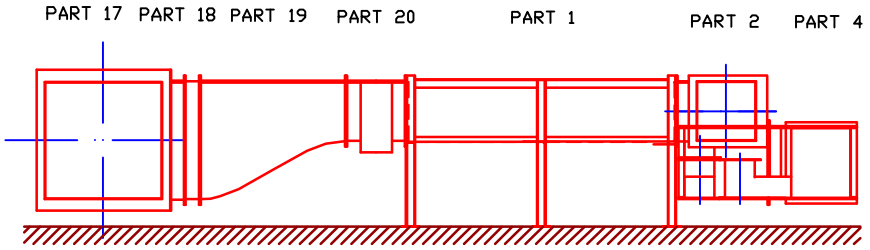
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
OVERALL PLAN

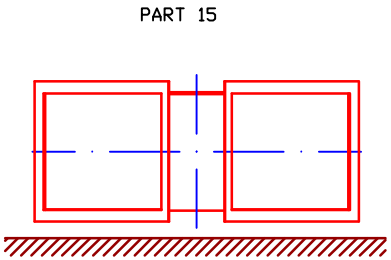


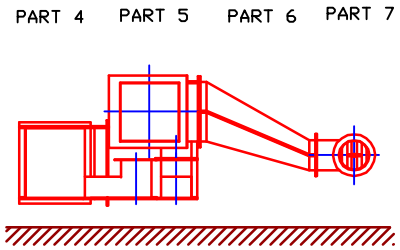
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL

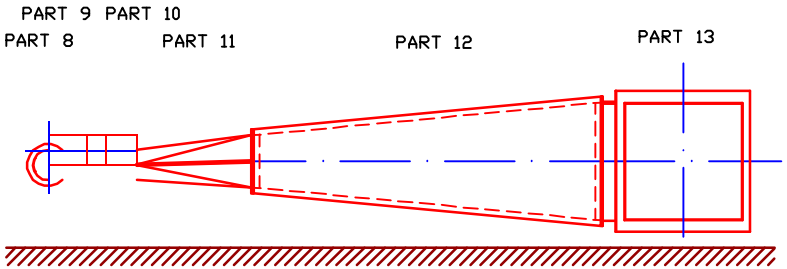
ELEVATION

(FROM CENTRE LOOKING OUT)





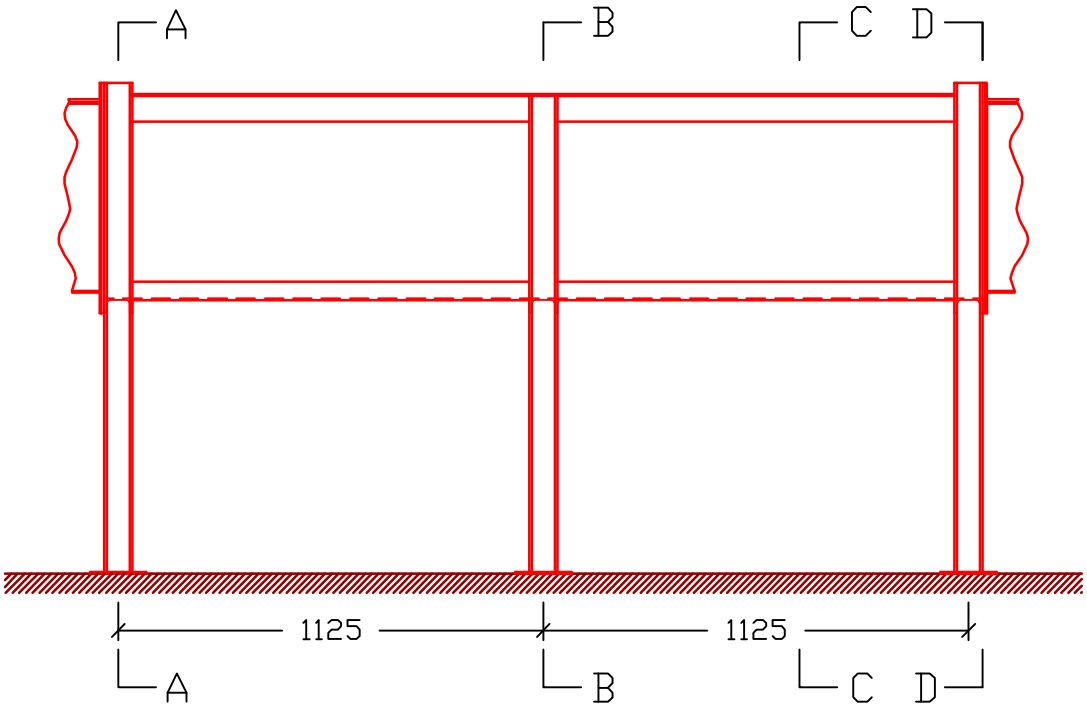




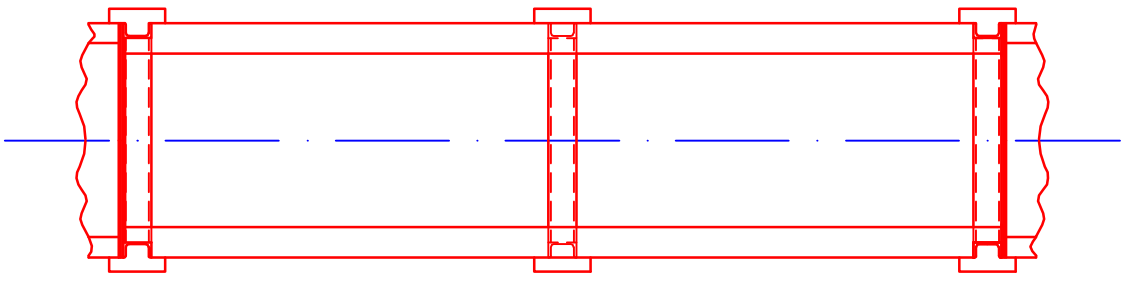
IMU(V) CIRCULATING WATER CHANNEL

1:4 SCALE MODEL

PART 1



ELEVATION



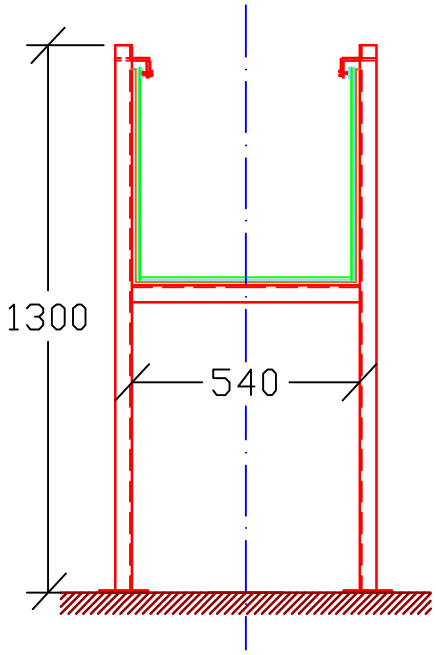
PLAN

GLASS PLATES NOT SHOWN

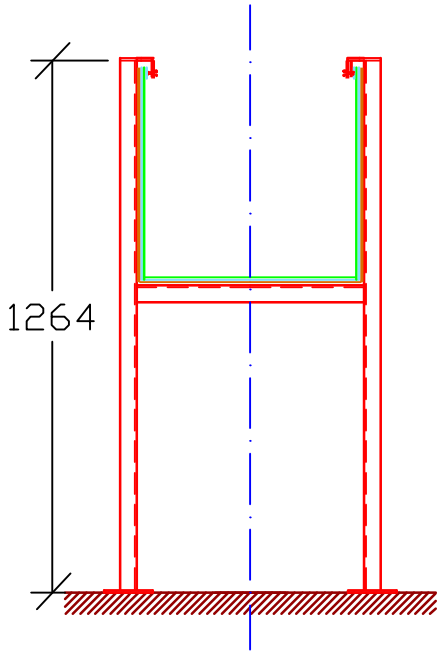
IMU(V) CIRCULATING WATER CHANNEL

1:4 SCALE MODEL

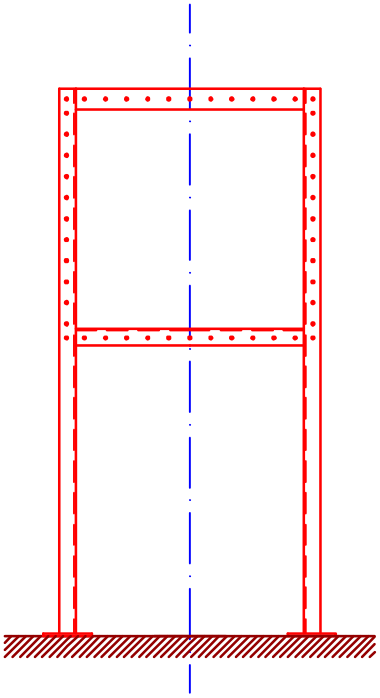
PART 1 : SECTIONS



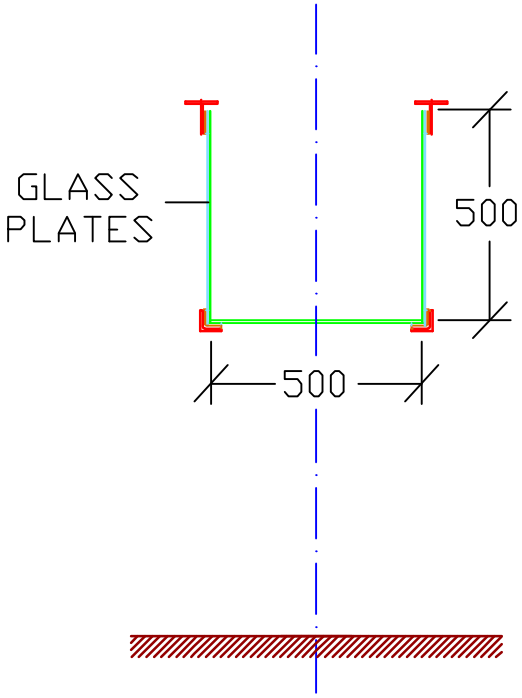
SECTION A-A



SECTION B-B



SECTION D-D

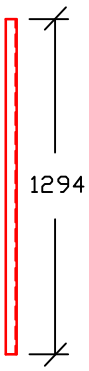


SECTION C-C

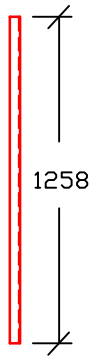
IMU(V) CIRCULATING WATER CHANNEL

1:4 SCALE MODEL

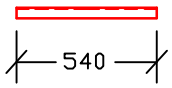
PART 1 : COMPONENTS



END PILLAR (FOUR)



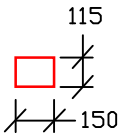
MIDDLE PILLAR (TWO)



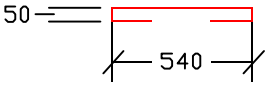
BEAM (THREE)

IS CHANNEL SECTION MCP75 (Parallel sides)

END PILLARS AND BEAMS TO HAVE BOLT HOLES AND ACT AS FLANGES FOR ADJOINING PARTS

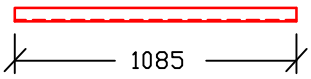


FOOT PLATE (SIX)



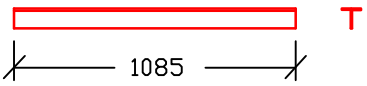
UPPER FLANGE (TWO)

BOLT HOLES TO BE PROVIDED



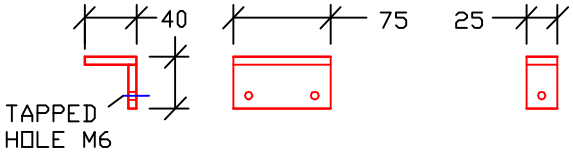
BOTTOM LONGITUDINAL (FOUR)

IS EQUAL ANGLE 50X50X6



UPPER LONGITUDINAL (FOUR)

BULIT-UP TEE SECTION 75X75X6



SECTION

MIDDLE (TWO)

ENDS (FOUR)

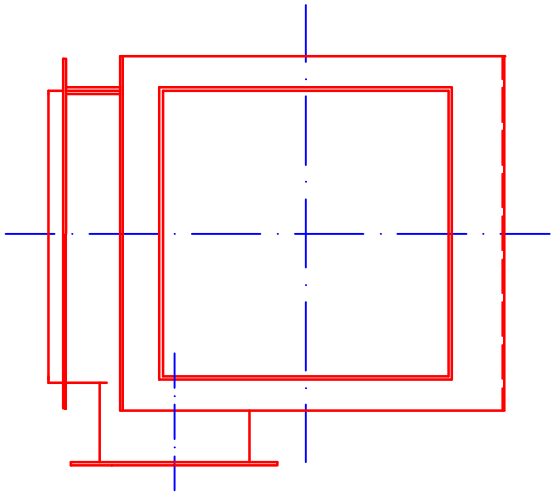
GLASS PLATE RETAINING ARRANGEMENT

(ENLARGED SCALE)

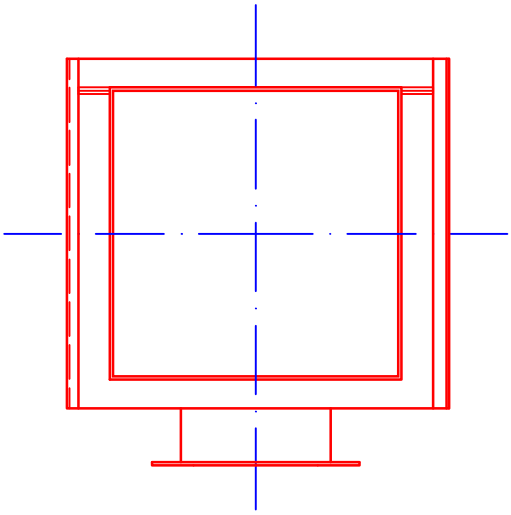
IMU(V) CIRCULATING WATER CHANNEL

1 : 4 SCALE MODEL

PART 2

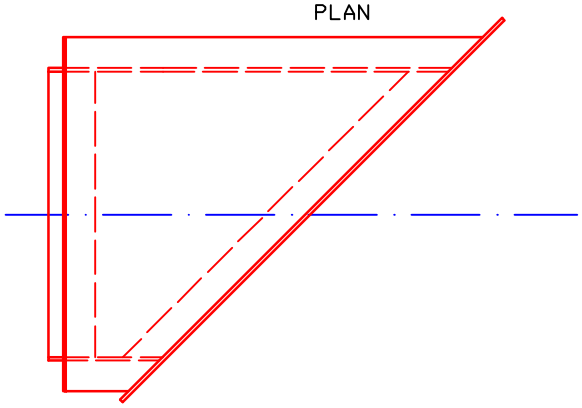


ELEVATION



END VIEW

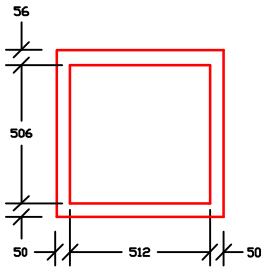
PLAN



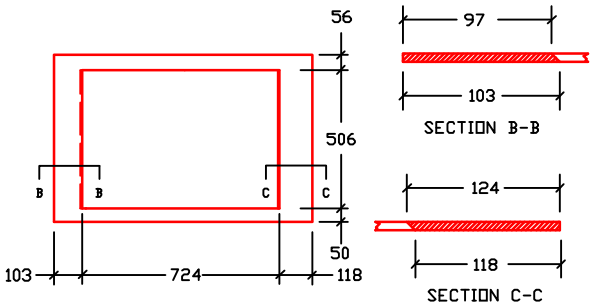
IMU(V) CIRCULATING WATER CHANNEL

1:4 SCALE MODEL

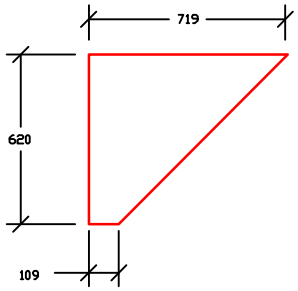
PART 2 : COMPONENTS



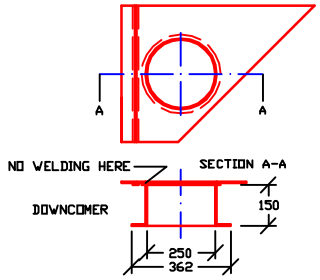
INLET FLANGE



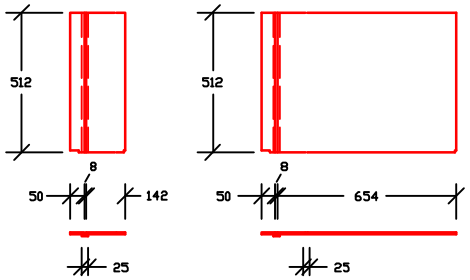
OUTLET FLANGE



TOP PLATE

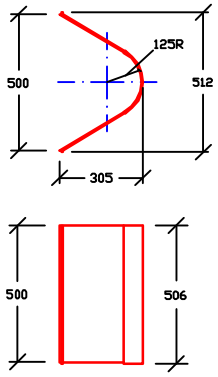


BOTTOM PLATE ASSEMBLY

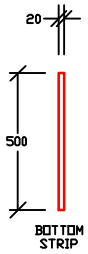


INNER SIDE PLATE

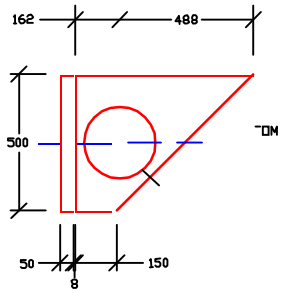
OUTER SIDE PLATE

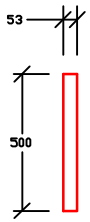


FLOW GUIDE TO DOWNCOMER



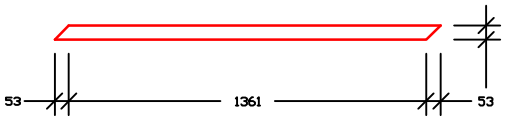
BOTTOM STRIP

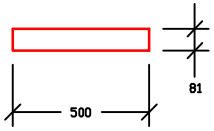


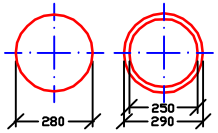


TOM PLATE

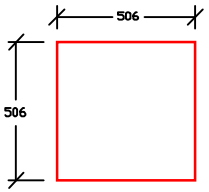
INNER FLANGES







COVER PLATE BOTTOM RING

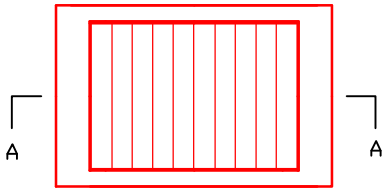


WAVE REFLECTOR

IMU(V) CIRCULATING WATER CHANNEL

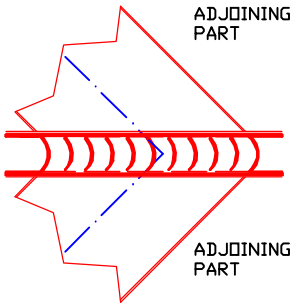
1 : 4 SCALE MODEL

PART 3

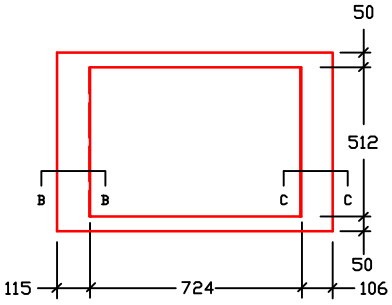


ELEVATION

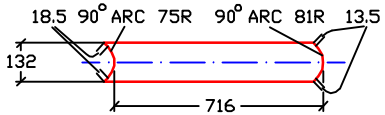
PLAN



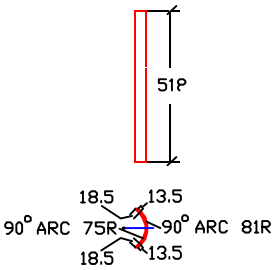
SECTION A-A



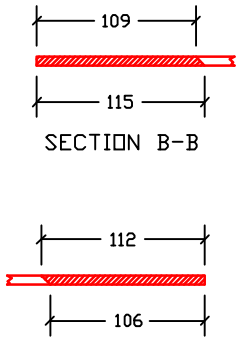
FLANGE (TWO)



TOP AND BOTTOM PLATES

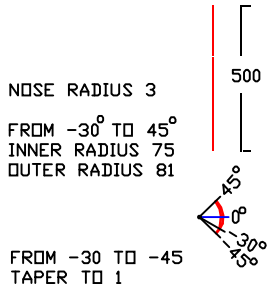


SIDE PLATES (TWO)



SECTION B-B

SECTION C-C



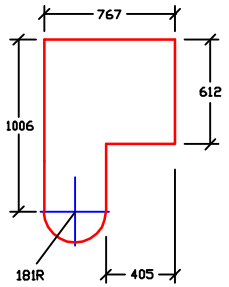
GUIDE VANES (NINE)

IMU(V) CIRCULATING WATER CHANNEL

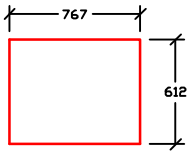
1:4 SCALE MODEL

PART 4 - COMPONENTS

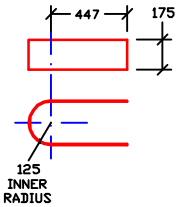
PARTS 4.1 AND 4.3



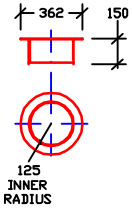
BOTTOM PLATE (TWO)



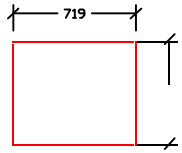
TOP PLATE (TWO)



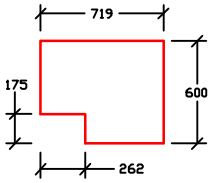
INLET/OULET DUCT (TWO)



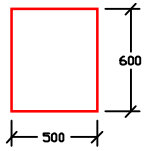
INLET/OUTLET
PIPE (TWO)



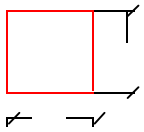
OUTER SIDE PLATE
(TWO)



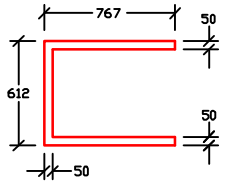
INNER SIDE PLATE
(TWO)

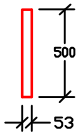


END PLATE
(TWO)

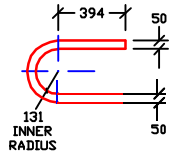


BAFFLE PLATES
(SIX)

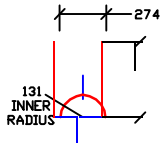




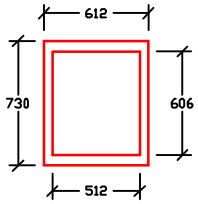
TOP/BOTTOM FLANGES
(FOUR)



DUCT FLANGE
(TWO)

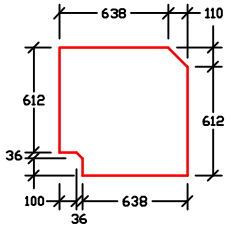


DUCT TOP
(TWO)

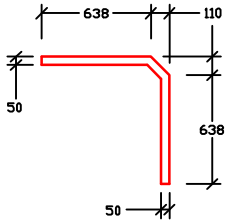


END FLANGE
(TWO)

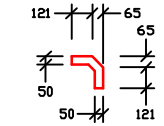
PART 4.2



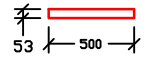
TOP/BOTTOM PLATE
(TWO)



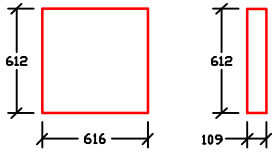
OUTER SIDE FLANGE
(TWO)



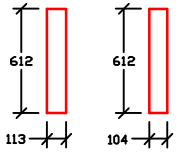
INNER SIDE FLANGE
(TWO)



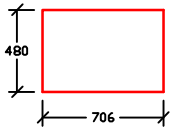
INNER FLANGE
(TWO)



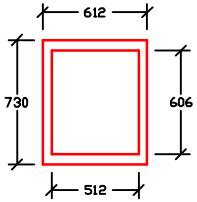
OUTER SIDE PLATES
(TWO) (ONE)



INNER SIDE PLATES
(TWO) (ONE)



BAFFLE PLATE
(ONE)

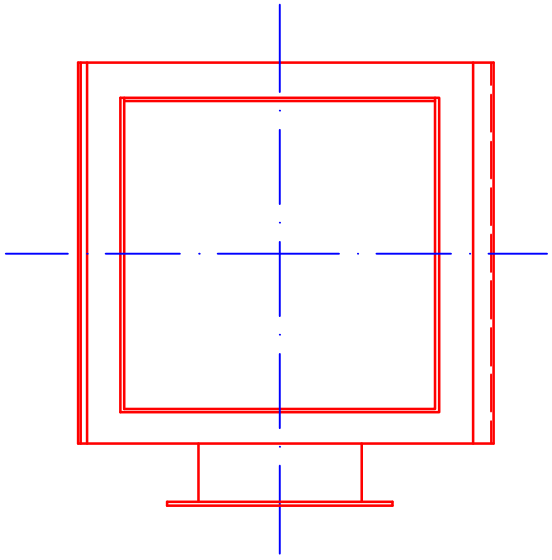


END FLANGE
(TWO)

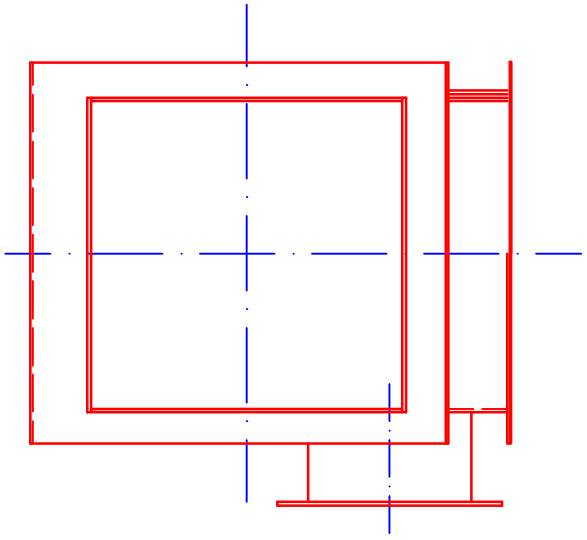
IMU(V) CIRCULATING WATER CHANNEL

1 : 4 SCALE MODEL

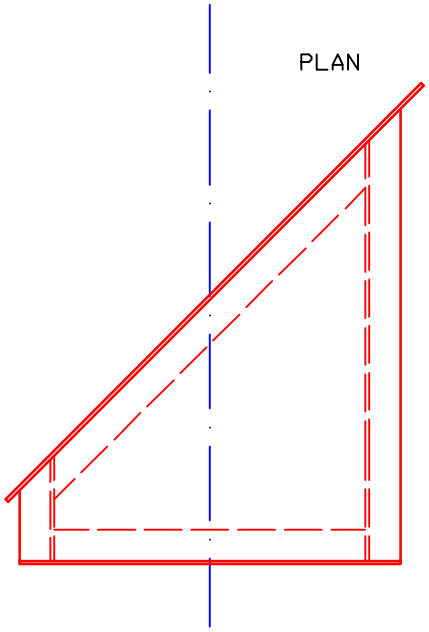
PART 5



ELEVATION



END VIEW

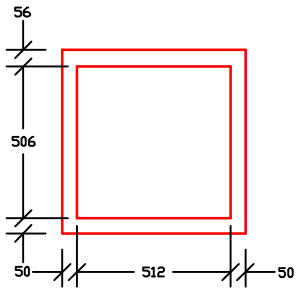


PLAN

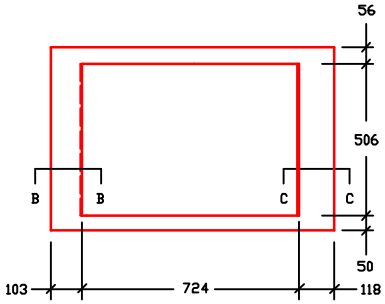
IMU(V) CIRCULATING WATER CHANNEL

1:4 SCALE MODEL

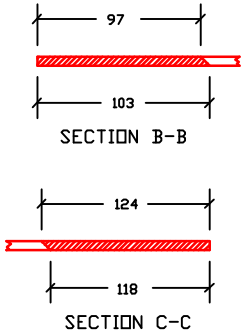
PART 5 - COMPONENTS

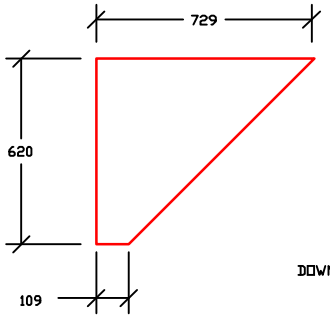


OUTLET FLANGE

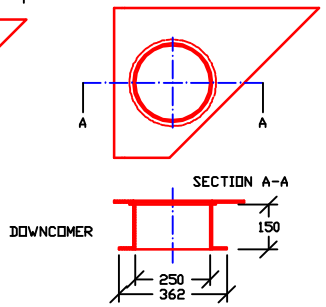


INLET FLANGE

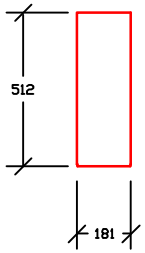




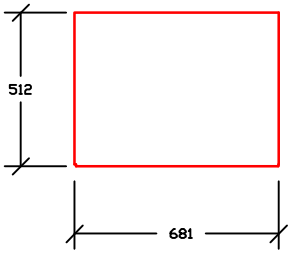
TOP PLATE



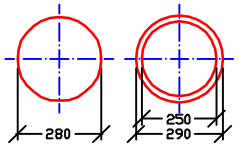
BOTTOM PLATE ASSEMBLY



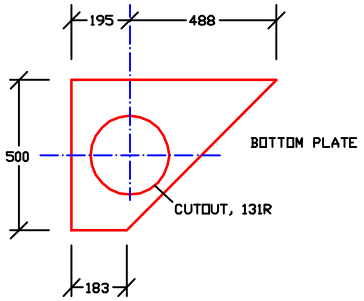
INNER SIDE PLATE



OUTER SIDE PLATE

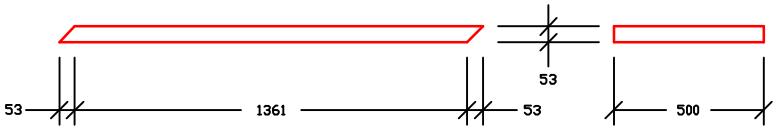


COVER PLATE BOTTOM RING

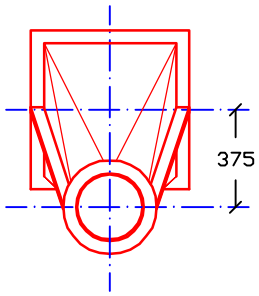


BOTTOM PLATE COMPONENTS

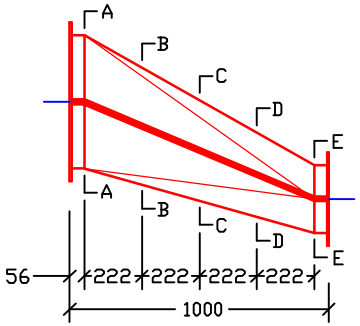
INNER FLANGES



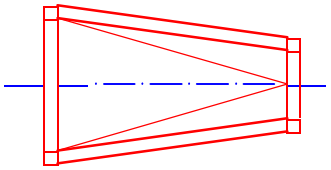
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 6



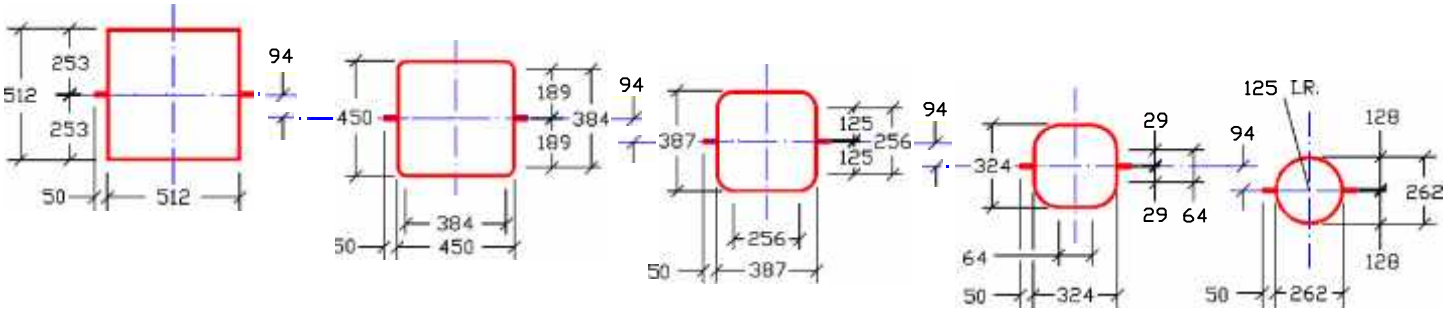
END VIEW



ELEVATION

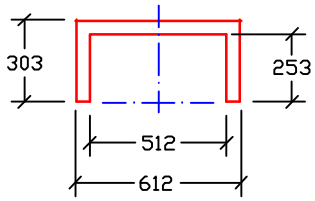


PLAN

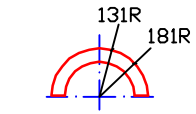


SECTIONS A-A B-B C-C D-D E-E

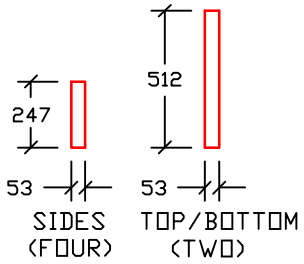
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 6 - COMPONENTS



INLET END
FLANGE
(TWO)

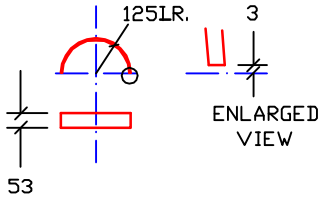


OUTLET END
FLANGE
(TWO)



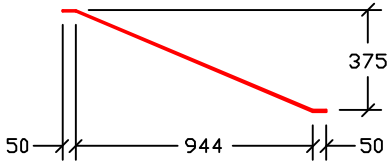
SIDES (FOUR)
TOP/BOTTOM (TWO)

INLET END PLATES



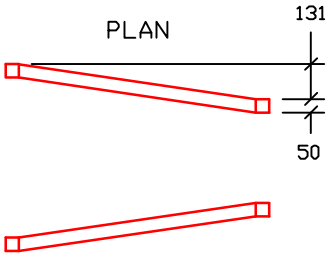
OUTLET END PLATES
(TWO)

TOP/BOTTOM FLANGE

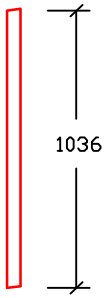


ELEVATION

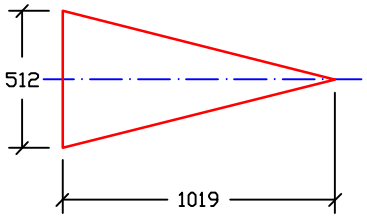
PLAN



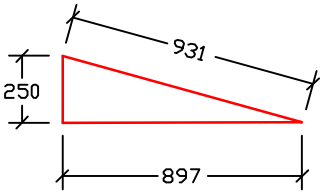
END PIECE
(EIGHT)



MIDDLE
PIECE
(FOUR)

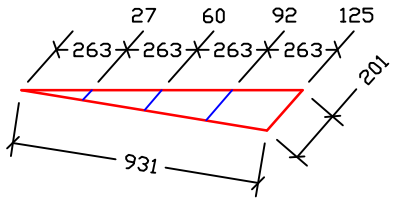


TOP FLAT PLATE (ONE)



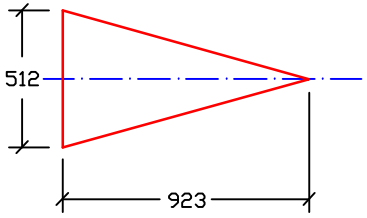
UPPER SIDE PLATE (TWO)

PLATE TO BE BENT TO
HAVE INNER RADII AT
INDICATED LINES AS
FOLLOWS :

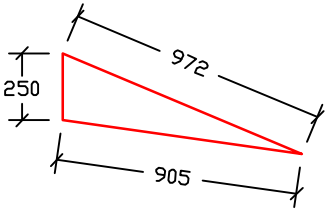


UPPER CURVED PLATE (TWO)

BOTTOM FLAT PLATE (ONE)

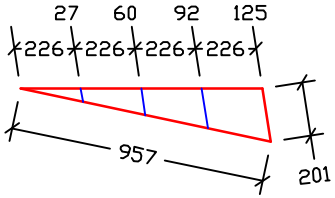


LOWER SIDE PLATE (TWO)

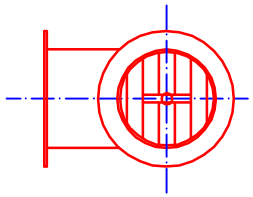


LOWER CURVED PLATE (TWO)

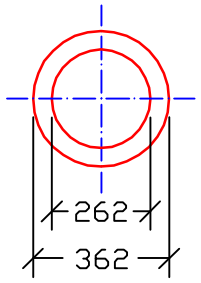
PLATE TO BE BENT TO
HAVE INNER RADII AT
INDICATED LINES AS
FOLLOWS :



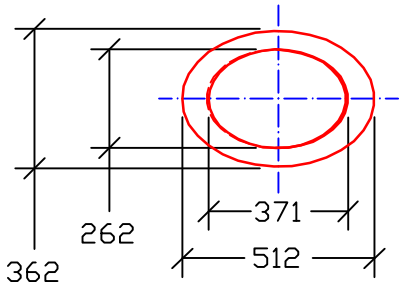
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 7

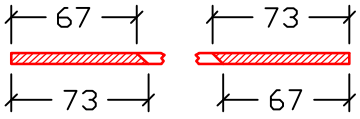


ELEVATION



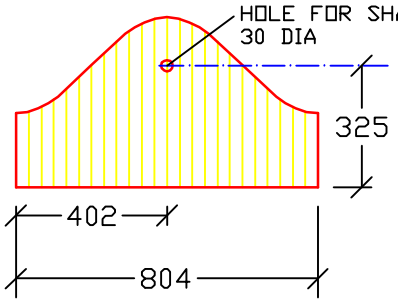
INLET FLANGE





ENLARGED SECTION AT
HORIZONTAL CENTRE LINE

OUTLET FLANGE

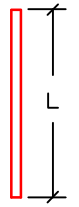


CURVED PLATE
(DEVELOPED)

NOSE RADIUS 3

FROM -30° TO 45°
INNER RADIUS 75
OUTER RADIUS 81

FROM -30° TO -45°
TAPER TO 1



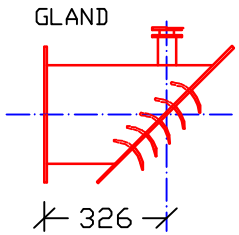
APPROX LENGTHS :

135 - TWO
220 - TWO
115 - FOUR

SUPPORTING
PLATES - SIX

GUIDE VANES

PLAN

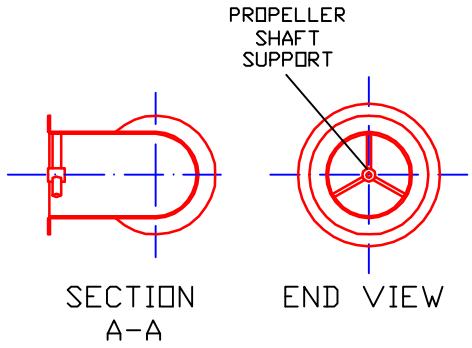


OFFSETS OF THE DEVELOPED PLATE AT 33.5 MM INTERVALS ARE :

198, 202, 215, 235, 262, 293, 326, 359, 390, 417, 437, 450, 454,
450, 437, 417, 390, 359, 326, 293, 262, 235, 215, 202, 198.

DETAILS OF GLAND WILL BE DECIDED AFTER SHAFT BEARING DETAILS ARE KNOWN.

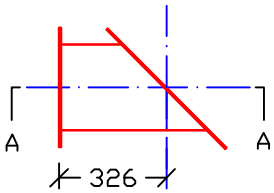
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 8

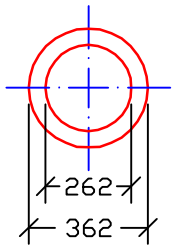


SECTION A-A

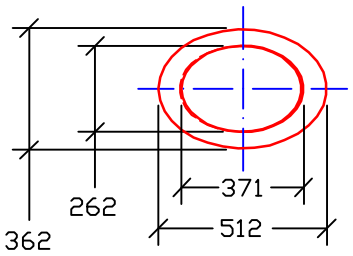
END VIEW

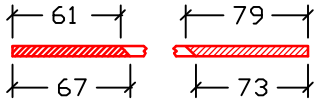
PLAN





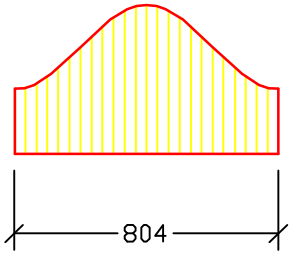
OUTLET FLANGE





ENLARGED SECTION AT HORIZONTAL CENTRE LINE

INLET FLANGE



CURVED PLATE (DEVELOPED)

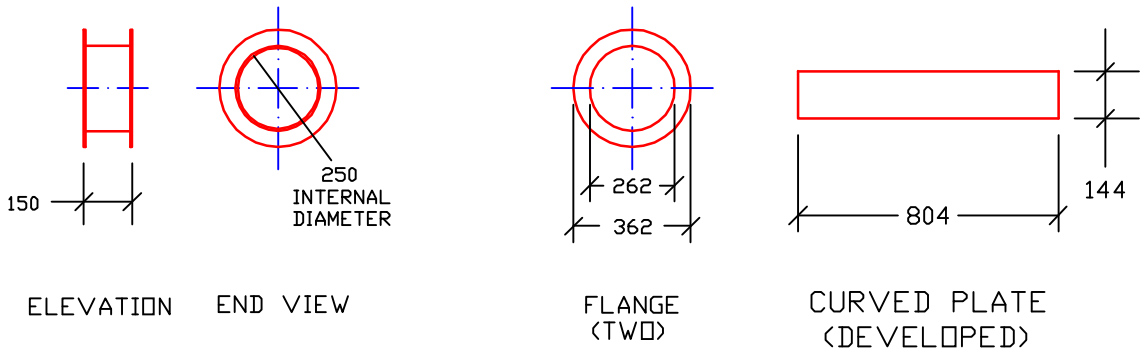
OFFSETS OF THE DEVELOPED PLATE AT 33.5 MM INTERVALS ARE :

198, 202, 215, 235, 262, 293, 326, 359, 390, 417, 437, 450, 454,
450, 437, 417, 390, 359, 326, 293, 262, 235, 215, 202, 198.

DETAILS OF PROPELLER SHAFT BOSSING AND SUPPORTING STRUTS WILL BE DECIDED LATER AFTER DIMENSIONS OF SHAFT BEARINGS ARE OBTAINED.

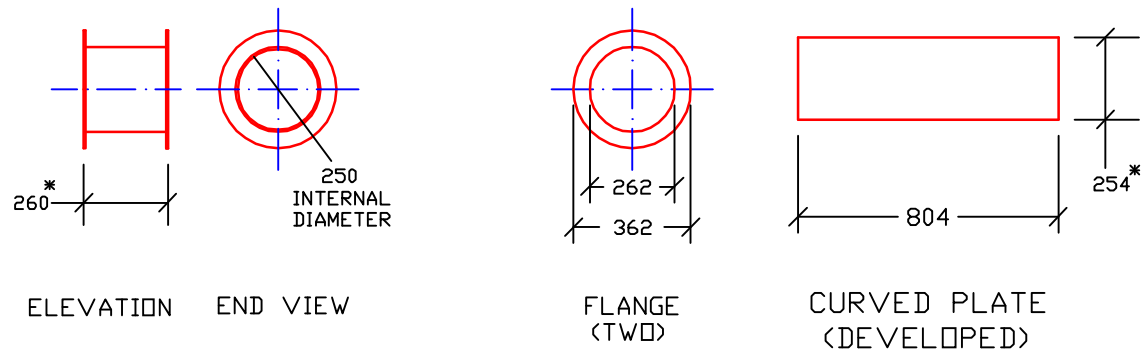
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PARTS 9 AND 10

PART 9



ELEVATION END VIEW FLANGE (TWO) CURVED PLATE (DEVELOPED)

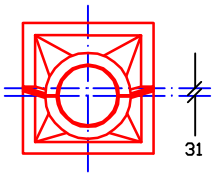
PART 10



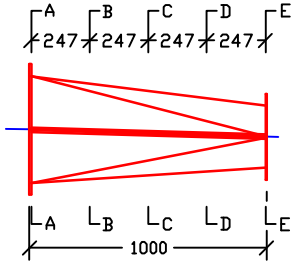
ELEVATION END VIEW FLANGE (TWO) CURVED PLATE (DEVELOPED)

* : EXACT VALUE TO BE DETERMINED AT SITE

IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 11

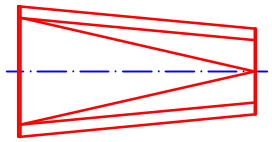


END VIEW

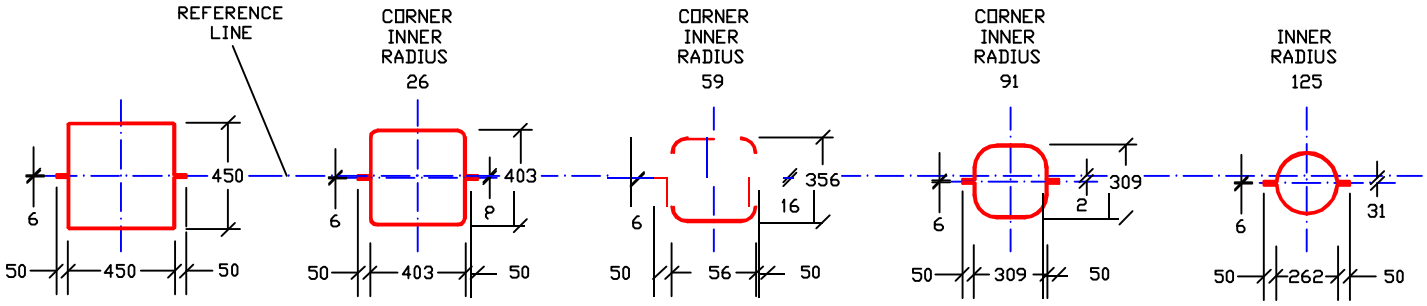


ELEVATION

PLAN

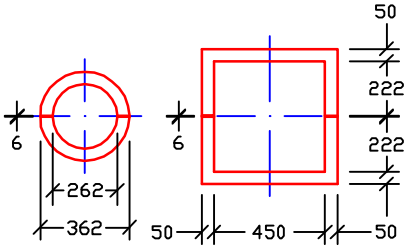


SECTIONS



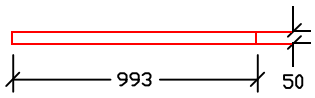
A-A B-B C-C D-D E-E

IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 11 - COMPONENTS

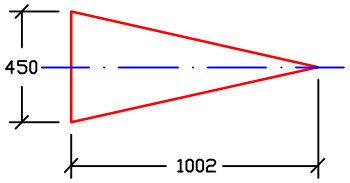


INLET FLANGE (ONE)

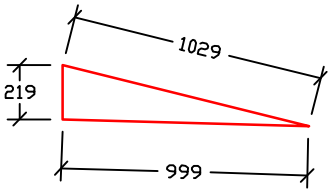
UTLET FLANGE (ONE)



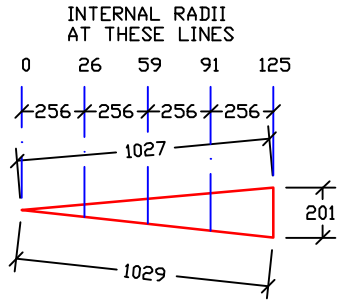
SIDE FLANGES (FOUR)



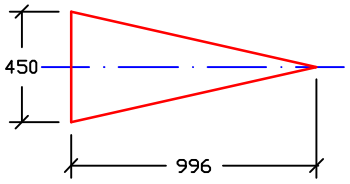
TOP PLATE (ONE)



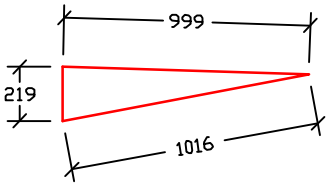
UPPER SIDE PLATE (TWO)



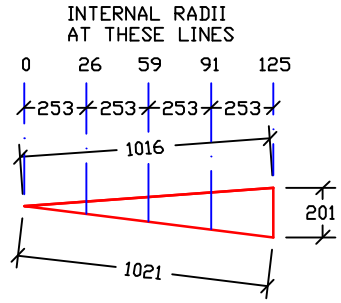
UPPER CURVED PLATE - DEVELOPED (TWO - MIRROR IMAGES)



BOTTOM PLATE (ONE)

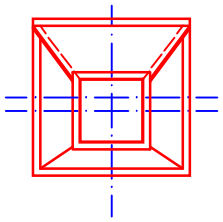


LOWER SIDE PLATE (TWO)

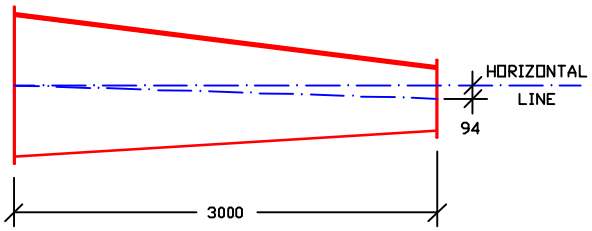


LOWER CURVED PLATE - DEVELOPED (TWO - MIRROR IMAGES)

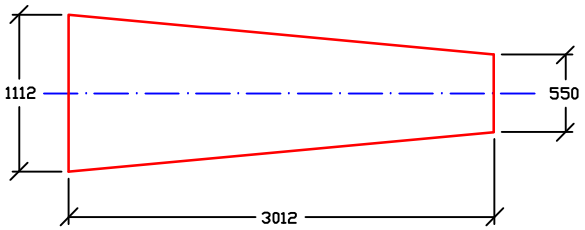
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 12



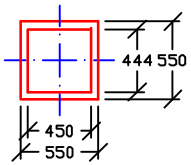
END VIEW



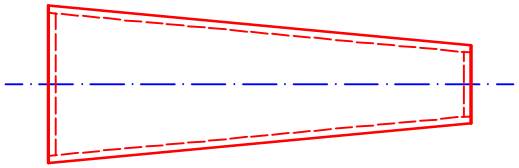
ELEVATION



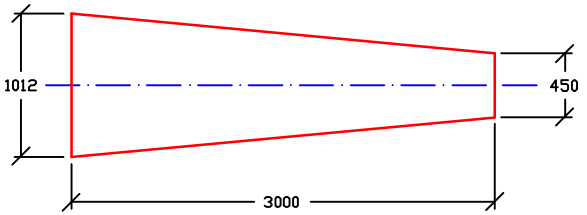
TOP (COVER) PLATE



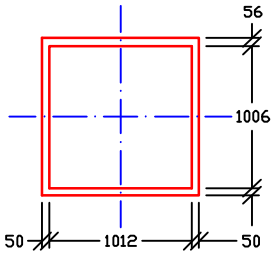
INLET FLANGE



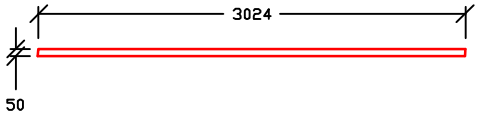
PLAN



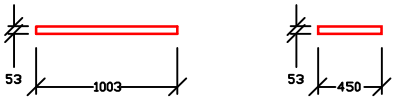
BOTTOM PLATE



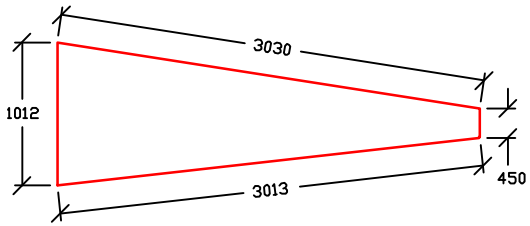
OUTLET FLANGE



SIDE FLANGE (TWO)



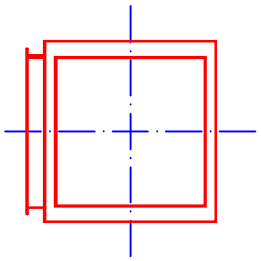
INNER FLANGES



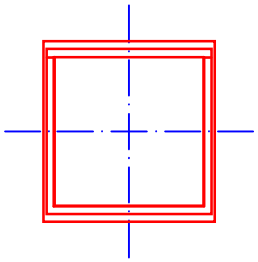
SIDE PLATE (TWO)

IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL

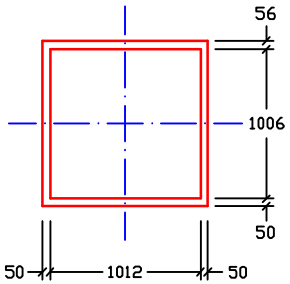
PART 13



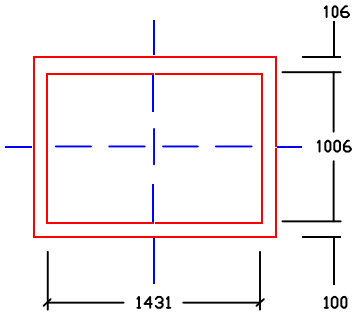
ELEVATION

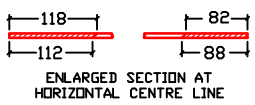


END VIEW



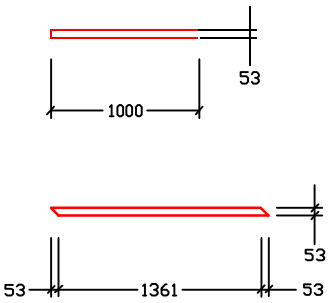
INLET FLANGE



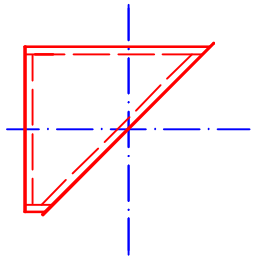


ENLARGED SECTION AT
HORIZONTAL CENTRE LINE

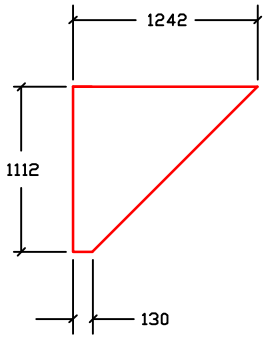
OUTLET FLANGE



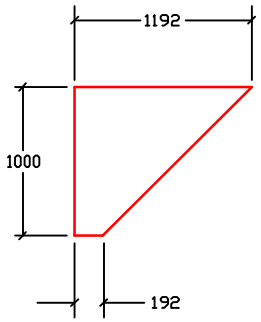
INNER FLANGES



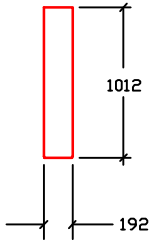
PLAN



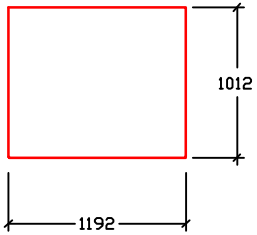
TOP PLATE



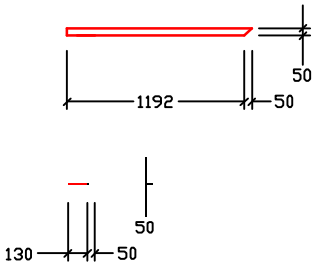
BOTTOM PLATE



INNER SIDE
PLATE

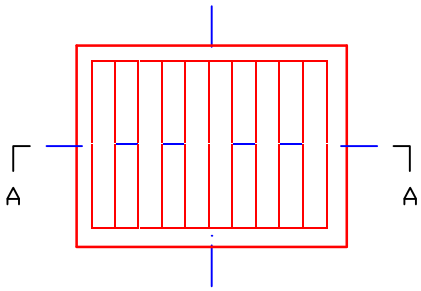


OUTER SIDE
PLATE



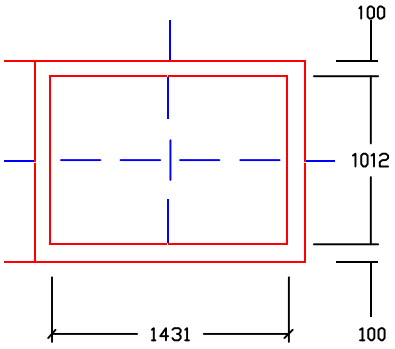
FLANGES

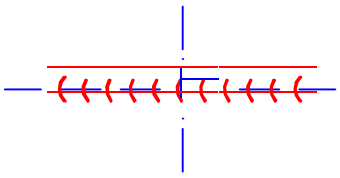
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 14



ELEVATION

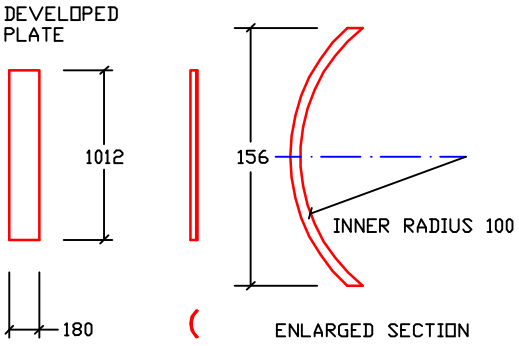
END VIEW



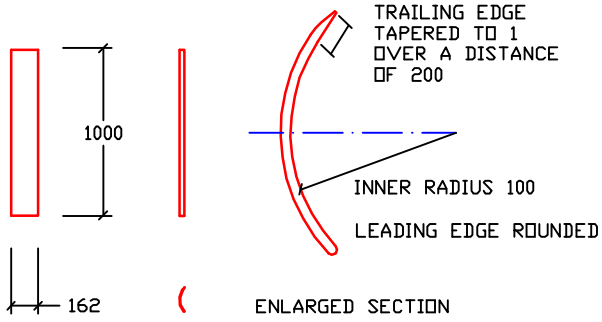


SECTION A-A

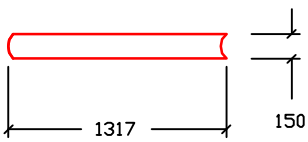
FLANGE (TWO)



SIDE PLATE (TWO)



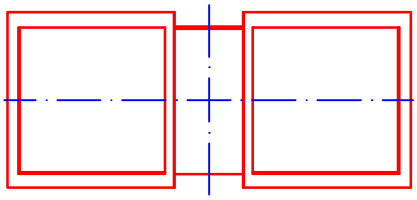
GUIDE VANE (NINE)



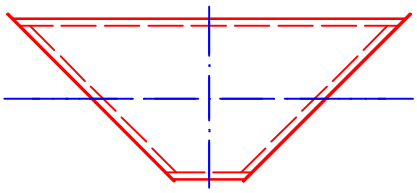
TOP AND BOTTOM
PLATES (TWO)

IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL

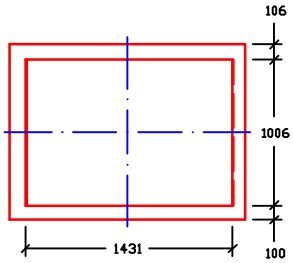
PART 15



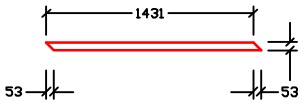
ELEVATION



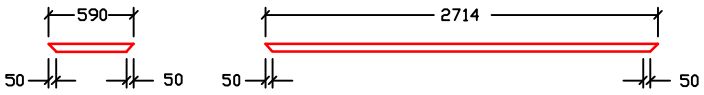
PLAN



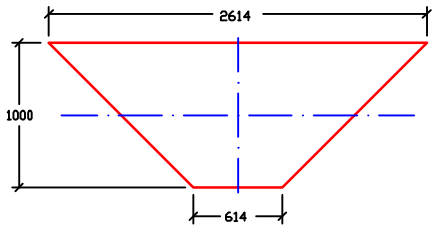
END FLANGE
(TWO)



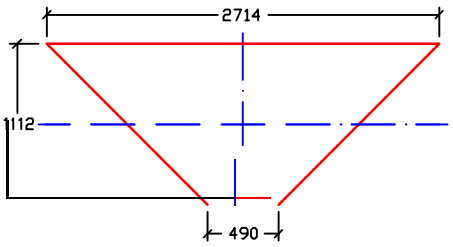
INNER FLANGE
(TWO)



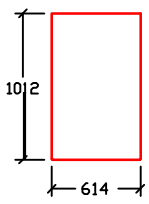
SIDE FLANGES



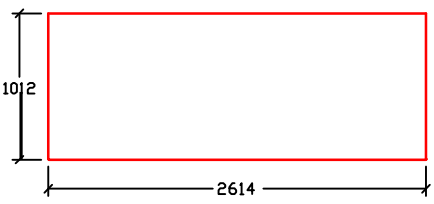
BOTTOM PLATE



TOP PLATE

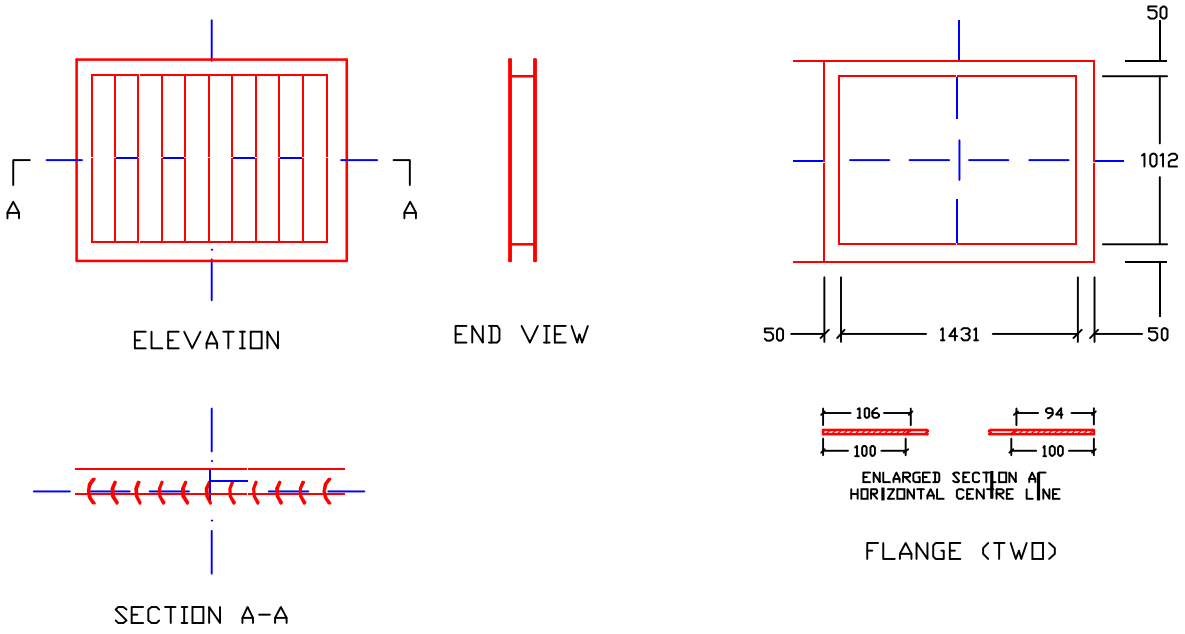


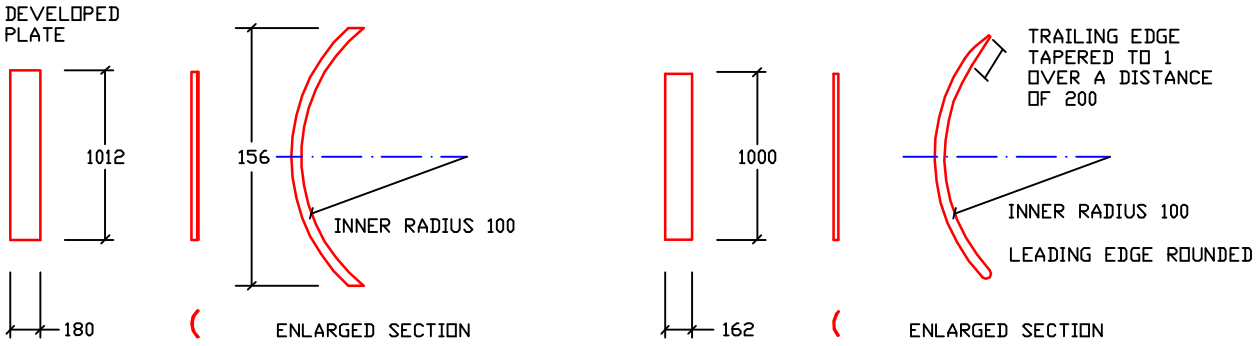
INNER SIDE PLATE



OUTER SIDE PLATE

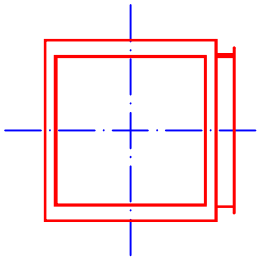
PART 16


A
A
ELEVATION
END VIEW
50
1012
50
1431
50
106
100
94
100
ENLARGED SECTION AT
HORIZONTAL CENTRE LINE
FLANGE (TWO)
SECTION A-A

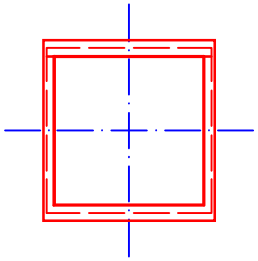

DEVELOPED
PLATE
1012
180
156
INNER RADIUS 100
ENLARGED SECTION
1000
162
TRAILING EDGE
TAPERED TO 1
OVER A DISTANCE
OF 200
INNER RADIUS 100
LEADING EDGE ROUNDED
ENLARGED SECTION

IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL

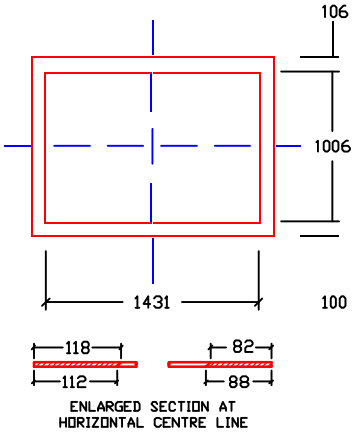
PART 17



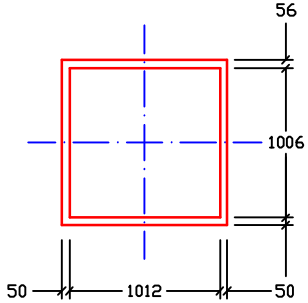
ELEVATION



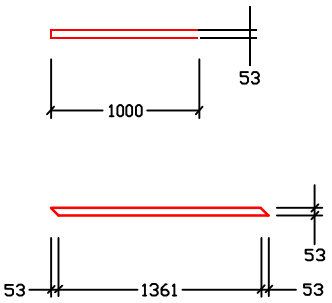
END VIEW



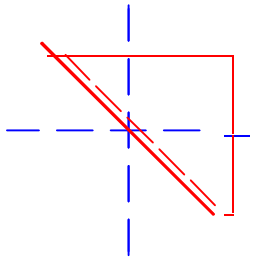
INLET FLANGE



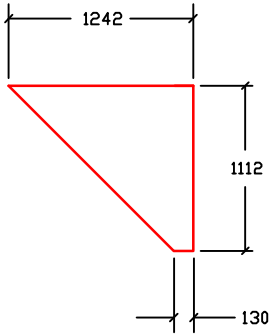
OUTLET FLANGE



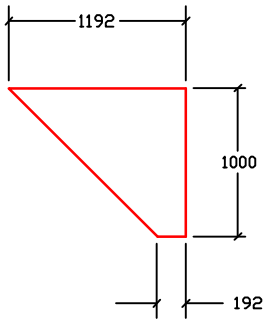
INNER FLANGES



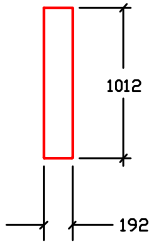
PLAN



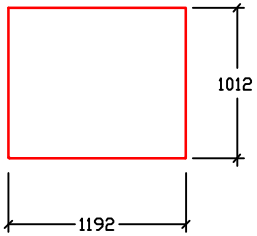
TOP PLATE



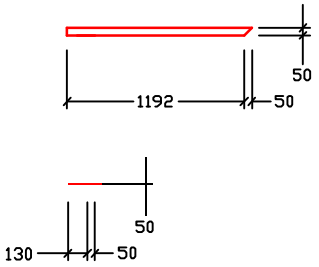
BOTTOM PLATE



INNER SIDE PLATE

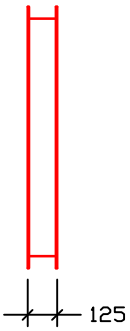


OUTER SIDE PLATE

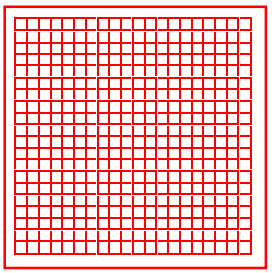


FLANGES

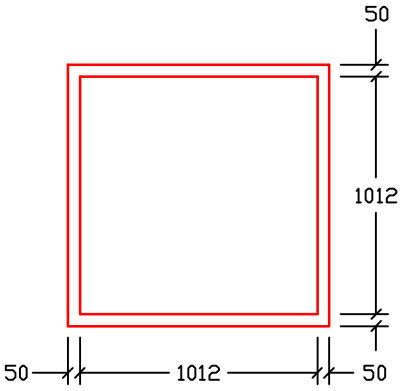
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 18



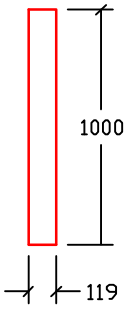
ELEVATION



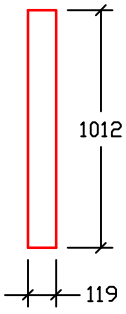
END VIEW



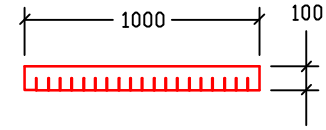
END FLANGE
(TWO)



TOP/BTM
PLATE
(TWO)

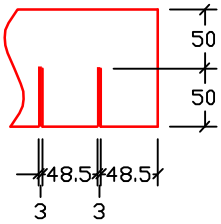


SIDE
PLATE
(TWO)



SLOTS 50 DEEP, 3 WIDE
SPACED 50 APART

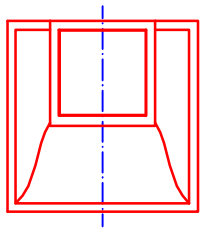
PLATE THICKNESS 3



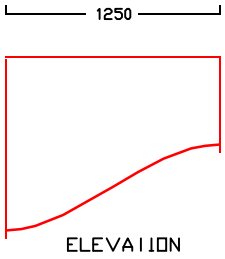
ENLARGED VIEW OF
SLOTTED PLATE

SLOTTED PLATES
(THIRTY-EIGHT)

IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 19

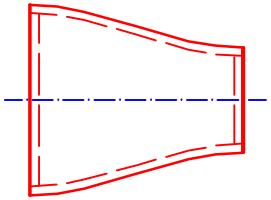


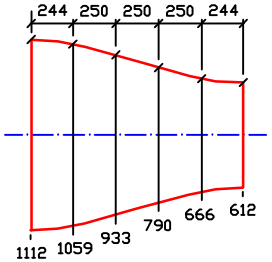
END VIEW



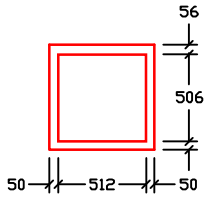
ELEVATION

PLAN

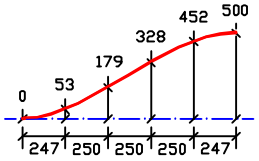




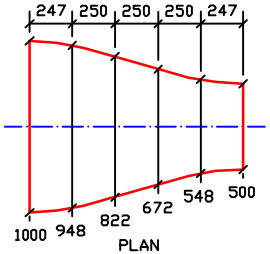
COVER PLATE



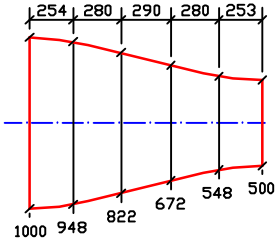
OUTLET FLANGE



SECTION ON CENTRE LINE

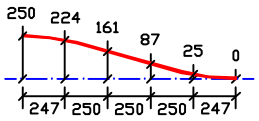


PLAN

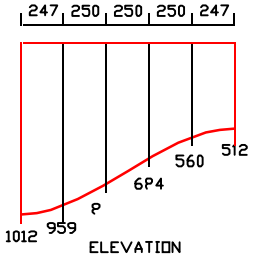


DEVELOPED SHAPE

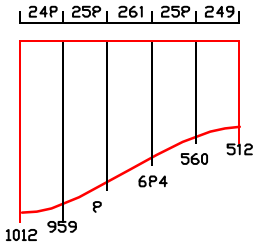
BOTTOM PLATE



TOP VIEW

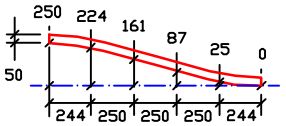


ELEVATION

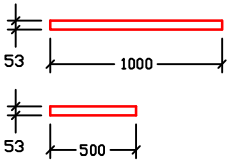


DEVELOPED SHAPE

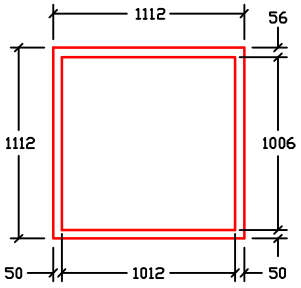
SIDE PLATE
(TWO - MIRROR IMAGES)



TOP FLANGE
(TWO - MIRROR IMAGES)

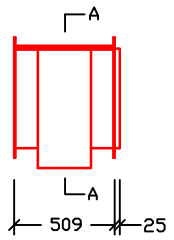


INNER FLANGES

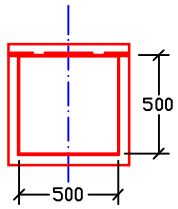


INLET FLANGE

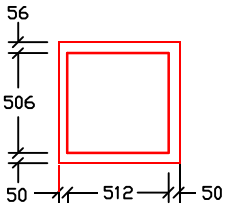
IMU(V) CIRCULATING WATER CHANNEL
1:4 SCALE MODEL
PART 20



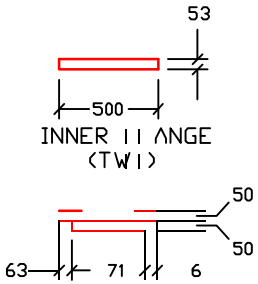
ELEVATION



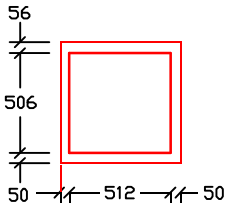
END VIEW



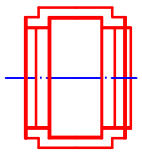
INLET FLANGE

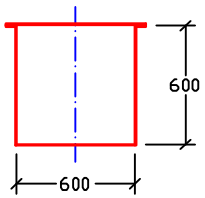


INNER FLANGE (TW1)
TOP FLANGE (TW2)

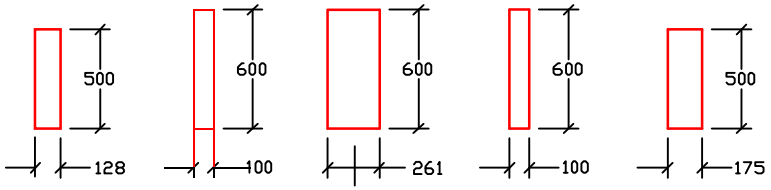


OUTLET FLANGE

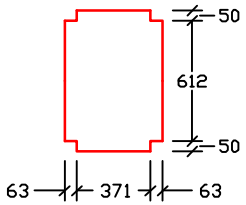

PLAN
(TOP COVER REMOVED)



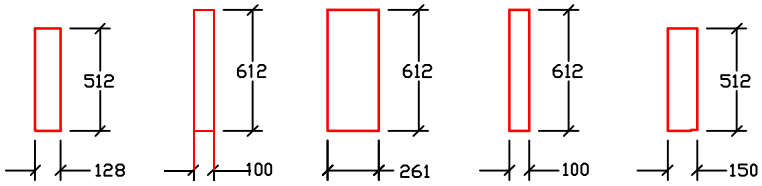
SECTION A-A



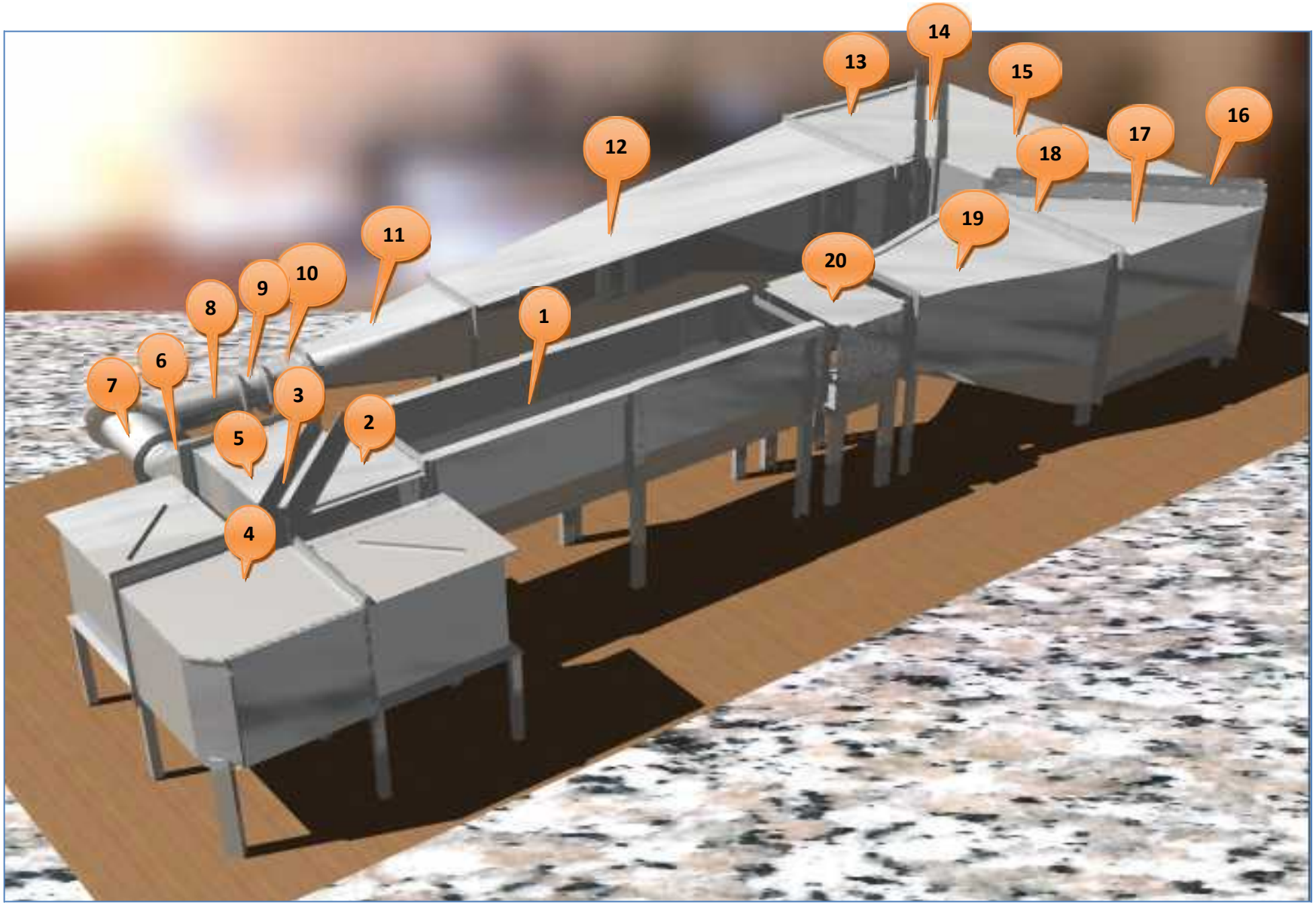
BOTTOM PLATES



COVER PLATE



SIDE PLATES (TWO EACH)



Rendered view of CWC with the respective part numbers