



ATTOCK PETROLEUM LIMITED
TENDER DOCUMENTS FOR
CONSTRUCTION OF R.C.C. UNDERGROUND PIT AND
STORM WATER DRAIN CHANNEL AT APL SHIKARPUR
BULK OIL TERMINAL

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TABLE OF CONTENTS

1.0 GENERAL CONDITIONS OF CONTRACT

Conditions of Contract Part-1 –Annexure – 1

Conditions of Contract Part-2 –Annexure – 2

2.0 BILL OF QUANTITIES

BOQ –Annexure – 3

3.0 APL'S SAFETY AND SECURITY REQUIREMENTS

APL's Safety Requirements-Annexure – 4

APL's Security Requirements-Annexure –5

4.0 SPECIFICATIONS

Specifications for Civil Works-Annexure – 6 (A)

Specifications for Mechanical Works-Annexure – 6 (B)

5.0 DRAWINGS

Drawings-Annexure – 7



CONDITIONS OF CONTRACT PART-1

General Conditions

Article 1.0: Security

- 1.1 All Contractors' Manpower has to prove their identity by submitting National Identity cards.
- 1.2 All contractors' staff working must wear yellow I.D. Cards during working.

Article 2.0: Material and Equipment

- 2.1 Unless specified otherwise, all the material required for the job will be supplied by the Contractor. The Contractor shall be allowed to proceed with the job only after material has been inspected and approved by the Owner/authorized representative of the Owner. The inspection of both the work and material shall progress till the completion of the job.
- 2.2 Deleted.
- 2.3 Diesel generator sets, cable and all accessories including fuel to be provided by the Contractor, as and when required.
- 2.4 All tools/equipment required for the execution of the said job to be provided by the Contractor.
- 2.5 All equipment/material, consumable or other required for the welding operation i.e., welding rods, helmets/visors, goggles, grinder wheels/machines etc. to be provided by the Contractor. All protective apparel/gear/canopies required during/before or after the welding operation also to be provided by the Contractor.
- 2.6 All equipment required for the testing of the executed job to be provided by the Contractor.

Article 3.0: Site Cleaning

- 3.1 It is the responsibility of the Contractor to clear away all rubbish and surplus materials from the site at his own expenses on completion of the work and shall leave the site clean and tidy. The debris shall be removed from site.
- 3.2 Any usable surplus items redundant from site which are the property of the APL shall be delivered to the General Stores by the Contractor against a Credit Delivery Order duly authorized by a representative of the APL. However, in case of material supplied by the



Contractor, the Contractor can take the surplus material out of APL site after thorough inspection and approval by the Representative of the Owner.

Article 4.0: Guaranties and Warranties

- 4.1 A high standard of workmanship shall be maintained by the Contractor as per Specifications.
- 4.2 All work shall be guaranteed for a period of **one year** after issuance of Provisional Completion Certificate. Should any defect develop during this period, due to bad workmanship or faulty material supplied by the Contractor, he shall rectify the same at his own cost to the satisfaction of the Owner's authorized representative.

Article 5.0: Errors and Omissions

- 5.1 The Contractor will be responsible for corrections of all errors and omissions related to their work including resolution of all issues related to their work to the satisfaction of APL at no additional cost for a period of one year starting from the date of issuance of Provisional Completion Certificate. Previous approval by the owner shall not relieve Contractor of the responsibility of rectifying any shortcomings or discrepancies.

Article 6.0: Insurance/Medical

- 6.1 The contractor shall be responsible for obtaining and keeping in force at his cost an appropriate (contractors all risk/comprehensive insurance policy), in a manner and to an extent and only from an Insurance Company to be approved in writing, by the owner, valid during the entire period of execution, completion and maintenance of the works. Contractor shall be able to invoke it when required.
- 6.2 The Contractor ALL RISK policy shall, inter alias, cover the following risks:
1. Third party risk.
 2. Accident or injury to workman.
 3. All loss or damage from whatever cause arising for which the contractor is responsible under the contract.
- 6.3 In case the contractor fails to submit the **insurance policies** mentioned in Article 6.2, then deduction @ 3.43% or as applicable under the law will be made from contractor's bills.



- 6.4 In case of any injury / accident caused to any employee / worker during the course of employment the Contractor shall immediately refer him to any recommended Hospital of APL for necessary medical treatment for which charges shall be borne by the Contractor.
- 6.5 All employees hired by the Contractor for the execution of the works shall be provided all medical treatment from recommended Hospital of APL at against the prescribed charges of the Hospital to be paid by the Contractor on case-to-case basis.

Article 7.0: Contractor's employment conditions

- 7.1 Contractor shall be independently and directly responsible for payment of dues and wages to his employees and to settle terms and conditions of their service. He would also be directly responsible for compliance with all laws, Rules and Regulations that may be applicable to the employees hired by him for the due execution of this agreement.
- 7.2 Contractor shall be solely and exclusively responsible for payment of dues under the Provincial Employees Social Security Ordinance 1965 and contribution payable under Employees Old-Age Benefits act 1976 and any other law applicable to his establishment.

Article 8.0: Taxes

- 8.1 Owner will make tax deductions from payments made to the Contractor under this Contract, as required under the law.

Article 9.0: Additional Services/Change Orders

- 9.1 Owner during the execution of the said project may call upon Contractor to render any extra/additional services or change orders with regard to the said project. Payment and time schedule will be on mutually agreed basis between the Contractor and the owner. However, in case of any dispute the authorized representative of the Owner reserves the rights to fix the rates.

Article 10.0: Indemnity

- 10.1 The Contractor shall indemnify and keep indemnified the owner and all its employees and assignees against all losses and claims for injuries or damage to any person or any property what-so-ever which may arise out of or in consequence of the awarded work and against all claims, demands, proceedings, damages, costs, charge and expenses what-so-ever in respect of or in relation thereto.



Article 11.0: Confidentiality

11.1 All data, drawings, analysis etc. provided by the owner or conducted by the Contractor on behalf of the owner will be held confidential and would not be revealed to any outside agency/party.

Article 12.0: Law to Govern

12.1 This contract shall be interpreted in accordance with the laws of Pakistan.

Article 13.0: Force Majeure

13.1 The term "Force majeure" means any cause beyond the control of the Contractor, which the Contractor could not foresee and/or reasonably provide against and which prevents the Contractor from wholly or partly performing any duties under the Contract. Force Majeure includes, but is not limited to, any of the following:

13.1.1 War, revolution, insurrection or hostilities (whether declared or not).

13.1.2 Riot, civil commotion or civil uprising
(Other than among the Contractor's Employees);

13.1.3 Earthquake, flood, tempest, hurricane, lightning or other natural disasters (not including rains of any proportion);

13.1.4 Any fire of major proportions, or explosion;

13.1.5 Epidemic;

13.2 If any event occurs constituting Force Majeure, the Contractor shall give written notice to the owner as soon as possible describing the Force Majeure and its effect upon the performance of this Contract, and shall continue to undertake and perform the duties set forth in this contract as far as is reasonably practicable.

13.3 In the event of a Force Majeure, resulting in a suspension of work, this Contract shall be extended by a period equal to that for which the Contractor was prevented from performing.

13.4 If the Contractor's inability to perform by reason of the Force majeure lasts for more than 45 days after notice has been given to the Owner, either party may terminate this contract



and the Contractor shall be entitled to any sums which would be payable in case of termination of this contract.

Article 14.0: Suspension of Work

- 14.1 The Owner may, at any time, by written order to the Contractor (Suspension of Work), require the Contractor to stop all, or any part, of the work required by the contract for a period of up to 21 days from the specified effective date.
- 14.2 Upon receipt of such an order, the Contractor shall immediately comply with its term, and take all reasonable steps to minimize the incurring of costs allocable to the work covered by the order.
- 14.3 Within the period of the Suspension of Work Order, the Owner shall either:
- 14.3.1 Cancel the Suspension of Work Order; or
 - 14.3.2 Terminate the work covered by such Order as provided in the termination clause of the contract.
 - 14.3.3 If the Suspension of Work Order is cancelled or the Order expires, the Contractor shall resume work. An equitable adjustment shall be made as necessary in the time schedule, the budget, or a combination thereof, or any other provisions of the contract that may be affected and the contract shall be amended accordingly, if the Contractor asserts a claim for such adjustment within 30 days after the end of the period of work suspension.

Article 15.0: Termination by the Owner for Default

- 15.1 The performance of work under the contract may be terminated by the Owner in whole, or from time to time in part, in accordance with this clause, whenever the Contractor defaults in performance of this contract and shall fail to cure such default within a period of 10 days (or such longer period as the Owner may allow) after receipt from the Owner of a written notice specifying the default.
- 15.2 Termination shall be effected by a Notice of Termination to the Contractor specifying that termination is for the default of the Contractor, the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.



- 15.3 After receipt of a Notice of Termination and except as otherwise directed by the Owner, the Contractor shall:
- 15.3.1 Stop work under the contract on the date and to the extent specified in the Notice of Termination; and place no further orders, except as may be necessary for completion of the portion of the work under the contract.
 - 15.3.2 Terminate all orders and to the extent that they relate to the performance of work terminated by the Notice of termination;
 - 15.3.3 Assign to the Owner as it may direct, all of the rights, titles, and interests of the Contractor under the orders so terminated, in which case the Owner shall have the right to settle or pay any claims arising out of the termination of such orders;
 - 15.3.4 With the approval or ratification of the Owner to the extent the Owner may require, which approval or ratification shall be final and conclusive for all purposes of this clause, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, the cost of which would be reimbursable in whole or in part in accordance with the provisions of this contract;
 - 15.3.5 Transfer title to the Contracting Office and deliver as directed by the Owner, the completed or partially completed drawings, information, and other property which would be required to be furnished to the Owner under the contract except that this requirement shall not apply to goods for which the Contractor has not been reimbursed.
 - 15.3.6 Complete performance of the part of the work which has not been terminated by the Notice of Termination; and
 - 15.3.7 Take such action as may be necessary for the protection of the property related to this contract which is in the possession of the Contractor and to which the Owner has title.
 - 15.3.8 If the contractor fails to complete the job the owner reserves the right to carry out the remaining jobs at the risk and cost of the contractor by engaging another contractor.
 - 15.3.9 If the contractor fails to start the work after the lapse of mobilization period or his performance is slow, the Owner reserves the right to terminate the contract.



15.4 If the progress of the work is slow or the Contractor fails to complete his obligations under this Contract then the Owner may terminate the Contract and will carry out the remaining work through other sources at the risk and cost of Contractor.

Article 16.0 Subcontracts or Assignments

16.1 The Contractor shall not subcontract all or any part of the Contract without first obtaining Owner's approval in writing of the sub-contracting and the sub-contractor.

16.2 The Contractor guarantees that any or all sub-contractors to the Contractor for performance of any part of the work under the Contract will comply fully with the terms of the Contract applicable to such part of the work under the Contract.

Article 17.0: Inspections

17.1 The Contractor agrees to permit Owner/authorized representatives of the Owner to inspect the activities, and work pertinent to this Contract.

Article 18.0: Amendments

18.1 Modification of the terms of this contract shall be made by an amendment signed by the parties. Any amendments, including such amendments, which increase the Contract amount or extend the completion date of the Contract, must be approved by the Owner.

Article 19.0: Dispute and Appeals

19.1 In the event of any dispute that the parties hereto are unable to resolve, "Inter parties" the parties hereto agree to submit such dispute to arbitration under Pakistan's Arbitration Act (X of) 1940 in Civil Courts of Rawalpindi.

Article 20.0: Delays on the part of Owner

No delay in the contract on the owner's side will be admissible unless the contractor has advised the owner about it in writing within two working days after occurrence.



CONDITIONS OF CONTRACT - PART -2

Conditions of particular application (Terminals)

Article 1.0: Work Schedule

- 1.1 Work to be carried out according to specifications and instructions of Owner/authorized representative of the Owner following the work schedule provided by the Contractor and approved by the Owner.

Article 2.0: Liquidated Damages

The work shall be completed to the approval of the Owner/ authorized representative of the Owner within **90 Calendar days** of start failing which the Contractor will be liable to **Liquidated Damages @ 0.3% of the contract value per day up to a maximum of 10% of contract value after final measurement**. The liquidated damages will be imposed for each day of delay in achieving the milestones stipulated in work schedule and shall be deducted from the amount of the running bills. This shall however, be refunded whenever the progress is back on schedule.

Article 3.0: Payment Schedule

- 3.1 All payments shall be made on monthly basis after bills submitted by Contractor have been verified by Owner/ authorized representative of the Owner, whose decision will be final and binding. Payment will be made to the Contractor once a month up to a maximum of **90%** (after deduction of **10% retention money**) of estimated value of work (supply & services) done while amount of **Federal and Provincial Sales Tax** will be retained in addition to retention money and will be released after provision of relevant sales tax returns which clearly disclose supply/sales to APL. However, other deductions (advance, taxes, insurance etc.) will be made from the bills as applicable under the contract. **All the payments will be subject to deduction of taxes in accordance with applicable laws.**
- 3.2 The contract price **includes** all charges such as labor, plants, tools, cartage and all taxes as may be levied by the **Federal / Provincial Governments / Competent Authorities etc** till completion of the job.
- 3.3 Payment against secured advance will be made @ **75 %** of estimated cost of material as per verification of Owner's authorized representative. No advance against cement is allowed.
- 3.4 No increase or decrease resulting through any change in the fiscal policies of the Federal/Provincial Governments affecting the existing taxes or levies on such materials as are to be incorporated in the works or by way of any additional/enhanced benefits to the labor or any fluctuations in the foreign exchange rates or on any other account shall affect



the contract price. For clarity, any change in taxes on procurement of products/services by Contractor will not affect the contract price.

- 3.5 Contract price can be varied up to a maximum of **10%** on same unit rates as given in the Scope of Work. However if variations are exceeding **10%** of contract value or additional work (non BOQ) whose rates are not covered in the contract has been included then the contract will be amended after mutual agreement with the Contractor.
- 3.6 The federal and provincial sales tax will be applicable as per prevailing laws at the time of issuance of invoice to APL for supply of product and services.

Article 4.0: **Authorized Representatives**

- 4.1 For coordination / execution and other purposes to this contract and the Project, _____ will act as the Contractor's authorized representative. He will co-ordinate and will inform the Owner regarding progress of the work.
- 4.2 For implementation and other purposes of this contract and the Project, **Mr.** _____ will be authorized to act for & on behalf of the Owner.

Article 5.0: **Retention money**

- 5.1 **10%** of the contract value will be retained from the running bills as retention money. Retention money will not be deducted from advance payments; however, deductions from all running bills will be made proportionately so as to retain **10%** of the contract value. The Owner will release retention money after issuance of **Final Completion Certificate** of works.

Article 6.0: **Earnest money**

- 6.1 **2%** of bid amount deposited, as earnest money along with the bid will be released after the Contractor has furnished Performance Bond from a scheduled bank acceptable to the Owner as per Article 8.0, below.

Article 7.0: **Advance payments**

- 7.1 **10%** of the contract value will be paid to the Contractor as advance against mobilization if required by Contractor after the contract has been signed and the Contractor has furnished a **Bank Guarantee** for the **full amount** of advance payment. The guarantee should be from a scheduled bank acceptable to the Owner and the conditions of the guarantee shall bind the Contractor to pay the Owner in full or any part of the advance payment, which remains not, paid by the Contractor to the Owner. Advance payment made to the Contractor will be



adjusted **proportionately** from all running bills **or as Owner considers appropriate** till full adjustment of the advance payment.

Article 8.0: **Performance Bond**

8.1 Contractor will have to submit Performance Bond equivalent to 5% of the contract value from a scheduled bank acceptable to the Owner within seven (7) days from the date of signing of the contract, failing which an amount equivalent to 5% of the contract value will be deducted from the amount of the **initial** running bill(s). The performance bond shall remain valid for the entire contract period. After the completion of the contract period, the above also remain effective for (12) month's maintenance period in addition to the above term.

Article 9.0: **Transportation**

9.1 Transportation of material to site is the responsibility of the Contractor.

Article 10.0: **Supply/Storage of material**

10.1 Contractor will have to make his own arrangement for storage of material and equipment at site during contract period.

10.2.1 Unless specified all material required for the execution of job is to be provided by the Contractor including consumables. However, material supplied by the Contractor will only be incorporated in permanent work after Owner's representative has **verified** it.

Article 11.0: **Progress Report**

11.1 Daily/weekly & monthly progress reports shall be prepared by the Contractor and submitted to the Owner in accordance with the requirement of the contract.

Article 12.0: **Miscellaneous**

12.1 Any deliberations held, correspondence exchanged, minutes recorded or any views expressed for or any issue in any manner whatsoever prior to the signing of the contract shall have no legal sanctity and will be construed as non-existent. The same partly or wholly shall not be cited for any clarification or interpretation on any of the provisions contained in the contract in aid thereof. The stipulations contained in the contract mutually agreed and lawfully signed shall only be enforceable in its own tone and tenor without any consideration to any eventuality outside the scope of contract.



- 12.2 Any damages to property caused due to Contractor's executions shall be repaired at Contractor's risk and cost.
- 12.3 Compaction tests shall be undertaken at Contractor's cost as and when desired by the Owner.
- 12.4 Work execution must be planned to ensure that movement of vehicles is least disturbed.
- 12.5 Payment shall be made on actual measurements.

ATTOCK PETROLEUM LIMITED					
BOQ OF CIVIL WORK FOR CONSTRUCTION OF R.C.C. UNDERGROUND PIT AND STORM WATER DRAIN CHANNEL AT APL SHIKARPUR BULK OIL TERMINAL					
Sr. #	DESCRIPTION	Unit	QUANTITY	UNIT RATE	AMOUNT (PKR)
1.0	DISMANTLLING WORK:				
	Dismantling of existing structure safely & removal of debris from site as per instruction of the Consultant and approval of Client (Site Engineer).				
1.1	Any type of Brick or Concrete work with embedded parts	Cft	50		-
1.2	Removal of Tuff Paver	Sq. Ft.	165		-
1.3	Refixing of Tuff Paver including Sand cushion	Sq. Ft.	60		-
2	Excavation & Back Filling Cutting the earth including site clearing and leveling of site, dressing, watering and compaction, also including dewatering, if required to achieve require level and disposal of surplus material outside boundaries or as directed by Engineer Incharge. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Cft	5500		-
3	Stone Soling Providing and laying stone soling 12" thick set in 1:6 cement sand mortar hand packing and filling voids, consolidating and compacting as directed by Engineer Incharge. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Cft	400		-
4	Constructing P.C.C in 1:4:8 concrete. The concrete should be poured 1:4:8 ratio with approved quality of crush stone, cemet and sand in area (at any height or depth) specified by Engineer Incharge, complete in all respect. Scope also includes Blind concrete, Form work, Scaffolding, Curing etc.Job should be completed as per standards and as direction of Engineer Incharge.	Cft	400		-
5	Concrete Work (R.C.C 3000 psi): Constructing R.C.C concrete. The concrete should be poured having 3000 psi cubical crushing strength (1:2:4 ratio) with approved quality of crush stone, cemet and approved sand, in area (at any height or depth) specified by Engineer Incharge, complete in all respect. Scope also includes Form work, Scaffolding, Curing, cube crushing report from approved lab, etc.Job should be completed as per standards and as direction of Engineer Incharge.	Cft	800		-
6	Steel Reinforcement: Providing and laying steel reinforcement of 60,000 psi yield strength (as per ASTM A-615) including the cost of straightening, cutting, bending, binding, wastage and such overlaps as are not shown over the drawings, placing in position on m.s, chairs, tying with binding wires, etc., in all kinds of RCC work including the cost of 18 gauge binding wires, chairs, spacers, Steel test report from approved lab, etc. complete in all respects as per drawings, specification and as directed by the owner's representative / engineer.	Tons	7		-
7	Surface drain with Heavy Duty M.S. Grating: Excavation in all type of Soils from existing Ground level as per dimension given in applicable drawing for foundation , drain including cost of dressing, shoring, back filling in approved manner where require, and disposal of excavated Soil outside Contonment or Municipal limit as per applicable drawing and specification and direction of Engineer Incharge. Providing and Laying Plain Cement Concrete of specified mixed for Base to foundation , steps, walls footing and under floor etc. with Stone Ballast 2" Gauge including cost of all materail, lab our and equipment, compacting, curing, complete as per drawing and specification and/or as directed by the Engineer Incharge. 1:4:8 for base concrete 3" thick. Providing and Laying structural Concrete of specified Mix 1:2:4 with Minimum 3000 Lbs. PSI work Cube Crushing strength at 28 days using crushed stone 3/4" and down guage for Reinforcement Cement Concrete in Foundation including cost of all materail, form work and its removal, labour and equipment, compacting, vibrating, curing etc. complete but excluding cost reinforcement as per drawing and specification and / or as directed by the engineer incharge. RCC Base slab 6" thick & R.C.C wall 6" thick with RCC precast slab for cover to drain 6" thick. Supplying, Fabricating, placing in position including tying of MildSteel Plain round bars reinforcement at any level and elevationwith Minimum yield stress 36000 Lbs. PSI including all costinccurred for using 20 SWG binding wire, steel / precast concretechairs and spacers to drawing specification and / or directed by the Engineer Incharge (wastage of bars / rerolling margins / cut pieces etc. over laps are to be Contractor's account). Providing and laying 3/4" thick water proof cement plaster using pudlo at the ratio of 5lbs per beg of cement to wall floor and slab l/c curing smooth finished to the plumb kine level etc. Providing and Laying P.C.C. of specified Mix 1:2:4 with Minimum 3000 Lbs. PSI work Cube Crushing strength at 28 days using crushed stone 3/4" and down guage for R.C.C. Pipe connecting surface drain channel including cost of all materail, form work and its removal, labour and equipment, compacting, vibrating, curing etc. complete as per drawing # 17 and specification and / or as directed by the Engineer Incharge. Providing & Laying 8" dia RCC Pipe and Collar of approved make including excavation in all types Soil/to required Gradients cutting,fixing and jointing with sphalt composition and sement moter (1:1) and testing with water to a head of 50 ft. above the top of the highest pipe, Provision of steel grating complete as per specification and instruction of the Engineer including cost of Providing & Laying 21"x12"x 6" in bed in 1:3:6 below at the joints.	Rft	55		-
8	Kerb wall (Precast) Supply and fixing of Precast Kerb stones 12"x18"x6" (Tuff Pavers, Tuff Tiles, Bannu Mukhtar or approved equivalent) at specified locations, Job including Excavation, backfilling, CC 1:4:8 below & back side (hatching) kurbstone, Enamel paint (yellow & black) complete in all respect as drawing specifications and direction of Engineer incharge.	Rft	20		-

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BOQ OF CIVIL WORK FOR CONSTRUCTION OF R.C.C. UNDERGROUND PIT AND STORM WATER DRAIN CHANNEL AT APL SHIKARPUR BULK OIL TERMINAL					
Sr. #	DESCRIPTION	Unit	QUANTITY	UNIT RATE	AMOUNT (PKR)
9	Sub Base & Base Work Approved filling material brought from outside base & sub-base layer will be laid in two layers stone metal well compacted to achieve 98% as per relevant AASHTO standard. This item will be complete as per drawing & standards and as direction of Area Engineer.	Cft	200		-
10	Brick Work Providing & laying of 1st Class Burnt Clay Bricks of approved Standard & Quality, having a minimum crushing strength of 1450 Psi & maximum water absorption of 14% to 20%. Brickwork comprises of laying water soaked bricks in C:S (1:4) mortar in courses having English bond & segregated joints. The joints of the bricks shall have 1/4" deep grooves which should be racked before plaster. Cement Mortar should be prepared in the quality to be used within 30 minutes. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Cft	160		-
11	Plastering Work Plastering with the Cement-Sand mortar of 1/2" thickness, having mix ratio of 1:4. The surface shall be free of defects & deformations & shall be thoroughly pre-soaked & plastering shall result in neat edges & free from bulging, depression etc. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Sq. Ft.	200		-
12	Water Stopper Supply & Installation of best quality water stopper at construction joint of footing and walls. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Rft	60		-
13	Bitumen Coating Providing & applying of 02 coats of bitumen Grade 10/20 on concrete surface exposed to the earth. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Sq. Ft.	750		-
14	MS Pipe 6" dia: Providing & laying 6" dia MS pipe as per direction of incharge. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Rft	10		-
15	Heavy Duty Manhole cover: Providing & fixing of 2 feet dia heavy duty manhole cover. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Job	1		-
16	MS Stair: Providing & fixing of MS stair for cleaning of pit. Complete in all respect as per drawings, specifications and direction of Engineer Incharge.	Job	1		-
17	Dewatering & Despose of water: Dewatering of underground water for execution of work, job also include dispose of the water and surplus material, site cleaning etc. Complete in all respect as per direction of Engineer Incharge.	Job	1		-
Total Amount					-
13 % PST					-
Total Amount Including Tax					-

NOTES:

1. PAYMENT WILL BE MADE AS PER ACTUAL SITE MEASUREMENTS
2. WASTAGE WILL BE ON ACCOUNT OF CONTRCTOR
3. ALL MATERIAL WILL BE SUPPLIED AND FABRICATED BY THE CONTRACTOR UNLESS OTHER WISE SPECIFIED
4. QUOTED PRICE WILL BE FOR SUPPLY AND FABRICATION JOBS.
5. QUANTITIES TAKEN IN BOQ ARE ESTIMATED, ONLY FOR BIDDING PURPOSE. CONTRACTOR IS RESPONSIBLY TO CALCULATE THE QUANTITIES AS PER SITE REQUIREMENT DRAWINGS.
6. CONTRACTOR IS RESPONSIBLE TO CALCULATE QUANTITIES BEFORE GOING ANY PURCHASING
7. CONTRACTOR IS RESPONSIBL TO ADD ANY MISSING OR REQUIRED ITEM AS PER SCOPE OF WORK



GENERAL SPECIFICATIONS FOR CIVIL WORKS

1. GENERAL:

- a. Entire work shall be carried out within the specifications given hereunder and or those shown on drawings.
- b. The method of construction employed and the Workmanship shall be in accordance with current recognized good Engineering practice and bonafide principles.
- c. The work timings shall be in accordance with APL requirements.
- d. Site plan may be seen in the office of the Manager (Engineering). The contractor is deemed to have inspected and acquainted himself with site conditions and no claim what-so-ever at this account will be entertained.

2. EXCAVATION AND EARTH WORK:

- a. The site shall be cleared without extra charges of all rubbish spoil or over burden etc. and made level as directed by the Engineer Incharge before buildings etc. are set out.
- b. The contractor shall set out the works and shell is responsible for true and perfect setting out of the same and for the correctness of the positions, levels, dimensions and alignment of all parts thereof.
- c. Excavation should be carried out in accordance with excavation plans on the drawing.
- d. Excavated material unsuitable for use as fill and backfill shall be disposed off by the contractor at locations approved by the Engineer within specified free haulage limit.
- e. Excavation for pits, cable trenches equipment foundations and other structure shall be taken out to the levels and dimensions as the Engineer may direct.
- f. Before starting the excavation, the contractor shall ensure the correct alignment of the pipelines on the ground, depth and width of excavation of the trench, all in accordance with the drawings and instruction of the Engineer.



- g. The excavation done in excess of mutual requirements, and dimensions as shown on drawing and/or subsequently ordered shall be filled with P.C.C. (1:5:10) at the Contractor's own expenses without extra cost.
- h. The excavated material shall either be used on buildings for filling under floors and around foundations or transported and disposed off as directed by Engineer Incharge.

3. CONCRETE WORK:

- a. Coarse Aggregate: Coarse aggregate shall consist of crushed stone, gravel or approved crushed stone (Approved stone) inert material from approved quarry with similar characteristic or combination of such material having clean, hard, durable, uncoated particles free from injurious amount of salt for all R.C.C./P.C.C. Aggregates for Portland Cement Concrete shall be well graded, clean, hard gravel, and coarse sand, non-frost susceptible material, and free of deleterious (organic) matter, yellowish stone and coatings of silt or clay. The gradations shall be determined by standard laboratory sieves with square openings. Material retained on a No. 4 screen shall be classified as coarse aggregate, which shall conform to the requirements of AASHTO M-80 and have the following limits of gradation:

Coarse Aggregate for Portland Cement Concrete

U.S. Standard Sieve Size	AASHTO No. 67 (¾" to #4) Cumulative % Passing By Weight	AASHTO No. 4 (1 ½" to ¾") Cumulative % Passing By Weight
2"	----	100
1 ½"	----	90–100
1"	100	20–55
¾"	90–100	0–15
½"	----	----
⅜"	20–55	0–5
#4	0-10	----
#8	0-5	----

- b. Fine Aggregate: Approved course sand of grading (Approved) shall be used for all R.C.C. and P.C.C. work and fine sand will be used for plaster work from approved source. All material passing a No. 4 sieve shall be classified as fine aggregate and



shall conform to the requirements of AASHTO M-6 and have the following gradation:

Fine Aggregate for Portland Cement Concrete

<u>U.S. Standard Sieve Size</u>	<u>Cumulative % Passing By Weight</u>
3/8"	100
#4	95-100
#8	80-100
#16	50-85
#30	25-60
#50	10-30
#100	2-10

- c. Water: Water to be used in the work for mixing and curing of concrete and for washing of aggregates shall be potable water and shall be free from other impurities.
- d. Mixing: Concrete mixing shall be carried out by power operated concrete mixing machine. Hand mixing shall only be allowed where the total mix per day in any particular job does not exceed 30 cft. Hand mixing for R.C.C. work shall not be allowed.
- e. Strength of Concrete: The minimum crushing strength of concrete (1:2:4) mix at the age of (7) days and (28) days shall be 141 and 210 kg/sq.cm respectively. In case of concrete mix (1:3:6) the strength at the age of (7) and (28) days shall be 70.30 and 105.45 kg/sq.cm respectively. Cube size will be 15 cm x 15 cm x 15 cm.
- f. All cubes will be prepared and tested on contractor's own expenses from any Government Laboratory for any work required to be tested by APL. And if results show that strength of concrete is less than as specified, work will be rejected and redone by the Contractor on his own risk and cost.
- g. Adequate protection is provided and approval is obtained from the Engineer, concrete shall not be placed when it is raining, during hot period, the temperature of concrete shall be not rise above 32 degree centigrade.



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- h. Concrete shall be conveyed and deposited as quickly as possible after mixing and shall proceed within 40 minutes before the initial setting time start unless and otherwise some retarding material shall be used as directed by the Engineer.
 - i. All work such as excavation, form work, and reinforcement inserts ready for concreting shall be subjected to the Engineer approval; concrete shall not be placed until the Engineer has indicated that he is satisfied with the work.
 - j. Joint filler shall be a high-grade performed compressible, resistant water proof as approved by the Engineer.

4. **REINFORCEMENT:**

- a. All reinforcement will be prepared, bended, binded and placed in position using 18 BG binding wire and shall be checked and approved by the Engineer Incharge before pouring of concrete is allowed.
- b. The steel chairs should be provided wherever required and spacer blocks should be of the same class concrete as that of in the slab etc.

5. **CURING:**

The concrete shall be kept continuously wet by the application of water for a minimum period of seven days after the concrete has been placed. Cotton mats, carpets or sand blankets, may be used as a curing medium to retain the moisture.

6. **FORM WORK:**

- a. All formwork shall be of steel unless otherwise directed by the Engineer.
- b. All form work and shuttering shall be approved by the Engineer In charge before binding and placing the reinforcement.
- c. The design of formwork and its pertinent calculation should be submitted to the authorized Engineer of APL.
- d. Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights at his own expenses; damage to masonry form scaffolding or from any other cause shall be repaired by the contractor at his own expenses.

TABLE OF CONTENTS

S. NO. DESCRIPTION PAGE NO.

1.0	SCOPE	
2.0	GENERAL	
3.0	MATERIAL	
4.0	WATER	
5.0	CLASSIFICATION OF CONCRETE	
6.0	PROPORTIONING OF CONCRETE MIXES	
7.0	MAXIMUM ALLOWABLE WATER CONTENT	
8.0	SLUMP TESTS	
9.0	BATCHING & MIXING	
10.0	PROTECTION & CURING	
11.0	PVC RUBBER SEAL JOINT/WATER STOPPER	
12.0	FORMWORK	
13.0	CONSTRUCTION JOINTS	
14.0	ANCHOR BOLTS & BASE PLATE/EMBEDDED PARTS	
15.0	REINFORCEMENT STEEL	
16.0	SAMPLES & TESTING	

1.0 SCOPE

This specification covers the proportioning, mixing and placing of plain and reinforced concrete, including requirements for concrete materials, storage of materials, design of concrete mix, sampling and testing, batching, forms and form work, construction joints, preparation, placement of concrete including mixing, conveying, depositing and curing, finishing, grouting, inspection and clean-up. All information pertaining to plain and reinforced concrete shown and noted on the construction drawings shall be considered part of this specification.

2 GENERAL

Full cooperation shall be extended to other trades to install embedding items, and form ducts and opening, etc. Embedded items shall have been inspected and check tested for concrete and other materials or for mechanical operations and approved before concrete is placed.

3.0 MATERIAL

3.1 Cement

- i) Grey Portland cement shall be normal setting cement of the specific gravity, fineness and chemical composition fully conforming to British Standard Specifications B.S. No. 12:1958 and shall be capable of satisfying all tests such as the tensile strength tests contained therein. Standard test briquettes prepared with 1:3 cement sand mortar shall give the following tensile strengths:

At 3 days not less than 300 lbs/in² (2.1 N/mm²)

At 7 days not less than 400 lbs/in² (2.8 N/mm²)

- ii) Sulphate Resistant Cement whenever required shall be sulphate resistant cement type 'A' fully conforming to British Standard Specification B.S. No. 4027, Part 2, 1972 satisfying the requirements for fineness, chemical composition, strength, setting time and soundness, etc.
- iii) Test certificate of each batch of cement delivered should be made available for Owner's Representative / Engineer review. If vendor of the cement supplied is changed, the Contractor should submit the concrete mix design along-with the

necessary test for cement supplied by new vendor before it is used at site.

- iv) The supply of cement must be so programmed by the Contractor that at no time the quantity of cement stock shall be less than that required for an average consumption of four weeks. Lorry or truck or other means of transportation, for the conveyance of cement to the site of works, shall be clean, dry, metallised lined and covered from top with water proof sheets, so that cement is sufficiently protected from any deterioration during transit.
- v) The Contractor shall provide at his own cost, on the site, all necessary sheds which shall be perfectly dry and water tight for the storing of cement to be delivered to the works, to ensure adequate supplies being available at site of work.
- vi) If at any time the Owner's Representative/Engineer considers that any batch of cement may have deteriorated on the site during storage for any reason, he will direct the Contractor that tests shall be made and the batch of cement on the site which may be in question shall not be used until it has been shown by test at laboratory, approved or appointed by the Owner's Representative / Engineer to be satisfactory. Contractor shall bear all costs of such testing. Any rejected cement shall be removed from the site by the Contractor without delay. Cement reclaimed from cleaning bags or leaking containers shall not be used.

3.2 Aggregates

- i) All fine and coarse aggregates to be used shall be supplied from approved source, which shall not be changed without permission in written from the Owner's Representative / Engineer. Aggregates shall conform to the test requirements of British Standard 882:1954 or equivalent.
- ii) Fine aggregates, shall be approved sand having specific gravity in the region of 2.65 and shall be clean, sharp, free from clay, earth, vegetable and organic matters, alkaline or acid reactions or other deleterious matter or impurities and conforming to British Standard BS 812:1954.
- iii) Fine aggregates shall conform to British Standard Specifications BS No. 882:1954
- iv) Coarse aggregates shall be approved hard crushed stone from a source approved by the

Owner's Representative/Engineer, with specific gravity of 2.66 and shall be clean free from sand, dust, salt, lime, chalk, clay, organic impurities or other deleterious matter and conforming to BS 812: 1954.

- v) Coarse aggregates shall conform to the relevant British Standard Specifications BS No. 882:1954.

Coarse aggregate shall be graded as follows:

FOR CONCRETE CLASSES A, B & C (NOMINAL SIZE OF GRADED AGGREGATE 1" TO $\frac{3}{16}$ " (25.4 MM TO 4.8 MM))

BS SIEVE PERCENTAGE (BY WEIGHT) PASSING

1" (25.4 MM) 100 $\frac{3}{4}$ " (19 MM) 90-100 $\frac{3}{8}$ " (9.5 MM)

20-55 $\frac{3}{16}$ " (4.8 MM) 0-10

FOR CONCRETE CLASSES D & E (NOMINAL SIZE OF GRADED AGGREGATE 1 $\frac{1}{2}$ " TO $\frac{3}{16}$ " (38 MM TO 4.8 MM))

BS SIEVE PERCENTAGE (BY WEIGHT) PASSING

1 $\frac{1}{2}$ " (38 MM) 1001" (25.4 MM) 95-100 $\frac{3}{4}$ " (19 MM) 35-70 $\frac{3}{8}$ " (9.5 MM) 10-33 $\frac{3}{16}$ " (4.8 MM) 0-5

- vi) All aggregates shall be stored on properly constructed paving and in bins and there shall be a physical partition between the stock piles of coarse and fine aggregate. No mixed-up aggregates shall be used in any concrete. Under no circumstances aggregates shall be allowed to be in contact with ground.
- vii) If required, aggregates shall be washed and screened to the satisfaction of the Owner's Representative/Engineer before use by processing through proper screening and washing plant. Adequate time is to be allowed therefore, for the moisture content to become substantially uniform before use in works.
- viii) Sieve analysis and other necessary tests of all aggregates shall be carried out as and when required by the Owner's Representative/Engineer. Samples for such tests shall be taken in the presence of the Owner's Representative/Engineer. All costs in connection with the test shall be borne by the Contractor.

- ix) All aggregates shall be subject to the approval of the Owner's Representative/Engineer. Any aggregates not found to the required standard shall be rejected by the Owner's Representative/Engineer and shall have to be removed from site without delay. Concrete structures executed with rejected aggregate shall be removed and rebuilt at the Contractor's expense.

4.0 **WATER**

Unless otherwise authorized in writing only water from potable supply system will be used for mixing concrete. Similarly only potable water shall be used for curing of concrete.

The source of water for construction purposes shall be approved by the Owner's Representative/Engineer, based on the satisfactory results of test for potability of water. Sampling and testing of water shall be the responsibility of Contractor, all cost thereof shall be deemed to have been included in the quoted rates for concrete works.

5.0 **CLASSIFICATION OF CONCRETE**

Classes of concrete to be used in various parts of the works shall be as indicated on the drawings and mentioned in Bills of Quantity.

6.0 **PROPORTIONING OF CONCRETE MIXES**

All concrete shall be proportioned by weight for concrete mixes, unless specifically directed by Owner's Representative/Engineer to proportion them by volume. The Contractor shall submit to the Owner's Representative/Engineer proposed mix designs for concrete to be used, based on preliminary laboratory tests to determine proportion of cement, aggregates and water in the concrete conforming to the quality and strength requirements as specified herein. However, the amount of cement for any class of concrete shall not be less than that indicated in the above table. Preliminary test results of at least three different mixes of each class of concrete with varied water cement ratios shall be submitted. The results of 7 days and 28 days cube tests shall be used to establish the ratio between 7 days and 20 days strengths. The Contractor may make adjustments in the ratio of fine to coarse aggregate in the mix for a certain work. Preliminary design of mixes and testing shall be the responsibility of the Contractor. The proportion of

voids in the coarse aggregate shall be controlled and if it exceeds than 45%, sand and consequently the cement content shall be increased by the Contractor without any charge. If the proportion is less than 40%, sand shall be decreased but not the cement.

7.0 **MAXIMUM ALLOWABLE WATER CONTENT**

All concrete specimens shall be made, cured and tested in accordance with British Standard or ASTM Standard. A curve representing the relation between the water content and the average 28 days Crushing Strength or earlier strength at which the concrete is to receive its full working load shall be established for a range of values, including all the crushing strengths shown on the plans. The curve shall be established by at least four points, each point representing average values for at least four specimens. The maximum allowable water content for the concrete shall be as determined from this curve and shall correspond to a strength 15% greater than indicated on the plans. No substitution shall be made in the materials used in the work without additional tests in accordance with this procedure to indicate that the quality of the concrete is satisfactory.

8.0 **SLUMP TESTS**

The slump for concrete, determined in accordance with BS No. 1880:1952 "Slump Test for Concrete" shall be minimum of 25mm (1") and a maximum of 75mm (3") provided the requisite strength is obtained. Corrective additions to remedy deficiencies in aggregate gradations shall be used only with the written approval of the Owner's Representative/Engineer. When such additions are permitted, the materials shall be measured separately for each batch of concrete.

9.0 **BATCHING & MIXING**

9.1 Concrete can be mixed by a mechanical batch type mixing plant with adequate facilities for accurate measurements and control of each material entering the mixer and for changing the proportions to conform to varying conditions of the work. If approved by the Contractor, volumetric batching can be adopted using cement by weight. Water shall be measured for every batch with due allowance made for water already present in aggregates. The mixing plant assembly, if used by the Contractor, shall permit ready inspection of operations at all times. The plant and its location

shall be subject to approval of the Owner's Representative / Engineer.

The Contractor shall ensure and arrange sufficient mixing machines along with standby arrangement are made available for mass concreting to ensure monolithic concreting.

9.2 **Batching**

Units whenever used shall be supplied with the following items:

- i) Weighing unit shall be provided for each type of material to indicate the scale load at convenient stages of the weighing operations. Weighing units shall be checked at times directed by as well as in the presence of the Owner's Representative / Engineer and required adjustments shall be made before further use.
- ii) Water mechanism shall be tight with the valve interlocked so that the discharge valve cannot be opened before the filling the valve is fully closed and shall be fitted with graduated gauge.
- iii) Discharge gate shall control the mix to produce a ribboning and mixing of cement with aggregates. Delivery of materials from the batching equipment to the mixer shall be accurate within the following limits:

Mixers shall not be charged in excess of noted capacity nor be operated in excess of noted speed. In general not more than 20 revolutions per minute are necessary for adequate mixing. Excessive mixing requiring addition of water to preserve required consistency shall not be permitted. The entire batch shall be discharged before recharging.

- ii) Mixing time shall be measured from the instant water is introduced into the mixer drum containing before one fourth of the mixing time has elapsed. Mixing time for mixers of one cubic yard or less shall be between 1 minute and 1½ minute; for larger than one cubic yard capacity mixers time shall be increased 15 seconds for each additional cubic yard or fraction thereof. If an air-entraining agent is used, additional mixing time shall be allowed such as to provide the specified air content.
- iii) On cessation of work, including all stoppages exceeding 20 minutes, the mixers and all handling plant shall be washed with clean mixing water. If old concrete deposits remain in the mixer drum, it shall be rotated with clean aggregate and water prior to production of new

concrete.

iv) **Discharge Lock**

Unless waived by the Owner's Representative/Engineer, device to lock the discharge mechanism, until the required mixing time has elapsed, shall be provided on each mixer.

- v) No hand mixing under any circumstances even with extra cement shall be permitted. If during concreting, the mixing plant fails, the concrete already poured shall be removed, unless directed otherwise by the Owner's Representative / Engineer.

9.4 **Batching Aggregate by Volume**

- i) Whenever batching aggregates by volume is allowed, as and when required, the cement shall be batched by weight and the water by weight or volume. Each size of aggregate shall be measured in metallic containers the dimensions of which are 1'-0 (300) × 1'-0 (300) × 1.25' (375). The containers shall be of such shape that their volume can be easily checked by measurement.

- ii) Concrete shall be mixed in a (Full Load) batch mixer (half load or hand operated mixers will not be allowed) of an approved type and in good condition having a drum rotating about a horizontal or inclined axis.

Continuous mixers shall not be used. Each mixer is to be fitted with a water measuring device having accuracy within one per cent of the quantity of water required for the batch. The water measuring device shall be such that its accuracy is not affected by variations in the water supply pressure.

- iii) The batch shall be so charged into the mixer that some water (about 10 percent) enters the drum in advance of the cement and aggregates. Water shall then be added gradually while the drum is in motion such that all required water shall be in the drum by the end of the first quarter of the mixing time. The concrete shall be mixed until a mixture of uniform colour and consistency is obtained.

- iv) The amount of concrete mixed in any batch is not to exceed the rated capacity of the mixer. The whole of the batch is to be removed before materials for a fresh batch enters the drum.

9.5 Transporting & Placing Concrete

- a) Concrete shall be conveyed and deposited as quickly as possible after mixing and shall proceed so that, as far as possible a complete section of the work is done in one operation.
- b) Transport of concrete shall be in a manner approved by the Owner's Representative/Engineer and shall be so as to avoid segregation or loss of ingredients of concrete.
- c) All foundations and portions of work to be concreted shall be approved by the Owner's Representative/Engineer before concrete is poured.
- d) All forms and reinforcement shall be completed, cleared inspected and approved before pouring of concrete. No concrete is to be deposited till the Owner's Representative/Engineer has inspected and approved in writing all reinforcement, foundations, forms, details, positioning of all fixture and materials to be embedded in concrete, control levels and screeds etc., and he is satisfied with the arrangements that the Contractors has made to efficiently proceed with the work such as sufficient labor, materials, plants, etc. Such an approval will not relieve the Contractor from any of his obligations under this Contract. Water shall be removed from excavations before concrete is deposited.
- e) Placing of concrete shall not be permitted when, in the opinion of the Owner's Representative/Engineer, the sun, heat, wind, cold, snow or limitations or facilities furnished by the Contractor prevent proper placing finishing and curing of concrete.
- f) All concrete shall be thoroughly compacted and consolidated by means of pneumatic or mechanical vibrators or other approved compacting method. Care shall be taken to avoid segregation due to excessive vibration. The Contractor shall maintain on site at all times one or more standby vibrators. Tapping or other external vibration of forms shall not be allowed, unless so directed by the Owner's Representative/Engineer. Compaction shall be done until the whole mass assumes a jelly like appearance and consistency with the water just appearing on the surface.

Concrete shall be sufficiently tamped and consolidated around the steel rods, care taken that the vibrator does not touch steel or formwork and into all parts of the moulds in order that no voids or cavities are left. Steel shall not be disturbed during operations of concreting. Concrete shall be brought up in even layers not more than 150mm (6") thickness and worked against side of

forms to give a smooth and uniform surface. No excessive water shall be allowed to come out and lie on the surface of concrete.

The concrete must be of such a consistency that after ramming, consolidating and tamping is completed, a thin film of water is just appearing on the surface.

- g) Hardened concrete, debris and foreign material shall be removed from interior of forms and from inner surface of mixing and conveying equipments.
- h) Concrete shall not be dropped freely from a height of more than 2.0 meters. In cases where an excessive drop is inevitable the Contractor shall provide spouts, down pipes, chutes, or side parts to forms with pockets which will protect concrete from segregation. The discharge of the spouts, down pipes or chutes shall be controlled so that the concrete may be effectively compacted into horizontal layers not more than 200 mm (8") thick.
- i) Concrete is to be deposited as quickly as possible after mixing and to proceed continuously. Concrete which has attained its initial set or has contained its mixing water for more than 20 minutes shall not be allowed to be placed in the work.
- j) When concrete is laid on hard core, such as sub grade for floor slabs, or other absorbed material, the surface is to be watered, consolidated and, where specified, blinded before the concrete is deposited.
- k) Fresh concrete shall not be placed on previously laid concrete or on old concrete surfaces until the later has been cleaned of dirt, scum and laitence by wire brushes. The clean surface shall then be thoroughly wetted and grouted with cement slurry as approved by the Owner's Representative / Engineer.
- l) Care shall be taken not to disturb newly placed concrete by vibrator, indirect loading or otherwise. No traffic or loading shall be allowed on the concrete until it has thoroughly set and hardened.
- m) Construction joints in concrete shall only be given at locations indicated on the drawings or as approved by the Owner's Representative/Engineer. At the end of the day's work the concrete shall be finished off against a temporary shutter stop which shall be vertical and securely fixed. Such stops shall be removed within 24 hours of placing of concrete.

Construction joints not shown on the drawings shall be reinforced with steel bars or dowels, if deemed necessary by the Owner's Representative / Engineer shall be furnished without any additional payment. Surface shall be wetted and coated with neat cement grout immediately before placing new concrete.

- n) No concrete shall be placed during rains or in acclement weather and all fresh concrete shall be suitably protected from rainfall and excessive heat or cold.
- o) Should any part of the exposed surface present a rough uneven or imperfect appearance when the shuttering is removed, it shall be picked out to honeycomb depth and refilled and properly re- surfaced or entirely redone as per directions of Owner's Representative/Engineer at the cost of the Contractor.
- p) On removal of the forms and before the skin has had time to harden, all faces of the concrete inside or outside, to be kept exposed shall be rubbed over with carborandum stone, and washed with cement to remove all marks, projections, hollows or any other defect. No extra payment shall be made for this work.

All exposed surfaces and lines of the concrete work are to be true and fair without cracks, bends, windings and distortions of all kinds, and if accruing, shall be removed without any extra charges by the Contractor. All un-plastered concrete works is to be fair faced, smooth, pleasing and to the entire satisfaction of the Owner's Representative/Engineer.

A float or screed is to be worked over the exposed surfaces of all concrete work on the flat or curve, so as to render the surfaces perfectly smooth, clear, and to the necessary slopes or falls or as required to receive the floor or roof finishes, according to the drawings, and as directed by the Owner's Representative/Engineer without any extra charges by the Contractor.

10.0 **PROTECTION & CURING**

All exposed concrete shall be cured. Curing shall be accomplished by preventing loss of moisture, rapid temperature change and mechanical injury or injury from rain or flowing water for a period of at least 7 days. Curing shall be started as soon as the concrete has hardened sufficiently for the surface not to be marked. Curing shall be done either by continuous sprinkling of water on the surface or by covering with sand, hessian, canvas or other approved fabrics mats, which shall be kept continually wet. If required and so directed by the Owner's

Representative/Engineer, formed surfaces with forms in position shall also be cured by keeping all forms continually wet. As an alternative, curing of concrete, on all exposed surfaces which could not be kept covered, such as sides of the beams, under side of the slabs, may also be done by sealing concrete surfaces with curing compounds like "Paccacure" or equal so as to arrest loss of moisture from concrete, with approval of Owner's Representative/Engineer. The Contractor shall take special care that curing of concrete is satisfactorily carried out and in accordance with methods specified herein and/or as specified. Any negligence in this regard may result in total rejection of such concrete works, which in the opinion of the Owner's Representative/Engineer have not been adequately cured.

All concrete components of concreted structures shall be clearly marked with non-washable paints to indicate the date of placing concrete. During hot weather, curing shall be done even at night.

11.0 **PVC RUBBER SEAL JOINT/WATER STOPPER**

a) **Material**

All PVC hydrofoil water stops shall be central bulb type 230mm wide from a manufacturer approved by the Owner's Representative/Engineer. The specific gravity of PVC hydrofoil water stop shall not be less than 1.07. Full stretch breakout intensity when tested at normal temperature shall not be less than 12.94 MPa.

The material shall have a modulus of rigidity of 853 psi at 106°C 72.65 MPa at 200°C.

b) **Placing & Connections**

In general all PVC hydrofoil water stop shall be placed in the centre of the structural member as shown on the drawings and as directed by Owner's Representative / Engineer. Each piece of the hydrofoil water stop shall be of maximum practicable length. An ordinary sharp knife saw or any other sharp tool can be used to cut the water stop. Joints at inter sections and at ends of pieces shall be made in the manner most appropriate to the material being used. Joints shall develop effective water tightness fully equal to that of the continuous water stop material and shall permanently retain their flexibility. For straight line connection melting method of connection can be used by pressing two water

stops intended for connection against a heated iron or copper sheet when they are melted, the two are combined.

After joining, the water stop should be allowed to cool.

For all other connection such as T-type or L-type, the welding method of joining should be used. Welding rod of same material as the water stop shall be used. The welding rod and the water stop shall be heated and melted at the same time by means of heated air jetting from the hot jet gun.

12.0 **FORMWORK**

12.1 The formwork shall be inclusive of all labor, material, workmanship and alike. All formwork and supports thereto shall be designed by the Contractor and relevant drawings for approval from the Owner's Representative / Engineer before the work is put in hand. Such an approval shall not relieve the Contractor from all the obligations of the Contract or give rise to any claims. The material for formwork shall be of steel.

12.2 **Making Forms**

- i) The formwork for columns, beams, slabs and all other works whether to be precast or cast in situ shall be capable of obtaining industrial finishing and shall be rigidly formed and designed by the Contractor to the shapes and forms as per drawings in accordance with the best of the existing practices so as to be able to withstand, without displacement, deflection or deformation movements of any kind, the pressure of the moist concrete and all other loads. The exposed surfaces of all beams, columns, walls, slabs, etc., shall be Homogenous, perfectly even and smooth in appearance.
- ii) Scaffolding pipes shall be used for supporting the shuttering of walls, beams, columns and slabs etc.

12.3 **Rigid with allowance for camber and bulges**

It shall be fabricated and erected in position, perfect in alignment, levels and true to plumb and shape and securely braced so as to enable it to stand all weights, live and

vibrating to be endured during placing of concrete and its subsequent hardening till the formwork is struck. It shall be so sufficiently rigid as not to lose its form and shall be so made for bulging, and deflection as to give the finished concrete the required lines, plumb, size and shape.

12.4 **Exposed surfaces left un-plastered**

For concrete work, where concrete surface is to be exposed for Industrial finish and left un-plastered, the formwork shall be made up of M.S. plates as approved by the Owner's Representative/Engineer, so as to make a perfectly smooth surface of the finished concrete.

Where any surface defects on the exposed concrete surfaces occur and which do not impair the structural performance, being in excess of the designed surfaces, and the architectural appearance of the work in the opinion of Owner's Representative/Engineer, such defects may be removed by ganting and grinding with carborandum stone or in any other approved manner, at the cost of the Contractor, otherwise the whole or part of the work may have to be removed and remade good by the Contractor at his own cost. For precast concrete members the forms shall be rigid, exact, smooth and made of steel.

12.5 **Injury or Damage**

The Contractor shall be responsible for any injury to the work and any consequential damages caused by or arising from the removal and striking of forms, centering and supports, due to striking too soon, and any advice, permission or approval given by the Owner's Representative / Engineer, related to the removal and striking of forms, centering and supports shall not relieve the Contractor from the responsibilities herein defined.

12.6 **Treatment after removal of Forms**

Any minor surface honey combing or other irregularities are to be properly made good immediately upon the removal of the formwork and the surface made good to the satisfaction of the Owner's Representative/Engineer. Any small voids shall be neatly filled with cement mortar consisting of one part of cement to two parts of sand and the

whole surface rubbed over with carborandum stone and cement wash and bring the whole to a smooth a pleasing finish and uniform colour.

13.0 **CONSTRUCTION JOINTS**

Construction joints shall be located within the middle third of spans of slabs, beams and girders or as indicated on the drawings or as approved or directed by the Owner's Representative/Engineer. Joints in columns shall be made at the under-side of the deepest beam framing thereto. Beam stems shall be poured monolithically unless directed otherwise by the Owner's Representative/Engineer. Joints not specified or shown on the drawings shall be so located as to least impair the strength and appearance of the work. Except where indicated on the drawings no joint shall be made in footings or foundations without written approval of the Owner's Representative/Engineer.

Construction jointing shall be at angles to the member and shall be formed against firm stop boards, the stop boards shall be removed as soon as possible after placing the concrete but without the risk of movement of the concrete and the concrete surface shall be well brushed with a hard brush and washed-off with a spray of water, two (2) to four (4) hours after casing, to expose the aggregates and provide a key for the next pour. In all liquid retaining structures and other sub-structures pits and trenches, etc. PVC or any other approved water stops shall be provided at the construction joint in the manner shown on the drawings and/or approved by the Owner's Representative/Engineer.

Whenever a section of concrete is left unfinished, for any reasons with the approval of Owner's Representative/Engineer, leaving a surface which will be hard set before additional concrete can be joined to it, dovetails, grooves or other bond with the new work shall be provided at cost of the Contractor. Before depositing fresh concrete upon or against any concrete which has already set, the surface of the set concrete shall be roughened with a cutting tool, any laitance removed, thoroughly cleaned of all foreign matter, well watered and covered with cement grout, and special care shall be taken to ram the fresh concrete thoroughly up and against the set concrete; and, if deemed necessary by the Owner's Representative/Engineer, the joints shall be reinforced with steel bars or dowels to be all furnished and done by the Contractor without any additional payment.

14.0 **ANCHOR BOLTS & BASE PLATE/EMBEDDED PARTS**

- 14.1 All sleeves, inserts, anchor bolts, and other embedded items shall be positioned accurately and supported against displacement by template wherever required or as directed.
- 14.2 Material for Anchor bolts and nuts shall be ASTM A-307 Gr.B.
- 14.3 Material for Base Plates, Embedded plates/template shall be ASTM A-36.
- 14.4 Anchor bolts shall be positioned inside vertical reinforcement by means of temporary template 5mm thick.
- 14.5 The Contractor shall fabricate template as per bolt circle Diameter at no extra cost to the owner.
- 14.6 Special anchor bolts for machinery engines pumps and compressors shall be in accordance with the equipment manufacturer recommendations.
- 14.7 Plates and sections shall be true to form Stiffeners, plates and the like shall be ground to fit the profile of the member. Sections to be cut to 'exact' lengths shall be accurately cold sawn or machined. Preparation of edges by flame-cutting shall, wherever practicable, be done by machine. Cold sawn, machine-cut and flame-cut edges shall be cleaned free of burrs and slag and left as smooth and regular as those produced by edge planing. All holes shall be drilled properly.
- 14.8 No welding allowance will be paid while calculating the weight of embedded parts.

REINFORCEMENT STEEL

15.1 **Scope of Work**

The work covered in this section of the specifications consists of furnishing all materials, tools, labors and in performing all operations in connection with providing, straightening, cutting, bending, binding, fixing, including binding wire, chairs, pins, spacer block complete in strict accordance with this section of the specifications, the applicable drawings, approved bar bending schedule, and the terms and conditions of the Contract.

15.2 **Materials**

- a) Reinforcing steel to be new billet stock of mild steel (plain bar), hard grade (deformed bar)

and ribbed tor steel as specified on the drawings and shall confirm to British Standard Specifications or equivalent ASTM or Pakistan Standard.

- b) The Contractor shall purchase the steel from Owner's Representative / Engineer approved factory of steel manufacturing. The Contractor shall furnish to Owner's Representative / Engineer, Manufacture's mill certificate to guarantee that steel meets the standard, specification requirement and minimum certified yield stresses as follows:
- i) Mild Steel plain bars confirming to BSS 15 or BSS 4449 or PS231-1962.
Tensile Strength -438 to 517 N/mm² (63500 to 75000 lbs/in²) Yield Strength -250 N/mm² (36000 lbs/in²) Elongation -16% to 24% (average 20%)
- ii) Ribbed Tor Steel confirming to BS 4461. Tensile Strength -490 N/mm² (70,000 lbs/in²). Yield Strength -420 N/mm² (60,000 lbs/in²) Elongation -14.5%
- c) All steel to be true to the Standard Specifications with regard to bend ability specially the hard grade deformed bars under Ø19mm (¾") shall be capable of being bent cold through 90 degrees round a bar of four times its own diameter without fractures or injury of any kind. In case of deformed bars over Ø19mm and under Ø28mm round a bar of 6 times its own diameter shall be capable of being bent cold.
- d) 18 gauge (preferably galvanized) or MS wire shall be used for binding the steel reinforcement.

15.3 **Testing**

Samples shall be tested for above specification in an approved laboratory whenever required by the Owner's Representative/Engineer and all costs of such tests shall be borne by the Contractor.

15.4 **Storage**

Reinforcing bars shall be stored on platforms above surface of ground and be free from scale, oil, structural defects prior to placement in works. Rusted or dirty steel bars shall not be used in the works unless brushed and cleaned by proper steel wire brushes and after being approved for use by the Owner's Representative / Engineer.

15.5 **Reinforcement Cutting & Placing**

- a) All reinforcement steel shall be cut and bent cold in strict accordance with approved bar bending schedules and drawings supplied by the Contractor. The Contractor shall prepare bar bending schedule from approved structural working drawings and instructions to be provided to him by the Owner's Representative/Engineer. The bending schedules shall be drawn on approved forms and submitted to the Owner's Representative/Engineer for checking and approval. The steel reinforcement shall be cut and bent to sizes as per drawings and approved bending schedules. In case any bars, cut, bent or even fixed in position are found incorrect in dimension size or shape according to the requirements of the drawings and instructions of the Owner's Representative/Engineer, the Contractor shall replace such steel bars cut bent or fixed in position by correct sized bars at his own cost and no extra payment shall be made to the Contractor on such account.

The system of holding bars in place shall ensure that all steel in top section will support weight of workmen without displacement or distortion. Suitable spacers/ chairs as approved by the Owner's Representative/Engineer shall be used for supporting and spacing of bars. In case, any bars are bent or displaced they shall be straightened on the limit of a day's pour and shall be in place and firmly tied with 18 gauge (preferably galvanized) or M.S. wires. Bars with kinks or bends not shown on drawings shall not be used.

- b) Where indicated in the drawings, mesh shall be of the sizes as shown on drawings and confirm to British Standard BS 785. Mesh reinforcement when used in slabs shall be supported at proper elevations by standard accessories. In slabs on ground, precast concrete blocks may be substituted for chairs.

15.6 **Laps & Splices**

a) No splicing of bars shall be allowed at position other than shown on the drawings. All lap lengths shall not be less than 48 times of the diameter for nominal M.S. bars while hard grade bars and tor steel shall have laps of 50 times the bigger diameter of lapping bars unless otherwise indicated on the drawings. Splices of adjacent bars shall be staggered or as directed by the Owner's Representative / Engineer.

- b) All reinforcing steel fixed in position shall be inspected by the Owner's Representative/Engineer and no concrete shall be poured until steel placement has been approved by the Owner's Representative / Engineer. For inspection purposes

the Contractor shall give to the Owner's Representative / Engineer reasonable notice before the scheduled pouring time. Clear concrete cover to reinforcement steel shall be as indicated on the drawings/specified.

16.0 **SAMPLES & TESTING**

16.1 **Cement**

Cement shall be tested as prescribed in the following British Standard or equivalent ASTM Standards.

a) Ordinary Portland Cement BS 12 b) Sulphate Resistant Cement BS4027

16.2 **Aggregates**

Aggregates shall be tested as prescribed in relevant Pakistan Standard or British Standard 882. In addition fine aggregates shall be tested for organic impurities in conformity with BS 812 or equal ASTM Standard or Pakistan standard.

16.3 **Testing of Concrete**

- i) The Contractor shall provide for test purposes one set of mix cubes taken for each class of concrete poured on each day. The Owner's Representative / Engineer, however, may order for more cube tests if any irregularity is found in the concrete.
- ii) All test cubes shall be 150 × 150 × 150mm (6" × 6" × 6") size.
- iii) All test cubes of the same set shall be made from the same batch of concrete.
- iv) Three cubes of the set shall be tested at 7 days and three shall be tested at 28 days or at a date as directed by the Owner's Representative/Engineer.
- v) All test specimens shall be made and cured in accordance with Pakistan Standard PS 560:1965 or British Standard BS 1881 or ASTM C-31.
- vi) Specimens shall be cured under laboratory conditions except that the owner's Representative/Engineer may require curing under field conditions.

- vii) All cube moulds shall be steel-moulds perfectly true having all internal and the meeting faces machined to a smooth surface.
- viii) If the strength tests of the laboratory controlled specimens for any portion of the work falls below the minimum allowable compressive strength at 28 days required for the class of concrete used in that portion, the Owner's Representative/Engineer shall have the right to order replacement of the effected work.
- ix) All test cubes cast at site shall bear distinguishing mark showing serial number, date of casting, quality of concrete and place from where sample was taken and where that batch of concrete was placed in the structure. A proper daily record of test specimen made, best results obtained shall be maintained by the Contractor and weekly test results shall be submitted to the Owner's Representative/Engineer.
- x) The Owner's Representative/Engineer may require load tests for the part of the structure from where test specimens have shown unsatisfactory results at the cost of the Contractor.

In the event that load test indicate bad quality of concrete, measures as prescribed by the Owner's Representative/Engineer shall be taken to correct the deficiency at no additional cost to the Owner. The nature, descriptions and details of load test shall be determined by the Owner's Representative/Engineer and shall be binding on the Contractor.

16.4 **Reinforcement**

Reinforcing bars shall be tested as per relevant B.S 785 and B.S 4461: 1969 or ASTM Standard. The Contractor shall furnish copies of manufacturer certificates of tests for steel reinforcement to be supplied to prove yield, ductility, (elongation) and tensile strength.

The cost of the tests is a Contractor charge. In any case, materials not according to requirements shall be rejected.



ATTOCK PETROLEUM LIMITED

DETAILED ENGINEERING SERVICES FOR THE DEVELOPMENT OF APL
TERMINAL

SPECIFICATION FOR
STRUCTURAL STEEL WORKS

TABLE OF CONTENTS

<u>S. NO.</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
1.0	SCOPE	3
2.0	APPLICABLE STANDARDS	3
3.0	GENERAL	3
4.0	FABRICATION	4
5.0	ERECTION	5
6.0	PAINTING	7

1.0 **SCOPE**

This specification cover the minimum requirements of steel, steel work fabrication, methods including precautions for erection of steel structures, painting and other general requirements incidental to steel work, for complete job as shown on the Drawings.

The work covered by this specification consists of supply of all material, labor, plant, equipment and appliances including welding, bolts, nuts, washers, anchor bolts and embedded parts etc.

2.0 **APPLICABLE STANDARDS**

Latest edition of the following standards are relevant to these specifications, wherever applicable:

AISC	Code standard practice
AISC	Specification for Architecturally exposed structural steel.
ASTM	Specifications for structural joints using ASTM A-325 or A 490 Bolts.
AISC/SSPC	Guide to shop painting of structural steel.
AWS	Specifications for welding of steel structures (AWS D 1.1)
BS 449	Use of structural steel in Buildings.

3.0 **GENERAL**

- 3.1 Structural steel work shall be provided and fixed complete with all plates, cleats, bolts, etc, cut to lengths and sizes and drilled as shown on the drawings.
- 3.2 Unless otherwise required by the Contract all forms of steel used shall be of standard section and shall be of the exact dimensions. If the Contractor is unable to obtain steel to the required dimensions he shall submit alternative proposals to the Owner and Owner's Representative / Engineer for their approval.
- 3.3 Welding electrodes shall comply with the requirements of AWS series E60XX.
- 3.4 The workmanship shall be of the best quality and all persons employed at the site shall be competent and skilled in their respective trades.

3.5 The allowance welding processes are according to AWS A 3.0.

4.0 FABRICATION

The Contractor shall notify the Owner's Representative / Engineer about doubts and errors discovered in the drawings for clarification / rectification well in advance to prevent any fabrication errors. Fabrication shall not be commenced until approval is obtained from the Owner's Representative / Engineer.

4.1 Straightening of Material

Rolled material, before being worked upon must be straightened within tolerances by ASTM specifications A6. Straightening necessarily shall be done by mechanical means or by the application of limited amount of localized heat. The temperature of heated areas, as measured by approved methods, shall not exceed 1100 degree F for A 514 steel or 1200 degree Fahrenheit for other steels.

4.2 Cutting

As far as possible cutting must be done by shearing. Oxygen cutting shall be done where shear cutting is not possible and shall preferably be done by Machine. All edges shall be free from gauges, notches or burs. If necessary the same shall be removed by grinding.

4.3 Holes Punching and Drilling

The Holes shall be fabricated by Machine drilling only and shall be punched where thickness of the material is not greater than the diameter of bolt + 3 mm. if the thickness of the material is greater the holes shall either be drilled or sub-punched and reamed to size. The die for all sub-punched holes and the drill for all sub-drilled holes shall be at least 2 mm smaller than the nominal diameter of the rivet or bolt.

4.4 Plates and sections shall be true to form. Stiffeners, plates and the like shall be ground to fit the profile of the member.

4.5 Welding

4.5.1 The work shall be erected, fitted and temporarily bolted together for the approval of the Owner's Representative / Engineer before any welding is carried out.

- 4.5.2 Maximum and minimum size and lengths of fillet welds shall be in accordance with AISC specifications.
- 4.5.3 Welding shall be carried out in accordance with Standards of American Institute of Steel Construction using electrodes as specified. Welders shall be suitably qualified and experienced and efficient methods for removing all welding slag, spatter and flux residues thoroughly.
- 4.6 Purlins shall, wherever possible, be fabricated to span continuous over two bays. To achieve this purlin joints should be staggered, with suitable continuity joints for single bay length members.
- 4.7 Holding down bolts shall be supplied as required for building into the supporting concrete members.

4.8 Tolerances

A variation of 1 mm is permissible in the overall length of members with both ends finished for contact bearing. The bearing surfaces shall be prepared to a common plane by milling.

Members without end finished for contact bearing which are to be framed to other steel parts of the structure shall have a variation from detailed length not greater than 3 mm.

5.0 ERECTION

5.1 Test Assembly

- 5.1.1 Fabricated shop assemblies of all components such as Columns, Beams, Girders, Purlins, Bracing, Trusses, shall be test assembled together after fabrication, prior to field erection.
- 5.1.2 Test assembly of beams and bracings of each floor and columns, beams, and bracing of each grid/axis may be done separately and partly, but involving, all components of at least 3 bays.
- 5.1.3 Test assembly work and procedure should be planned during fabrication process. Major fabrication work of locating the gussets etc. marking and drilling of holes for interconnecting joints, spliced connections levelling, placing of bracings etc should be done simultaneously with test assembly.

5.1.4 Each test assembly will be inspected by the Owner's Representative /Engineer and will be dismantled by getting his approval in written.

5.2 Bracing

The frame of steel skeleton buildings shall be carried up true to plumb within the limits defined in the AISC code of standard practice, and temporary bracing shall be introduced wherever necessary to take care of all loads to which the structure may be subjected including the equipment and the operation of the same. Such bracing shall be left in place as long as required for safety.

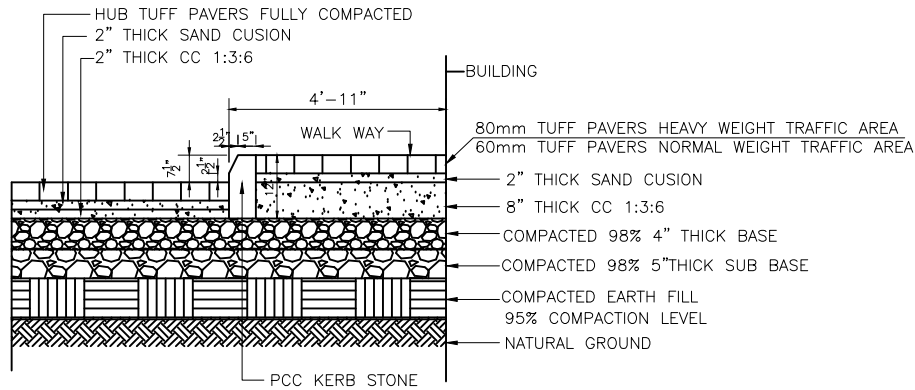
Wherever piles of material, erection equipment and other loads are carried out during the erection, proper provision shall be made by the Contractor to take care of the stresses resulting from such loads.

5.3 Alignment

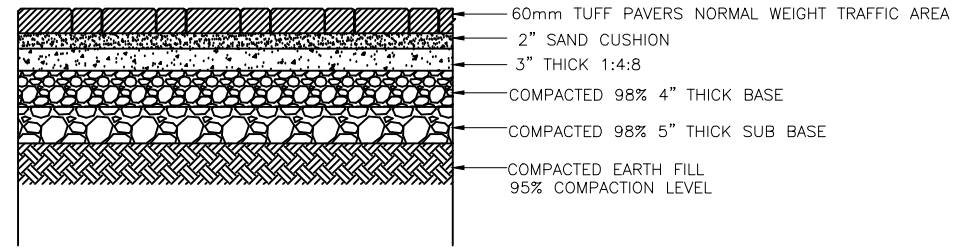
No riveting, permanent bolting or welding shall be done at site during erection until as much of the structure as will be stiffened thereby is properly aligned.

6.0 PAINTING

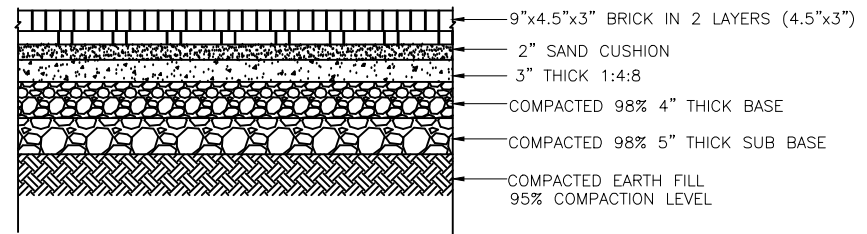
All structural steel work shall be Sand Blasted to SA 2.5, and painted with 2 coats of primer and 2 coats of Enamel finish of NIPPON, ICI or Berger. The shade shall be approved by Owner's Representative/Engineer.



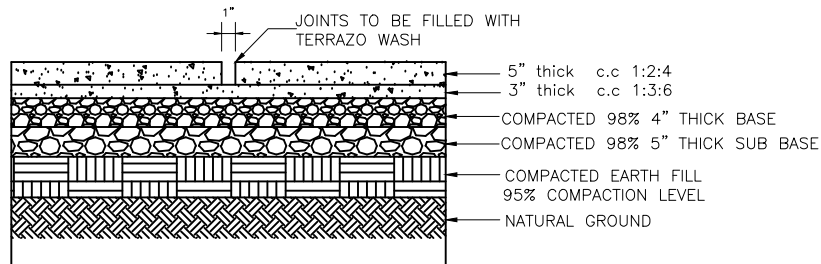
SECTION OF HARD STADING/WALKWAY



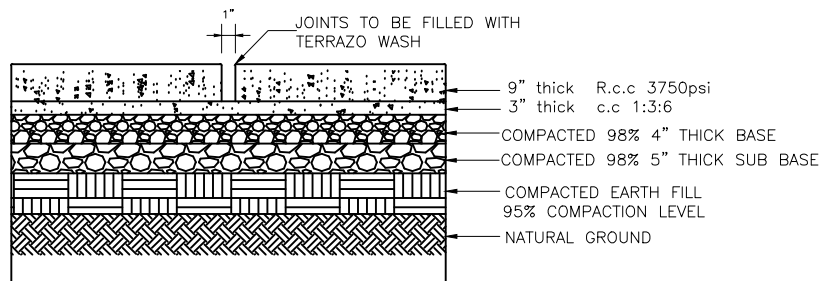
SECTION OF TUFF TILE APPROACHES



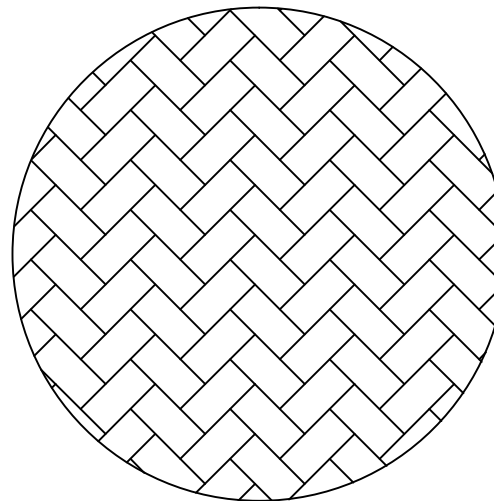
SECTION OF TUFF TILE APPROACHES



SECTION OF C.C HARD STANDING



SECTION OF R.C.C HARD STANDING



ARRANGEMENT OF PAVERS

NOTES

1. ALL CONCRETE FOR STRUCTURAL WORKS SHALL HAVE A MINIMUM CUBE CRUSHING STRENGTH OF FCU = 3,000 PSI.
2. ALL REINFORCING STEEL SHALL BE COLD DRAWN, DEFORMED BARS HAVING A MINIMUM YIELD STRENGTH FCU = 60,000 PSI.
3. CONCRETE COVER TO MAIN REINFORCEMENT IS 1-1/2".
4. USE SULPHATE RESISTANT CEMENT FOR ALL CONCRETE WORKS BELOW GROUND LEVEL.

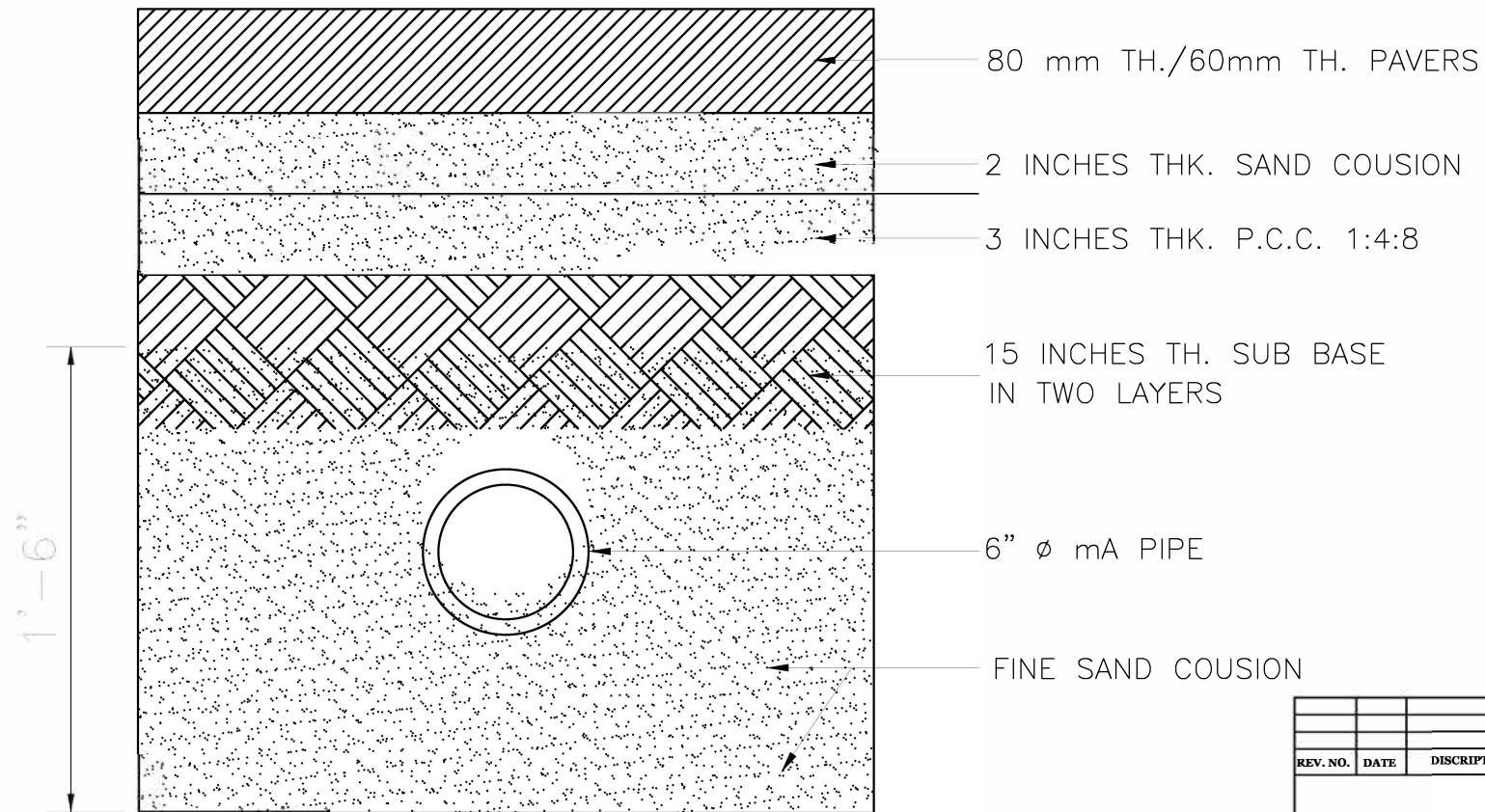
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ATTOCK PETROLEUM LIMITED

PROJECT:
CONSTRUCTION DETAIL OF
**HARD STANDING
PAVERS & PAVEMENT**

DRAWING NO.	02	PAGE NO.	
DESIGNED BY	MM	DATE	20-06-2017.
DRAWN BY	MA/WA	APPROVED BY	



**ULTRA POLYETHELYNE
PIPING SYSTEM**

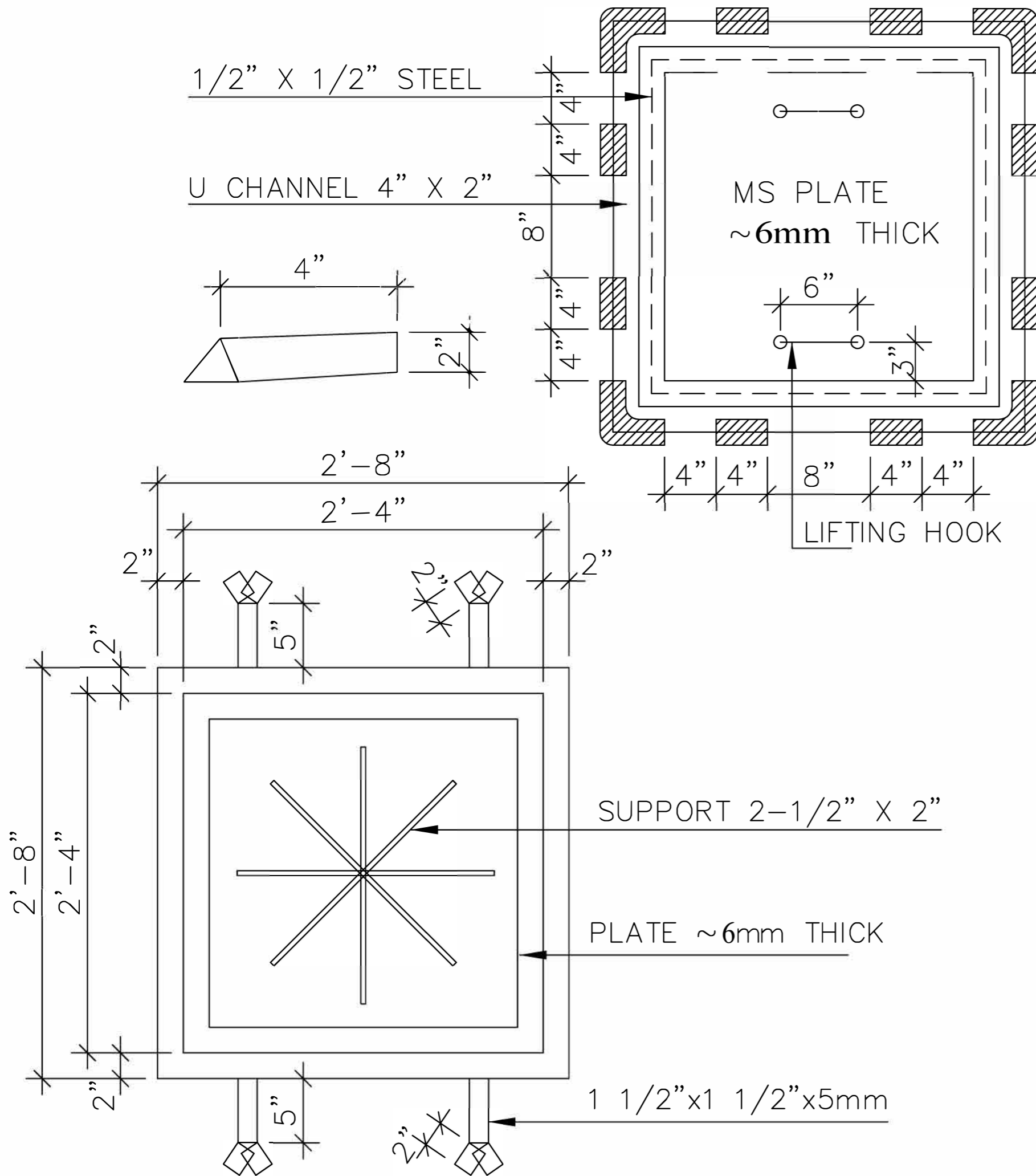
REV. NO.	DATE	DISCRIPTION OF REVISION	DRAWN	CHECKED	APPROVED



ATTOCK PETROLEUM LIMITED

PROJECT:
**CONSTRUCTION DETAIL OF
MS PIPING SYSTEM**

DRAWING NO.	07	PAGE NO.	
DESIGNED BY	MM	DATE	20-06-2017.
DRAWN BY	MA/WA	APPROVED BY	



NOTES:
I. STRUCTURAL STEEL:

1. MATERIALS:

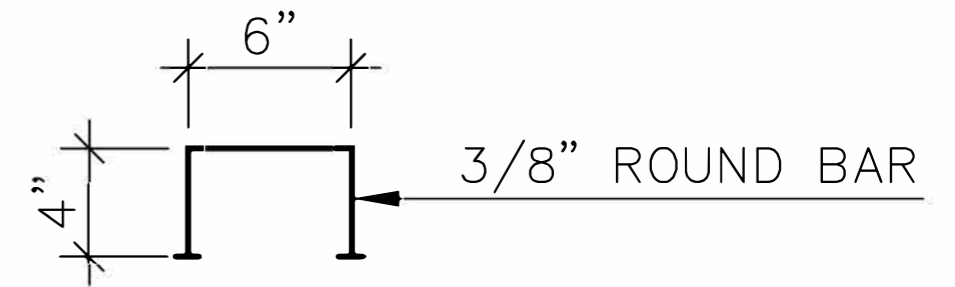
- a) ALL STRUCTURAL STEEL SHALL BE PRIME GRADE BILLET QUALITY HOT ROLLED MILD STEEL CONFORMING TO ASTM-A36 BS-15./PAKISTAN STEEL
- b) ALL WELDING SHALL BE CARRIED OUT USING E60XX TYPE ELECTRODES MADE BY PAKISTAN OXYGEN OR APPROVED EQUIVALENT.

2. WELDING:

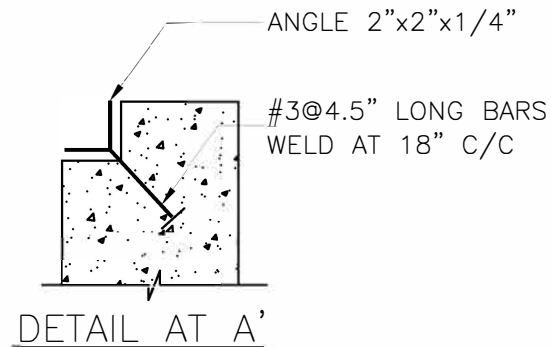
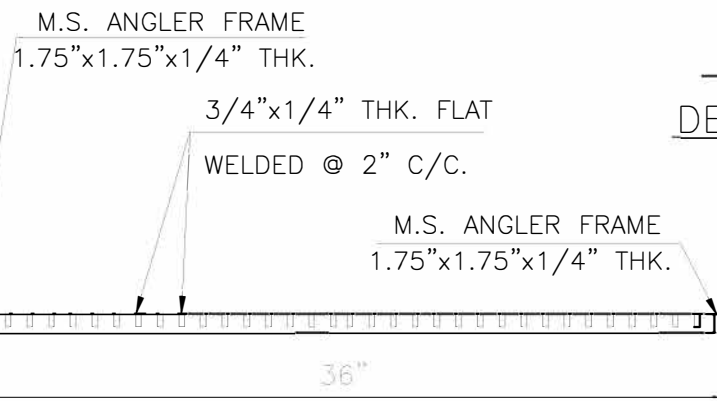
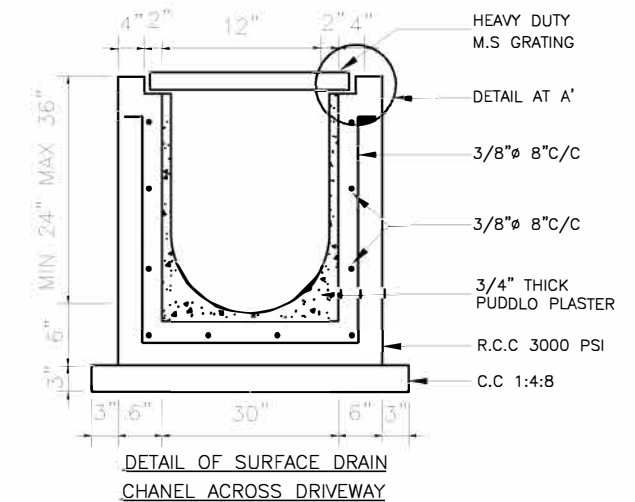
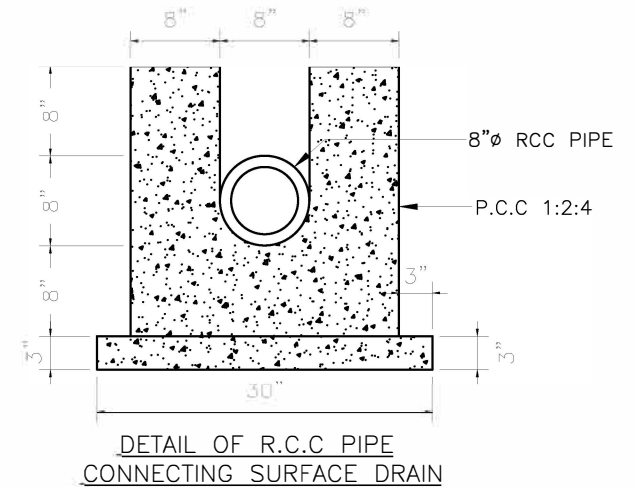
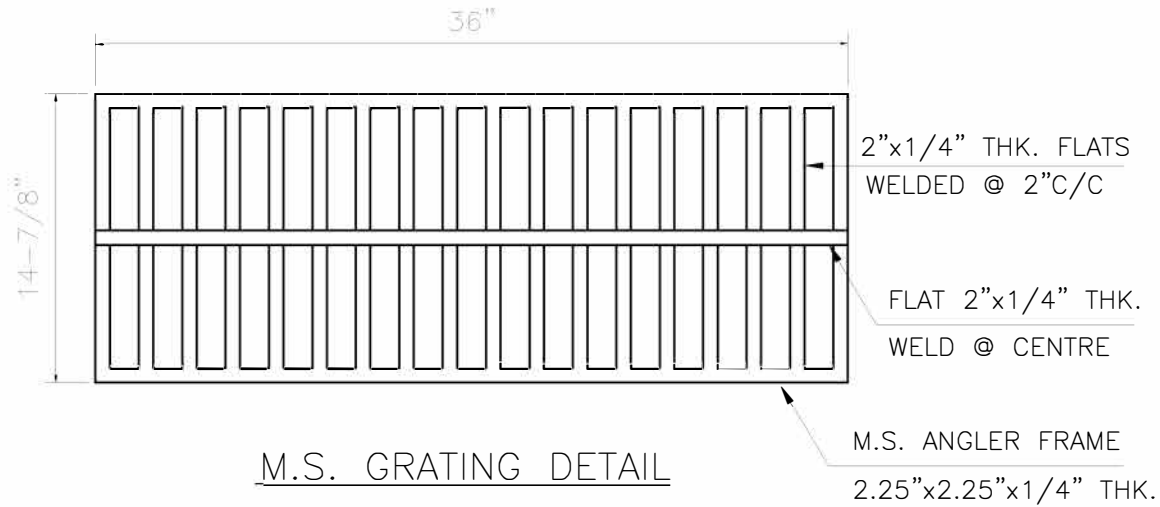
- a) WELDING SHALL BE DONE BY LICENSED WELDER. MINIMUM SIZE OF THE WELD AND PIECES SHALL BE:
PIECES: THICKNESS OF THE PIECE EQUAL TO OR GREATER THAN ~4" (6mm).
FILLET WELD: ~1" (1mm) LESS THEN THE THINNER PIECE JOINTED.
- b) ALL WELDS SHALL BE CONTINUOUS ALL AROUND WITH FULL RETURNS AT ENDS.

3. WELD LENGTH ALONG THE LONGITUDINAL AXIS OF THE MEMBER SHALL BE SUFFICIENT TO DEVELOP THE FULL WORKING FORCE OF THE MEMBER BASED ON 21 KSI WORKING STRESS ON THE GROSS MEMBER SECTION.

4. ALL SURFACES TO BE PAINTED WITH TWO COATS OF RED LEAD PRIMER OR COATS OF RED OXIDE AFTER WIRE BRUSHING



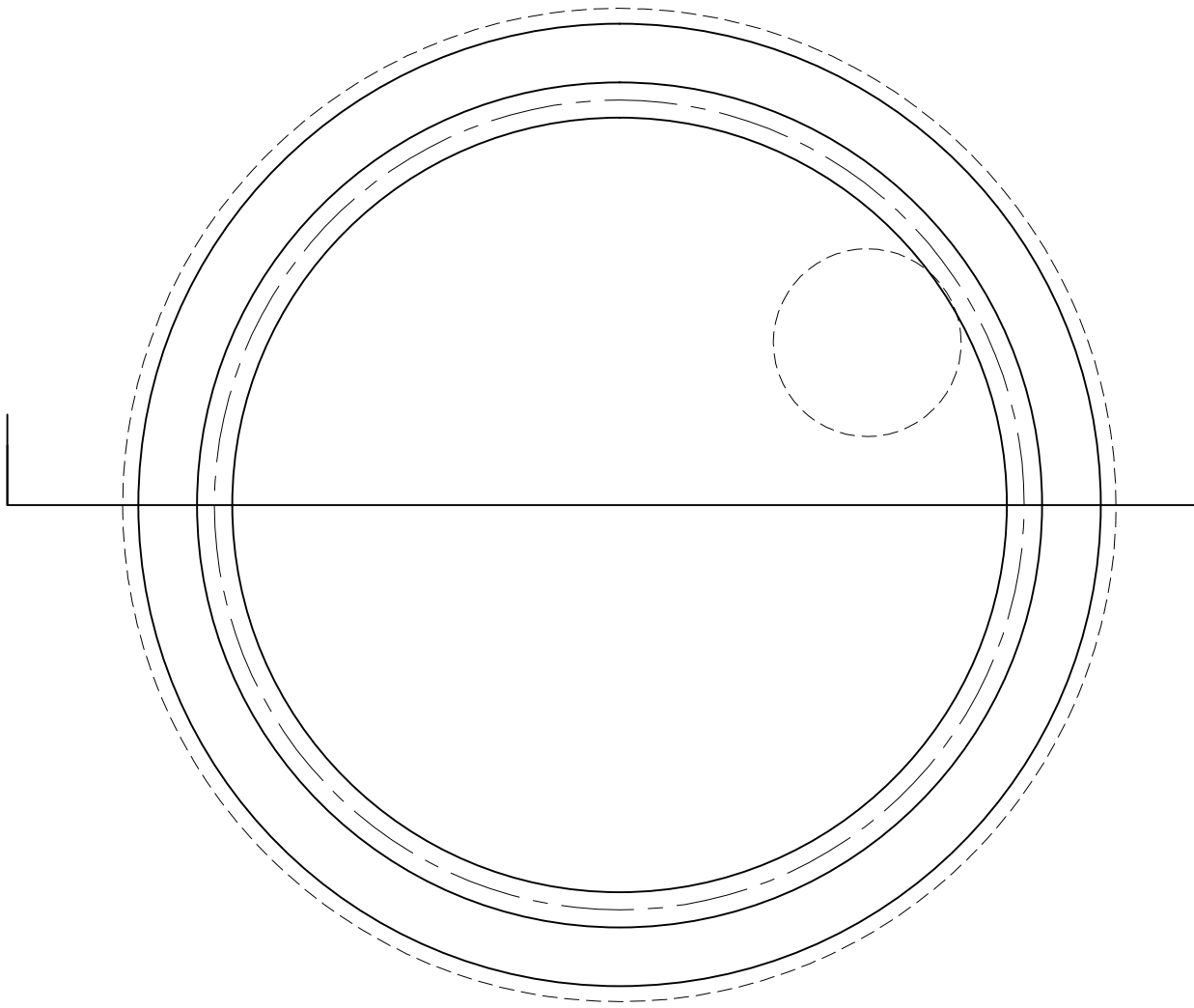
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ATTOCK PETROLEUM LIMITED			
MAN HOLE COVER			
DRAWING NO.	11	PAGE NO.	79
DESIGNED BY	MM	DATE	07-04-2012.
DRAWN BY	ZA/MA	APPROVED BY	



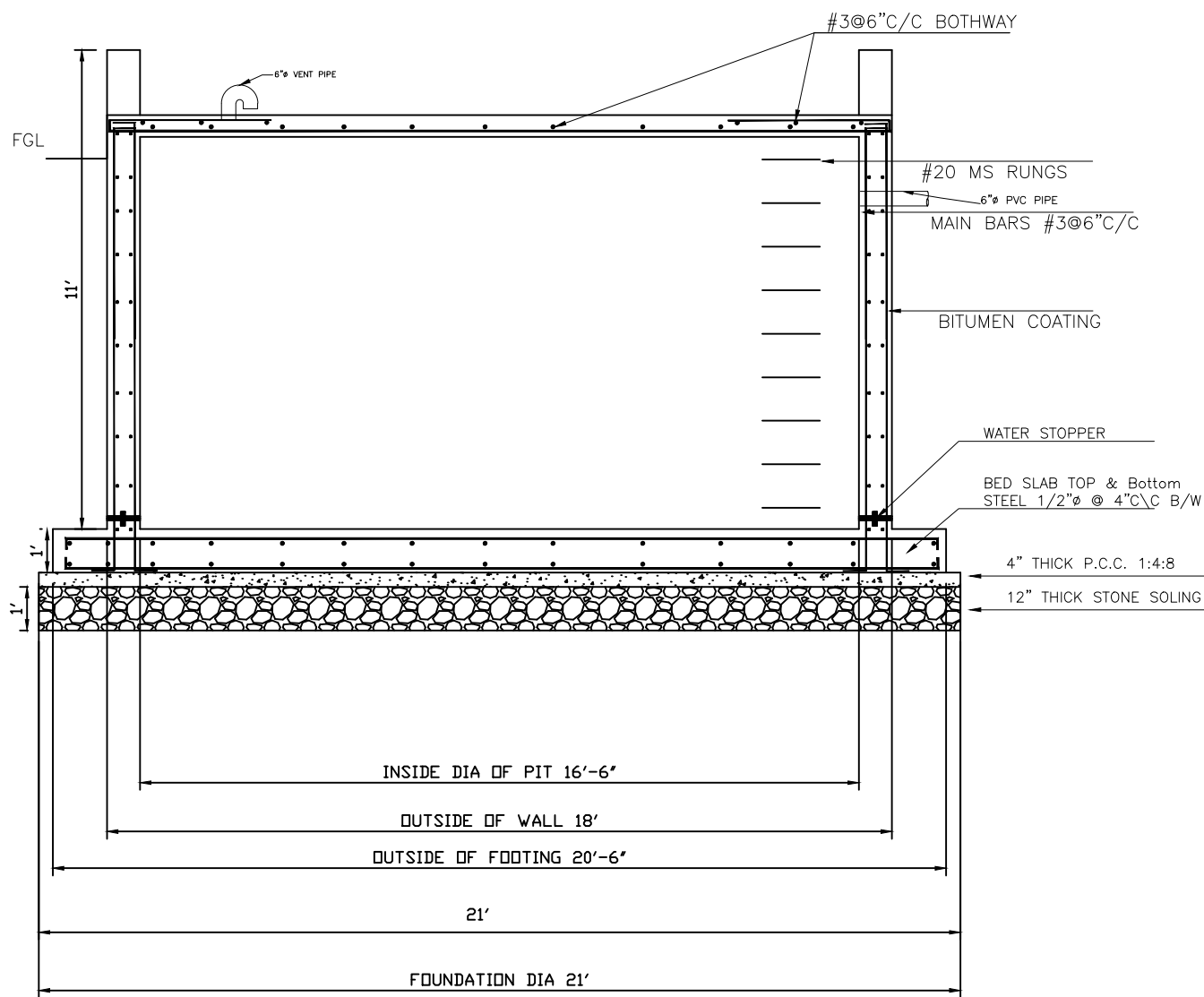
NOTES

1. ALL CONCRETE FOR STRUCTURAL WORKS SHALL HAVE A MINIMUM CUBE CRUSHING STRENGTH OF FCU = 3,000 PSI.
2. ALL REINFORCING STEEL SHALL BE COLD DRAWN, DEFORMED BARS HAVING A MINIMUM YIELD STRENGTH FCU = 60,000 PSI.
3. CONCRETE COVER TO MAIN REINFORCEMENT IS 1-1/2".
4. USE SULPHATE RESISTANT CEMENT FOR ALL CONCRETE WORKS BELOW GROUND LEVEL.

REV. NO.	DATE	DISCRIPTION OF REVISION	DRAWN	CHECKED	APPROVED
ATTOCK PETROLEUM LIMITED PROJECT: CONSTRUCTION DETAIL OF STEEL GRATING FOR SURFACE DRAIN CHANNEL					
DRAWING NO.	17	PAGE NO.			
DESIGNED BY	MM	DATE	20-06-2017.		
DRAWN BY	MA/WA	APPROVED BY			




PLAN OF RCC PIT



SECTION AT A'-A

NOTE:-

1. ALL CONCRETE FOR STRUCTURAL WORKS SHALL HAVE A MINIMUM CUBE CRUSHING STRENGTH OF (1:2:4) FCU = 3,000 PSI.
2. ALL REINFORCING STEEL SHALL BE COLD DRAWN, DEFORMED BARS HAVING A MINIMUM YIELD STRENGTH OF 6000 PSI.
3. FOUNDATION DESIGN IS BASED ON A NET ALLOWABLE BEARING CAPACITY OF 0.75 TSF.
4. CONCRETE COVER TO MAIN REINFORCEMENT SHALL BE:
 BOTTOM SLAB = 3"
 WALLS = 1-1/2"
5. USE SULPHATE RESISTANT CEMENT FOR ALL CONCRETE WORKS.
6. THE DEPTH OF THE SEPTIC TANK MAY HAVE TO BE ADJUSTED TO SUIT THE LEVEL OF OUT LET PIPE & UNDER GROUND WATER LEVEL.

DATE	REVISION NO
	
ATTOCK PETROLEUM LIMITED DRAWING NO. _____ CONSTRUCTION DETAIL OF STORM WATER COLLECTION PT (R.C.C)	
DRAWING NO.	USAGE TYPE
DESIGNED BY	DATE
DRAWN BY	APPROVED BY
	10-10-2023.