UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

VOLUME – 1

PART 1 - STANDARD CONDITIONS

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STANDARD CONDITIONS

1. Definitions and Interpretations

1.1 In this Contract the following words and expressions shall, unless the context otherwise requires, have the meanings hereby respectively assigned to them.

1.1.1 Contract

Means the documents forming the Tender and acceptance thereof together with the documents referred to in the Letter of Acceptance including these Conditions, the Specifications, the Schedule of Unit Rates, Reinstatement Charges and Conditions, the Schedule of Work and the drawings and any other document which the parties hereto agree to form part of the Contract. All these documents taken together shall be deemed to form one Contract and shall be complementary to one another.

1.1.2 Work

Means all work to be carried out in pursuance to the Contract, including any work carried out under the provisions of Condition 3 hereof.

1.1.3 Employer

Means Ooredoo Q.S.C. a share holding company established by Law No. 21 for the year 1998 of the State of Qatar, its successors and assigns.

1.1.4 Contractor

Means the individual, firm or company undertaking the work and shall include authorized representatives and permitted assigns of such individual, firm or company.

1.1.5 Engineer

Means the person appointed by the Employer to act as Engineer, for the proposes of this Contract, or the representative of such person.

1.1.6 Supervising Officer

Means the officer for the time being appointed by the Engineer for the purpose of superintending the work; or, where the context permits, the representative of such officer.

1.1.7 Specifications

Means the Specifications, or any modification thereto, of the Works or any addition thereto included in the Contract or approved by the Employer.

1.1.8 Tender

Means the Contractor's priced offer to Employer (as adjusted or varied by the Letter of Acceptance) for the execution and completion of the Works and the remedy of any defects therein in accordance with the provisions of the Contract.

1.1.9 Letter of Acceptance

Means the formal acceptance by Employer of the Tender incorporating any adjustments and variations to the Tender as agreed between Employer and the Contractor.

1.1.10 Commencement Date

Means the date stated in the Letter of Acceptance or in the Engineer's instructions to the Contractor for commencement of the Work whichever is latest.

1.1.11 Time for Completion

Means the time stated in the Contract, or any extension thereof approved by the Engineer, for completing the works or any part or section thereof and passing the tests on completion calculated from the Commencement Date.

1.1.12 Site

Means the place or places provided by Employer where the Works are to be executed and any other places as may be specifically designated in the Contract as forming part of the Site.

1.1.13 Contract Price

Means the sum stated in the Letter of Acceptance as payable to the Contractor for the execution and completion of the Works and the remedy of any defects therein or such other sum as may be ascertained and become payable under the Contract.

1.1.14 Maintenance Period

Means the period of maintenance stated in Appendix 'A' calculated from the date of completion of the Works.

1.1.15 Contractor's Normal Working hours

Means the hours on each day of the week, which the Contractor shall usually work in the execution of the Contract, or which are specified in the Contract.

1.1.16 Highway Authority

Means streets authority, land owner, or any other authorizing body, which maintains or owns carriageways, verges thoroughfares, passages or private land.

1.1.17 Time Work

Means work for which there are no fixed rates in the Contract and to which the Employer's Schedule of Unit Rates applies.

1.1.18 Permanent Reinstatement and Making Good

Means restoring excavated surfaces in accordance with the conditions imposed by the Highway Authority.

1.2 The headings and marginal notes in these conditions shall not affect the interpretation thereof.

1.3 Words importing the singular only also include the plural and vise versa where the context requires.

1.4 Where in the Contract provision is made for giving or issue of any notice, consent, approval or certificate by any person, unless otherwise specified such notice, consent, approval or certificate shall be in writing and the words "notify", "approve" or "certify" shall be constructed accordingly. Any such consent, approval or certificate shall not unreasonably be withheld or delayed.

2. Standard of Work

The Contractor shall execute the Contract in the most substantial and workmanlike manner and to the entire satisfaction of the Engineer. The Contractor shall be responsible for the correctness of the work throughout the whole term of the Contract including the maintenance period.

3. Alterations, Additions and Omissions

3.1 The Engineer may, by a Variation Order to the Contractor at any time before the Works are taken over, instruct the Contractor to :

a. increase or decrease the quantity of any work
b. omit any such work
c. change the character, quantity or kind of any such work
d. execute additional work of any kind necessary for the completion of the Works
e. make any deviations from the footway to the carriageway (and viceversa) or from one street to another or alter the details of the construction of a jointing chamber etc.
f. change the levels, lines, position, depth and other dimensions of any part of the Works.

3.2 Employer reserves the right to carryout by itself or other agents any work, in connection with the works, which is not provided for in the Contract or the Schedule of Unit Rates.

4. Local Consents

4.1 Prior to giving instructions to commence the works, the Employer shall obtain any necessary consent of the highway Authorities or any other body or person for the work and shall furnish the Contractor with the conditions, if any, attaching to such consent in so far as such conditions bear upon the execution of the work.

4.2 During the progress of works, if the Contractor encounters any surface or underground obstruction and consent to remove or cross it is required, the Contractor shall obtain such consent from the competent authorities.

5. Notice served

The Contractor shall notify the Supervising Officer of any notice served on the Contractor by any public body and shall inform the Supervising Officer of the date on which any such notice is served on the Contractor.

6. Safety Precautions

6.1 In connection with the work and at his own cost, except as is otherwise provided for in this Condition, the Contractor shall be responsible for the implementation, observance and performance by himself, his sub-contractors, agents or workers of all safety precautions for the protection of himself, his workers and any other person and of all property as may be affected by the execution of the works, whether required by any instrument, rule, order, regulation or law or otherwise necessary or desirable, whether imposed on himself or Employer.

6.2 The Contractor shall comply also with such safety instructions as may be given by the Supervising Officer and shall observe all the Employer's security instructions.

6.3 Without prejudice to the generality of the foregoing provisions in this Condition, the precautions to be taken by the Contractor shall include, but shall not be limited to :

a. Any necessary tests for the presence of gas;

b. Any necessary tests for the presence of cables, pipes, connections and other appliances for public utilities.

Employer shall, wherever possible, provide the Contractor with the details of the positions of cables, pipes, connections and other appliances for public utilities. The Contractor shall not commence any excavation until he has obtained from the Supervising Officer all details that are available. Any excavation ordered by the Supervising Officer to determine the presence of such cables, pipes, connections and other appliances shall be deemed to be a Pilot Hole.

c. Provision and maintenance of all lights, guards, fencing and watching when and where necessary or required by the Supervising Officer or by any competent statutory or other authority.

6.4 Any information or instruction which may be provided or given by any Employer servant shall in no way relieve the Contractor of his responsibilities under para (1) of this condition or of his liabilities under Condition 38 hereof.

6.5 The Contractor shall have posted at the site the name and address of a responsible representative who can be contacted in an emergency.

7. Compliance with Laws and Regulations

The Contractor shall comply with all Government Laws, Regulations and Orders and all by-laws of any local Authority in the district in which the work is to be carried out whether in respect of any accommodation which may be provided by the Contractor for the workmen employed on the Contract, or any other matter to which the by-laws apply, and, unless otherwise directed by Employer, conform to all regulations of any Highway Authority having the control of the streets concerned, and shall give all such notices as are required by law to be given.

8. Cartage and Demurrage

8.1 The Contractor shall cart all materials, tools and plant which he has to provide, and shall, on completion of the work, remove all such materials, tools and plant as may be surplus.

8.2 The Contractor shall, as and when required by the Supervising Officer after issue of the notice to commence the work, collect from wharfs, docks, goods yards, or equally accessible places all articles provided by Employer and shall deliver such articles on the work, and shall on completion of the work collect all such articles provided by Employer as may be left or over, or any stores recovered during the course of the work and deliver them at such places as the Supervising Officer may direct. The Contractor shall supply sufficient labour and / or mechanical aids, except where provided by the duct transporter (see Condition 9 of Part II), to perform safely all such loading, unloading and other services as may be necessary in connection therewith. The Contractor shall repay to Employer the amount of any demurrage, handling, storage or other charges which Employer may incur in consequence of any delay in collecting on the part of the Contractor.

9. Care of Stores

The Contractor shall be responsible for the safety of all materials and tools deposited with him by Employer for incorporation in the work, and shall be liable for any loss of, or damage to, such materials and tools whilst they are in his custody. Also, the Contractor shall keep readily available such records of the materials so deposited as will enable the Supervising Officer from time to time to check the quantities used and in hand against those delivered to the Contractor’s charge.

Employer Stores (e.g.ducts) in the custody of the Contractor may not in any circumstances be employed for guarding openings or any obstructions.

10. Stores and Materials Provided by the Contractor

With the exception of the articles named in the Specification as articles to be supplied by Employer, the Contractor shall supply whatsoever materials and stores as may be necessary, and shall, if so required, furnish the name and address of the maker of any article he proposes to use, and obtain at his own expense for the Engineer, or any officer who may be deputed by the Engineer for the purpose, all facilities for examining and testing such article at the maker's works before dispatch, and shall also furnish all facilities for the Supervising Officer to examine and test materials and stores on the ground if he desires to do so.

11. Tools, Plant and Appliances

The Contractor shall provide all requisite tools, plant and appliances with the exception of those specified in the Specification as being provided by Employer.

12. Storage Accommodation

The Contractor shall provide, on or at a convenient distance from the work, suitable storage accommodation for all materials for incorporation in the work, including such materials as are provided by Employer.

13. Water and Fuel; Pumping and Baling

The Contractor shall furnish all necessary water and fuel. He shall undertake all requisite pumping and baling.

14. Office, Daily Report etc.

The Contractor shall, if required, provide on or near the Site a suitable and convenient office for the use of the Supervising Officer. As a minimum acceptable standard the office shall :

a. be soundly constructed and transportable

b. have a floor area not less than 4 sq. m. and a height not less than 1.9 m to eaves

c. be weatherproof and capable of being ventilated. Permanent ventilation at a low level shall be installed to prevent an accumulation of gas should there be a gas leak from the equipment provided under paragraph 14. The ventilator(s) shall be designed to prevent them being rendered ineffective by office furniture, etc., for example, by fitting suitable shaped wire grilles.

d. have the interior painted white or cream to give the maximum light reflection.

e. be secured against unauthorized entry.

f. be provided with lighting equipment. All flexible hoses connecting gas appliances and gas cylinders shall be securely attached by means of a "Jubilee" clip or similar device.

g. be provided with a desk, or bench, at least 1.40m long and 610mm wide, and under this at least one drawer, capable of being locked, of suitable size to hold diaries and other contract documents. The desk, or bench should preferably be sloped from back to front, which should then be about 1.0/m from the floor of the office.

h. have a window in such a position as to adequately light the working area of the desk or bench.

i. be provided with suitable chairs or stools for the desk bench.

j. be provided with suitable and washing utensils for the use of the Supervising Officer and agent.

k. be provided with air conditioning.

If the Supervising Officer considers one office inadequate, additional offices shall be provided. The office shall be reserved for clerical work in connection with the Contract and shall be maintained in a clean condition.

The Contractor shall keep on the work site a copy of the Specifications and relevant drawings. The Contractor shall fill daily the Monitoring and Progress Report form, entering therein the number and grades of men employed on the work, details and measurements of all work executed and details of any deviations and/or extra work. The completed report shall be submitted to the Supervising Officer for scrutiny. The Supervising Officer shall sign the report but he shall not be deemed thereby to have acknowledged on behalf of the Employer that the Contractor has complied with his obligations to carry out the work in accordance with the Contract. The Supervising Officer shall have full liberty himself to put notes of instructions therein. At the end of the day, the Contractor shall fax the Progress Report, complete in all respect, to the office of Engineer, Civil Works.

The terms of this Conditions shall apply to the whole of the work including the Contractor's permanent reinstatement.

15. Return to Site and Permanent Reinstatement Arrangements

In the event of any break in continuity of the work the Contractor must give 24 hours advance notice in writing to the Supervising Officer / Engineer of his intention to return to the site to perform further work under the Contract and must not commence any such further work without the Supervising Officer's / Engineer's written agreement that he may do so.

The foregoing shall also apply in all cases of return to site to carry out permanent reinstatement and making good.

Agreements to alter the basis of working regarding permanent reinstatement and making good from the specified in the Contract shall not be made with the Highway Authority without the prior approval in writing of Employer.

16. Contractor or Agent on Work

The Contractor or his accredited Agent, who shall be fully qualified to represent him, shall be always on the work site during work progress.

The Contractor's agent shall, in particular, be capable of and empowered by the Contractor to carry out the following duties :

a. To hire or discharge all necessary foremen or workmen.

b. To provide by hire or otherwise all necessary tools, equipment and mechanical aids other than items provided by Employer.

c. To purchase all necessary materials.

d. To give instruction to foremen or workmen on the principles and practice of Employer underground duct and jointing chamber construction.

e. To take any necessary action to ensure the safety of property and public.

f. To agree with the Supervising Officer day to day measurements of the work, carry out and record these in a legible manner in the Daily Progress Report.

g. To organize the work so as to meet the scheduled rate of progress.

17. Dismissal of Contractor's Servants

The Supervising Officer shall have power to require the Contractor, subject to compliance with any statutory requirements, immediately to cease to employ in connection with the Contract and to replace any foreman or person below that grade whose continued employment thereon is in the opinion of the Supervising Officer undesirable.

The Engineer shall have power to require the Contractor immediately to cease to employ in connection with the Contract and to replace any person above the grade of foreman, including the Contractor's agent, whose continued employment in connection therewith is in the opinion of Employer undesirable.

Any decision of Employer of the Supervising Officer as the case may be under this Condition shall be final and conclusive.

18. Sub-Letting

The Contractor shall not transfer or assign directly or indirectly to any person or persons whatsoever, the whole or any portion of this Contract except with the written permission of the Employer.

19. Overtime and Night Work

Only on receipt of authority in writing from the Supervising Officer / Engineer shall the Contractor perform work outside the Contractor's Normal Working hours and the

Contractor shall accurately record the particulars of the same in the Daily Progress Report. Payment for work performed outside the Contractor's Normal Working Hours shall be made only where such work is performed at the request of Employer.

20. Time Work

Only on the written authority of the Supervising Officer / Engineer shall the Contractor perform Time Work, and as in the case of work outside the Contractor's Normal Working hours he shall record the particulars in the Daily Progress Report and render an account of the same as hereinafter provided. All Time Work shall be performed and paid for as provided in Clause 8 of Part 2 - Measurement and Payment Conditions.

21. Access to Premises

The Contractor shall provide any necessary means of temporary access to any premises, the entrance of which is obstructed or interfered with by or in the course of the execution of the work.

22. Existing Plant or Other Obstructions

If conditions necessitate the adoption of such a course, the Contractor shall remove, divert or carry by means of blocks or concrete piers and/or, where necessary, provide supporting stabilized backfill for, any existing water main, telephone and electric cables, oil and gas pipes, drain, sewer and the like, as well as make good any vault, cellar, or subway disturbed. Such work will be paid for as indicated in Clause 12 (2) of Part 2 - Measurement and Payment Conditions provided prior written authority of the Supervising Officer be obtained. The Contractor shall record the particulars in the Daily Progress Report, which shall be duly signed by the Supervising Officer.

23. Suspension of Work

23.1 Should the work or any portion thereof be suspended for a period exceeding two normal working days :

a. by order of the Engineer or the Supervising Officer for Employer, or

b. with the concurrence of the Engineer or the Supervising Officer for Employer and without prejudice to the generality of the foregoing, if the Contractor be prevented from or delayed in proceeding with the work by Employer or some other Contractor employed by Employer, or

c. pursuant to the order or request of any Highway Authority, body or person, provided that such suspension is not necessary in order to avoid risk of damage from inclement weather or other like causes and is not due to any neglect or default of the Contractor.

Employer shall pay to the Contractor such reasonable expenses incidental to demobilisation and resumption of the work as it, in its sole discretion, may determine as proper to be allowed. Such allowance of expenses shall be made only in respect of suspension authorized in writing by the Engineer or the

Supervising Officer (such authorization not to be unreasonably withheld) and shall not include any wages paid by the Contractor to his workmen during such time. The Engineer shall decide such costs on the basis of the Contractor's manpower and plant on the day of suspension of work and resources required for the balance work i.e. expenses for the day of demobilisation and for the day of resumption. The Engineer shall also grant a fixed duration of time for the completion of the balance works. The decision of the Engineer shall be final.

23.2 The provisions of this Condition shall apply to any suspension of work due to a public function (even though such suspension may extend for a period less than two days) which could not be foreseen prior to the commencement of the work in any street affected.

23.3 No claim shall be made under this Condition unless the Contractor has, within a period of one week from date of authorization of suspension, given notice in writing to Employer of his intention to make a claim.

23.4 In the event that the work or any part thereof is suspended the Contractor shall, during such suspension, properly protect and secure the works or such parts thereof so far as, in the opinion of the Supervising Officer, is necessary.

24. Removal of Articles, Materials, Rubbish etc.

The Contractor shall remove all articles and material requiring removal, and all rubbish earth, dirt or filth and so leave the site clean as the work proceeds. He shall provide all necessary shoots or tips.

25. Non-availability of items in Employer's Stores

If during the progress of the work any item which is required for incorporation therein is not available in the Employer's stores, the Contractor shall install such item when it becomes available without any extra cost to the Employer. The Engineer shall grant a fixed duration to complete the balance of work. If the Contractor refuses or fails to comply within the specified time, the Employer shall be at liberty forthwith to either get the work done by its employees or employ and pay some other person/s to perform the work and all costs consequent or incidental thereto shall be recoverable from the Contractor and shall be deducted by the Employer from any monies in his hands due or to become due to the Contractor.

26. Imperfect Work

26.1 The Supervising Officer may condemn any work which may be damaged by heat, water, subsidence, or any other cause, or which in his opinion has not been performed in accordance to the Specification. The Contractor shall at his own cost and charge, rectify and reform or reconstruct the same wholly or partly as may be required. The Contractor shall also take back any materials or articles which may be considered by the Supervising Officer to be unsound or otherwise not in conformity with the Specification, and he shall not again attempt to use on any

work of Employer any such materials or articles. All materials or articles which are condemned shall be removed from the work site within 24 hours.

26.2 If the Contractor shall neglect to rectify, reform or reconstruct any work as aforesaid within a period to be specified by the Supervising Officer, or shall omit to take back any materials or articles which may be considered by the Supervising Officer to be unsound or otherwise not in conformity with the Specifications, or shall fail to immediately provide suitable materials or articles in lieu of those condemned, then the Contractor shall at once cause the work to be stopped if so instructed by the Supervising Officer / Engineer, and Employer shall be at liberty forthwith to employ and pay some other person or persons to perform the work, and to cause the required materials or articles to be purchased and all costs consequent or incidental thereto shall be recoverable from the Contractor and may be deducted by Employer from any monies in his hands due or to become due to the Contractor.

27. Re-examination of Condemned Work etc.

If any dispute or difference shall arise between the Supervising Officer and the Contractor in respect of any decision of the Supervising Officer condemning any work or rejecting any material or in respect of any other instructions of the Supervising Officer such dispute of difference shall be referred to the Engineer or to some other person or body appointed by the Employer to re-examine such condemned work or rejected material and to settle any such dispute and the decision of the Engineer or such appointed person or body shall be final.

28. Commencement and Completion

28.1 Instructions to proceed shall only be issued after approval by the competent utilities authority of Road Opening (RO2). For the purpose of this Contract non-approval of RO2 shall constitute good reason for the Employer to terminate the Contract.

28.2 The Contractor shall obtain and submit in writing, permissions from Public Works Authority (ASHGHAL), Municipality and Traffic Police (RO3), before commencing the work.

28.3 The Contractor shall commence the work within such a period (mobilising period) after the receipt from the Supervising Officer / Engineer written instructions to proceed as shall be specified in the Contract and at such point/s and in such positions as may be decided by the Supervising Officer.

28.4 Time shall be of the essence of the Contract and the work shall (subject to Condition 29 hereof), be completed within the period specified in the Contract.

28.5 Testing, measuring and cleaning the site are included in the Contract period. Hence, completion certificate shall not be issued unless the site is cleaned, measurements completed and ducts & boxes tested to the satisfaction of the Supervising Officer.

29. Extension of Time

In the event of :

a. the quality or nature of any additional or extra work ordered under clause 3 hereof or

b. delay, impediment or prevention by Employer

c. special circumstances which may occur for causes beyond the reasonable control of the Contractor,

being such as fairly entitle the Contractor to an extension of the Time for Completion, the Engineer shall allow and certify in writing such time of extension as he may, in the circumstances, deem, appropriate, provided that the Engineer shall not be bound to allow any extension of time unless the Contractor shall have within 14 days of the occurrence of any of the above events submitted to the Supervising Officer full and detailed particulars of any claim to an extension of time to which he may consider himself entitled.

30. Penalty

If the Contractor shall fail to complete the Works within the Time for Completion or any extension thereof, the Contractor shall pay to the Employer the sum stated in Appendix 'A' as penalty for such default for every day or part of a day which may elapse between the Time for Completion or any extension thereof as the case may be and the actual date of completion upto a maximum of 20% of the Contract Price.

Employer may without prejudice to any other method of recovery deduct the amount of such penalty from any monies in its hands due or which may become due to the Contractor.

The payment or deduction of such penalty shall not relieve the Contractor from his obligation to complete the works or from any of his other obligations or liabilities under the Contract.

If the delay shall exceed the time for which the maximum penalty is payable, Employer may confiscate the Bank Guarantee provided by the Contractor under clause 35 hereof in part or whole and terminate the employment of the Contractor and employ any other person to complete the Works at the expense of the Contractor.

31. Certificate of Completion

31.1 As soon as the Supervising Officer / Engineer shall certify the works have been completed in all respects and the prescribed tests successfully passed, the Engineer shall issue a Certificate of Completion in respect of the Works. For major works (CWC's), the period of maintenance shall commence from the date of completion stated in such Certificate. The Engineer shall also issue a Site Clearance Certificate to the concerned Municipality to enable the Contractor to obtain the Municipal backfilling Certificate.

31.2 If second phase Bitmac reinstatement is involved in the work, the Engineer shall issue a Partial Completion Certificate at the time of completion of the works and the Final Completion Certificate after the second phase re-instatement (after six months to one year).

32. Maintenance

32.1 To the extent that the Works shall, at or as soon as practicable after the expiration of the Maintenance Period, be delivered to Employer in the Condition required by the Contract to the satisfaction of the Engineer, the Contractor shall :

a. complete any outstanding work as soon as practicable after the date of Completion and

b. execute at his own expense, all such work of repair, amendment, reconstruction, rectification and making good of defects, imperfections, shrinkages or other faults as the Engineer may, during the Maintenance Period or as soon as practicable after its expiration, instruct the Contractor to execute.

32.2 If the Contractor fails to carry out such instructions within a reasonable time Employer shall have the right to employ and pay any other person to execute the required work and all cost consequent or incidental thereto shall be borne by the Contractor and may be deducted by Employer from any monies in his hands due or to become due to the Contractor.

32.3 The Contractor shall, if instructed by the Engineer at any time during the Maintenance Period or as soon as practicable thereafter, uncover any Works for inspection by the Engineer or the Supervising Officer and if as the result of any such inspection any defect, imperfection or fault in the work shall appear, the Contractor shall investigate the cause thereof and at his own expense remedy such defect imperfection or fault.

If the Contractor fails to carryout such instruction within a reasonable period Employer shall have the right to employ any other person to uncover the Works and correct any defects therein and charge the Contractor with all costs consequent or incidental thereto.

33. Default of Contractor

33.1 If the Contractor shall :

a. become bankrupt or insolvent, have a receiving order made against him, make an arrangement of composition with his creditors, carry on business under a receiver, trustee or manager for the benefit of his creditors, be wound up or goes into liquidation (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) or for any reason ceases business.

b. assign the Contract, or sub-contract the Works without the prior written consent of Employer.

c. repudiate the Contract or abandon the Works.

d. without good excuse fail to commence the Works or in the event of suspension, to resume it within 14 days of receiving written notice from the Engineer to commence or resume the work.

e. fail to correct condemned work or remove from the site and substitute any rejected materials within 14 days of receiving written instructions from the Engineer to do so.

f. despite previous warning from the Engineer in writing, persistently or flagrantly neglect to comply with any of his obligations under the Contract.

Employer may, on 14 days written notice to the Contractor, enter upon the site and the Works and expel the Contractor therefrom without thereby releasing the Contractor from any of his obligations and liabilities under the Contract or affecting the rights and powers conferred on Employer or the Engineer by the Contract, and may itself complete the work or employ any other Contractor to complete the work. Employer or such other Contractor may use for completion of the work so much of the Contractor's equipment, temporary works or materials as Employer or such other Contractor may think proper.

33.2 As soon as practicable after such entry and expulsion, Employer shall have the work so far carried out evaluated and shall ascertain all sums then due to the Contractor as of the date of expulsion.

33.3 Employer shall not be liable to make any further payments to the Contractor until the work has been completed. When the work has so been completed Employer shall have the right to recover from the Contractor the extra costs, if any, of completing the work and may deduct the same from any monies in his hands due or may become due to the Contractor or from the Bank Guarantee.

33.4 A decision by Employer to expel the Contractor from the site and complete the work by itself or by another Contractor shall not release the Contractor form his obligations to maintain the work during the Maintenance Period.

34. Certificate and Payments

34.1 The Contractor shall become entitled to payment for the works only after the issue by the Engineer of a Completion Certificate under clause 31.1 or a Partial Completion Certificate under clause 31.2, as the case may be and submission by the Contractor of the Municipal Clearance Certificate (Backfilling Certificate).

34.2 On completion of the works the Contractor shall prepare and submit to the Engineer, along with his invoice for payment, a bill of actual quantities on the Standard Works Diary duly certified by the Supervising Officer.

34.3 The Engineer shall, within 15 days of receiving the Contractor's invoice and bill of actual quantities certify to the Employer the amount of payment to the

Contractor which he considers due and payable subject to the retention of twenty (20) percent of the amount due and the deduction of any sum which may have become due and payable by the Contractor to the Employer.

34.4 Notwithstanding the foregoing, the Engineer may, in any case of a major civil works contract of value exceeding QR.300,000/-, certify to the Employer partial payment to the Contractor of an amount or amounts as the Engineer may decide; provided that no such payment may be certified unless the Engineer is satisfied that fifty (50) percent of the works has been completed in all respects, successfully passed the tests and duly certified by the Supervising Officer.

34.5 All payments shall be made by remitting the sum due to the Contractor's designated Bank account, or as the Contractor may instruct, within 45 days from the date issuance by the Engineer of a Payment Certificate.

34.6 Payment of Retention Money

a. Upon completion or the works 50% of the amount of the retention money shall become due and payable to the Contractor.

b. Upon expiration of the Period of the Maintenance for the whole of the works remaining fifty (50) percent of the retention money shall become due and payable to the Contractor, provided that if any defects or faults remain outstanding at the end of the Period of Maintenance, Employer shall be entitled to withhold payment until such defects or faults are made good or remedied.

35. Bank Guarantee

35.1 Employer hereby acknowledges that the Contractor had, at the time of his registration in Employer Register of Qualified Contractors, furnished to Employer a Bank Guarantee in the amount and validity as started in Appendix 'A', as a security for the Contractor's performance of any Contract for the execution of Underground Duct Laying and Associated Civil works which Employer may award to the Contractor during the validity term of the said Bank Guarantee.

35.2 Notwithstanding anything to the contrary in any of the Contract documents, in the event that the completion of the Works and the remedy of defects therein extend beyond the validity date of the said Bank Guarantee the Contractor shall, 7 days before the date of expiration thereof, renew the said Bank Guarantee and maintain it valid until such time as the Works are completed and all defects therein remedied. If the value of the Contractor shall within 7 days of his receipt of the Letter of Acceptance furnish additional security for the balance value in a form of a Performance Bond valid until the completion of the Maintenance Period.

35.3 Employer shall at any time have the right to demand from the Bank payment of the full amount of the Bank Guarantee and the Performance Bond or any of them or any part there of if any the following events shall occur.

a. If the Contractor is in breach of the Contract and fails to remedy such breach within the time specified in a written notice from Employer requiring him to do so.

b. If any amount of money becomes due and payable under the Contract by the Contractor to Employer and the Contractor having been given written notice to pay fails to do so within the time specified in such notice.

c. If Employer, having reason to believe that the Highway Authorities may make a claim in respect of any work of permanent reinstatement and making good of carriageways or footways or in respect of any other charge, decides to retain such amount as is sufficient to cover any such claim or charge which may become payable to the Highway Authorities.

35.4 The Contractor shall at all materials times during the Contract period maintain the Bank Guarantee and/or the Performance Bond valid to their full value, replenishing them from time as appropriate.

36. Patents etc.

All royalties, license fees or similar expenses in respect of the supply or use for or in connection with the work of any invention, process, drawing, model, plan or information, shall be deemed to have been included in the sum accepted or in the sum calculated in accordance with the prices accepted and the Contractor shall indemnify Employer from and against all claims, proceedings, damages, costs and expenses which may be made or brought against Employer or to which Employer may be put by reason of such supply or use.

37. Corrupt, Gifts and Payments of Commission

37.1 The Contractor shall not :

a. offer to give, or agree to give, to any person in the service of Employer any gift or consideration of any kind as an inducement or reward for doing or forbearing to do, or for having done or forborne to do, any act in relation to the obtaining or execution of this or any other contract for the service of Employer or for showing, or forbearing to show favour or disfavour to any person in relation to this any other contract for the service of Employer.

b. enter with the Employer into this or any other Contract in connection with which commission has been paid or agreed to be paid by him or on his behalf, or to his knowledge, unless, before the Contract is made, particulars of any such commission and of the terms and conditions of any agreement for the payment thereof have been disclosed in writing to a duly authorized representative of Employer.

37.2 Any breach of this Condition by the Contractor or by anyone employed by him or acting on his behalf (whether with or without the knowledge of the Contractor) or the commission of any offence by the Contractor or by anyone employed by him or acting on his behalf, in relation to this or any other Contract for the service of Employer shall entitle Employer to determine the Contract and recover from the Contractor the amount of any loss resulting from such determination and/or to recover from the Contractor the amount for value of any such gift, consideration or commission.

37.3 Any dispute or difference of opinion arising in respect of either the interpretation, effect or application of this Condition or of the amount recoverable hereunder by Employer from the Contractor shall be decided by Employer whose decision shall be final and conclusive.

38. Services Rendered by Employer

If Employer shall accept delivery of any articles, materials or stores in connection with the work on behalf of the Contractor and shall pay any charges upon such articles, materials and stores, either for demurrage handling, storage, cartage or carriage, or for the price of such materials or stores, or if Employer shall, at the express or implied request of the Contractor, perform any other services for the Contractor, any expense so incurred by Employer shall be recoverable from the Contractor.

39. Recovery of Sums Due

Whenever under the Contract any sum of money shall be recoverable from or payable by the Contractor, the same may be deducted from any sum then due or which at any time thereafter may become due to the Contractor, under this or any other Contract with Employer.

40. Use of Documents, Information etc.

40.1 Except with the consent in writing of Employer, the Contractor shall not disclose the Contract, or any provision thereof, or any Specification, Plan, Drawing, Pattern, Sample or information issued or furnished by or on behalf of employer in connection therewith to any person, other than a person employed or engaged by the Contractor in the carrying out of the Contract or any sub-contractor, supplier or other person concerned with the same.

40.2 Any disclosure to any person permitted under Clause 1 of this Conditions shall be made in confidence and shall extend so far only as may be necessary for the purposes of the Contract.

40.3 Except with the consent in writing of Employer, the Contractor shall not make use of the Contract or any Specification or any other things mentioned in Clause 1 of this Condition otherwise than for the purpose of carrying out the work under the Contract.

40.4 Any Specification, Plan, Drawing, Pattern or Sample mentioned in Clause 1 of this Conditions remains the property of Employer and must be returned to Employer on completion of the Contract.

41. Injury to Persons: Loss of Property

The Contractor shall indemnify Employer against all losses and claims in respect of :

a. death of or injury to any person

b. loss of or damage to any property (other than the Works),

which may arise out of or in consequence of the execution, completion or maintenance of the Works and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect thereof and in relation thereto.

42. Law to apply

The Contract shall be construed and operated and shall be interpreted in accordance with law of Qatar.

43. Right to increase or decrease

The Employer shall have the right at any time during the Contract to increase or decrease the quantity or material upto 20% of the Contract lumpsum price without any change of unit price and contract duration, or other terms and conditions of the Contract.

44. Force Majeure

44.1 Force Majeure means any circumstance reasonably beyond the control of the parties, including but not limited to :

a. war and other hostilities, (whether war be declared or not), invasion, act of foreign enemies, mobilization, requisition or embargo.

b. ionizing radiation or contamination by radio-activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosives, or other hazardous properties of any explosive nuclear assembly or nuclear components thereof.

c. rebellion, revolution, insurrection, military or usurped power and civil war.

d. riot, commotion or disorder, except where solely restricted to employees of the Contractor.

44.2 Neither party shall be considered to be in default or in breach of his obligations under the Contract to the extend that performance of such obligations is prevented by any circumstances of Force Majeure.

44.3 If either party considers that any circumstances of Force Majeure have occurred which may affect performance of his obligations he shall promptly notify the other party thereof.

44.4 Upon the occurrence of any circumstances of Force Majeure the Contractor shall endeavour to continue to perform his obligations under the Contract so far as reasonably practicable. The Contractor shall notify the Employer of the steps he proposes to take including any reasonable alternative means for performance which is not prevented by Force Majeure. The Contractor shall not take any such steps unless directed so to do by the Employer.

44.5 If circumstances of Force Majeure have occurred and shall continue for a period of 180 days then, notwithstanding that the Contractor may by reason thereof have been granted an extension of Time of Completion of the Works, either party shall be entitled to serve upon the other 30 days notice to terminate the Contract. If at the expiry of the period of 30 days Force Majeure shall still continue the Contract shall terminate.

44.6 If the Contract is terminated under Sub-Clause 43.5 the Contractor shall be paid the value of the Work done.

The Contractor shall also be entitled to receive :

a. the amounts payable in respect or any preliminary items so far as the work or service comprised therein has been carried out and a proper proportion of any such items in which the Work or service comprised has only been partially carried out,

b. the cost of materials of goods ordered for the Works or for use in connection with the Works which have been delivered to the Contractor or the delivery of which the Contractor is legally bound to accept. Such materials or goods shall become the property of and be at the risk of the Employer when paid for by the Employer and the Contractor shall place the same at the Employer's disposal.

END OF PART I

APPENDIX – A

CONTRACT CLAUSE

DESCRIPTION OF CLAUSE	CLAUSE NO.	STANDARD CONDITIONS
Maintenance Period	**1.1.14**	**One Year**
Penalty	**30**	**1% of the Contract sum upto a maximum of 20% of the Contract price.**
Retention	**34.3**	**20% of the invoice sum.**
Payment Due	**34.6**	**50% of the retention held upon completion of works.** **Remaining 50% of the retention upon completion of Maintenance period.**
Payment Due	**34.5**	**45 days after date of issue of payment certificate.**
Bank Guarantee	**35.1**	**Amount** : **Ref. :** . **Valid Until** : / / .

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

VOLUME – 1

PART 2 – MEASUREMENT AND PAYMENT CONDITIONS

Ooredoo Q.S.C.,
P. O. BOX 217,
DOHA, STATE OF QATAR.

TEL : 44400355 / 44400365
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01 Conditions affecting the execution of the work

The descriptions of pavings, etc., to be excavated, as shown in the Schedule of Work are such as appear from a surface inspection.

The Contractor shall be deemed to have obtained all further details of the pavings, etc. or otherwise, required by him in connection with his tender, including the nature of the foundations and of the subsoil on the line of route. He shall also be deemed to have satisfied himself as to the conditions under which the work may or will be carried out and the supply of and conditions affecting labour.

02. Work to be carried out

The details of the work as given in the Schedule of Work are only provisional, and the lengths are approximate. No discrepancies in lengths or boundaries as shown shall affect the rates in the Contract or the schedule of units rates, but in the case of deviations see Condition 3.

03. Added and Omitted Work

Payment for additional work executed by the Contractor pursuant to an order from the Engineer under clause 9 of the Standard Conditions shall be as follows :

(1) In the event of increase or decrease of any quantities of items which are priced in the Bill of Quantities, payment shall be in accordance with the rates quoted in the Bill of Quantities.

(2) In the event that the additional work executed is not included in the Bill of Quantities, payment shall be made as a percentage of the agreed civil rate directly proportional to the ratio of the total quoted sum and the total unit rate sum.

04. Work in Remote Places.

Payment for work carried out in Remote places, will be calculated using a Distance Factor by increasing the actual value of the work by 15% for distances of more than 30 km and upto 60 km, and 22% for distances more than 60km, and 40% for places in Saudi border.

The Distance factor shall be radially measured from Doha Central Exchange to the site using the Distance Factor chart issued by the Employer's GIS Section.

05. Application of Rates

The rates in the Contract or the schedule of unit rates, and the Fixed Rates shall be deemed to cover for work done during the Contractor's Normal Working Hours unless otherwise stated in the Contract. They shall include all necessary labour, materials, plant and services as stated in the Standard Conditions. The rates in respect of work under any given descriptions or pavings, etc., shall be applicable to work of that class in any portion of the route.

Where, with the agreement of the Employer the paving is permanently reinstated so that its description is different from that of the excavated paving the rate payable shall, if there is no other inclusive rate, be that applicable to the permanently reinstated paving.

Except where a paving is described in the schedule of Work as a dual paving and a special rate for the dual paving contained in the Contract or the schedule of unit rates, all other appropriate Conditions shall apply to the paving.

In the case of work requiring the application of an Anti-Skid dressing such as "Shellgrip" or similar material, an extra rate shall be payable.

06. Saw Cuts in Concrete Pavings

The rates in the Contract or the schedule of unit rates, for concrete or reinforced concrete in situ pavings shall not include for any sawn edges. Where saw cuts are required to be made these will be paid for, at a rate agreed in writing between the Contractor and the Employer.

07. Deduced Rates: Special Rates

In the case of deviations or additions, if there be no appropriate rate in the Contract, and a rate cannot be deduced from the Employer's Schedule of the unit rates, payment will be made on the basis of a special rate to be agreed in writing between the Contractor and the Employer.

08. Time Work

All Time Work performed under the terms of Standard Condition 20 of Part I, Time Work, shall be paid as a percentage of the Unit rate, directly proportional to the ratio of the total tendered value and the total unit rate value i.e.

09. Collection of Materials & Clearance of site

The Contractor shall perform at his own expense in all respects, all collection of materials. Clearance of site and other services as specified in condition 8 of Part I.

10. Pumping on Tendered Works

The rates in the Schedule of tendered Rates, shall be deemed to be inclusive of all requisite pumping except as detailed in Conditions 11.

11. Ground Water Lowering

If carried out by the Contractor for his own convenience as an alternative method to sump drainage, dewatering costs will be deemed to be inclusive in the Schedule of tendered Rates.

Notwithstanding anything in Condition No. 40 of Part I to the contrary, the Contractor shall be responsible for liability for any loss of property or injury to persons arising from the dewatering operations.

12. Existing Plant or Other Obstructions

1. The rates payable under the Contract or the schedule of unit rates shall cover the cost of any temporary slinging or shoring rendered necessary by the carrying out of the Contract.

2. The cost of work in connection with existing mains, plant or other obstructions done in accordance with Condition 22 of Part I will be treated as an extra, and will be paid for at the rates in the Contract or the schedule of unit rates provided the precedent written authority of the Supervising Officer be obtained.

13. Surplus Excavated Material

The rates in the Contract or the schedule of unit rates, shall be deemed to be inclusive of cartage to and disposal at shoot or tip of any excavated material made surplus by the work.

14. Covering in

The Contractor shall give due notice to the Supervising Officer / Engineer whenever work is intended to be covered in. Where the Supervising Officer / Engineer gives the Contractor prior permission to fill in a trench prior to approval of the work to be covered in thereby, payment for such test holes as may later be requested by the Supervising Officer / Engineer shall only be made if no material departures from the requirements of the Contract are revealed by these test holes. Payment for test holes, where allowable, shall be made at the appropriate rates in the Contract or the schedule of unit rates.

Where the work intended to be covered in includes work payable at any of the excavation rates in the Contract or the schedule of unit rates, or at any of the rock rates in the Section, payment for the work payable at these rates shall only be made if such work is seen and authorised by the Supervising Officer / Engineer before filling in is commenced.

15. Measurement – General Provisions

1. The Contractor shall provide the requisite number of persons and proper means and appliances to carry out the measurement.

2. The measurement shall be taken on behalf of the Employer by the Supervising Officer or other representative of the Engineer, and by the Contractor himself or a person appointed by him, such person not being in the employment of the Employer.

3. The Contractor shall afford all reasonable facilities and assistance to Supervising Officer / Engineer for compiling records of the location of the work excluded under the Contract. The Supervising Officer / Engineer is responsible for the accuracy of these measurements.

4. The general works and materials shall, unless otherwise specified, be measured, net, in situ (to the nearer 100mm in the case of length, 50mm in the case of width of trench and 25mm in the case of depth), as executed, without reference to any practice or other local custom that may obtain.

5. Measurements shall always be taken and recorded wherever there is a change in the quantities chargeable under the Contract.

16. Sulphate Resisting Cement or Super Sulphated Cement

No extra payment for use of sulphate resisting cement or super sulphated cement will be made.

17. Abandoned Work

If due to obstruction or unforeseen difficulties the work cannot be completed in any trench or excavation, on the instruction of the Supervising Officer / Engineer such trench or excavation shall be filled –in and restored as provided by the Specification, the entire cost of such work being governed by the appropriate "Excavation", "Filling-in and Ramming" and "Permanent Reinstatement" rates.

If abandoned work abuts on adopted work the measurement of the restoration work common to both shall be excluded from the measurement of the abandoned work restored, and the margins shall not be claimed in respect of the sides of the abandoned and adopted work which abut on each other.

18. Pilot Holes; Trial Excavations

If all or part of any Pilot Hole be utilised for a trench or Jointing Chamber excavation, it shall be measured in with the work and the remaining part of such a Pilot Hole not properly included as part of the work shall be termed a Partially Abandoned Pilot Hole and measured and charged for as Abandoned Work.

Where no part of a pilot Hole is proper to be measured in with the work, the excavation will be termed Totally Abandoned Pilot Hole and charged for as Abandoned Work.

Payment for a Trial Excavation shall be made at the appropriate rates in the Contract or the schedule of unit rates.

19. Rock

No extra payment will be made for excavating in rock which does not meet the requirements of one of the categories in the Specification.

Excavation will be measured and charged for at the appropriate rates in the Contract or the schedule of unit rates. The amount of rock paid for shall be limited to the volume necessarily excavated in compliance with the requirements of the Specification.

Where complete removal of a boulder is approved by the Supervising Officer, extra payment will be made at the rate in the Contract or the schedule of unit rates, for the total volume of the rock excavated. Such extra payment will be deemed to cover all additional work involved by the removal of the boulder.

20. Timbering of Excavations

The rates in the Contract or the schedule of unit rates, shall be deemed to be inclusive of all necessary timbering, sheet piling and shoring except as detailed in Conditions 21 and 22.

21. Timber left in

In order to provide for the safety of adjoining land or property, or otherwise, the Supervising Officer / Engineer may direct that timber shall be left in any excavation and, except when inclusive rates for tunnelling apply, such timber may be charged for separately at the appropriate rate in the Contract or the schedule of unit rates. The measurement on which payment will be calculated will be :-

a. the full length where the timber does not extend beyond ground level, or
b. the length up to ground level in respect of timber which extends beyond ground level.

Timber which the Supervising officer / Engineer has directed shall be left in may, subsequently, at his direction or which his authority, be cut off at some point below ground level, but this shall not affect the volume of timber to be paid for, neither shall any extra payment be made in respect of filling-in and ramming the space which was occupied by the pieces of timber cut off.

Timber left in by the Contractor without the direction of the Supervising Officer / Engineer may not be charged for.

22. Cost of Precautions following an Objection to Route

The following basis applies where precautions are ordered by the Supervising Officer / Engineer under the terms of the Specification. The cost of precautions ordered below ground level to safeguard against damage to property must be borne by the Contractor, with the exception of timber left in and concrete or other additional strengthening material only, which will be paid for as if there had been no objection to the line of route. The cost of precautions ordered above ground level to decrease the risk of damage to property will be borne by the Employer. Timber used for this purpose above ground level and recovered later by the Contractor will be paid for at the appropriate rate in the Contract or the schedule of unit rates.

23. Earth Free from Stones

Wherever earth free from stones is called for in the Specification, no extra payment will be made for providing and/or carting any necessary materials.

24. Independent Sumps, Rubble Bottoms, etc.

Where agreed necessary by the Supervising Officer / Engineer such items as Excavation, Filling in and Ramming, Reinstatement and materials used, (other than temporary earth supporting timber), to provide independent sumps, rubble bottoms, etc., in any excavation will be treated as extra to the Contract or the schedule of unit rates, and paid for at the appropriate rate, except fixed rate works which will be deemed as inclusive.

25. Test Cubes

The rates payable under the Contract or the schedule of unit rates shall be deemed to include the cost of making, and curing of all test cubes of Concrete which are ordered to be taken by the Supervising Officer in accordance with the Specification.

The cost of all such tests deemed to be necessary by the Supervising Officer or Engineer shall be borne by the Employer.

DUCT AND CABLE LAYING

26. Abutting Pavings

1. General

If a trench be opened on a line along which two or more pavings abut, thus involving the disturbance of more than one class of paving, payment shall be made at the rates per square metre as deemed necessary by the Supervising Officer.

2. Concrete backing to Kerb

The rates in the Contract or the schedule of unit rates for Kerb shall include for concrete backing.

3. Layered Depth rates

For all Polyethylene Duct and Cable Laying and for other Duct laid under Grass or Unmade the rates in the Contract or the schedule of unit rates, are for laying, etc., ducts or cables at certain specified depths (inclusive of variations as defined) or at layered depths. In such cases if the ducts or cables are laid at depths greater than the maximum depths for which inclusive contract rates exist, the excavation, filling-in and ramming for the extra depth shall be treated as "Excavation" and "Filling-in and Ramming" and be charged for at the appropriate rates in the Contract or the schedule of unit rates.

4. Use of Mechanical Excavators

Where a trench is excavated by a mechanical excavator, under the terms of the Specification the payment of extras, if any, will be based on the agreed necessary width of trench using manual excavation.

27. Duct laying

1. Rates inclusive to Standard Depth

The rates in the Contract or the schedule of unit rates, shall, except where otherwise indicated, be inclusive for all work down to Standard Depth or Layered Depths and for any widening down to such depths which may be required because of extra depth.

2. Non-standard Depths

If by direction of the Supervising Officer the average depth of a trench exceeds the Standard Depth prescribed in the Specification the excavation, filling-in and ramming, below standard depth, shall be treated as "Excavation" and "Filling-in and Ramming", and be charged for at the appropriate rates in the Contract or the schedule of unit rates. If the average depth of trench be less than the standard, a corresponding deduction shall be made at the same rates.

3. Variation in Duct Grouping

If by direction of the Supervising Officer a variation in duct grouping be required from that shown on the Schedule of Work and the rates in the Contract or the schedule of unit rates are inappropriate to such variation, they shall be adjusted by an addition or allowance calculated from the appropriate rates of the same Schedule.

4. Ducts through Service Pipes

Ducts installed through service pipes or crossing will be paid for at the appropriate rates in the schedule of rates and shall include all operations necessary thereto.

5. Laying and Jointing Duct in Open Trench

The rates for "Laying and Jointing Duct in Open Trench" shall include for laying the duct by itself or in conjunction with other ducts, also for cleaning, testing, draw rope left in situ and for any earth free from stones necessary to meet the requirements of the Specification.

6. Rodding and Roping and / or Cleaning and Testing

a. The cleaning and testing of ducts laid under the Contract as required by the Specification including the modified tests required where the building of a jointing chamber is deferred until after the completion of a section of duct, shall be deemed to be included in the rates in the Contract or the schedule of unit rates.

b. Where rodding and roping and / or cleaning and testing (including leaving a draw rope in situ) of ducts laid other than under the Contract is requested by the Supervising Officer, such work will be paid for as appropriate at the fixed rate (s). The fixed rate (s) payable shall be related to the total bore length rodded and roped / cleaned and tested between two adjacent jointing chambers.

7. Side Shafts

Where the trench is at normal depth, Side shafts, if agreed by the Supervising Officer to be necessary, should be regarded as Abandoned Work and charged for accordingly. Where, however, the trench is at extra depth, payment for the Side Shaft excavation shall be limited to that which is over and above the extra width arising from the extra depth.

8. Measurement – Items excluded

a. Jointing chambers and concrete extensions shall not be included when measuring the length of ducts laid.

b. Bends

Bends shall be paid for at the rates appropriate in the Contract or the schedule of unit rates.

9. Slewing

The rates for Slewing shall include for all operations detailed in the Specification for supporting the ducts so that they may be slewed and / or lowered and / or raised including movement to and from any temporary positions and the replacement and / or repair of any ducts broken during the operation. The rates do not apply to ducts laid in mass concrete. Separate payment will be made for Excavation, Filling-in and Ramming, Reinstatement, Rodding and Roping and / or Cleaning and Testing.

For the purpose of calculating the volume for Excavation, Filling-in and Ramming no credit will be claimed by The Employer in respect of the volume of Ducts.

When measuring the length of the duct slewed on both sides of a jointing number, the length of the jointing chamber will be added to the length of the duct actually slewed. When a duct entering a jointing chamber is slewed on one side of the jointing chamber, half the length of the jointing chamber will be added to the length of the duct actually slewed. Such allowance shall be deemed to cover for the slewing of any apparatus in the jointing chamber.

10. Testing after Slewing

When jointing chambers are constructed on an existing duct route necessitating the slewing and / or lowering of existing ducts or when slewing and / or lowering of existing ducts is necessitated by road alterations the rodding and testing of the “spare” ways will be paid for in accordance with the fixed rate.

11. Marking Ends of Duct Lines

Work in connection with the fixing of markers at the end of duct lines at points indicated in the Schedule of Work will be paid for at the rates previously agreed in writing between the Contractor and the Employer.

12. Cutting and Removing existing Ducts

Cutting and removing existing ducts, including the rounding of cut edges, will paid for at the appropriate fixed rate in the Contract or the schedule of unit rates.

13. Ducts entering Column entry Manholes

When a duct formation is opened out to enter the manhole, payment for the section in which ducts change formation shall be made at the appropriate rates in the Contract or the schedule of unit rates. The volume payable at "Filling-in and Ramming" rates to exclude the volume occupied by duct, concrete surrounding the ducts, and any concrete infill between separated duct formations.

14. Rocky Soils

In rocky soils where earth free from stones is required to afford a bedding in accordance with the Specification, the additional work is paid for at the appropriate rates for excavation and Filling-in and Ramming in the Contract or the Schedule of Unit rates.

28. Polyethylene Cable Laying

Rates

1. When there is no suitable tendered rate, the rates in the Contract or the schedule of unit rates will be deemed to cover the laying of polyethylene cable only. The installation of markers buried jointing points or terminating coils will be paid for at the appropriate time work rate.

2. Measurement

Measurement for payment for a length of Polyethylene Cable laid shall be restricted to the length of trench including the crossing of jointing chambers. Where a small length of cable is overlapped at jointing points or cable is left for jointing in a Joint Box or Manhole, such length will not be measured for payment purposes.

3. Drawn through or into Duct

Polyethylene Cable drawn through or into duct (including all necessary operations and rodding where required) will be paid for at the rates in the Contract or the schedule of unit rates. Measurement for this purpose will be restricted to the length of ducts involved.

4. Laid in open trench

The tendered rate for laying polyethylene cable in open trench (single cable) shall apply to laying a cable by itself or in conjunction with other cables in all cases where there is no appropriate rate in the Contract or the schedule of unit rates.

5. Earth Free from Stones

The supply and ramming of the 75mm layers of earth free from stones in stony ground, both below and above the cable or cables, including the necessary additional excavation below the cable or cables, will be paid for at the appropriate rate.

29. Foundations

1. General

The rates in the Contract or schedule of unit rates in relation to the reinstatement of the paving material and insertion of any foundation material deemed necessary by the Supervising Officer will be paid for in addition to the excavate, fill and ram rates.

2. Concrete Pavings and / or Foundations

When breaking concrete pavings and /or foundations, the hard rock rate in the tendered rate or the Contract or the schedule of unit rates shall be deemed to cover all operations involved being booked separately and excluded from the total excavate, fill and ram or excavation.

3. Concrete other than Paving Foundations

Where reinforced or unreinforced concrete, not forming part of the carriageway or footway foundations, is encountered and the concrete is of comparable hardness to soft, hard or boulder rock as defined in the Specification then the excavation of such concrete will be paid for at the appropriate rock rate, as encountered.

4. Pulverised Fuel Ash with added Cement

Where Pulverised Fuel Ash with added cement, of comparable hardness to soft, hard or boulder rock as defined in the Specification is encountered, the excavation shall be paid for at the appropriate rock rate.

30. JOINTING CHAMBERS

GENERAL

1. Rates in the Schedule of Rates

Subject to the supply by the Employer of such articles as are specified in the Specification the rates in the Contract or the schedule of unit rates include the supply of all materials and fitting and complete construction, but excepting cutting to length of existing ducts (e.g. excavation; cartage of materials displaced; concreting; reinforced concreting ; roofing as shown in the respective drawings; filling-in; all work in connection with terminating ducts in jointing chambers; all necessary timbering and shoring). Such measures as required by the specification to protect cables and associated equipment will be paid for as an extra at the appropriate rate. Any permanent reinstatement required will be paid for at the appropriate rate.

2. Variations in Jointing Chamber Construction

Where under the terms of the Specification the Supervising Officer may require modification of standard dimensions or, the thickness of the jointing chamber, the price for the standard structure shall be adjusted at the appropriate rate in the

Contract or the schedule of unit rates, except for variation in depth of Joint Boxes, for which a variation rate is quoted or in the Contract or the schedule of unit rates.

3. Demolition of Jointing Chambers

The prices for demolition or recovery of jointing chambers in the Contract or the schedule of unit rates, which are inclusive of demolition of shaft etc., shall apply to appropriate description of jointing chambers irrespective of the type, thickness of walls variations in depth etc. of the jointing chamber concerned.

When an existing chamber is demolished and a new one constructed on the site, the appropriate rate of the new jointing chamber will be reduced accordingly, by the volume of excavation not required, at appropriate rate due to the demolished structure.

31. MANHOLES

1. Measurement

Measurements of manholes shall be taken as follows :-

Length and width. All types. Between outside surfaces of walls.

Depth – Boxes. Between bottom of concrete floor and surface of carriageway or footway.

Manhole Shaft. Between the top of the roof slab and the bottom of the Frame and Cover.

2. Alternative Frames and Covers

The prices in the Contract or the schedule of unit rates shall be on the basis of a 150mm frame, frames and covers C/W No.2 shall be fitted to all the Manholes.

3. Shaft Entrance

When a shaft entrance to a manhole is provided (see Drawing No. CN 1153) deeper than normal the extra work involved will be chargeable in accordance with the appropriate variation rates.

4. Pumping Payment

On all tendered works, pumping will be deemed to be involved in the tendered rate. In all other cases the appropriate rates shall apply for any pumping deemed necessary by the Supervising Officer.

32. Joint Boxes

Concrete Surrounds

The concrete surround called for in the specification will be deemed to be included in the tendered or schedule of joint box rates.

33. Operations to Include

Renewing and / or Raising Frames and Covers

The rate for renewing and / or raising up to 75mm Frames and Covers in any paving and foundations includes :-

1. breaking away surrounding concrete,
2. removal of old frame and cover and delivery to such places as the Supervising Officer may direct,
3. breaking out existing mortar or concrete bed down to the top of the jointing walls or shaft and cleaning off.
4. fitting and / or raising frame and cover as required in accordance with the Specifications.

The rate however excludes the modifications to jointing Chambers quoted separately in the Contract or the Schedule of unit rates.

REINSTATEMENT

34. Public Works Authority (Ashghal) Specifications

Code of practice and specification for trench work in the highways issued by Public Works Authority (Ashghal), is applicable as incorporated in Part IV B of the Specification.

35. Margins

As regards margins, the rates in the tender of Contract or the schedule of unit rates shall be held to cover the restoration of the area disturbed by the whole of the work including deterioration occurring during the one year maintenance period plus the following margins which are the maximum trimming allowance which the Employer will recognise, namely :-

Footway

In asphalt, wood, setts, brick, macadam, treated macadam, gravel, flint, in-situ paving, or similar pavings, a margin as laid down in the State of Qatar's, Ministry of Public Works, Engineering Services Department's codes of practice for trenchworks in the highway.

Carriageway

1. Dual Carriage way and major roads

   Open textured bitmac road base, no margin will be given. Dense bitmac base course type 'B', a margin of 200mm on each side, bitmac wearing course type 'D' paving, a margin of 100mm on each side, this margin to be aggregated with that of the base course.

2. Single carriage way minor roads

   In bitmac single course type 'C' paving a margin of 200mm on each side.

Important Note

All of the aforesaid conditions shall be laid in accordance with Part IV B of the Specification and regardless of this in compliance with the current prevailing methods of the highway authorities rules in force at that time.

In gravel, Flint, or similar pavings, a margin of 75mm on each side, except where on concrete or reinforced concrete foundations other than lean concrete, cement bound granular or stabilised soil.

In wood, setts or brick paving, a margin of 115mm on each side.

In concrete or reinforced concrete in-situ pavings, a margin of 150mm on each side.

In asphalt or treated macadam surfaces on concrete or reinforced concrete foundations, a margin of 100mm on each side of the surfacing material and 150mm on each side of the foundations; the margins to be aggregated.

(**Note** : The margins to be taken in concrete or reinforced concrete foundations shall not apply to foundations of lean concrete, cement bound granular or stabilised soil).

Where an excavation in a concrete or reinforced concrete in-situ paving approaches the edge of that paving, the Contractor shall, if so directed by the Supervising Officer, remove the remaining area to the edge of the Paving and include such area in the area to be reinstated. Payment for the excess area broken out and reinstated will be made at the appropriate rates in the tender or Contract or the schedule of unit rates.

Any marginal reinstatement necessary in connection with work to be paid for under the tender or Contract or the schedule of unit rates, is also subject as regards payment to the foregoing limitations.

36. Flags or Cultivated Grass

In flag paving or cultivated grass, the rates in the tender or Contract or the schedule of unit rates shall be held to cover the restoration of the area of paving which it is necessary to disturb; restoration of the area which it is necessary to disturb will be paid for by The Employer.

37. Broken Flags, Etc.

Before Disturbance

1. Except for cartage of handling costs (see (3) below) no allowance shall be made in the rates to cover the cost of supplying new flags, paving bricks, tiles, kerbs or setts to replace those found broken or cracked before disturbance by the Contractor. Before the paving is disturbed representatives of The Employer, the Highway authority and the Contractor will jointly survey the route and will agree upon the number of these items found broken or cracked which cannot be re-laid. Where the Highway authority carried out the permanent reinstatement of the paving, payment for new flags, paving bricks, tiles, kerbs or setts to replace those which are found broken or cracked before disturbance by the Contractor and which cannot be re-laid will be a matter

for settlement between The Employer and the Highway authority direct. Where the Contractor is allowed to carry out the permanent reinstatement of the paving he will, as instructed by the Supervising Officer, either obtain from the Highway authority the flags, paving bricks, tiles, kerbs or setts required to replace those which are agreed upon as broken or cracked before disturbance which cannot be re-laid, payment for such new items being a matter for settlement between The Employer and Highway authority direct, or will himself supply the new flags, paving bricks, tiles, kerbs or setts in which event The Employer will pay the Contractor the actual cost incurred.

2. During Operations

The cost of replacing all flags, paving bricks, tiles, kerbs or setts broken or damaged during the reasonable execution of the work shall be borne by The Employer at the discretion of the Supervising Officer. In the case of dispute, the Engineer's decision shall be final.

3. Cartage

Any costs of cartage or handling of the broken or new flags, paving bricks, tiles, kerbs or setts whether the permanent reinstatement is carried out by the Highway authority or the Contractor, shall be deemed to be included in the rates.

38. Strengthening Materials

Excluded from Other Rates

1. Except as in (2) below or otherwise specifically started in this Condition no allowance should be made in the rates in the tender or Contract or the schedule of unit rates for the supply and insertion or strengthening materials, e.g., concrete, quarry scalping, graded aggregate; for foundations over and above that which already exists. If any Highway Authority requires the insertion of additional strengthening material this should not be agreed to by the Contractor unless authorised by the Employer when the cost will be borne by the Employer. In those cases where additional strengthening material is provided by a Highway Authority, payment will be based upon the appropriate charges made by that authority and where provided by the Contractor, upon the appropriate rates in the tender or Contract or the schedule of unit rates.

2. Use of On-site Material

Where the Supervising Officer directs that suitable hard material available on the work shall be used as strengthening material no payment will be made for such material.

39. Compaction Tests

The rates in the tender or Contact or the schedule of unit rates, shall be deemed to include for the minimum testing as required by the Specification. Further tests carried out in accordance with the Specification shall be paid for at the rate for Compaction Testing provided they show the compaction to be adequate. The rate for Compaction Testing includes for all operations including the use and transport of the power rammer for this purpose.

END OF THE SECTION

UNDERGROUND DUCT LAYING & ASSOCIATED WORKS

VOLUME - 2

PART III – SPECIFICATIONS – DEFINITIONS & QUALITY OF MATERIALS

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DEFINITIONS

SECTION 1 - INDEX

In the Tender and the Conditions and the several schedules thereto unless the context otherwise requires:-

101. "Abandoned Work" means a trench or excavation which, due to obstructions or other unforeseen difficulties, cannot be wholly utilized but which is required to be filled in, rammed and the surface restored, and is not proper to be measured in with the work charged for at inclusive rates.

102. "Access Subway" means a horizontal passage providing remote access to a manhole (eg. an access subway from an entrance in the footway to manhole sited in the carriageway).

103. "Damp mix" means a mixture of concrete of the quality specified but containing no more water than is sufficient for hydration of the cement and coagulation of the ingredients; the concrete shall have no measurable slump. As a guide, the consistency may be checked by squeezing between the hands a small quantity of the freshly mixed concrete which should hold the shape formed and not exude excess water.

104. "Duct" means a single or multi-way duct formation using the duct of PVC or other material.

105. "Dune Sand" means loose soft sand, all of which will pass through a 0.7mm mesh sieve and shall be capable to fill voids around, and between, ducts of any type. In either case, the material shall not cause damage to the ducts during back filling and shall not leave voids to form a water course.

106. "Jointing Chamber" means any manhole, joint box or other underground vault or chamber giving access to duct routes and/or cable.

107. "Pilot Hole" means an excavation taken out during the execution of a duct work scheme in order to determine the position of buried plant and/or conditions below the surface. The usual form of a Pilot Hole for a duct or cable trench and for a Jointing Chamber, Cabinet, Pillar, etc., at any position necessary to indicate a clear excavation space for the proposed structure.

108. The definition of rock is divided into the following types:

(a) Soft Rock.

Means a bed of rock which may consist of a mass of soft stone or a mass of hard stone containing fissures or seams or in-filled material; it not being practicable to excavate by fork and/or spade and although possible to excavate using an ordinary pickaxe would, if so excavated, result in a very uneconomical rate of progress and so necessitate the use of a compressor and pneumatic tools for economical excavation.

(b) Hard Rock.

Means a solid mass of rock which may have seams, but is virtually unaffected by a blow from a pickaxe and requires a compressor or blasting equipment to execute excavation.

(c) Boulder Rock.

Means a solid stone in a boulder formation similar in character to hard rock having a measurement exceeding 380mm cube or volume exceeding 0.055 cubic metre.

109. "Shaft" means the vertical access aperture (a) to an underground manhole, (b) to a horizontal passage forming part of a manhole, or (c) to a tunnel constructed for the purpose of Laying duct. In the case of (a) and (b) the shaft commences from a point 150mm below the footway or carriageway Frame and Cover down to the top of the manhole roof; in the case of (c), from the point at which the excavation commences to a point level with the top of the tunnel roof timbers.

110. "Side Shaft" means an excavation carried out parallel to or at some angle alongside and constituting a widening of a trench in order to facilitate the laying of a duct past an obstruction.

111. "Shuttering" means all formwork used in concrete construction.

112. "Trail Excavation" means an excavation of an exploratory nature, as directed by Ooredoo Engineer in order to determine the position of or to expose buried plant and/or to determine conditions below the surface for any or all of the following (a) planning of a proposed ductwork scheme (b) maintenance work by Ooredoo staff and (c) recording of buried plant.

113. "Way" means a single duct or one duct within a multi-way duct formation.

114. Are defined as follows and in accordance with Part - IV :

CARRIAGEWAY AND FOOTWAY

Bitumen Macadam

A mixture of aggregate and bitumen having a preponderance of coarse aggregate and a substantial proportion of voids. It can be of either single or multiple course

construction and is usually warm when consolidated. Usually of open or medium texture and has the appearance of aggregate held together by a bitumen binder.

Concrete in situ

Concrete, granolithic and all other similar paving.

Cultivated Grass

A level of even grass surface which requires the careful removal and storage of the turf, and protection from damage of the adjacent turf. In reinstating, the turf shall be carefully replaced; damaged turf being renewed by importing new turf, and the reinstated area shall be level or even of itself and with the adjacent area. All surplus stones and spoil shall be cleared from the reinstated and adjacent areas.

Flags artificial

All classes of artificial flagstones.

Kerb

All classes of kerb.

Unmade

Unmade ground.

Bricks or tiles

All classes of brick or tile paving.

QUALITY OF MATERIALS

SECTION 2 - INDEX

201. All materials not otherwise specified are to be in accordance with the specifications of the British Standards Institution, insofar as those Specifications apply.

202. (a) Concrete shall be of the Quality required by this Specification, or as directed by the Supervising Officer / Engineer. The qualities commonly used are as follows, but see also Para. 203.

	PARTS BY VOLUME				
	Quality-A	**Quality-B**	**Quality-C**	**Quality-F**	**Quality Lean Mix**
Cement.	1	1	1	1	1
Sand (Fine Aggregate)	2	2	3	2	-
Aggregate (Course)	4	7	9	3	-
All-in-aggregate substantially to BS 882 Table 3	-	-	-	-	15 - 20
Slump Limits, mm	25 - 75	25 - 100	25 - 125	25 - 50	*

* As directed by the Supervising Officer.

(b) The Contractor may use ready mixed concrete at his discretion for any quality specified. In the case of jointing chambers, however, prior permission must be obtained from the Supervising Officer / Engineer. All ready mixed concrete shall conform to BS 1926.

203. (a) Where necessary , details of the concrete to be employed for Jointing Chamber construction will be as specified by the engineer and in accordance with part IVA of this specification. In all other cases, concrete Quality "A" shall be used for the construction of Jointing Chambers and for other operations as specified.

(b) Concrete Quality "F" shall be used for the construction of Manholes.

(c) Concrete Quality "F" shall be used for concrete blocks in which ducts are laid and installation of Frames and Covers, unless otherwise specified.

(d) Where a coarse concrete is required for supporting, or protecting buried plant, concrete Quality "C" shall be used, unless otherwise specified.

(e) Concrete Quality "B" shall be used for insertion between electricity supply and Ooredoo plant where normal separation cannot be obtained, unless otherwise specified.

204. (a) Concrete mixing shall be carried out only by mechanical means.

(b) When large volumes of concreting are required, ready mixed concrete may be used, at the discretion of the Supervising Officer / Engineer.

(c) When mixed by machine the ingredients shall be batched and put into the machine dry without prior mixing. The water may be inserted either first or last. Such machines shall, however, be used only so long as they ensure thorough mixing and are maintained in clean condition.

(d) Care shall be taken prior to, during and after mixing that the concrete or mortar ingredients, collectively or separately, are not allowed to enter gullies and drains.

(e) Sand and aggregate, other than all in aggregate, shall be stored separately on site.

(f) At the discretion of the Supervising Officer / Engineer, a sample (cube) of each concrete mix (batch) may be taken for test with a view to the Engineer's approval. Work will not normally be delayed for the result to be ascertained, but should the concrete mix cube test fail to meet the specified compressive strength, the Engineer shall have the power to reject and redeem any structure work in which that mix has been used.

205. The standard of cleanliness of water for mixing shall be in accordance with para. 204 of this specification. The quantity used shall be sufficient, but not more than sufficient, to secure a plastic mixture and shall not exceed that necessary to provide the maximum specified slump. The Supervising Officer / Engineer may reject concrete which, in his opinion, is over-watered to the extent that its strength will be impaired.

206. (a) The concrete once mixed shall be placed in its intended position within the period of initial set (normally less than 60 minutes for SRC). In no circumstances shall concrete be re-mixed for further use. All concrete foundations and footings shall be tamped and carefully leveled.

(b) Concrete which has become hard, dry or dirty after being mixed shall not be used. If any earth falls on the top of any concrete after laying and before the work is completed, it shall be carefully removed.

(c) Cleanliness shall be observed in all operations and in relation to all materials.

207. (a) All cement used shall be fresh and sulphate resisting.

(b) The cement shall be stored under cover and clear of the ground.

(c) Cements of different types shall not be mixed one with another.

208. The use of High Alumina (HA) cement shall not be permitted.

209. Where specified, the Contractor shall use Polyester Resin (Bonding Agent) Bedding and Mortar when installing or renewing and/or raising Frames and Covers in the carriageway.

210. All sand shall be in accordance with the requirements of fine aggregate in BS 882 Part 2 Zones 1, 2, or 3.

211. The coarse aggregate shall be in accordance with BS 882 Part 2.

212. Aggregate for each of the qualities of mix included in Para. 202 shall be graded up to and including:

a. 20mm.
b. 20mm.
c. Any size suitable for work.
d. 10mm.

213. The cement mortar shall consist of:

One measure of cement.
Three measures of sand.

(a) The materials after being gauged shall be thoroughly mixed in a dry state on mixing boards (Para. 204 refers), and then thoroughly mixed with sufficient water to form a stiff mortar.

(b) On no account shall water be added after mortar has once been mixed, and mortar, after it has once begun to set shall not be used, or mixed with other cement and sand.

(c) An excess of water shall in no case be used for mixing, and if more water than is necessary be used, such mortar after it has once begun to set shall not be mixed with a further quantity of sand and cement, but the whole shall be condemned.

214. (a) Steel joists, boiler plates, trough and fish plates shall be in accordance with BS 4360 for structural steel.

(b) Reinforcing bars, wire and mesh shall be in accordance with BS 4449, 4461, 4482 and 4483.

(c) Bolts, nuts, rivets and other accessories shall be in accordance with the relative BS.

(d) All invoices for steel shall be open to inspection by the Engineer or his representative.

215. Stabilized backfill shall consist of excavated soil mixed with cement. The ratio of excavated soil to cement shall be 10 to 1, or as otherwise specified for the backfilling of trenches. Mixing may be carried out by hand or machine; in either case the mixing shall be sufficient to give even colour throughout.

EXCAVATION

SECTION 3 - INDEX

301. The Contractor shall excavate in the Carriageway or Footway, in positions as he may be directed by the Supervising Officer / Engineer, carefully segregating the surface and foundation materials from other excavated materials in order that, unless otherwise directed by the Supervising Officer / Engineer, they may be replaced, as early as possible, in their original order.

302. (a) Excavated subsoil shall be protected from Weathering action which would cause a damaging increase or decrease in the natural moisture content of the soil, leading to the formation of voids and/or settlement after backfilling.

(b) The amount of excavated soil left exposed above ground overnight shall be kept to a minimum.

(c) Normally a certain amount of subsoil, roughly equivalent to the volume of duct being laid, is surplus and carted to tip. Subsoil which is damaged or unsuitable shall be selected for cartage to tip and, if required, suitable undamaged subsoil shall be brought from a newly excavated length, or imported to site to replace the subsoil carted away.

303. The type of protection to be undertaken is as follows:

Wet weather - Excavated material shall be stacked in a ridged heap and protected against rain by covering with polythene or other waterproof sheeting. Where excavated materials cover a water channel, boards, or alternatively a length of duct, shall be laid beneath the excavated material to maintain the water channel. Some of the excavated material shall be placed to act as a dam to turn water away from any open excavation.

304. Except where otherwise provided, the excavation shall include all necessary timbering, sheet piling and shoring to maintain stability of the excavation.

305. If the Contractor shall object, in writing, to any position selected as being likely to cause damage to adjoining property, the Supervising Officer / Engineer shall give such modified directions as shall remove the objection or shall submit the matter to

the Engineer, and, if he deem the objection to be reasonable the Contractor shall be relieved of liability for damage that may result from due and proper execution of the work in the position so objected to. In this event the Engineer or Supervising Officer will specify the precautions that the Contractor must take to safeguard the property which gives rise to the objection.

306. Any mechanical excavator must be capable of allowing for, and should be used in such a manner as to fulfill the requirements of Para(s) 301 and 312 of this Specification in respect of segregation of materials and width of trench obtainable by using manual excavation.

307. Where pneumatic drills or other power driven road breaking appliances are used, they shall be fitted with efficient silencing devices, including muted steel moil points and cutters. The compressors and other power driven machines used for the works shall be maintained in an efficient condition so as to avoid undue noise.

308. The Contractor shall take all reasonable steps to prevent damage to paving by his plant, and, to protect paving from contamination by fuel and/or oil from his equipment.

309. The Contractor shall excavate in the Carriageway or Footway in positions as he may be directed by the Supervision Officer / Engineer, such pilot holes or trail excavations as are necessary to meet the requirements defined in Section -1, of this Specification.

310. Where deemed necessary by the Supervising Officer / Engineer, Side Shafts shall be excavated alongside the trench, as required, to negotiate obstructions.

311. (a) The supports of an excavation shall be so designed and placed to prevent loss of ground from beneath adjacent paved surfaces and to permit, wherever possible, withdrawal of such supports and consolidation of the space occupied. The prior approval of the Supervising Officer / Engineer must be obtained and recorded in the Works Diary where the withdrawal of supports is considered to constitute a greater danger to the surrounding property than the subsequent void produced by rotting timber.

(b) Existing mains and services shall be adequately supported by temporary slinging or strutting or, where required by the Supervising Officer / Engineer, by brick or concrete piers. At the discretion of the Supervising Officer / Engineer, where existing mains or services render compaction of the backfill beneath them difficult the backfill shall be stabilized by mixing it with cement in the ratio of ten parts soil to one part cement by volume.

312. In no case shall the width of each excavation be greater, than is reasonably necessary for satisfactory execution of the work. Diary entries shall show the agreed necessary width, the actual width being recorded as a Note. The Supervising Officer may not, however, waive the requirements of Para(s) 301, 306 and Section - 6 of this Specification.

313.

Type of Duct	Standard Width and Depth of cover to top of uppermost barrel or, for Ducts laid in concrete, to top of concrete surround.	
	Width mm.	Depth mm.
PVC Duct No. 54D – Single way and 2 ways.	350	600

PVC Duct No. 54D - 4 way.	400	600
PVC Duct No. 54D - 6 way.	600	600
PVC Duct No. 54D – Multi way over 6 way.	At discretion of Sup. Officer / Engineer	600
PVC Duct No. 56.	350	600

314. In passing from footway to carriageway and vice versa, or where ducts enter jointing chambers below standard depth, or in any other circumstances where it is necessary to change the level, the bottom or the trench shall rise or fall gradually as the Supervising Officer / Engineer may direct.

315. (a) Excavation for the laying of polyethylene cables direct in the ground shall be carried out by the Contractor at such positions as may be directed by the Supervising Officer / Engineer.

(b) The general conditions detailed in Para(s) 301-313 of this Specification shall apply.

(c) The trench may be "V" shaped provided that (i) the base of the trench is of sufficient width to accommodate the cable or cables, laid adjacent with no separation, and (ii) it is of the required depth.

(d) At points, detailed on the schedule of work, or by the Supervising Officer / Engineer, where a cable has to cross a boundary wall from a footway to a customer's garden or cartilage and it is not possible to lay under the boundary wall, the Contractor shall break through the wall and insert a short length of Duct No. 100, Wrought Iron or other suitable duct. Any void around the duct shall be packed with concrete and the ends of the duct well rounded to prevent the possibility of damage to the cable.

316. (a) Where site conditions are such that water could be removed from the area by suction pumps working from sumps into which the water drains, the Contractor may, for his own convenience and with the Supervising Officer's / Engineer’s consent, use a de-watering system. The Supervising Officer's consent to use in the vicinity of an excavation a de-watering system involving riser pipes, which draw water from the ground through fixed filters attached to the riser pipes will be subject to:

(i) The provision, where necessary, of sand filters in the ground around the riser pipes.

(ii) The absence of fine particle in the discharge after the first 20 minutes of pumping. If, after this period of time, fines are still being extracted with the water the riser pipes shall be individually withdrawn to facilitate a check of the ball valve and gauze screens in each Well point head.

The consent of the Supervising Officer may be withdrawn at any time, if the de-watering operation appears to be causing subsidence due to soil migration or shrinkage.

317. Excavation of rock encountered below ground during duct laying operations may be assisted by the use of explosives. The use of explosives will be allowed, provided that:

(a) Public and Private property, above and below ground, are in no way endangered.

(b) Ooredoo is satisfied as to the competence of the shot firer's ability which may require a trial demonstration.

(c) The Contractor takes all necessary precautions for the safety of members of the Public, Ooredoo and Contractor's own staff.

(d) The cost to Ooredoo no greater, in respect of trench width than would be the cost if the rock were removed without the aid of explosives.

(e) The Contractor has obtained all necessary permits from the relevant government bodies.

DUCT AND CABLE LAYING

SECTION 4 - INDEX

401. Drawing Nos. CN 10617, 10686, 10836, 1890, 9041, 9042, 9050, 9048, 9047, 9043, 9046 refer.

402. The line of duct shall be kept as straight as possible.

403. The duct formation shall be either as specified for the type of duct concerned or as detailed on the Schedule of Work but subject to the direction of the Supervising Officer / Engineer.

404. Duct laying shall be done only in accordance with this Specification and such directions and instructions of the Engineer or Supervising Officer, which shall be closely followed. Duct laying may only be done in the absence of Ooredoo representative when prior permission has been given.

405. All Duct Leading into Ooredoo buildings shall be both Gas tight and Water tight.

406. All types of ducts and cables laid direct in the ground shall be kept well clear of gas or water mains, services pipes, sewers, subways, manholes and joint boxes belonging to other undertakers. In order to admit the use of "Tapping" machines on gas and water mains, at least 150mm also be given if practicable, to the other classes of plant mentioned above. In no case shall the clearance be less than 25mm and, where two sets of plant cross each other, the minimum vertical clearance shall be 150mm with gas mains and 50mm in the case of other plant. Before any excavation works take place in the vicinity of oil, petroleum and gas pipelines prior consultation must be sought from the concerned governing authority.

407. Clearance of Ooredoo plant from electricity supplies shall be as follows:

(a) As much clearance as is practicable shall be given to the bases of electric lamp standards, traffic signal posts and other similar plant. Where it is impossible to

provide a clearance of 150mm or more, a layer of concrete Quality "B", not less than 50mm thick, shall be placed between the two sets of plant.

(b) High voltage single-core cables for electricity supply EXCEEDING 650 VOLTS, shall have a standard minimum clearance of 450mm. No exceptions to this requirement is permitted.

(c) High voltage multi-core cables for the same systems referred to in (b) above and EXCEEDING 650 VOLTS, shall have a standard minimum clearance of 1 meter. In difficult cases a reduced separation will be permitted, provided that where a separation of more than 500mm is impracticable, the Contractor must immediately inform the Supervising Officer who shall obtain prior permission from the Kahramaa representative or concerned governing body. All such deviation must be confirmed in writing.

(d) Medium and low voltage cables for supply systems NOT EXCEEDING 650 VOLTS, shall have a standard minimum clearance of 50mm. Where the two sets of plant cross each other NO exception to this requirement will be permitted. At other points, where difficulties arise, a reduced clearance down to 25mm will be permitted in which case the space between the two sets of plant shall be filled with a layer of concrete Quality "B". The concrete shall not be less than 25mm thick and of such width and length that at every point the shortest path between the two sets of plants, round the concrete, shall exceed 75mm.

(e) Before commencing any excavation work in the vicinity of 66KV cables or above prior permission must be sought from Kahramaa.

408. In any case in which the Supervising Officer / Engineer so directs, the type of duct may be varied for the good and efficient execution of the work.

409. The Contractor shall do any necessary cutting of duct and bending of steel or wrought iron duct according to the requirements of the work. Only purpose designed equipment capable of providing a gradual curve shall be used for the bending of steel duct which shall be continuously mandrelled during the bending operation. Exceptionally, apparatus of the "Jim Crow" type may be employed subject to the apparatus being repositioned frequently to produce a smooth curve. The inside edges of all cut ducts shall be thoroughly rounded off or so dressed that there can be no possibility of damage to cables.

410. All duct not laid in concrete, shall be laid and surrounded by Dune Sand not less than 75mm all-round, unless otherwise specified.

411. Dune Sand shall be spread over the trench bottom to afford a bedding approximately 75mm thick on which to lay the duct, as directed by the Supervising Officer / Engineer. In such cases 75mm of extra excavation of the trench will be necessary to achieve the required depth of cover.

412. (a) On completion of the duct line (including compaction of the backfill) between any two jointing chambers, or sites thereof, a cylindrical brush and an Iron Test Mandrel shall be passed once through each "way" to test the duct and to remove any foreign matter which may have entered. The size of the test

mandrel and brush shall be as specified for the particular duct. The mandrel shall follow the brush to minimize possible scoring or breaking of the duct.

(b) For details of the additional test required for ducts when the building of a jointing chamber is deferred until after the completion of a section of duct see paragraph 415 of this Specification.

(c) The Contractor shall supply the labour needed for the testing operations.

(d) All tests shall be carried out in the presence of the Supervising Officer / Engineer, and if any obstruction or other defect be discovered it shall be rectified forthwith to his satisfaction.

413. When the building of jointing chamber is deferred until after the completion of a section of duct included in the work, the last 2 metres of each "way" shall be tested, on completion of the jointing chamber, by means of the mandrel and brush specified for the particular duct. A visual check shall first be made by the Supervising Officer, with the aid of a torch or similar means of illumination, that no foreign matter or materials are likely to be pushed up the duct. All such tests shall be at the Contractors expense.

414. A suitable plug, supplied by Ooredoo, shall be inserted in the end of each "way" of a duct route to prevent the ingress of water and/or other foreign matter until all work has been completed on that section and the length tested and accepted by Ooredoo.

415. A draw rope, supplied by Ooredoo shall be threaded through and left in every "way" following duct laying operations and satisfactory tests. Jointing together lengths of draw rope to make up the necessary length between jointing chambers shall be carried out as directed by the Supervising Officer. Draw rope shall not be joined for the purpose of conserving lengths shorter than 50 metres.

416. When jointing chambers are provided on an existing duct route or when any disturbance takes place which may affect the alignment of the duct, and the Supervising Officer / Engineer so directs a test mandrel and brush of the appropriate dimensions shall be drawn through each of the spare "ways".

PVC DUCT – DUCT NO. 54D

417. Duct No. 54D is manufactured from Poly Vinyl Chloride (PVC). It is supplied in lengths of 5.9m has an internal diameter of 90mm and a nominal wall thickness of 3.25mm. Each duct length has a tapered socket at one end which will accept barrel of the duct. Collars, Duct 54A, 300mm in length and also available for use with short lengths of duct which have no socket. Collars, Duct 54A shall not be used for duct leading into buildings.

418. The trench shall be excavated to the required width and depth; the trench bottom shall be free from stones, level and well punned. The duct shall be laid at standard depths (Section 3 refers) unless otherwise specified.

419. Duct No. 54D may be laid as a single duct or in multi way formation as follows:

(a) Up to and including 9 ways in rectangular formation.

(b) Over 9 ways in rectangular formation with concrete surround.

420. (a) Single way

(i) The open starting end of the trench shall be blanked off with a board, to act as an anvil against which the duct can be driven home. The duct shall be recessed into the wall of jointing chambers10mm from the inside surface. The outside surface of the duct shall be roughened with glass paper or sand paper for its length in the jointing chamber wall.

(ii) The duct shall be laid on the trench bottom with the socket towards the duct layer; the spigot end and the inside of the socket of the ducts to be jointed shall be thoroughly cleaned with a dry rag.

(iii) The spigot end of the duct shall be offered to the socket, initially pushed in by hand and then to achieve proper engagement a suitable wooden batten is placed across the remote socket and tapped with a hammer. Full engagement is indicated when the point of the arrow head on the spigot end of the duct meets the edge of the socket. Occasionally, due to variations in size, this cannot be achieved, in which case, excessive force must not be exerted after a tight joint has been effected.

(iv) When jointing short lengths of duct together with a Collar Duct No. 54A, both spigot ends and the inside of the Collar shall be thoroughly cleaned with methylated spirits applied with a clean rag. The spigot ends should be given a liberal coating of an approved solvent and then fitted into the Collar so that they butt together at the midpoint. This operation involves using toxic and inflammable materials (see Section 7).

(b) Multiway up to and including 9 ways:

(i) The preparatory work and jointing shall be as outlined in Para. 420 (a) of this Specification

(ii) The first layer of ducts shall be laid on the prepared trench bottom so that their outer surfaces touch each other and a minimum gap of 75mm remains between the outside ducts and the sides of the trench, or trench timbering where used. Wooden stakes or an approved alternative shall be driven into the ground at 3 metres intervals along the trench to keep the ducts in the correct position. Dune Sand (Definition (a) Section –1) shall be placed to fill the spaces between the ducts and the next layer of duct where the latter is bedded down. The second and subsequent layers of duct shall be laid between the wooden stakes so that they are vertically above and them bedded down to touch the ducts in the layer below, the spaces between the ducts being filled in the same way with Dune Sand (Definition (a) Section –1). The joints shall be staggered so that no joint touches any other joints.

(iii) At approximately 5 metres from the jointing chamber at each end of the track, the duct formation shall open cut to provide a gap between each duct, both vertically and horizontally, of 25mm using Spacers, Duct No. 2. Over this 5 metres section all spaces between the ducts and the trench wall shall be filled with well compacted Dune Sand and all spaces between the ducts shall be filled with hand compacted earth, free from stones (Definition (a) Section –1), as directed by the Supervising Officer.

(c) Multiway over 9 ways, Drawing CN 10686 refers:

(i) The preparatory work and jointing shall be as outlined in Para. 420 (a) of this Specification.

(ii) The first layer of duct shall be laid on the prepared trench bottom so that their outer surfaces touch each other and a minimum gap of 75mm remains between the outside ducts and the sides of the trench, or trench timbering where used. Mild steel bar, 12mm diameter and of the required length, shall be driven into the ground at 1.5 metre intervals along the trench to keep the ducts in the correct position. The second and subsequent layers of duct shall be laid between the mild steel bars so that they are vertically above and touching the ducts in the layer below. The joints shall be staggered so that no joints touches any other joint. On completion of the assembly of the duct nest, 8mm diameter mild steel bar shall be placed horizontally across the uppermost layer of ducts and tied to the vertical bars.

(iii) Where the total number of layers of duct in any one formation exceeds 8 and the number of ducts in each layer exceeds 2 the following shall apply. Between the two layers of duct midway, approximately midway, from the top and bottom of the duct nest an intermediate layer of reinforced concrete, 75mm in depth and with 12mm mild steel reinforcing bars conforming to the layout of reinforcing in the top cover detailed in Drawing CN 10686, shall be placed across the duct nest. The additional reinforcing required by this sub-paragraph shall not be required in the 5 metre sections detailed in sub-paragraphs (iv) and (v) below.

(iv) At approximately 5 metres from the jointing chambers at each end of the track, the duct formation shall open out to provide a gap between each duct, both vertically and horizontally of 25mm. Banks of Spacers, Duct No. 2 shall be placed at 325mm and 1,325mm from the jointing chamber wall to provide this spacing. Each spacer bank shall enclose all the ducts except those in the bottom layer on which the spacer bank shall rest. Where sub-paragraph (iii) applies, the 75mm intermediate layer shall be reduced over the 5 metre sections to provide the required 25mm spacing at the jointing chambers.

(v) Where the total number of layers of duct exceeds three, concreting of spaced formations shall be in stages such that the number of layers of duct laid and concreted at each stage shall not exceed three. The

concrete shall be brought to a level which shall not interfere with the laying of subsequent layers of duct and spacers.

(vi) Concrete Quality "F" made with Sulphate resisting cement shall be used throughout and shall have slump of 50mm. The concrete shall be evenly placed around the duct to give a finished minimum thickness of 75mm on both sides and to a depth of 130mm above the top layer of ducts. Care must be taken to ensure that each batch, as it is placed, is properly compacted without creating unbalance side thrust against the ducts. Each batch shall be vibrated using a vibrator having a maximum diameter of 51mm; the poker shall be lowered into the concrete between the wall of the trench and the outside of the duct nest and shall not touch the duct. In spaced formation sections care must be taken to ensure that the gaps between the ducts are properly filled with concrete; the final layer of concrete shall be thoroughly trowelled. The contractor may use ready mixed concrete for construction of the duct surround.

(vii) With formation of four or more ducts, wide, mild steel reinforcing bars conforming to Drawings CN 10686 shall be placed and wired in position before placing concrete over the uppermost ducts of the completed nest.

(viii) In the case of column entry manholes, the duct formation shall open out to enter the manhole as shown on the appropriate manhole drawing and at right angles to the entry wall. The distance over which the transformation is made shall be no greater than is necessary to satisfy the 5 metres minimum bending radius for Duct No. 54D. The ducts shall be secured in position during concreting either with Spacers, Duct Nos. 2 and 3 built up to the required centres or by reinforcing rods which may be encased in the concrete. The volume between the separated duct formations shall be excavated and filled with concrete of the same quality as that surrounding the duct formations.

421. Provided space permits, Duct No. 54D may jointed above ground and fed into the trench from one end. The leading end of each duct way being guided into position using a suitable hocked tool made from 6mm diameter mild steel reinforcing rod.

422. Normally bends are not supplied since the duct is sufficiently flexible to provide a minimum bending radius of 5 metres. Tighter bends should not be attempted otherwise kinking of the duct may result. 30° bends may be used at the discretion of the Supervising Officer / Engineer.

423. Any variation of duct formation and/or depth shall only be carried out with the prior agreement of the Supervising Officer.

424. (a) Backfilling of trenches where Duct No. 54D has been laid to Para. 420 (a) and (b) shall be carried in accordance with Section – 6 of this Specification.

(b) Where Duct No. 54D has been laid to Para. 420 (c) the end shuttering and trench supporting timber, if used, shall be removed not less than 12 hours after the concrete has been placed. Backfilling of the trench in accordance with

Section – 6 of this Specification, shall not be carried out until a further 48 hours have elapsed.

425. The iron test mandrel to be used for testing Duct No. 54D shall be 240mm long and 83mm in diameter. The cylindrical cleaning brush shall be 95mm in diameter. (See also Para. 412).

LEADS - IN

426. (a) Normally, the duct seal and first 1.5 metres of Duct No. 54D leading into a new building will be included in the construction of the building. The remaining lead-in duct shall then be connected to the "Starter" duct and laid to the exchange jointing chamber in accordance with Para. 428 and Drawing CN 10836.

(b) In the case of existing buildings, and occasionally new buildings, an opening will be provided into which a duct seal shall be constructed in accordance with Para. 447 prior to the laying of the remaining lead-in duct which shall be in accordance with Para. 428 and Drawing CN 10836. Alternatively, where specified, individual holes 125mm dia. shall be diamond drilled in the wall at 150mm centres. Each gland and appropriate length of duct shall be assembled in accordance with Para. 427 (b) and grouted into the holes, using Resin Motar to within 25mm of the wall surfaces, as shown on Drawing CN 10836. The remaining recesses shall be filled with synthetic rubber sealant (Para. 431 refers).

427. (a) A duct seal, complete with glands, shall be constructed in accordance with Drawing CN 10836 and the following sub-paragraphs prior to any duct laying operations.

(b) The spigot end of 1.5 metre lengths of Duct No. 54D be thoroughly cleaned with methylated spirits applied with a clean cotton rag. Jointing adhesive shall be applied liberally to the full circumference of the outside end 100mm of the spigot with a clean cotton rag. The spigot end shall then be pushed into the back of a Gland, Caulking, No. 2. Surplus adhesive shall be wiped around the gland end to form a sealing fillet of adhesive; additional adhesive shall be applied, if necessary to form this sealing fillet (See also Section – 7).

(c) The external surface of the assembled duct and gland shall then be cleaned with methylated spirits and coated with jointing adhesive onto which a 3:1 mixture of dry sharp sand and cement shall be pressed, a small area being treated at a time because of the speed with which jointing adhesive dries out. These applications shall continue until a 50mm length of the gland and a 250mm length of the duct adjacent to the joint have been completely coated.

(d) Two plywood templates, each a minimum of 25mm thick and at least 150mm larger all round than the duct opening, shall be drilled with 106mm diameter holes at 130mm centres to match the number of ducts forming the lead-in. The template for the gland end shall be positioned on the inner wall of the cable chamber/trench, reinforced and braced as necessary to ensure that it will remain flat and in position during the subsequent operations.

Note: Where the lead-in is angled, the spacing of the centres of the holes in the templates must be adjusted to provide a separation of approximately 35mm between ducts.

(e) The jointed glands shall be fitted to the template and secured, each with two Collars, Gland, Caulking, with their chambered ends facing each other, and a lock nut (Drawing CN 10826 refers). Where the lead-in is angled, the Contractor will be supplied with the appropriate angled collars, information of which is given in the following table:

Collar, Gland, Caulking No.	Angle.	Number required per gland.
2	5°	2
3	10°	2
4	15°	2
5	Straight	2

(f) As the ducts are fixed to the template they shall be temporarily supported so that no strain is placed in the gland/duct joint. When all the ducts have been secured in position, the second (outer) template shall be positioned 50mm along the socket, reinforced and braced. The Contractor shall ensure that all ducts are parallel and, except for angled leads-in, at right angles to the templates and so maintained during the subsequent concreting operations.

(g) Concrete Quality "F", having a slump of 50mm, shall then be carefully placed to completely fill the interstices of the duct nest and to provide a minimum cover of 150mm on the top and sides of the duct nest. The concrete shall be placed in "lifts" no greater than 2 ducts high and each "lift" shall be well compacted by using a vibratory poker (maximum diameter of 50mm) on each side of the duct nest.

(h) When at least two days have elapsed after placing the concrete, the templates shall be removed and the concrete examined. Small voids shall be filled, and rendered flush with the existing face providing they do not extend beyond two adjacent ducts, or do not exceed 50mm in depth. If larger voids than this exists, the concrete will be regarded as substandard and must be completely removed and replaced.

428. (a) Duct 54D shall be used for all lead-in sections between the building and the exchange jointing chamber. The duct shall be gas tight and water tight, and irrespective of the number of ways, shall be laid in accordance with Para(s) 420 (c) to 425, terminating with duct sockets recessed 10mm from the inside face of the jointing chamber wall. Additionally, prior to jointing, the spigot and socket of each duct shall be thoroughly cleaned with methylated spirits applied with a clean cotton rag. The full circumference of the outside end 100mm of the spigot shall then be liberally coated with jointing adhesive using a clean cotton rag and the duct joint shall be made as quickly as possible (Para. 420 (a) (iii) refers). Finally, the surplus and, if necessary additionally adhesive shall be wiped around the end of the socket and adjacent surface of the duct with a clean cotton rag to form a continuous sealing fillet (see also Section-7).

(b) Plentiful supplies of clean, dry cotton rags shall be available and in inclement weather, protection for the jointing operations shall be provided, eg. a temporary awning.

429. Pressure testing of the duct ways into Ooredoo buildings, and elsewhere, if called for, shall be carried out in the following manner prior to concreting. After the last joint has been completed in each way, pressure plugs shall be inserted at each end and tightened, care being taken to avoid over tightening the pressure plugs which could overstress the end of the duct. Not less than 10 minutes after making any joint on a duct way to be placed under test, an air pressure of 275 millibars (4 p.s.i) shall then be applied to each duct under test. If, after 30 minutes a loss in pressure is recorded, the fault shall be located and any remaining pressure released from the duct. The area around the leak shall be thoroughly cleaned with methylated spirits and Compound No. 21 applied, confining it to the area of the leak. After a further 10 minutes the pressure shall be re-applied to check that a satisfactory repair has been effected. Once it has been confirmed that the ductway is free from leaks, the pressure may be released and the pressure plugs removed. It should be noted that under no circumstances should any attempt be made to remove pressure plugs from a ductway which is under pressure.

430. CAULKING

On completion of the cleaning and testing of the lead-in duct route and acceptance by the Supervising Officer / Engineer, each ductway shall be caulked in the following manner:

(a) Drill two 6mm diameter holes, 12mm from the edges, and on the same diameter line, of a Disc Gland Caulking.

(b) Tie a knot approximately 200mm from the end of the draw rope (a draw rope is left in each "way" following completion of the duct route Para. 417 refers), pass the end of the draw rope through one hole and back through the other hole and tie a further knot; thus leaving a loop which can be used to remove the inner disc.

(c) Push any surplus draw rope into the duct and place the disc in the gland against the internal shoulder.

(d) Tightly pack the gland with thoroughly worked Compound No. 16 or approved alternative, and slightly overfill.

(e) Place a second disc into the recess of the end cap and screw onto the gland so compressing the compound. Additional compound may be required after the original has been compressed to ensure that there are no voids in the compound between the discs.

(f) At the exchange jointing chamber, the Contractor shall repeat the procedure in (a) - (c) above, and tightly pack the socket with thoroughly worked Compound No. 16, or approved alternative. The compound shall be compressed with a second disc until this disc is recessed approximately 3mm into the socket.

431. SEALING OF CONDUITS AND PIPES

Unless otherwise required by a further specification or drawing, or directed by the Supervising Officer, ducts, conduits and pipes into customers' premises, call offices,

kiosks, cabinets, posts etc., shall be sealed at the end within the structure or customers' premises as follows:

(a) Duct 54D, other than into pillars, in a similar manner to that detailed in Para. 430 (a).

(b) All other ducts of approximately 90mm internal diameter be means of a Plugs, Pressure No. 1.

(c) Smaller conduits and pipes by pressing a clean rag into the aperture and facing off with a layer of synthetic rubber. A 25mm depth of rag and a 10mm depth of rubber shall be used. (Silicone Sealant A, or an equivalent material, shall be used for this purpose; it is available from builder's merchants).

PVC DUCT NO. 56

432. Duct No. 56 is manufactured from PolyVinyl-Chloride (PVC). It is supplied in 1.5 and 3.0 meters lengths, has an internal diameter of 50mm and a nominal wall thickness of 3.25mm. Each duct length has a tapered socket formed at one end which will accept the normal barrel of the duct.

433. The trench shall be excavated to the required width and depth and the bottom shall be free from stones, level and punned. The duct shall be laid at standard depths (Section 3 refers) unless otherwise specified.

434. (a) The duct shall be laid on the trench bottom with the socket towards the duct layer; the spigot and the inside of the socket of the ducts to be jointed shall first be thoroughly cleaned with a dry rag.

(b) The spigot end of the duct shall be offered to the socket, initially pushed in by hand, and then to achieve proper engagement a suitable wooden batten is placed across the remote socket and tapped with a hammer. Full engagement is indicated when the point of the arrow head on the spigot end of the duct meets the edge of the socket. Occasionally, due to variations in size, this cannot be achieved, in which case, excessive force must not be exerted after a tight joint has been effected.

(c) Alternatively, the duct may be jointed above ground and lowered into position on the trench bottom where this is more convenient.

(d) All spaces alongside the duct shall be filled with Dune Sand and to a thickness of not less than 75mm above the top of the duct barrel.

435. The duct is sufficiently flexible to provide a minimum bending radius of 9.5 metres. Tighter bends should not be attempted otherwise kinking of the duct may result. Bends, Duct No. 56 (90° - 229mm radius) and Bends Duct No. 56A (90° - 622mm radius) are supplied only for termination purposes at poles and small buildings respectively. Bend duct 56 - 30° may be used in line of route at the discretion of the Supervising Officer / Engineer.

436. Any variation of duct formation and/or depth shall only be carried out with the prior agreement of the Supervising Officer.

437. Backfilling of the trench shall be carried out in accordance with Section - 6, of this Specification.

438. The iron test mandrel to be used for testing Duct No. 56 shall be 216mm long and 43mm in diameter and unpainted; the cylindrical cleaning brush shall be 57mm in diameter. (See also Para. 412).

SLEWING AND/OR LOWERING OR RAISING OF DUCT

439. (a) The size of the excavation for slewing and/or lowering or raising a duct line should be as directed by the Supervising Officer / Engineer.

(b) Where lowering only is necessary the duct line shall be suspended and the required excavation taken out down the side and under the duct line. When this method is impracticable the duct line shall be slewed and raised or lowered temporarily as required by the Supervising Officer / Engineer for a distance which is just sufficient to allow access for carrying out the excavation.

(c) With the exception of making slight adjustments to the duct line after slewing and lowering the duct line shall not be moved in any way without adequate reinforcement in the form of a strongback being firmly lashed to it.

440. (a) The strongback shall be lashed to the duct line, with both ends of each duct firmly held, using separate lashings or a continuous rope. The lashings shall be tightened, by driving wedges between the ducts and the strongback, or otherwise, to the satisfaction of the Supervising Officer.

(b) Any forces which it is necessary to apply to the duct line to move it in anyway be applied not directly to the duct line but to the strongback lashed to it. Such forces shall be applied at points whose spacing is sufficiently close to keep the bending of the ducting line and strongback between the points to a negligible amount.

441. When the duct line is to be lowered, the complete length shall be suspended from suitable beams or tripods and/or approved winching devices spanning the excavation. When the duct line is to be slewed whilst suspended in this way, the suspending ropes shall be fastened to sling poles resting on the supporting beams and running parallel to the duct line and strongback, and free to move across the beams. All suspending ropes shall be so arranged that the duct can be raised or lowered as required, smoothly and continuously, and can be tied off firmly at any stage.

442. When the duct line is to be slewed only, it may be moved without suspending it, provided that:

(a) The surface across which the duct line is to be slid shall be reasonably level and regular, made so if necessary by setting boards in the surfaces.

(b) The strongback shall be firmly lashed to the side of the duct line.

(c) The moving force shall be applied to the strongback by rope, jack or other method to allow the duct line to be moved smoothly and without jerking.

443. The slewing and/or lowering of the duct line shall be carried out by making a succession of very small movements of the duct line, each made progressively along the affected length. The curvature of the duct line at any intermediate stage between the initial and final positions shall not exceed the deviation limits laid down for laying new duct of the same type.

444. Prior to finally placing the duct, the trench bottom shall be prepared in the same way as is specified for duct laying.

445. After the duct line has been finally lowered into its required position and the strongback has been removed, any slight irregularities in the general line of the ducts shall be corrected at the direction of the Supervising Officer.

446. Where, following slewing and/or lowering or raising operations, a duct joint or joints have pulled apart, short lengths of ordinary or split duct may be inserted in the duct line and satisfactory joints effected as directed by the Supervising Officer.

447. After all operations are completed, the joints of all ducts shall be inspected to ensure that they are forming an effective seal, any defects shall be made goods to the satisfaction of the Supervising Officer.

448. All spare bores of the duct line shall be rodded and roped and/or cleaned and tested as specified for the particular duct concerned.

JOINTING CHAMBERS

SECTION 5 - INDEX

501. Jointing Chambers shall conform to the standard drawing(s) and/or other drawing(s), as specified, unless Para. 504 applies.

502. (a) The standard types of manholes with the code references employed, are as follows:

Code	Drawing No.
MR 2*	CN 1938-A
MR 4	CN 1953-A
MR 11	CN 1954-A
MRT 7	CN 1955-A
MRT 8*	CN 1956-A
MRT 9	CN 1957-A

* These manholes have a range of internal heights.

502. (b) The standard types of joint boxes with the code reference employed are as follows:

Item	Reinforced Concrete.	
	Code	Drawing No.
Carriageway		
No. 4	JRC 4	CN 9106
No. 12	JRC 12	CN 9108
No. 14	JRC 14	CN 9109

503. In addition to the drawings listed above, the following CN Drawing Nos. also refer – 1153, 1161, 1162, 1465A and 1814.

504. The presence of unforeseen obstructions in the ground, or adverse ground conditions may necessitate the construction of a type other than that specified, or a modification of one or more of the dimensions stipulated on the relevant drawings. The Contractor shall be advised of any modification to the drawings and/or schedule of Work by the Supervising Officer / Engineer and such modifications will be confirmed by Ooredoo in writing. The Contractor shall not carry out modifications without the approval of the Supervising Officer.

505. Ducts shall enter manholes as shown on the relevant drawings or as directed by the Supervising Officer. Unless otherwise required by the drawings or by the Supervising Officer, the ducts shall enter the manholes at such depths as will ensure a minimum clearance of 450mm above and below the duct to the roof and floor respectively.

506. During the cutting of duct entries into existing structures, irrespective of whether vibration-free methods are used, or during the demolition and rebuilding of jointing chambers, the Contractor shall take such measures as the Supervising Officer may direct to protect cables and associated equipment. Such measures may include any or all of the following requirements:

(a) All movement of cables shall be carried out under the direction of the Supervising Officer.

(b) A ladder shall be provided by the Contractor for access into and out of manhole excavations. Under no circumstances may cables, joints and associated equipment be used for climbing, standing or sitting on.

(c) Sufficient pumping capacity shall be made available and operated to ensure that when cables are removed from their bearers they shall not be immersed in water at any time. The responsibility of keeping cables and joints dry will pass to Ooredoo when Ooredoo commences checking and/or testing the cables.

(d) All cables shall be protected at duct entries be shielding as necessary against mechanical damage and by packing with foam rubber to act as a cushion when any movement occurs.

(e) During demolition of the roof of a manhole, the Contractor shall erect a deck of timber between the cables and the roof of the manhole to protect Ooredoo plant from falling debris in the following manner.

(i) A minimum of four screw jacks shall be evenly spaced and placed horizontally between the uppermost cables and the underside of the roof. A 25mm recess in each wall is necessary for the screw jack plate. UNDER NO CIRCUMSTANCES shall friction joints be used between the screw jack plate and wall. Lengths of poling boards or other similar timber shall then be placed over the screw jacks to completely protect the cables and/or other equipment from falling debris.

(ii) Alternatively, the Contractor may use vertical and horizontal timber supports as follows:

A minimum of three 225mm x75mm timber uprights shall be evenly spaced against each long wall of the manhole with the 225mm side against the wall. The length of the uprights shall be such that they terminate approximately midway between the uppermost cables and roof. Further lengths of 225mm x 75mm timber shall be placed horizontally on top of the uprights and secured, and between the uprights and secured, and between the uprights at the bottom; all positions to be wedged and blocked to the satisfaction of the Supervising Officer. Lengths of poling boards or other similar timber shall then be placed on top of the horizontal support.

(iii) When the manholes roof and walls have been demolished down to the level of the timber decking and all debris removed, the cables and any other equipment shall be suspended from the surface to the satisfaction of the Supervising Officer.

(iv) Cables and joints and other equipment shall be protected by draping (not tying) with several layers of sacking while the timber decking is being erected and dismantled, and during the demolition of the remainder of the walls.

(v) During rebuilding operations cables shall be supported on wooden benches with cushions of sacking or similar material once the floor has been laid and the concrete allowed to set.

507. (a) General – structures, such as jointing chambers, telephone exchanges, repeater stations and other similar buildings, which contain co-axial cables with soldered joints and/or equipment liable to damage by vibrations, shall have all new duct entries cut with substantially vibration-free cutting equipment.

(b) Approved Methods – where vibration-free cutting equipment is necessary as specified on the Schedule of work or as directed by the Supervising Officer, the Contractor shall only employ diamond impregnated or rotary- percussion drilling methods. PNEUMATIC TOOLS, SLEDGE OR CLUB HAMMERS AND OTHER SIMILAR TOOLS MUST NOT BE USED UNDER ANY CIRCUMSTANCES. In the case of rotary-percussion equipment it shall conform to the following requirements:

(i) have a maximum power rating of 850 watts.

(ii) have a working voltage of 110 volts.

Note : The Contractor may use the services of a firm specializing in diamond drilling on a sub-contract basis.

(c) Positions of Entry – this will be as specified in the Schedule of Work or as directed by the Supervising Officer. Any departure from this position must be agreed with the Supervising Officer prior to commencement of work.

(d) Protection – the Contractor shall carry out such protection of cables and/or equipment, prior to drilling operations, as directed by the Supervising Officer.

(e) Reinforcement – where the method used requires that reinforcing bars are cut as a separate operation, bar-croppers or hacksaws only shall be used. Gas cutting equipment must not be used.

(f) Anchor Irons – where possible new duct entries should be positioned at least 300mm from any existing Anchor Iron. Where this clearance cannot be obtained, the Anchor Iron concerned shall be sawn off. Gas cutting equipment must not be used.

508. The concrete around all ducts where they enter jointing chambers shall be carefully flushed up and rendered in cement mortar.

509. (a) All iron and steelwork, except as in Para. 509 (b), supplied by the Contractor and which has not been galvanised by an approved method, shall be free from mill scale and given one coat of red lead and oil after delivery, and two coats of an approved bituminous paint after fixing.

(b) Any ungalvanised iron or steel which is to be embedded in concrete shall be free from mud, oil, loose mill scale, snow, ice, grease or any other substance which can be shown affect adversely the steel or concrete chemically, or reduce the bond. Normal handling prior to embedment in concrete is usually sufficient for the removal of loose rust and scale from reinforcement.

(c) All reinforcement in the floor, walls, roof and shaft shall be secured together by means of approved wire ties sufficient to prevent displacement of the reinforcement during the placing and compaction of the concrete.

510. After the demolition or alteration of existing jointing chambers, any recovered serviceable material shall be delivered to a nominated Ooredoo site, or disposed of as instructed by the Supervising Officer.

511. Where a sump is provided the floor shall have a slight fall thereto.

512. Concrete when placed and if subject to rapid drying out by sun and/or wind, shall be protected to prevent it becoming dry during the seven days following placing. Prior to pouring the base, the area shall be lined with heavy gauge polythene sheeting. Under no circumstances shall concrete be left exposed in direct contact with the ground.

513. (a) Construction joints shall be provided where shown on the relative construction drawing. A minimum of 12 hours shall elapse between the construction stages thus indicated. The construction joint shall be effected by cleaning the existing concrete, wetting it and rendering with a 5mm layer of well trowelled cement mortar before the new concrete is placed in position.

(b) Whenever possible, concrete walls shall be completed in one operation. Where this is not practicable, construction joints shall be made after the existing concrete has set but not hardened, the joint being cleaned with a stiff brush to remove the mortar skin and to expose, but not disturb, the larger aggregate. The new concrete shall be well compacted (Para. 515 refers) but care shall be taken during its placing close to the joint. Such construction joints shall be sited at least 150mm from any anchor iron position.

514. (a) Unless otherwise directed by the engineer, all concrete used for the construction of jointing chambers shall be Quality "A" (Section – 2 refers).

(b) At his discretion, the Supervising Officer / Engineer may require test cubes to be taken of any batch of site mixed concrete used for jointing chamber construction. Where ready mixed concrete is used, the Supervising Officer will require test cubes to be taken on the following basis:

Joint Boxes	A minimum of two test cubes from any one batch of concrete.
Manholes.	A minimum of three test cubes from any one batch of concrete.

The equipment necessary for the making of the test cubes shall be provided by the Contractor. The cubes shall be tested by a Testing Laboratory approved by Ooredoo and crushed in the presence of the Supervising Officer or any other person designated by the Engineer.

Work will not normally be delayed for the result of any test to be ascertained. The making, curing and testing of all cubes of concrete for compressive strength tests shall be in accordance with BS 1861, Part 3 and 4 and the results shall, unless a specific grade of concrete has otherwise been stipulated by the Engineer, satisfy the following table:

Age of Concrete.	Type of Concrete used.
	Sulphate Resisting.
7 days	21 MN/m^2
28 days.	30 MN/m^2

(c) Whether test cubes have been taken or not, the Engineer may as a result of inspection, rebound hammer tests or the cube tests, condemn the jointing chamber. Alternatively, test cores shall be taken and tested in accordance with BS 1881, part 4. The cores shall be examined and tested, and the estimated cube strength ascertained, by an approved and independent laboratory. The Contractor shall be provided with a copy of the test report as soon as it is available and, if this indicates that the quality of the concrete in the structure is unsatisfactory, the jointing chamber shall not be accepted.

(d) All external surfaces of walls and roof shall be treated with a Ooredoo approved quality bituminous paint or equivalent. No concrete surface shall be left without treatment or in direct contact with the ground soil.

(e) On completion of a jointing chamber, the floor shall be rendered with cement mortar in accordance with the relevant drawing (Para. 511 refers). The walls of concrete jointing chambers shall have a smooth finish; any slight cavities exposed when the shuttering is removed shall be made good with cement mortar, and any projections removed. UNDER NO CIRCUMSTANCES SHALL THE WALLS BE COATED WITH A CEMENT OR CEMENT/SAND WASH.

515. In consideration of concrete or reinforced concrete jointing chambers, the concrete shall be thoroughly worked and tamped into all parts of the moulds or forms and around the reinforcement. All concrete shall be compacted by the use of a poker type vibrator until a dense solid mass without voids is obtained.

NOTE : CARE SHALL BE TAKEN NOT TO TOUCH REINFORCEMENT STEEL WITH THE POKER DURING COMPACTION.

516. In wet situations, the Supervising Officer / Engineer may direct the Contractor to implement such methods as are deemed necessary to prevent damage to freshly placed concrete or mortar and to ensure a waterproof jointing chamber. These methods may include an independent sump, or the use of heavy duty polythene sheet or other suitable materials, or drainage beneath the concrete floor.

517 (a) Subject to compliance with the drawings as regards, dimensions, the Contractor shall be at liberty to adopt any arrangement he may think fit for the make-up of shuttering, it is being understood that on completion of the chamber, the whole of the materials shall be withdrawn through the entrance to the chamber. The shuttering shall be oiled or lime-washed prior to concreting.

(b) In all cases the shuttering used shall be of such dimensions and so constructed, as to remain rigid and unyielding to weight and vibration during the laying and tamping of the concrete. No shaking or jarring shall be permitted during setting.

517. The minimum periods after completion of any concrete which must elapse before:

(a) The shuttering of Jointing Chambers is removed.

(b) The restoration of paving or surfaces may be commenced.

(c) Traffic is allowed to pass, are as follows:

Type of Cement Used.	For Manholes and Joint Boxes built in the Carriageway.		
	(a) to removal of shuttering.	(b) before commencing the restoration.	(c) before allowing passage of traffic.
Sulphate Resisting	5 days	7 days.	7 days.
Sulphate Resisting.	For Manholes built in the Footway.		
	5 days.	5 days.	7 days.
Sulphate Resisting.	For Joint Boxes built in the Footway.		
	Shuttering shall be struck in not less than 24 hours.		

518. The frame shall be bedded on cement mortar at as near the correct level as possible. The cross piece(s) where required shall then be fitted and the cover(s) placed in the frame. The cover(s) shall be tested for rocking; if rocking occurs packing of hard material shall be placed beneath the lowest part of the frame until rocking ceases and the cover(s) lie firm and level. All voids below the frame shall then be completely filled with cement mortar to the same level as the packing. In an unmade surface or grass the frame shall be surrounded with a 100mm wide strip of cement mortar, finished level with the top edge of the frame and the outside edge finished straight and parallel to the frame.

520. (a) The cover shall be fitted with concrete Quality “F” by the Contractor with the joint box name plate centrally installed.

(b) Installation – the joint box shall be constructed with the top of the joint box 90mm below the carriageway surface. The top of the joint box shall be moistened with water and a 15mm layer of cement mortar trowelled over the entire surface. Additional mortar shall be placed so that it conforms approximately to the contour of the frame section which shall then be placed on top and lightly tapped with a piece of wood to force out excess mortar until the frame projects approximately 5mm above the surrounding carriageway surface.

The excess mortar shall be neatly struck off inside the joint box. Using two joint box keys the cover shall be carefully placed in the frame and the whole assembly lightly tapped downwards until the cover is level with the surrounding carriageway surface. If rocking occurs, packing of hard material shall be placed under the low corner of the frame until the cover seats satisfactorily. The mortar shall be neatly trowelled off round the outside of the frame. In an unmade surface or grass the frame shall be surrounded with a 50mm wide strip of concrete Quality "F", finished level with the top edge of the frame and the outside edge finished straight and parallel to the frame.

FRAMES AND COVERS, CARRIAGEWAY NOS. 2 AND 3 (DOUBLE TRIANGULAR TYPE)

521. Carriageway Frame and Covers nos. 2 and 3 are supplied for the following jointing chambers:

Type of Frame and Cover	Used for Jointing Chambers	Dimensions of Opening	No. of Covers.
No. 2	JRC 12 and all manholes	1220mm x 696mm	4
No. 3	JRC 14	1830mm x 696mm	6

522. Site handling of these frames and covers involves fitting the following weights:

Type of Frame and Cover	C Weights			
	Each Cover	Cover Total	Frame	Total Weight
No. 2	60 Kg.	240 Kg.	175 Kg.	415 Kg.
No. 3	60 Kg.	360 Kg.	205 Kg.	565 Kg.

523. (a) Preparation of New Jointing Chambers - The jointing chamber walls or shaft shall be terminated to and leveled off at a depth of 165mm below the carriageway surface. Where the joint box walls or manhole shaft is constructed of concrete, and the frame and cover is to be set on mortar bedding, the walls shall terminate at this level with a course of suitable thickness quarry tiles on cement mortar. Installation of the frame and cover must not be commenced until the concrete has been allowed to set for at least 12 hours.

(b) Preparation of Existing Jointing Chambers - The existing frame and cover shall be removed and the top of the jointing chamber walls or shaft cut back or built up, as the case may be and leveled off to approximately 165mm below the carriageway surface. Where building up is necessary, brick or quarry tiles of suitable thickness shall be used and set on cement mortar.

(c) Preparation of Frames and Covers - Prior to installation remove the triangular covers and, where provided, the safety grid(s), and ensure that the frame is

clean, dry and free from grease. Remove any loose rust or scale with a wire brush.

(d) Setting of Frames - Using cement mortar (Frames and Covers, Carriageway No. 2 and 3), The top surfaces of the manhole shaft shall be brushed clean, moistened with water and a 20mm layer of cement mortar trowelled over the entire surface to be covered by the frame. The frame, with covers removed, shall be lowered carefully onto the cement mortar and gently tapped with a wooden punner until the top edge is level with the carriageway surface. Any surplus mortar shall be struck off flush with the inside walls and, in the case of a new manhole, haunched around and over the lower flange of the frame. For at least 2 hours after the frame has been set on the cement mortar, care must be taken not to disturb or walk on the frame. The covers shall then be replaced and, in the case of an existing manhole, the sides of the excavation and frame shall be primed with bitumen emulsion and the space around the frame shall be reinstated with coated macadam. The coated macadam shall be well compacted in two layers with a suitable power rammer to finish level with the top of the frame and the surrounding surface.

(e) Opening to Traffic - Before opening to traffic, it must be established that the covers do not foul the safety grids or the sides of the shaft or joint box walls. If there is evidence of fouling, it shall be obviated in a manner acceptable to the Supervising Officer.

Cement Mortar - The minimum period after installation of the frame which must elapse before commencing reinstatement and opening to traffic shall be in accordance with Para. 518 of this Specification in respect of the jointing chamber and bedding under the frame.

524. In flint, gravel, macadam, un-surfaced or other similar carriageway, paving, the frames of jointing chamber covers, other than Frames and Covers, Carriageway No. 4, shall be surrounded with 150mm of concrete, Quality "A" to the depth of the frame; for existing structures this shall be in lieu of the coated macadam. Opening to traffic shall be subject to Para. 521 in respect of the surrounding reinstatement.

CABINETS, CROSS-CONNECTION

525. (a) Excavations of the sizes shown on Drawing CN 1464 Sheets 1 to 3 and 8, shall be made in the positions indicated by the Supervising Officer.

(b) The bottom of each excavation shall be well rammed.

526. (a) Template - A template shall be provided by the Contractor and used to register accurately the positions of the Bends Duct No. 54A - 90° and Bolts FI. No. 1 and their position relative to the footway surface. The bends shall be so placed to give the required depth of cover on the duct and to project 70 - 100mm above the proposed base. Any surplus duct shall be cut off and removed (Section 4 refers) after the base has been placed and the periods given in Para. 526 (b) have elapsed. The foundation bolts shall be fixed in the template so that they are set vertically in the base and to project 38mm above the proposed base. Where Cabinets are installed on sloping ground.

(d) Concreting - Prior to concreting, the ends of the PVC duct bends shall be sealed with plugs (Section 4 refers). Concrete Quality "A" shall be placed round the PVC duct bends and carefully leveled. The minimum period, after the completion of concreting, which must elapse before the Cabinet is erected, shall be 48 hours.

527 (a) Prior to the erection of the Cabinet, the surface of the concrete base shall be thoroughly cleaned and a bed of cement mortar shall be laid to a depth of 13mm over that part of the surface on which the base flange will rest. The cabinet internal walls shall be scraped to a height of 40mm from the base of the cabinet to remove all rust and loose paint. The Cabinet shall then be set on the cement mortar in a truly vertical position and secured by the foundation bolts. The cement mortar shall now be struck off in line with the internal surface of the cabinet; on the outside the mortar shall be trowelled to form a fillet around the flange to assist in the shedding of water. When the mortar has set the cabinet walls shall be cleaned and dried to a height of 40mm from the concrete, and the concrete surface inside the cabinet shall be brushed to remove any dust and foreign matter.

(e) Backfilling of the excavations shall proceed in accordance with Section 6 of this Specification.

528. A "Key Pillar" or krone, obtainable from the Supervising Officer, is required to open all types of Cabinets Cross-Connection.

FILLING-IN AND RESTORATION OF STREETS

SECTION 6 - INDEX

601. (a) The Contractor shall execute interim restoration and permanent reinstatement, to the satisfaction of the Supervising Officer, the Municipal Authorities and Roads Dept.

(f) The operation of filling-in a trench shall not normally be commenced until the work to be covered thereby has been approved by the Supervising Officer / Engineer. Filling-in may only commence before such approval is given, provided that, prior permission has been received from the Supervising Officer, and the Contractor agrees to excavate, fill and reinstate such test holes as may be requested later by the Supervising Officer / Engineer.

602. (a) The periods of time between the placing of concrete and the commencement of backfilling shall be in accordance with the requirements of Section 4 and 5 of this Specification, and must be strictly followed.

(b) All spaces outside the walls of jointing chambers, duct laid in concrete in trench and all other duct laid in trench shall be carefully filled in with granular materials or concrete as directed by the Supervising Officer and rammed, care being taken to ensure that the ramming does not disturb any recently completed work.

(g) All ducts not laid in concrete shall be covered by a layer of Dune Sand (Section 4 refers) and hand punned to a thickness of not less than 75mm, or as otherwise directed by the Supervising Officer.

(h) Except where otherwise directed by the Supervising Officer / Engineer, all materials shall be replaced in 150 to 230mm layers, in the reverse order to which they were excavated (Section 3 refers) and thoroughly compacted. Mechanical punners shall normally be used. If this is impracticable a hand punning is employed, there shall be at least three punners to one filler.

(i) Where directed by the Supervising Officer / Engineer as being necessary in order to make excavated road pavement suitable for use as a sub-base materials, the pavement shall be broken, either during excavation or otherwise so that it is graded up to and including a size approximately 70mm.

603. (a) Backfilled excavations shall be tested at various levels by applying and continuously operating either, an explosive type rammer weighing approximately 102 Kg over an area of one half square metre for a period of three minutes, or a vibration rammer weighing not less than 50 Kg over a similar area for three minutes, or less if the behaviour of the machine indicates

maximum compaction. Rammers used for the compaction tests must be in efficient working order. At least one test, in a position selected by, and in the presence of the Supervising Officer, shall be carried out during backfilling as follows:

(i) Carriageway trench excavations - within a 50 metre length of trench or between jointing chambers and/or jointing chamber positions, whichever is shorter; and

(ii) In all other carriageway excavations.

(d) Further tests shall be carried out in the carriageway or footway, at such times and locations as the Supervising Officer / Engineer considers necessary.

(e) The compaction will be considered satisfactory providing the test results (MDD) comply with Roads Dept. requirements.

604. The Supervising Officer / Engineer will not allow the inclusion of an interim sealing coat as part of the permanent reinstatement unless approved in writing by Roads Dept.

605. Whatever method is used, the filling-in and the restoration of Streets shall comply with the obligations imposed on Ooredoo by the Municipal Authorities and Roads Dept.

SAFETY PRECAUTIONS

SECTION 7 - INDEX

701. (a) Ducts, pipes and cables existing in the ground shall not be diverted either by levering or otherwise; they shall not be allowed to rest upon (other than as a temporary means of support) or to be incorporated into any part of Ooredoo structures or duct. This shall apply unless the Supervising Officer otherwise directs, in which case the Supervising Officer will be responsible for obtaining the agreement of the owner of the existing apparatus to the arrangements to be adopted.

(f) When using certain materials referred to in this Specification the safety precautions contained in the following paragraphs should be observed.

702. When using jointing solvent and/or methylated spirits, care should be taken to ensure that working areas are adequately ventilated. Naked flames should not be used under any circumstances and smoking should not be permitted.

TOOLS, PLANT & EQUIPMENT

SECTION 8 - INDEX

801. Ooredoo will provide such of the articles named in the following lists as may be required:

Anchor Irons for Jointing Chambers.
Bends, Duct PVC.
Bolts, Foundation Indented (FI).
Brackets, Joint Box.
Cabinets, Cross-Connection and Krone.
Cable Bearers.
Cable, Protected and Unprotected.
Capping, Rolled Steel or PVC.
Clips Binding.
Collars, Gland Caulking.
Connectors Bends.
Discs, Caulking No. 1.
Draw Rope No. 1.
Ducts, PVC, Steel and Polyethylene or other types as specified.
Frames and Covers for Jointing Chambers - all types.
Glands, Caulking
Gratings, Sump.
Ladders, MS with Hooks and Bar.
Markers Joint.
Mixture No. 2.
Pillars, Distribution, comprising cover and slotted base.
Plugs, Cork.
Plugs, Hardwood.
Polyethylene Cable on returnable drums.
Posts, Marking.
Spacers Duct Nos. 2 and 3
Strips, Binding.
Steps Manholes.
Washers, No. 19.

802. Tools, etc. loaned:

Brushes Cylindrical for cleaning ducts.
Diaries.
Jacks Cable Drum.
Keys, Lifting, for Manhole Covers.
Keys, Pillar and Krone.
Mandrels, Testing.
Plugs Pressure No. 1 and 2.
Spindles, Cable Drum.

UNDERGROUND DUCT LAYING & ASSOCIATED WORKS

VOLUME – 3

PART IV-A – SPECIFICATIONS – CONCRETE

Ooredoo Q.S.C
P. O. BOX 217,
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Ooredoo Q.S.C.

UNDERGROUND DUCT LAYING & ASSOCIATED WORKS

PART IV A – CONCRETE

IMPORTANT

It should be noted that this section of the Ooredoo specification is an extract of the State of Qatar's, current Qatar National Construction Standards (QCS), dealing with concrete. Parts relevant to Ooredoo's Civil Works Duct Laying and associated works contracts have been extracted without any modification whatsoever. Notwithstanding this, the State of Qatar, Public Works Authority's prevailing specification, with reference to concrete, in force now or at any time in the future, shall be deemed to overrule this document.

Ooredoo Q.S.C.

INDEX

SECTION – 1 - GENERAL

1.1 Concreting in Hot Weather

A. Special measures shall be taken in hot weather to ensure that the temperature of the concrete when placed does not exceed 35^{o}C. Such measures shall be approved by the Engineer / Supervising Officer and shall include some, and if necessary, all of the following:

1. Aggregate stockpiles shall be protected from the direct rays of the sun by shades. The stockpiles shall not be watered.

2. Water for mixing concrete shall be cooled by means of mechanical equipment or the addition of ice. Storage tanks shall be painted white or sited under shade and distribution pipes shall be insulated or painted white.

3. Cement shall be stored in the shade. Bulk storage containers shall be painted white.

4. The mixing plant and delivery equipment shall be painted white and sited under shade wherever possible. The interval between mixing and placing shall be kept to a minimum.

5. Reinforcement shall be kept in the shade for a minimum period of four hours before concreting.

6. Immediately before the concrete is placed, formwork, reinforcement, etc. shall be sprinkled with cool water.

7. During the curing period, exposed concrete surfaces shall always be protected from the direct rays of the sun, and where possible, the formwork shall also be protected.

1.2 Testing Facilities

A. The Contractor shall carry out the various test procedures described in this specification at the stated intervals and, in addition, whenever the Supervising Officer so directs, utilizing facilities available within his own organization or an approved independent testing laboratory.

B. The Supervising Officer may also require samples of materials as indicated in Table 4.02 to be delivered to the ESD Materials Testing Laboratory for additional tests.

C. The Minimum equipment required for site testing is given in Table 4.03. This equipment shall be maintained on site at all times during concreting operations together with the necessary scoops, buckets, samples containers,

etc. required for sampling. The cube curing tank shall be located in an air-conditioned area.

1.3 Storage of cement

A. Cement delivered to site in bags shall be stored under cover on a raised floor in accordance with Clause 1.11. The covering shall be raised above the surface of the stored material to permit adequate ventilation, and shall be arranged to protect the cement from moisture. Bags that have been opened or damaged shall be removed immediately.

B. Cement delivered in bulk shall be transported to the site in closed, purpose made containers and shall be stored in elevated, airtight and weatherproof storage bins.

C. Different types of cement shall be stored in separate locations and each storage area shall be clearly identified.

1.4 Storage of Aggregates

A. Aggregates shall be stored on site in such a manner as to prevent contact with the ground, contamination by foreign material and segregation. The base to the storage area shall be laid to fall away from the mixer.

B. The stockpiles of fine and coarse aggregate shall be physically separated by means of substantial partitions of blockwork, timber or other suitable material, and shall be covered to prevent contamination by wind blown material when concreting is not being carried out.

C. Reserve approved aggregate stockpiles shall be maintained on site so that samples from each delivery of aggregate can be tested before the stockpile is required for use in the works.

1.5 Storage of Reinforcement

A. Reinforcement shall be stored on site above ground on racks in an approved manner so as to avoid damage, both before and after bending. The racks shall be covered to prevent contamination by wind blown material.

B. The reinforcement shall be stored in separate lots by size and by type.

1.6 Rejected Materials

A. Any materials rejected by the Supervising Officer, in particular cement which has deteriorated or aggregates which have segregated or become contaminated, shall immediately be removed from the site.

1.7 Records

One copy of all test results shall be sent to the Supervising officer immediately on completion of the report on results.

SECTION – 2 - MATERIALS

2.1 Cement.

A. Sulphate resisting cement shall comply with the 1996 edition of BS 4027 and shall be capable of satisfying the tests specified therein.

B. At the time of use all cement shall be free flowing and free from lumps. Cement that has been in storage so long that there is doubt as to its quality shall be tested in accordance with the respective BS to determine its suitability for use. Such cement shall not be used without approval.

C. Unless otherwise specified sulphate resisting cement shall be used for all concrete work.

2.2 Aggregates.

A. Aggregates shall consist of crushed, hard, clean, durable rock or washed sand or a combination thereof, obtained from approved sources and having the properties described in this Clause.

B. Aggregates suitable for the manufacture of good quality concrete shall not contain any deleterious, organic or other harmful matter.

2.3 Reinforcement.

A. Hot rolled mild steel bars and hot rolled high yield bars shall comply with the requirements of BS 4449 except that the stress requirements shall comply with Table 4.06.

B. Steel fabric reinforcement shall comply with the requirements of BS 4483 and shall be delivered to the site in flat mats.

C. Hard drawn mild steel wire shall comply with the requirements of BS 4482. Tying wire shall either be:

1. 1.6mm diameter soft annealed iron wire

2. 1.2mm diameter stainless steel wire

D. All reinforcement shall be free from loose scale, rust, oil, grease or any other matter that may impair the bond between the concrete and the reinforcement or cause corrosion of either.

E. Samples of the reinforcement shall be submitted to an approved independent testing laboratory as and when directed by the Supervising Officer for testing in accordance with BS 4449 to the stress requirements of this specification.

F. Samples shall be adequate for the tests to be carried out, shall be representative specimens of the steel being used in the works and shall have mill identification marks along the test length. If identification marks are not rolled into the steel, the source of supply shall be submitted at the time of the submission of the samples.

2.4 Water.

A. Water for mixing concrete, shall not contain total chemical impurities exceeding 2000 ppm and, in particular, the sulphate content shall not exceed 1000 ppm and the chloride content shall not exceed 500ppm.

2.5 Release Agents.

A. The release agent shall be an approved material, marketed as such and shall be one of the following types:

1. Cream emulsion.

2. Neat oil with surfactant added.

3. Chemical release agent.

B. The release agent must not, at any time, be diluted by the addition of water or other material.

SECTION – 3 - WORKMANSHIP

3.1 Designed Concrete Mixes

A. All mixes shall be designed by the Contractor to produce concrete of the required compressive strength within the limits shown in Tables 4.07 and 4.08.

B. The grade of concrete is denoted by the number which indicates the characteristic compressive strength of the concrete in N/mm^2, determined by the cube tests made at 28 days, prefixed by the type of cement to be used in the mix, thus:

OPC 20 = a design mix with a characteristic strength of 20 N/mm^2 using ordinary Portland cement.

SRC 25 = a design mix with a characteristic strength of 25 N/mm^2 using sulphate resisting cement.

C. The characteristic strength of concrete is defined as the crushing strength of concrete cubes at 28 days below which not more than 5% of the test results may be expected to fail. The mixes shall be designed to have at least the average strength shown in Table 4.08 under the heading "Design Strength".

3.2 Works Cube Tests

A. Samples shall be taken at the point of discharge from the mixer, or delivery vehicle if ready mixed concrete is being used. From each sample three 150mm cubes shall be made, one for testing at 7 days after casting and two for testing at 28 days. All cubes shall be clearly marked with their identification and accurate records shall be supplied to the Supervising Officer giving:

1. Identification of test cube.
2. Date and time for sampling.
3. Mix designation.
4. Location of sampled batch after placing.
5. Method of compaction.
6. Date of testing.
7. Results of test.

B. The concrete will be deemed to comply with the compressive strength requirements of this specification if:

1. The average strength determined from a group of four consecutive samples exceeds the characteristic strength value given in Table 4.08.

2. Each individual test result is greater than 85% of specified

characteristic strength.

C. If only one cube results fails to meet the second requirement, then that result may be considered to represent only the particular batch of concrete from which that cube was taken, provided the average strength of the group satisfied the first requirement.

D. If more than one cube in a group fails to meet the second requirement or if the average compressive strength of any group of four consecutive test cubes fails to meet the first requirement, then all the concrete in all the batches represented by all such cubes shall be deemed not to comply with the strength requirements.

E. When the average compressive strength of four consecutive samples fails to meet the first requirement, the Supervising Officer shall either instruct that:

1. All Concrete production ceases while further tests and trial mixes are carried out in accordance with Clause 3.02, or

2. The mix proportions of subsequent batches are modified in a manner approved by the Supervising Officer to increase the compressive strength.

F. If, in the opinion of the Supervising Officer, the concrete which has failed to meet the strength requirements of this specification is not likely to be capable of fulfilling its purpose in the structure, three cores shall be cut from the area represented by the test cubes. The actual location shall be decided by the Supervising Officer.

G. The cost of cutting the cores and any resultant delay shall be borne by the Contractor regardless of whether the quality of the deposited concrete proves to be satisfactory or not.

H. Where the average compressive strength found by testing the three cores taken from the structure, and adjusted to the equivalent cube strength at 28 days using Tables 4.09 and 4.10 is confirmed as below the strength requirements, then the Supervising Officer may instruct that further cores be cut in order to determine the full extent of the defective concrete and further investigations, e.g. load tests, etc. be carried out.

I. Defective concrete shall be cut out and replaced or alternative remedial action shall be taken, as the Supervising Officer directs, and the cost of such work and of cutting the additional cores shall be borne by the Contractor.

3.3 Seven Day cube Tests

A. The results obtained from the tests carried out on moulded cubes at 28 days shall be the means of ensuring that the concrete meets the compressive strength requirements of the specification. Tests shall be carried out at 7 days to establish a relationship between the 7 day and 28 day strengths. The

relationship shall be used to interpret further test results in order to predict the probable value of the corresponding 28 day strengths.

B. The Supervising Officer shall be advised without delay should any sample appear likely to fail to meet the specification so that necessary action can be taken to minimize the effect of such failure.

3.4 Batching and Mixing Concrete

A. The quantities of cement, fine aggregate and coarse aggregate shall be measured by weight. A separate weighing device shall be provided for weighing cement or the cement may be measured by using a whole number of bags in each batch.

B. Under no circumstances shall sulphate resisting and ordinary Portland cement be used in the same mix.

C. The weight of fine and coarse aggregate shall be adjusted to allow for the free water contained in the aggregate which shall be determined by a method approved by the Supervising Officer immediately before mixing begins and thereafter as the Supervising Officer requires. Aggregates from different sources shall not be mixed in the same batch without the approval of the Supervising Officer.

D. Mixers shall not be loaded in excess of the manufacturer's rated capacity, which shall be clearly displayed on the mixer in terms of volume of mixed concrete.

E. The materials shall be mixed until they are uniformly distributed and the mix is of uniform consistency and colour, but in no case for less than 2 minutes after all the material have been added to the drum. The mixer shall revolve at the speed recommended by the manufacturer.

F. The mixer shall be thoroughly cleaned out before any fresh concrete is mixed, when it has been out of use for more than 30 minutes or when the grade of concrete or type of cement is changed.

3.5 Ready-Mixed Concrete

A. Ready-mixed concrete from a central batching plant may be used in the works. Prior to the delivery of any concrete to the site, details of the proposed supplier shall be submitted to the Supervising Officer for approval. Arrangements shall be made for the Supervising Officer to inspect the plant if so required, and to be present during the preparation of trial mixes. The source of ready-mixed concrete shall not subsequently be changed without the further approval of the Supervising Officer.

B. The requirements of this specification in respect of materials, testing, storage, batching and mixing, shall apply equally to the central batching plant. In particular, works test cubes shall be taken on site as specified irrespective of any cubes which may have been taken by the supplier.

C. Extra water shall only be added at the site with the specific approval of the Supervising Officer, and in the event of such an addition, works test cubes shall be taken to check that the minimum strength requirements have been achieved.

D. The concrete shall be transported to the site in an approved type of truck mixer or agitator truck which apart from the cab and chassis shall be painted white and kept clean at all times. The discharge chute and other dirty areas shall be washed down after delivery to prevent spillage on the roads.

E. Copies of all delivery notes shall be submitted to the Supervising Officer and shall include at least the following information:

1. Name of supplier, serial number of ticket and date.
2. Truck number
3. Name of Contractor.
4. Name of contract and location of site.
5. Grade of concrete.
6. Specified workability.
7. Type and source of cement.
8. Source of aggregate.
9. Nominal maximum size of aggregate.
10. Time of loading at supplier's works.
11. Quantity of concrete.
12. Arrival and departure times of truck.
13. Time of completion of discharge.
14. Extra water added with the approval of the Supervising Officer.

F. The maximum time between the addition of cement to the mixer or agitator truck and the discharge of concrete shall be one hour, regardless of whether retarders have been incorporated in the mix, unless long distances render this impractical and the contractor shall have previously demonstrated to the Supervising Officer that concrete can be transported successfully for longer periods.

3.6 Placing Concrete

A. The Supervising Officer shall receive a minimum of 24 hours notice of the contractor's intention to place concrete and the Supervising Officer's approval shall be obtained before concrete is placed in any part of the works. If concreting has not started within 24 hours of approval being given, approval shall again be obtained.

B. Concrete when deposited shall have a temperature of not more than $35^{o}C$ and the formwork and reinforcer shall be at a temperature low enough to prevent the flash setting of the concrete.

C. No concrete shall be mixed or placed while the temperature is above $40^{o}C$ on a rising thermometer or above $43^{o}C$ on a falling thermometer. The day's concreting shall be planned in such a manner as to ensure that each bay or

panel is completed at an approved construction joint before the temperature rises above the permissible limit.

D. The concrete shall be compacted in its final position within 30 minutes of discharge from the mixer unless carried in purpose made agitators, operating continuously, when the time shall be within 1 hour of the introduction of the cement to the mix and within 30 minutes of discharge from the agitator.

E. Concreting shall be carried out continuously and fresh concrete shall not be placed against insitu concrete which has been in position for more than 30 minutes, unless a construction joint is formed. When insitu concrete has been in place for 4 hours, no further concrete shall be placed against it for a further 24 hours.

F. Concrete shall be placed as near as possible to its final position in such a manner as to avoid segregation of the concrete, displacement for the reinforcement, formwork and embedded items.

G. Concrete shall not be placed in standing water in the formwork.

H. Generally concrete shall be deposited in horizontal layers to a compacted depth not exceeding 300mm and each layer shall be well consolidated before the subsequent layer is placed. In the case of columns and walls, the compacted depth may be increased to a maximum of 450mm.

I. Concrete shall not be dropped into place from a height exceeding 2 meters and shall not be pumped or discharged through aluminum alloy.

J. When trunking or chutes are used, they shall be cleaned before and after each pour.

3.7 Pumped Concrete

A. Concrete may only be transported by pumping if the following information is submitted to the Supervising Officer for prior approval:

1. Details of mix design.
2. Details of pumping equipment.
3. Area and volume of concrete to be placed in one operation.
4. Distance over which the concrete is to be pumped.
5. Details of standby equipment.

3.8 Compacting Concrete

A. All structural concrete shall be compacted by means of approved mechanical vibrators of the immersion type having a frequency of not less than 10,000 oscillations, unless otherwise agreed by the Supervising Officer.

B. Sufficient standby vibrators shall be retained on site during concreting operations to ensure that spare equipment is always available in the event of

breakdown.

C. Vibrators shall not be operated by workmen who have had insufficient training in their use.

D. Compaction shall commence as soon as there is sufficient concrete within the formwork to immerse the vibrator and continue during the placing operation so that at no time shall there be a large volume of uncompacted concrete in the formwork.

E. The tubular part of the tool shall be immersed vertically into the full depth of the concrete to be vibrated at points spaced to suit the radius of action of the vibrator and the workability of the concrete, so that the whole of the concrete is uniformly compacted. Where the underlying layer is also fresh concrete the vibrator shall also penetrate that layer by at least 100mm to ensure that the surfaces knit together.

3.9 Construction Joints

A. The location and design of construction joints shall be approved by the Supervising Officer before concreting is commenced.

B. Construction joints shall be formed at right angles to the axis of the member concerned and in horizontal or inclined members the joint shall be formed by the insertion of rigid stopping –off forms.

C. The forms shall be split along the lines of the reinforcement passing through them, so that each portion can be positioned and removed separately without disturbance or shock to the reinforcement or concrete.

D. Stop ends made of expanded metal lath or similar material may only be left permanently in the concrete if approval is obtained. Where such stop ends are used no metal may be left permanently in the concrete closer to the surface of the concrete than the specified cover to the reinforcement.

E. In vertical member the upper surface of the concrete, lift shall be horizontal and the external face of the joint shall be neatly formed by means of a timber edging fixed to the formwork.

F. All contact surfaces of the existing concrete in the construction joint, except within 25mm of permanently exposed faces, shall be treated to remove laitance, together with any porous areas below the laitance, to expose the aggregate.

G. The treatment shall preferably consist of using a wire brush and water spray as soon as the concrete has hardened sufficiently or if the surfaces are too hard for this to be effective, by a light power tool. Particular care shall be taken not to disturb any of the remaining materials.

H. Before fresh concrete is placed against the joint, the surface shall be cleaned of all loose materials and washed with water. All free water shall be removed immediately before placing the fresh concrete, which shall be well

compacted against the joint.

3.10 Curing

A. Concrete surfaces shall be protected for at least the first 7 days of hardening so as to maintain the best possible curing conditions for the concrete.

B. The method of covering or other curing treatment adopted shall ensure that sufficient moisture is present to complete the hydration of the cement and shall be to the approval of the Supervising Officer. It shall not:

1. Disfigure permanently exposed surfaces, or
2. Affect the bonding of subsequent coatings, or
3. Increase the concrete temperature.

C. Unformed surfaces shall be protected as soon as possible after the concrete has been placed by hessian or other absorbent material which shall be kept wet for the required period. An adequate supply of fresh, salt-free water shall be kept on site at all times for this purpose. The Supervising Officer may instruct that the hessian be overlaid with polythene sheet to assist water retention during rapid drying weather conditions.

D. Formed surfaces shall be similarly protected if the formwork is removed before the 7 days have elapsed.

3.11 Surface Finish From Sawn Formwork

The irregularities in the finish shall be no greater than those obtained from the use of properly designed forms of closely-jointed sawn boards. Small blemishes caused by entrapped air or moisture will be permitted, but the surface shall be free from voids, honeycombing or other large blemishes.

3.12 Surface Finish From Wrought Formwork

A. The finish shall be smooth and of uniform texture and appearance, i.e. a “fair faced finish” and shall be obtained by the use of properly designed forms of closely-jointed material having a hard smooth surface. The particular material shall be used consistently throughout the structure.

B. The concrete surfaces shall be entirely free from stain, fins, lippings, nail or screw marks, raised grain or other blemishes with true, clean finishes. Any imperfections shall be made good as directed by the Supervising Officer.

3.13 Formwork Construction

A. The design of the formwork shall be the responsibility of the contractor notwithstanding any approval which may be given.

B. Formwork shall be so designed and constructed that the finished concrete is to the shape, size, position and finish shown on the drawings and to meet the following basic requirements:

1. It will safety support all loads that might be applied until the concrete has hardened sufficiently to support such loads itself.

2. It is sufficiently watertight to prevent the loss of liquid.

3. It fits tightly against previous concrete lifts to prevent lipping, loss of liquid or grout.

4. It is capable of being cleaned out immediately prior to concreting with temporary access holes provided as necessary.

5. It can be removed without damage to the concrete.

6. The side forms of members can be removed without disturbing the soffit form.

7. Props are positioned so as not to overstress any part of the completed structure.

3.14 Preparation of Formwork Before Concreting

A. Before concrete is poured, the forms shall be thoroughly cleaned.

B. The inside surfaces of all formwork, except permanent formwork shall be sparingly coated with an approved release agent to prevent adhesion of the concrete. Special care shall be taken to keep reinforcement and any hardened concrete on which new concrete is to be placed free from the release agent.

C. The same type and make of release agent shall be used on all formwork to concrete which will be visible in the finished work.

3.15 Removal of Formwork

A. The Supervising Officer shall be notified when the Contractor intends to remove any formwork.

3.16 Remedial work

A. Concrete exposed by the removal of formwork shall be inspected by the Supervising Officer before any remedial work, subsequent coating or any other treatment which would hinder the proper inspection of the concrete is carried out. Any concrete, the surface of which has been treated prior to being inspected by the Supervising Officer, shall be liable for rejection.

B. Concrete which in the opinion of the Supervising Officer is defective or which is not true to an acceptable line or level shall be cut out and rebuilt without delay, unless the Supervising Officer agrees that a repair may be satisfactorily effective. This agreement shall not preclude the subsequent rejection of the repaired work.

C. The methods to be used in removal and replacement or repair of defective work shall be submitted to the Supervising Officer for approval in each particular case before the work commences.

3.17 Tolerances

Permissible deviations from the dimensions and levels indicated in the contract documentation are given in table 4.12.

3.18 Fixing Reinforcement

A. Where it is necessary to bend mild steel reinforcement already cast in the concrete, the internal radius of the bend shall not be less than twice the diameter of the bar.

B. All reinforcement shall be fixed rigidly in position. At intersections the bars shall be bound together with tying wire and the loose ends of the wire shall be turned towards the inside of the member.

C. Reinforcement shall be fixed in the positions shown on the drawings within a tolerance of 5mm or 5% of the lowest dimension of the cross-section of the member, whichever is the greater.

D. The concrete cover to the reinforcement shall be carefully maintained utilizing approved spacers where necessary. Unless indicated elsewhere in the contract documentation, the minimum concrete cover to all steel shall be in accordance with relevant CN diagrams.

E. Where concrete spacer blocks are used, they shall not exceed 50mm square in section and shall be precast from concrete of similar mix proportions and strength as the adjacent concrete, except that the largest size of aggregate shall be 10mm.

F. Spacer blocks shall not be used where the concrete face will be visible in the finished work, without the approval of the Supervising Officer.

G. Each concrete spacer block shall be securely fixed to the reinforcement with wire or a clip. The wire or clip shall be embedded in the center of the block so that it does not subsequently cause rust marks on the concrete surface.

H. Scaffold boards shall be provided to ensure that the reinforcement is not displaced by being walked upon during concreting or other operations.

I. During concreting operations, a competent steel fixer shall be in attendance to ensure that the reinforcement is maintained in position as pouring and compaction proceeds.

SECTION – 4 - STANDARDS AND TABLES

4.1 Standards

The standards referred to in this section are:

BS EN 197	Specification for ordinary and rapid hardening portland cement.
BS 410	Test sieves.
BS 812	Methods for sampling and testing of mineral aggregates, sands and fillers.
	Part 1 Sampling, size, shape and classification Part 2 Physical properties Part 3 Mechanical properties
BS EN 12620	Aggregates from natural sources for concrete.
BS 1881	Methods of testing concrete.
BS 4027	Sulphate resisting Portland cement.
BS 4449	Specification for rolled steel bars for the reinforcement of concrete.
BS 8666	Bending dimensions and scheduling of bars for the reinforcement of concrete.
BS 4482	Hard drawn mild steel wire for the reinforcement of concrete.
BS 4483	Steel fabric for the reinforcement of concrete.
ASTM C88	Soundness of aggregates by use of sodium sulphate or magnesium sulphate.

4.2 Minimum sample sizes for ESD Materials Testing Laboratory.

MATERIAL	TEST	SAMPLE SIZE
Cement	Full range of tests	Composite sample of 7 kg taken from at least 12 bags
Aggregate	Full range of tests	200 kg
	Sieve analysis Chemical analysis Soundness test Specific gravity Water absorption Bulk density Flakiness index Dust content Abrasion value	50 kg
	Aggregate crushing value	25 kg
	Ten per cent fines	25 kg
	Immersed rotational test	100 kg
Reinforcement	Tensile test	500mm
	Bend test	300mm
Water	Full range of tests	1 litre

4.3 Minimum Testing Equipment for Each Site.

TEST	EQUIPMENT TO BE PROVIDED	NUMBER REQUIRED
Slump test BS 1881 Part 2	Slump cone with base plate Tamping rod Trowel 300mm rule Small scoop	1 1 1 1 1
Cube making BS 1881 Part 3	150mm cube moulds and base plate 1.8 Kg tamping bar 380mm long with 25mm square ramming face Set of tools for assembling and Stripping moulds Trowel as for slump test Scoop as for slump test Mould oil in closed container with brush	6 1 1 - - 1
Cube curing BS 1881 Part 3	Hessian or sacking, impervious sheet Maximum/minimum thermometer Waterproof marking crayon/paint or Equivalent	Lot 1 1
Concrete Temperature	Concrete thermometer	1

NOTE: The use of 100mm cube moulds is not permitted.

4.4 Coarse Aggregate Grading.

BS 410 TEST SIEVE (mm)	PERCENTAGE WEIGHT PASSING BS SIEVES							
	NOMINAL SIZE OF GRADED AGGREGATE			NOMINAL SIZE OF SINGLE SIZED AGGREGATE				
	40mm to 5mm	20mm to 5mm	14mm to 5mm	63mm	40mm	20mm	14mm	10mm
75.0	100	-	-	100	-	-	-	-
63.0	-	-	-	85-100	100	-	-	-
37.5	95-100	100	-	0-30	85-100	100	-	-
20.0	35-70	95-100	100	0-5	0-25	85-100	100	-
14.0	-	-	90-100	-	-	-	85-100	100
10.0	10-40	30-60	50-85	-	0-5	0-25	0-50	5-100
5.0	0-5	0-10	0-10	-	-	0-5	0-10	0-25
2.36	-	-	-	-	-	-	-	0-5

4.5 Fine Aggregate Grading.

BS 410 TEST SIEVE	PERCENTAGE WEIGHT PASSING BS SIEVES		
	GRADING ZONE - 1	GRADING ZONE - 2	GRADING ZONE - 3
mm			
10.00	100	100	100
5.00	90-100	90-100	90-100
2.36	60-95	75-100	85-100
1.18	30-70	55-90	75-100
µm			
600	15-34	35-59	60-79
300	5-20	8-30	12-40
150 (a)	0-10	0-10	0-10
150 (b)	0-20	0-20	0-20

(a) Natural sands.

(b) Crushed rock

4.6 Minimum Stress Requirements for Reinforcement.

TYPE	YIELD STRESS	ULTIMATE STRESS
	N/mm^2	N/mm^2
High yield steel	410	472
Mild steel	250	288

4.7 Mix Design Requirements.

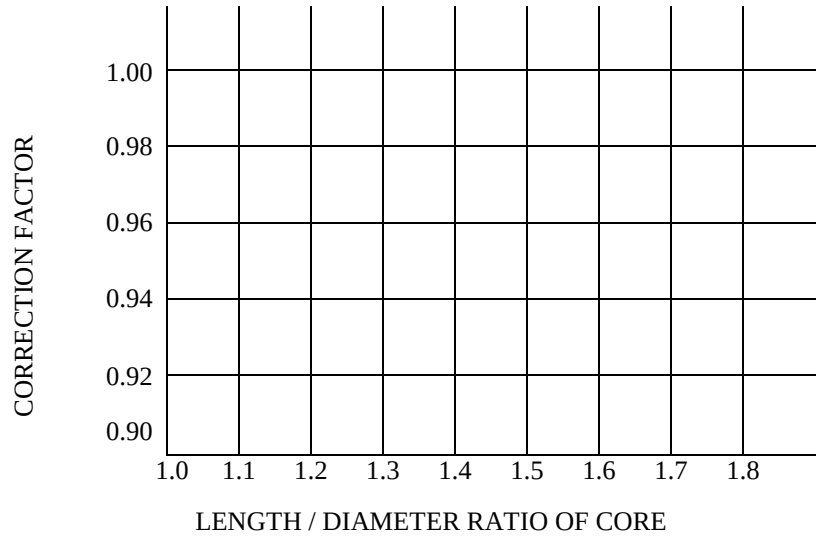
CONCRETE GRADE	MAXIMUM WATER/CEMENT RATIO	MAXIMUM AGGREGATE SIZE	MINIMUM CEMENT CONTENT	MAXIMUM CEMENT CONTENT
		mm	kg	kg
OPC 20	.55	20	300	500
SRC 20	.50	20	370	500
OPC 25	.55	20	300	500
SRC 25	.50	20	370	500
OPC 30	.55	20	300	500
SRC 30	.50	20	370	500
OPC 35	.55	20	300	500
SRC 35	.50	20	370	500

NOTE : The maximum water/cement ratio stated is for a standard mix not including additives.

4.8 Mix Design Compressive Strength Requirements.

CONCRETE GRADES	CHARACTERISTIC STRENGTH		TRIAL MIXES	
	7DAYS	28DAYS	7DAYS	28 DAYS
	N/mm^2	N/mm^2	N/mm^2	N/mm^2
OPC 20 SRC 20	15	20	22	30
OPC 25 SRC 25	19	25	26	35
OPC 30 SRC 30	22	30	30	40
OPC 35 SRC 35	26	35	34	45

4.9 Correction Factor for Compression Test on Cores.



NOTE: The equivalent cube strength of the insitu concrete at 28 days shall be calculated by:

1. Dividing the maximum load applied to the core by the mean cross sectional area.
2. Multipying by the correction factor for the length/diameter ratio of the specimen, obtained from above.
3. Multiplying by 1.25
4. Dividing by the age strength relation, obtained from Table 4.10

Example A

1.	Length of core after capping	=	127mm, diameter = 102mm
2.	15 days core strength	=	23.18 N/mm^2
3.	Corrected cylindrical strength	=	23.18 x 0.94 N/mm^2
4.	Equivalent cube strength	=	23.18 x 0.94 x 1.25 = 27.24 N/mm^2
5.	Equivalent 28 days cube strength	=	$\frac{27.24 \times 100}{88.75}$ = 30.69 N/mm^2

Example B

1.	Length of core after capping	=	127mm, diameter = 102mm
2.	110 days core strength	=	26.94 N/mm^2
3.	Corrected cylindrical strength	=	26.94 x 0.94 N/mm^2
4.	Equivalent cube strength	=	26.94 x 0.94 x 1.25 = 31.65 N/mm^2
5.	Equivalent 28 day cube strength	=	$\frac{31.65 \times 100}{125}$ = 25.32 N/mm^2

4.10 Age-strength Relation of Test cubes
(Related to 100% at 28 days)

DAYS	0	2	4	6	8
0	-	41.0	60.0	71.0	77.5
10	81.5	85.0	87.5	90.0	92.0
20	94.0	96.0	97.5	98.5	100.0
30	101.0	102.0	103.5	104.5	105.5
40	106.5	107.0	108.0	109.5	110.0
50	110.5	111.0	112.0	112.5	113.0
60	114.0	114..5	115.0	115.5	116.0
70	116. 5	117.0	117.5	118.0	118.5
80	119.0	119.5	119.5	120.0	120.5
90	121.0	121.5	122.0	122.0	122.5
100	123.0	123.5	123.5	124.0	124.5
110	125.0	125.0	125.5	125.5	126.0
120	126.5	126.5	127.0	127.0	127.5
130	127.5	128.0	128.5	128.5	129.0
140	129.0	129.5	129.5	130.0	130.0
150	130.5	130.5	131.0	131.0	131.5
160	131.5	131.5	132.0	132.0	132.5
170	132.5	132.5	133.0	133.0	133.5
180	133.5	134.0	134.0	134.5	134.5
190	135.0	135.0	135.0	135.5	135.5
200	135.5	135.5	136.0	136.0	136.5
210	136.5	136.5	137.0	137.0	137.0
220	137..0	137.5	137.5	137.5	138.0
230	138.0	138.5	138.5	138.5	138.5
240	139.0	139.0	139.0	139.5	139.5
250	139.5	140.0	140.0	140.0	140.0
260	140.5	140.5	140.5	140.5	141.0
270	141.0	141.0	141.5	141.5	141.5
280	142.0	142.0	142.0	142.0	142.0
290	142.5	142.5	142.5	142.5	142.5
300	143.0	143.0	143.0	143.5	143.5
310	143.5	143.5	144.0	144.0	144.0
320	144.0	144.5	144.5	144.5	144.5
330	144.5	145.0	145.0	145.0	145.0
340	145.0	145.5	145.5	145.5	145.5
350	146.0	146.0	146.0	146.0	146.0
360	146.0	146.0	146.5	146.5	146.5

4.11 Permissible Tolerances in concrete Dimensions
(Insitu concrete members)

STRUCTURE	DISTANCE OVER	PERMITTED TOLERANCE
Beams, Columns and Walls		
Cross sectional dimensions.		± 6mm
Variation from plumb and Level.	Up to 3m	6mm
Deviation from position of main centre line.	In any bay or 6m maximum	12mm
Slabs		
Thickness		± 6mm
Variation from level	In any bay or 6 m maximum	9mm

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

VOLUME - 4

PART IV-B – SPECIFICATION – TRENCH WORK IN THE HIGHWAY

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Ooredoo Q.S.C

CODES OF PRACTICE AND SPECIFICATIONS

FOR TRENCHWORKS IN THE HIGHWAY

IMPORTANT

It should be noted that this section of Ooredoo's Specification is an extract current copy of the State of Qatar's Public Works Authority's (Ashghal), Roads Operation & Maintenance Department Codes of Practice for Trench Works in the Highway, without any modification whatsoever. Notwithstanding this, the State of Qatar's Public Works Authority's (Ashghal), Roads Operation & Maintenance Department Codes of Practice for Trench Works in the Highway, in force now, or at any time in the future, shall be deemed to overrule this document.

CODE OF PRACTICE – TRENCH WORKS

ADMINISTRATION PROCEDURE

1. Application for Road Opening (RO) permit is applied for online through Ashghal site Q-PRO.

2. A copy of the approved RO will be submitted to Traffic Dept. to get the Police Permission.

3. Copies of all documents (Approved RO, Police Permission and Drawings) shall be submitted to the related work area Municipality in order to get the Excavation Permit.

4. Whenever it is considered necessary the Highway Maintenance Section will implement inspection of the works in progress. As the recruitment of specific trench inspectors has been withheld, inspections will be limited to particularly difficult sites of contractors whose work is thought to be substandard. In some instances Inspection Form RO5 may be implemented to ensure compliance with the Specification.

5. Where works are considered to be substandard, or deterioration has occurred during the maintenance period, the Remedial Form RO9 (Pink) will be issued to the service authority concerned. In general this action will only be taken where a serious hazard exists or informal approaches for improvement have failed.

6. On completion of the 12 months maintenance period the reinstatement will be inspected and a permanent reinstatement undertaken where necessary.

IMPORTANT DEFINITIONS

(a) The Highway.

"*The Highway*" shall include all roadways, footways, verge, etc., over which the public has right of passage.

(b) Major Works.

"*Major Works*" will be defined as trench works, that involve opening the road surface over a distance in excess of 100 linear metres in a continuous trench, or in any single street.

(c) Emergency Works.

"*Emergency Works*" are those works that the Authority must undertake without delay because of interruption of service. When the services has been resumed backfilling must be undertaken in the normal way, as the emergency has then been overcome. The provision of new services at short notice, does not constitute an emergency.

(d) Major Roads.

All dual carriageway and certain urban high density single carriageway routes.

(e) Interim (Temporary) Reinstatement.

"*Interim Reinstatement*" is initial restoration of the highway surface, which during the following 12 months must be maintained by the Authority, to provide a safe surface for the public.

On completion of the maintenance period, the interim reinstatement will be accepted as the permanent reinstatement where the work is deemed satisfactory, by the highway authority.

(f) Permanent Reinstatement.

"*Permanent Reinstatement*" is the removal and replacement of the wearing course material to upgrade the interim reinstatement to a satisfactory standard for adoption by the Highway authority.

CODE OF PRACTICE FOR TRENCHWORK IN THE HIGHWAY

This document supersedes all previous Specifications for trench reinstatements.

CONTENTS

SECTION - 1 - PROCEDURE.

100. Definitions.

For the purposes of this document the following terms shall apply:

"*PWA*" shall mean the Public Works Authority (Ashghal).

"*The Road Engineer*" shall mean the PWA (Ashghal) Highway Maintenance Engineer, or his accredited representative.

"*The Authority*" shall mean the service department or organization promoting the works. In contract documents it will have the same meaning as "the Employer".

"*The Contractor*" shall mean the company or organization employed by the Authority to execute the works.

"*The Highway*" shall include all roadways, footways, verge etc., over which the public has right of passage.

"*Major Works*" will be defined as trench works that involve opening the road surface over a distance in excess of 100 lin. metres in a continuous trench, or in any single street.

"*Emergency Works*" are those works that the Authority must undertake without delay because of interruption of service. When the service has been resumed backfilling must be undertaken in the normal way, as the emergency has then been overcome. The provision of new services at short notice does not constitute an emergency.

101. Application Procedure.

Application to undertake any works within the Highway must be made in accordance with current administrative procedure, and the requisite period of notice must be given. Applications must be submitted by the Authority through Q-PRO on Ashghal's office site and to all other Authorities and accompanied by a 1:10,000 location plan. In general the minimum period of notice shall be 7 days.

No further action shall be taken until formal approval has been granted by Ashghal and by all other Authorities through Q-PRO.

A copy of the approved RO must be submitted to the Traffic Police when permission to execute the works is requested, and the commencement Notice RO3 must be submitted to the Road Engineer.

In the case of Emergency Works an application Form RO1 must be forwarded to the Road Engineer as soon as possible; but in any case within 3 days.

102. Road Closures.

Where road closures will be unavoidable, proposals must be received at least 30 days prior to commencement of the works. The Road Engineer will liaise with the Traffic Police regarding the requirements for diversionary routes and the Authority will be advised of these requirements.

A greater time than 30 days may be required for the fabrication and erection of special signs where widespread diversions are necessary on major traffic routes.

The Contractor will be responsible for providing and maintaining the necessary signing of the diversionary route, to the satisfaction of the Road Engineer and the Traffic Police.

Roads and accesses shall not be closed without the prior approval of the Traffic Police.

103. Programme of Work.

There may be occasions where it is advantageous for the Authority and the Road Engineer to agree on site the actual line of the proposed trench, details of reinstatement or siting of temporary structures within the highway. The Authority shall, if required by the Road Engineer, submit revised plan and sections.

Authorities must ensure that openings in carriageways are no wider or longer than they reasonably need to be in order to execute the works with the minimum effect on traffic flows.

No trench shall be left open for a period exceeding one week, and the Contractor must submit his programme of work to achieve this seven days reinstatement cycle.

104. Underground Chambers.

The attention of the Road Engineer shall be specifically drawn to any proposal for an underground chamber in the highway with an interior length exceeding 4 metres and/or an interior width exceeding 2 metres. The overall dimensions shall be stated and detail drawings of the siting and construction shall be submitted to the Road Engineer, if requested, for approval prior to commencement of any work on site.

105. Fly-overs and Other Structures.

Where the Authority's work and apparatus are to be laid over or in close proximity to bridges and other highway structures, detailed proposals for the siting, depth and accommodation, together with the method of executing the works must be agreed with the Road Engineer and no work shall be undertaken without prior approval.

106. Road Markings.

Where trench work removes surfaces road markings such as white lines and cats-eyes,

the Road Engineer shall be notified and he will replace the road markings on the surface as soon as possible, and the costs shall be borne by the Authority.

107. Reinstatement

The Specification shall be implemented to ensure satisfactory reinstatement of the highway, PWA (Ashghal) Inspectors will visit trench works and initiate sampling and testing of materials and workmanship where necessary. In the case of Major Works the Certification Form RO5 may be required by the Road Engineer.

108. Unsatisfactory Work.

In the case of any materials or workmanship failing to meet the requirements of this Specification the Road Engineer will issue a Notice for improvement RO9. In the event of the Authority or the Contractor failing to meet the requirements of the Notice, the Road Engineer will arrange the necessary remedial works, recover the cost from the Authority concerned, and may impose an additional fine of Qrs. 10,000.00 on the Authority.

109. Traffic Signals.

Where the works are within 50 metres of a junction controlled by traffic signals the PWA (Ashghal) Traffic Section shall be consulted at least 7 days before the works are commenced in order to protect the signal detector loops and modify the signal timings if necessary.

110. Existing Contracts.

Where the works are within the area of existing contracts, the PWA (Ashghal) shall be consulted before the works are commenced in order that they can be co-ordinated with the construction work in progress.

111. New Road Surfaces.

No trench works will be permitted that involves excavations in any road surface that have been laid for less than two years.

SECTION - 2 - GENERAL REQUIREMENT

201. Control of Traffic.

Prior to the commencement of any works within the Highway, the Authority shall notify the Road Engineer and the Contractor shall obtain permission from the Traffic Police.

The Contractor shall organize and carry out his work so as to cause the least possible interference with the flow of traffic. Traffic flow shall be maintained on existing roads and vehicles shall not be permitted to travel over partially completed construction except with the Road Engineer's specific approval.

202. Temporary Road Signs.

The Contractor shall erect and maintain at the approaches to the work and at intervals along the works or at any points forming a hazard to traffic temporary road signs for the direction and control of traffic.

All temporary signing shall be to the satisfaction of the Traffic Police and the Road Engineer.

203. Method of Working.

The work shall be carried out to the satisfaction of the Road Engineer. The Contractor will be required to submit his proposed method of working to the Road Engineer and the Traffic Police for approval before commencing the works. Trenches shall not be left open for periods exceeding one week and the programme of reinstatement should be prepared accordingly.

204. Services.

The Contractor shall be responsible for ensuring continuity of supply of electricity, water, gas, drainage and telephone services. He shall arrange to excavate trial hole to determine the depths and positions and services, and phase his works to fit in with any necessary alterations to services apparatus. No extra payment shall be made for this work.

Should damage occur to any existing services during the works, the respective Service Authority, the Road Engineer, and if necessary, the Traffic Police, must be notified immediately by the Contractor.

All work to services included in the Contract shall be carried out under the supervision and to the absolute satisfaction of the Authority concerned.

205. Damage to Existing Road Surfaces.

Only pneumatic tyred plant shall be used for excavation on finished bituminous surfaces. Adequate protection must be provided at all times to prevent damage by

hydraulic leg supports and any spillage of fuel, oil, etc., onto existing or newly laid bituminous surfaces. Steel rollers etc. must be transported between sites by low-loader. The hand mixing of concrete directly onto bituminous surfaces is prohibited. Protective boards shall be supplied for this purpose, subject to the approval of the Road Engineer.

Should damage occur, the area shall be removed to the limits designated by the Road Engineer and reinstatement carried out according to the requirements of this Specification at the Contractor's expense.

206. Backfilling Trenches.

Backfilling of trenches will, wherever practicable, be undertaken immediately that the specified operations proceeding it have been completed satisfactorily.

For Major Work, the Contractor may be required to conform with the Certification Form RO5, which will be completed by the Road Engineer.

No layer shall be covered by the next layer of construction until it has been inspected, tested and approved by the Road Engineer.

If any approved layer is subsequently damaged or disturbed by any means or cause whatsoever, then it shall be reinstated to the Specification requirements and to the satisfaction of the Road Engineer prior to placing the next layer of construction, all at the Contractor's expense.

Note that this clause also applies to Bituminous Materials.

207. Sub-contractors.

The Contractor is required to nominate, prior to commencement of the works, and Sub-contractor he intends to employ for the completion of the works.

The approval of Sub-contractors shall be at the discretion of the Road Engineer and in no circumstances will any other contractor be employed on the works without the written approval of the Road Engineer.

208. Maintenance Period.

The Contractor shall be required to maintain the works at all times to the specified tolerance for a period of twelve (12) months.

Should subsidence or damage occur, the affected layer or layers of construction shall be immediately removed and replaced to the limits determined by the Road Engineer.

The excavation and reinstatement shall be carried out to the tolerances and requirements of this Specification. No additional payment shall be made to the Contractor for remedial works.

The PWA (Ashghal) will inspect the trench on completion of the maintenance period and will arrange the permanent reinstatement where necessary. The Contractor's retention monies will be retained by the authority to meet the cost of this operation.

208. Defintions.

(a) "*Sub-grade*" - The compacted fill beneath the pavement and shoulders but not including the sub-base.

(b) "*Formation of Sub-base*" - The surface of the compacted sub-grade shaped and compacted to the specified profile to receive the sub-base.

(c) "*Formation of Hard Shoulders*" - The surface of the sub-base shaped and compacted to the specified profile to receive the hard shoulder surfacing.

(d) "*Sub-base*" - The compacted selected fill material as required by the Contract to depths as indicated in the Bill of Quantities or as directed, forming the layer between the sub-grade and bituminous surfacing.

(e) "*Base Formation*" - The surface of the completed sub-base shaped and compacted to the specified profile to receive the bituminous base.

(f) "*The Site*" - The site shall be taken to include all working areas and any additional areas, within or outside the highway, that are used for storage of equipment and materials or any purpose associated with the works.

SECTION - 3 - EXCAVATION

301. Removal of Bituminous Material.

Revolving wheel cutters attached to mechanical plant, or similar approved methods, must be used initially to cut the line of the proposed excavation in bituminous surfaces.

Pneumatic compressors and spade type chisels shall be used, to cut and break the bituminous material prior to work being carried out by mechanical excavators. Initial excavation shall be to the dimensions shown on the drawings for earthworks and conforming with the Ashghal's requirements.

302. Removal of Excavated Material.

Where excavations are carried out by hand, adequate boards or metal sheets approved by the Road Engineer, must be provided as protection for the adjacent bituminous surfacing, and as a temporary base for excavated material.

Except with the specific approval of the Road Engineer, all excavated material must be removed from site immediately, to enable working areas and traffic lanes to be clean and free from obstacles for the duration of the works.

303. Protection of Excavations.

Provision shall be made by the Contractor, for the protection of excavations and exposed works from damage caused by ingress of water, inclement weather conditions and loss of moisture from the adjacent earthworks.

Should damage occur to adjacent earthworks, owing to flooding, loss of moisture, wall collapse etc., trimming back must be carried out until undamaged material is exposed, and the sides of the excavation made vertical through the total depth.

The sides of all trenches and excavations must be maintained in a safe condition by the Contractor at all times, and adequately supported where necessary.

304. Excavation.

The base of any excavation shall be level and the sides vertical to the dimensions shown on the drawings. Any modification or departure from this requirement is subject to the approval of the Road Engineer.

305. Debris.

On completion of the works all debris arising from the excavations and any other operations shall be removed from the site to an authorised tip. The Contractor will be responsible for the removal of all debris present on the site, and should debris be present prior to commencement of the work it shall be the Contractors responsibility

to notify the Municipality Authorities regarding its removal, and to comply with any regulations issued by that Authority.

The Contractor will be required to obtain certification from the Municipality that the site has been left in a neat and tidy condition and retention monies will not be released until certification has been obtained.

SECTION - 4 - EARTHWORKS

401. Bedding and Surround.

Bedding and surround materials are to be spread regularly along the base of the trench, at the depth indicated on the drawings, to receive the respective service line or duct and the protective cover of bedding or surround material placed. Additional service lines or ducts, if required, must then be correctly aligned and the remaining cover of bedding or surround material placed. Layers must not exceed 150mm depth and hand ramming must be carried out or approved compaction plant used to ensure that the full depth of the layer is consolidated and free from cavities.

The requirements of this clause are subject to the individual requirements of the Authority.

402. Backfilling.

Prior to and during backfilling operations for trenches and excavations, all foreign material must be removed from the working and reinstatement areas. No backfilling shall take place in trenches containing water.

The thickness of each layer prior to compaction shall not exceed 200mm. Compaction shall be achieved by a minimum of two passes covering the full width of the trench using vibrating plate compactors, vibrating rollers or other mechanical compacting plant approved by the Road Engineer. Each layer shall be compacted until no further settlement is observed and must not exceed 150mm thick.

403. Tidal or High Water Table.

In the case of tidal or high water table areas defined by the Road Engineer, the standard back filling procedure shall be varied as follows:

(a) All excavations are to be kept free from standing water at all times during construction.

(b) Proposals for dealing with the situation, such as the insertion of membranes or use of filter media, must be submitted for approval to the Road Engineer prior to implementation.

404. Sub-Grade.

Sub-grade material shall consist of Desert Fill. It shall have a maximum stone size of 50mm, liquid limit less than 35% and plasticity index not more than 10. It shall be placed in layers of maximum compacted depth of 140mm, at optimum moisture content, and 95% of the maximum dry density as determined by the B.S. Heavy Compaction Test. Selected excavated materials may be re-used subject to the specific approval of the Road Engineer and compliance with the above requirements of this clause.

404. Sub-Base.

1. Single Carriageway Minor Roads.

Quarry scalpings or crushed stone to an approved grading and quality as defined by the Engineer.

The maximum stone size and Atterberg Limits as specified for sub-grade, shall have a maximum soaked C.B.R. value not less than 20% when tested at 100% of the B.S. Heavy Compaction Dry Density. The sub-base shall be placed to a compacted depth of 150mm, at optimum moisture content and 100% of the maximum dry density as determined by the B.S. Heavy Compaction Tests.

2. Dual Carriageway Major Roads.

Sub-base shall consist of a completed depth of 150mm Open Textured Bitmac Roadbase supplied and laid in accordance with the requirements of Section - 5 of this Specification.

405. Unsatisfactory Compaction.

In the event, of an area of trench backfill, sub-grade or sub-base material failing to meet the compaction requirements, the area must be watered, re-rolled and re-tested until the specific requirements are obtained to the satisfaction of the Road Engineer.

406. Rectification Sub-Base.

High spots are to be graded off, low spots are to be scarified and filled with selected fill material and the whole area watered and compacted to Specification.

Sections containing unsuitable fill material or failing to meet compaction requirements are to be removed and replaced by suitable material in accordance with the specification and to the satisfaction of the Road Engineer.

SECTION - 5 - BITUMINOUS TREATMENT

501. Clean Surfaces.

Immediately prior to the application of a prime or tack coat, all loose and objectionable material shall be removed from the surface to be treated by brushes or compressed air, to the satisfaction of the Road Engineer and kept clean at all times. Adjacent surfaces and kerbing must be protected against application of prime and tack coats.

502. Prime Coat.

Prime Coat shall consist of cut-back bitumen M.C.1. heated to a temperature of 60°C - 80°C and sprayed at a rate of 1 litre/sq. metre on to the approved sub-base layer.

Bitumen emulsion may be used in place of M.C.1., applied at a rate to ensure penetration at least 16mm into the sub-base to the satisfaction of the Road Engineer.

In all cases where emulsion is used it must be diluted to the manufacturers recommendations.

503. Tack Coat.

The material to be used for tack coat shall be cationic bitumen emulsion complying with class KI-40 of B.S. 434, 1973 and applied at a rate of 0.33 - 0.45 litres/sq. metre by a mechanical spraying tank or pressure hand spraying equipment onto bituminous surfaces.

504. Inclement Weather.

The spraying of prime coat, tack coat and the laying of bituminous materials shall not be carried out when the road surface is wet or when air turbulence is sufficiently strong to blow sand or dust onto the exposed treated surfaces.

505. Interim Reinstatement.

When the sub-base has been constructed and approved, the adjacent bituminous layer on each side of the trench shall be cut back using spade type chisels and compressors, or other approved means, to provide a staggered and stepped joint, the sides of which are to be vertical and parallel to the trench.

Prime and tack coats shall be sprayed at the specified rates ensuring that the sides of the bituminous joints have been adequately coated. Sufficient time must be allowed to enable penetration of the prime coat into the sub-base or complete breaking of the bitumen emulsion before placing any bituminous macadam. During this period traffic shall not be allowed on either surface, the Contractor providing temporary diversions if necessary and additional protection of the work if required.

506. Bituminous Material.

The manufacture of bituminous coated materials for use in the highway shall be carried out only by the Government approved batching plants. The supplier shall be nominated by the Contractor and be approved by the Road Engineer prior to execution of the works.

BINDER.

The binder shall consist of petroleum bitumen, grade 60/70 penetration, complying with the properties of B.S. 3690, 1970 Table 1.

AGGREGATES.

Coarse Aggregate.

Coarse aggregate for use in the manufacture of bitumen macadam shall consist of hard, clean, durable rock and shall satisfy the following requirements:

10 Minutes Rotational Test.

{ Wearing Course Layer }	]	
{ Single Course Layer }	]	Loss Factor not to Exceed 10%.
{ Friction Course Layer }	]	
{ Base Course Layer }	]	Loss Factor not to Exceed 20%

Magnesium Sulphate Soundness Test.

The maximum loss on any fraction of coarse aggregate shall not exceed 10%.

Soaked and Unsoaked 10% Fines Value.

The reduction in strength between the unsoaked and soaked 10% fines value shall not exceed 50 kN.

Acceptance aggregate shall conform to the requirements of all three of these tests.

Fine Aggregate.

Shall consist of not more than 40% by weight of clean natural sand, free from clay, shells and organic or other foreign matter.

BITUMINOUS MACADAM

The particle size distribution of the combined aggregate and bitumen content, shall fall within the limits specified for the particular course in the following table.

BS Sieve Size (mm).	Open Textured Bitmac Roadbase.	Dense Bitmac Base Course.	Bitmac Single Course.	Bitmac Wearing Course.	Friction Course.	Fine Hot Asphalt.
	Type - A	Type - B	Type - C	Type - D	Type - E	Type - F
	PERCENTAGE PASSING BY WEIGHT OF AGGREGATE.					
50.00	100	100				
37.50	87 - 100	92 - 100				
28.00	64 - 87	77 - 95	100			
20.00		63 - 86	90 - 100	100		
14.00	15 - 36	56 - 77	74 - 92	96 - 100	100	
10.00			58 - 78	65 - 80	95 - 100	100
06.30		44 - 60	43 - 63	53 - 72		95 - 100
05.00					32 - 53	
03.35		31 - 45	25 - 45	30 - 48	17 - 35	81 - 100
02.36	0 - 10				5 - 15	
01.40					0 - 10	
00.60			12 - 22	10 - 22		25 - 50
00.30		6 - 21				20 - 40
00.15						15 - 30
0.075		2 - 8	5 - 10	3 - 6	0 - 5	10 - 15

Binder Content	2.8 - 3.8	4.0 - 5.0	4.0 - 5.0	4.0 - 5.0	5.7 - 6.5	5.0 - 6.0
	% by weight of coated material.					

507. Type of Construction.

The construction shall conform to the cross-sections shown in PWA (Ashghal) Code of Practice & Specification relating to single or dual carriageway roads as appropriate.

Each finished layer of bituminous macadam shall be laid in a single pass to obtain the correct tolerance. The Contractor must determine the thickness of the uncompacted layer in order to achieve the correct final compacted thickness.

Single Carriageway Roads.

Dense Bitmac Single Course laid to a compacted thickness of 70mm.

Dual Carriageway Roads.

Dense Bitmac Base Course laid to a compacted thickness of 90mm and Dense Bitmac Wearing Course laid to a compacted thickness of 40mm.

In certain special cases, alternative materials may be specified, by the Road Engineer.

508. Transportation.

Bituminous macadam shall be transported with due care in order to prevent segregation of the mix between the batching plant to the site, and shall be covered during transit while waiting to prevent dust and moisture contamination. Should the temperature of the material fall below a minimum laying temperature of 135°C prior to discharge from the vehicle, the load shall be rejected and immediately removed from site. Similarly the delivery temperature shall not exceed 155°C. The bituminous

macadam shall be kept free from uncoated and foreign matter. The transit vehicles shall be provided with metal floors and sides and may be lubricated with thin oil or coated dust to facilitate discharge, but quantities used must be kept to the absolute minimum. Gasoline, kerosene other solvent shall not be used for this purpose. Should contamination of mixes occur, the loads will be rejected and must be immediately removed from site. The vehicles must be cleaned to the satisfaction of the Road Engineer prior to their continued use for transporting bitmac.

509. Spreading and Laying.

The bitmac shall be unloaded with care in order to avoid segregation onto lightly oiled flat metal sheets alongside the area to be reinstated. It shall be spread to a uniform thickness, and finished with hand rakes to the level required to give a smooth finish and correct shape and profile after compaction.

The temperature of the material immediately prior to compaction shall not be less than 120°C.

When trench dimensions permit the material shall be laid by a mechanical spreader and finisher capable of laying the bitmac to achieve the required compacted thickness of the course to produce a surface of uniform density free from segregation and unacceptable surface blemishes.

510. Compaction.

The compactive effort and mechanical condition of all compaction plant shall be to the satisfaction of the Road Engineer.

As soon as rolling can be effected without causing undue displacement of the mixed material, the bitmac shall be thoroughly and uniformly compacted by means of a smooth wheel roller or other approved compaction plant. The roller shall travel slowly enough to avoid displacement of the hot mixture and successive passes shall overlap. Care shall be taken to avoid displacing the surfacing when reversing the roller, and the edges of overlying layers of wearing course shall be protected from damage by the roller wheels during base course compaction.

Under no circumstances shall compaction be carried out with rollers straddling existing and new bituminous surfacing. The full width of the compaction plant must fit inside the excavated area, with sufficient space to ensure adequate compaction as specified over the full width of the new surface.

Rolling shall be concluded when all roller marks are eliminated and no further settlement takes place, all to the satisfaction of the Road Engineer.

Compaction plant shall not remain stationary on freshly compacted surfaces, or on finished work which is less than three days old.

In areas inaccessible to the rollers specified above, compaction shall be achieved by tamping with approved mechanical or hand tampers. Hand tampers shall not weigh less than 22.5 Kg and have a surface area not exceeding 645 sq. cm., enable the standard of compaction and surface regularity requirements to be achieved.

511. Wearing Course.

The wearing course shall be laid as soon as practicable after the base course. The Contractor shall ensure that the wearing course shall adhere without loss of bond or horizontal slippage to the base course, and shall apply tack coat to the base course surface specified in clauses 501, 503, 504, and form stepped joints in accordance with the drawings in Appendix - 3. Adjacent areas of bitmac, kerbing and paving shall be protected when spraying tack coat.

SECTION - 6 - KERBS, PAVED AREA AND VERGES

601. Removal.

Where kerbs, channels, paving slabs or edgings are to be disturbed, the Contractor will be required to reinstate them to their original condition. It is the Contractors responsibility to establish the condition of existing paved areas before starting his work, and if necessary to agree in advance with the Road Engineer where existing paving is sub-standard. No later claim will be accepted regarding the presence of damaged slabs. All materials suitable for re-use shall be carefully lifted and set aside in a safe place, and damage materials removed from the site to an approved tip, all at the Contractor's expenses.

602. Kerbs.

The units shall be laid on concrete bed and backed with concrete all in accordance with existing units or if necessary replaced by units of similar size, texture, colour and type, conforming as nearly as possible to those adjacent, all at the Contractor's expense.

Broken or damaged units shall not be re-used. Replacement kerbs, channels, etc. shall be hydraulically pressed to BS 340.

603. Temporary Reinstatement.

Where temporary reinstatement of paved areas is necessary it shall be laid as soon as possible after the trench has been backfilled. The reinstatement shall consist of 150mm of approved Desert Fill conforming to clause 404 of this Specification. This foundation shall be compacted with suitable equipment and primed in accordance with clause 502. The foundation will be sealed with a compacted thickness of 25mm of fine Hot Asphalt laid and compacted to the requirements of Section- 5, of this Specification.

604. Permanent Reinstatement.

The temporary surface and foundation specified above shall be removed to a depth of 100mm, leveled and re-compacted in accordance with Section - 4. The paving slabs previously set aside shall be re-laid on a 50mm firm bed of sand approved by the Road Engineer. The existing pattern and bond, and correct levels shall be retained, and all joints shall be clean and properly grouted with sulphate resisting cement mortar. The mortar shall be mixed in proportion of 1 part cement to 4 parts approved clean sand. Where necessary replacement slabs shall conform in size, colour and type as nearly as possible to those adjacent, and shall be 50mm thick hydraulically pressed to BS 368.

605. Concrete Foundation.

Where the disturbed slabs were laid on a concrete foundation the permanent reinstatement shall be carried out by the removal of 200mm of the temporary

restoration, and the formation leveled and re-compacted in accordance with Section - 4. Cracked or loose material from the faces of the existing foundation shall be removed, and a foundation of 100mm thick concrete shall be formed. The slabs shall then be re-laid on a 50mm firm bed of sand in accordance with clause 604 above.

606. Materials for Paving.

Kerbs shall be hydraulically pressed and manufactured to the standards of BS 340 using sulphate resisting cement.

Slabs shall be hydraulically pressed and manufactured to the standards of BS 368 using sulphate resisting cement.

Insitu Concrete shall have a minimum strength of 20 N/mm^2 at 28 days and manufactured using sulphate resisting cement. Additional water shall not be added to ready-mix concrete after initial batching.

Mortar shall be mixed in the proportions of one part sulphate resisting cement to four parts sand by weight, and only sufficient water added to obtain workability.

Cement for producing mortar and concrete shall be sulphate resisting complying with the requirements of BS 4027.

Sand for mortar shall be clean with a maximum sulphate content of 0.40% and a maximum chloride content of 0.06%. Sand for bedding slabs shall be clean subject to the approval of the Road Engineer.

Water for producing mortar and concrete shall not contain more than 2,000 parts per million total dissolved salts.

607. Verges.

The reinstatement of verges shall be in accordance with Section - 4 of the Specification, and the material to be used shall satisfy the requirements of clause 404.

On completion of the reinstatement, the verge shall be properly graded to conform with the level of the adjoining area.

All excess material shall be removed from the site in compliance with clause 305.

SECTION - 7 - TESTING OF MATERIALS

701. Tolerances.

The level of any point on the surface of the constructional course shall conform to that shown on the drawings with the tolerances detailed below :

Constructional Layer	Tolerance for level	Maximum depression under 3m straight edge.
Sub-grade formation.	± 5mm	–
Sub-base formation.	0 to – 10mm	–
Bitmac base course.	0 to + 6mm	9mm
Wearing course.	0 to + 6mm	5mm

702. Testing of Materials.

The contractor shall be responsible for carrying out all testing of materials as required by the Engineer, to ensure that the minimum specification requirements will be achieved and maintained. Testing shall be undertaken at the Contractor's expense at a laboratory approved by the Road Engineer.

In order to ensure the minimum specification requirements are being maintained the Road Engineer may require additional testing of materials and workmanship to be carried out.

The Road Engineer will condemn any materials or workmanship failing to meet the specified requirements.

The following construction control tests will be required.

Earthwork Testing.

1. Particle size by wet sieve analysis.
2. Atterberg Limits.
3. Soluble salts.
4. In-situ density and moisture content.
5. British Standard Heavy Compaction.
6. Re-moulded and Soaked CBR Test, to in-situ density and moisture content values. (The test surcharge to be designated by the Road Engineer).

Bituminous Materials.

7. Bitumen Content and Particle size distribution be sieve analysis.
8. 10 minutes Rotational Test.
9. Magnesium Sulphate Soundness Test.
10. Soaked and unsoaked 10% fines value.
11. In-situ cores.

703. Source of Materials.

Well in advance of laying bituminous materials, the Contractor shall submit his proposals for the supply and manufacture of bituminous materials in the works for approval by the Road Engineer.

In the event of materials failing to meet the specification requirements, the plant shall be re-calibrated, or an alternative supply of bituminous material provided, subject to the approval of the Road Engineer.

SECTION - 8 - PERMANENT REINSTATEMENT

801. Maintenance Period.

The Contractor shall be responsible for maintenance of the trench reinstatement for a period of 12 months.

During this period the Contractor must ensure that the carriageway surface is smooth and consistent in level to the adjacent carriageway surface at all times.

802. Rectification.

All materials laid outside the limits of the Specification shall be removed and re-laid at the Contractor's expense.

Sub-grade and sub-base formation.

High spots shall be graded off, low spots be scarified and filled with selected fill material, and the whole area re-watered and re-compacted to Specification.

Sections containing unsuitable fill material or failing to meet compaction requirements to be removed and replaced by suitable material in accordance with the Specification.

Bituminous Layers.

Measurement of level and tolerance shall be made by the Contractor while the material is still warm, and rectification where necessary carried out immediately. Regulation after compaction will not be permitted and the whole area may require to be removed to the full depth of the layer and re-constructed with fresh material.

Should any constructional layer suffer damage on removal of defective bituminous material, then the affected layer shall be either removed or reconstructed to the limits designated by the Road Engineer.

All replacement materials shall comply with the relevant clause of this Specification.

No additional payment shall be made for any such rectification work.

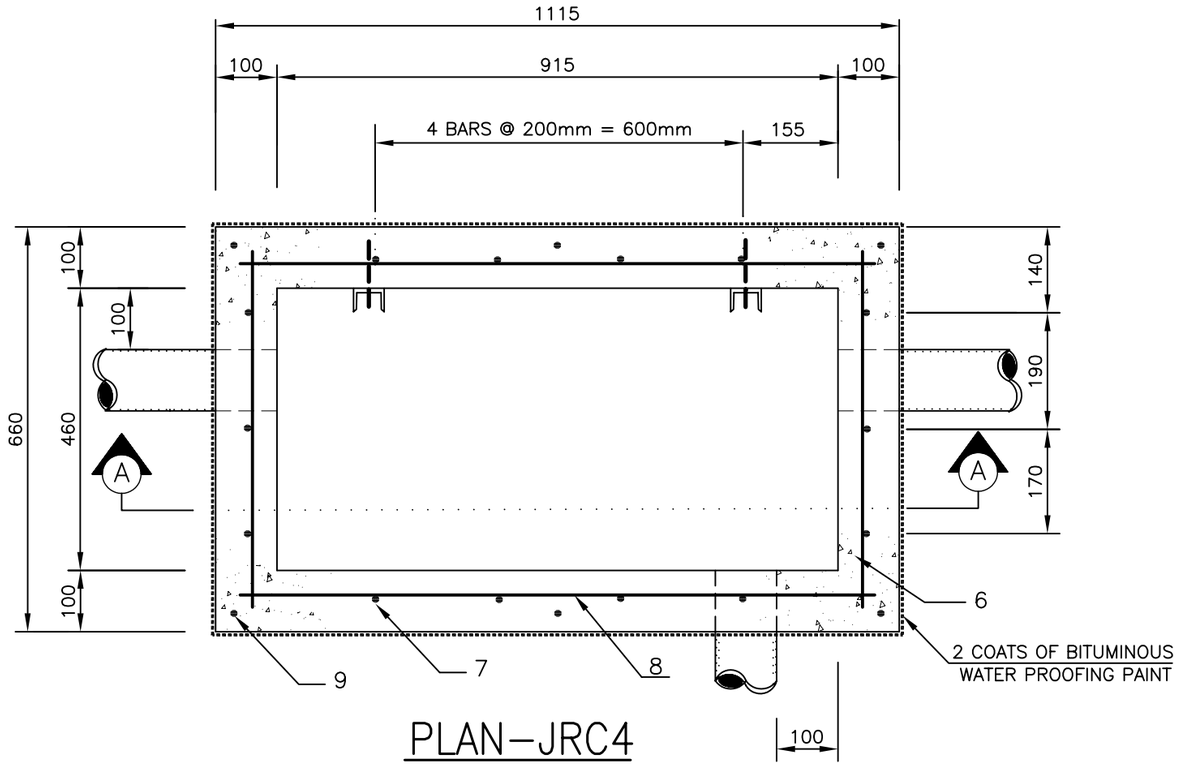
803. Permanent Reinstatement.

On completion of the maintenance period of 12 months the Road Engineer will inspect the interim reinstatement.

Where the reinstatement is satisfactory for adoption by the Highway Maintenance Section, the Contractor's reinstatement retention monies shall be released, and responsibility for future maintenance of the surface shall pass to PWA (Ashghal).

Where the reinstatement is unsuitable for adoption by the Highway Maintenance Section, the Road Engineer will arrange the permanent reinstatement of the works and the relevant Authority shall be charged a standard fee per square metre. This cost shall then be recovered from the Contractor's retention monies by the Authority.

In the event of the Contractor failing to meet his responsibility, the Road Engineer shall arrange any necessary remedial work and permanent reinstatement and recover the cost from the Authority.

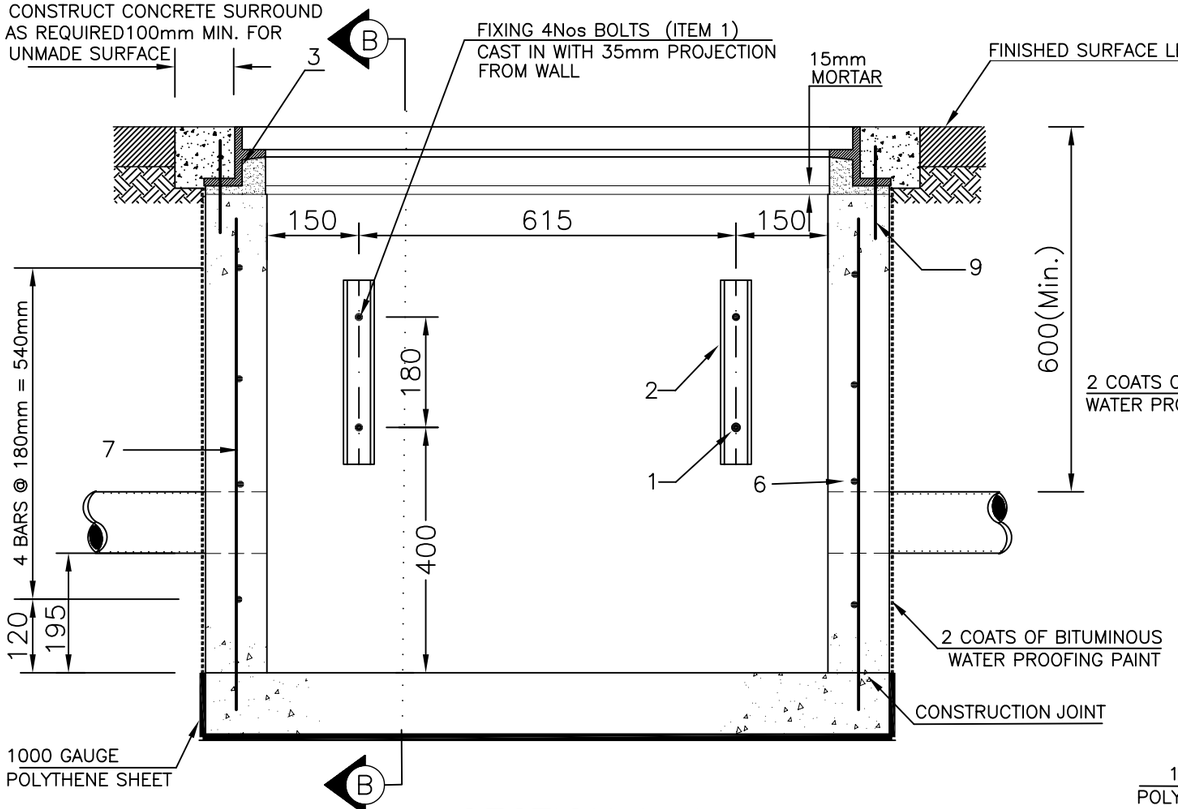


PLAN–JRC4

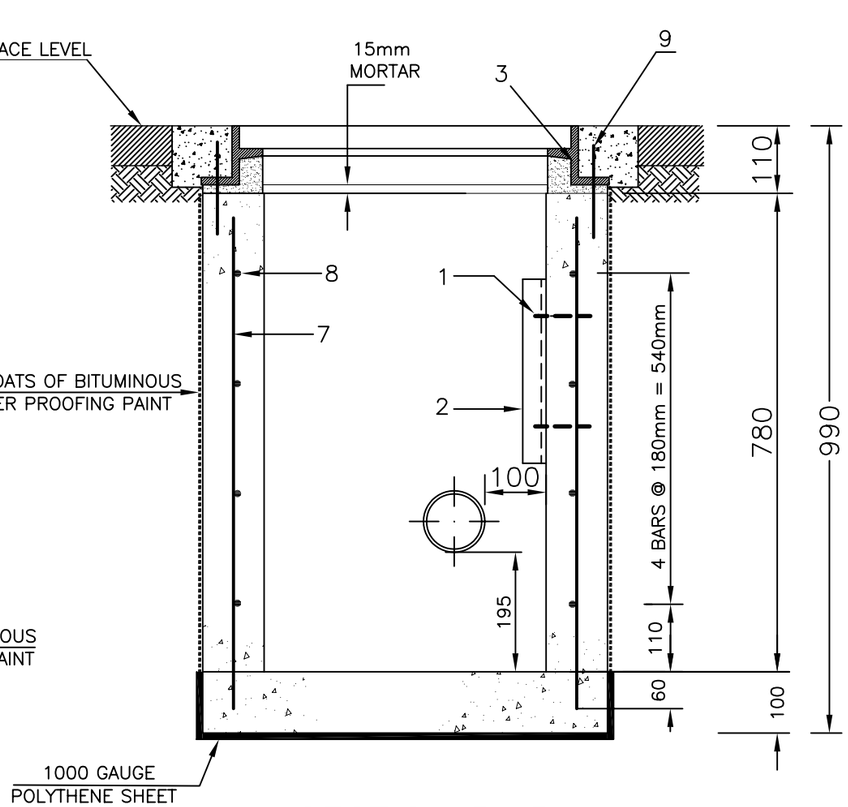
SCHEDULE JRC4		
ITEM	DESCRIPTION	Nos.
1	BOLTS FOUNDATION INDENTED NO. 2	4
2	CABLE BEARERS WALL TYPE NO. 2	2
3	FRAME&COVER CARRIAGEWAY NO. 4	1
4	BRACKETS CABLE BEARER NO.8	2
5	PINS LOCKING CABLE BEARER	2
6	REINFORCEMENT BAR 10 DIA x 580mm	8
7	" 10 DIA x 800mm	14
8	" 10 DIA x 1035mm	8
9	" 10 DIA x 150mm	6

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. ALL CONCRETE TO BE SRC 28 N/mm^2 (MIN.)
3. ALL STEELS HIGH YIELD WITH Fy 410 N/mm^2
4. THE NUMBER AND TYPE OF DUCTS USED TO BE AS PROPOSED BY THE WORK ORGINATOR.
5. COVER TO MAIN REINFORCEMENTS TO BE 40mm.
6. REINFORCEMENTS REPOSITIONED SLIGHTLY TO CLEAR DUCTS WHEN NECESSARY
7. IN UNMADE GROUND THE FRAME AND COVER ENCASED ALL ROUND WITH 100x100mm CONCRETE "35N/mm^2" SURROUND
8. ALL EXTERNAL CONCRETE SURFACES TO BE PAINTED WITH TWO COATS OF BITUMINOUS WATER PROOFING PAINT
9. ALL WORKS TO BE CARRIED OUT AS PER Ooredoo STANDARDS & SPECIFICATION.
10. ALL DUCT ENDS MUST BE IN LINE.
11. ALL DUCT ENTRIES TO THE JOINT BOX TO BE PERPENDICULAR TO THE WALL. THE DUCTS TO BE CUT FLUSH WITH THE INNER WALL AND EDGES TO BE ROUNDED OFF.
12. IN CASE OF JOINT BOX BUILT ON EXI. DUCTS, EXI.DUCTS TO BE CUT FLUSH WITH INT.WALL.



SECTION A–A



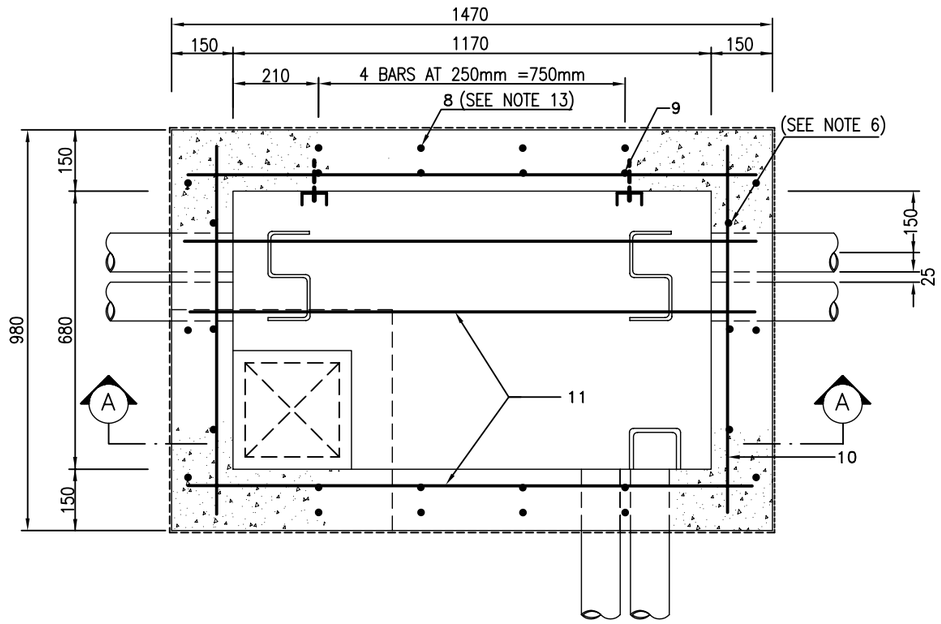
SECTION B–B

ooredoo
PO.BOX.217
DOHA–QATAR

TITLE

STANDARD DETAILS FOR
JOINT BOX –JRC 4

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:10
DWG. NO. CN 9106	SH. 1OF1

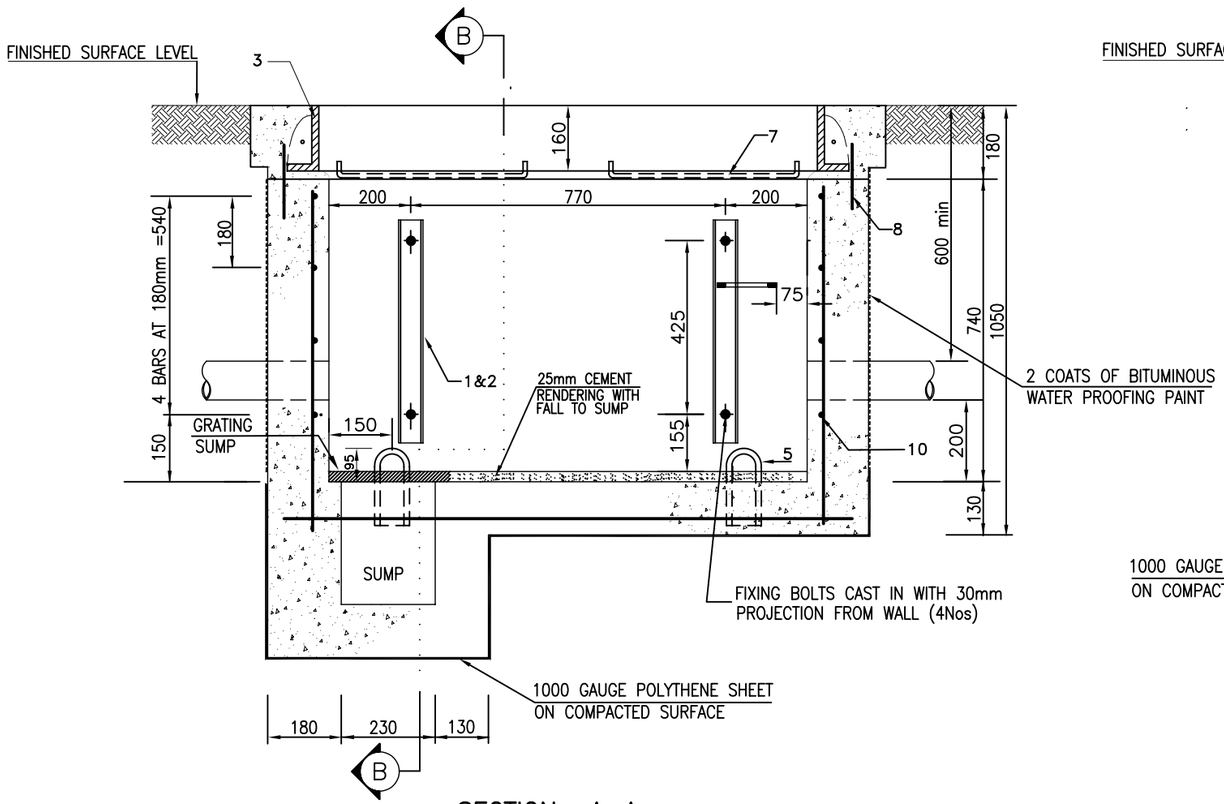


PLAN–JRC12

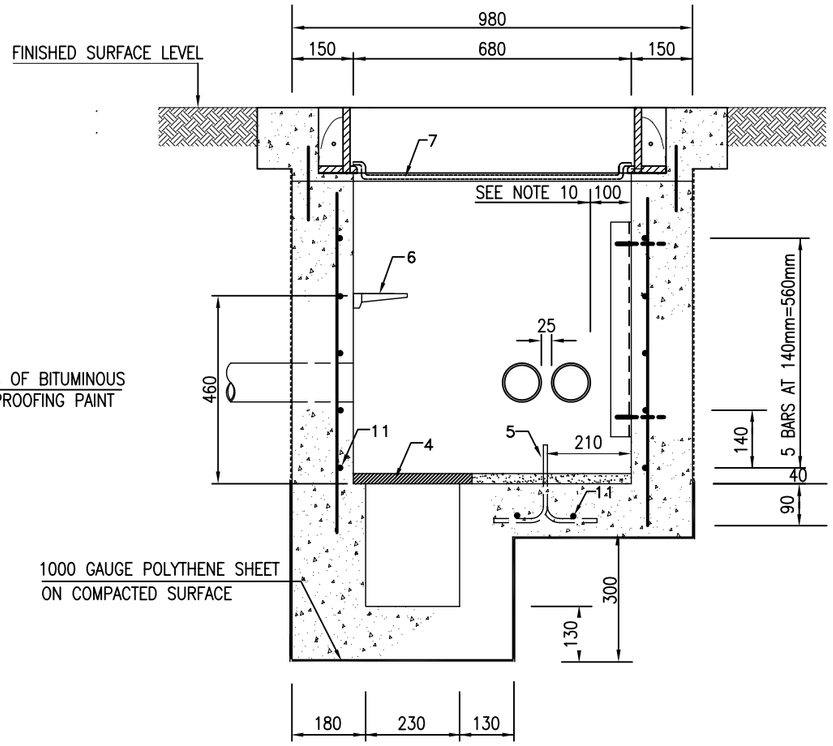
SCHEDULE JRC12		
ITEM	DESCRIPTION	Nos.
1	BOLTS FOUNDATION INDENTED No.2	4
2	CABLE BEARERS WALL TYPE No.3	2
3	FRAME & COVER CARRIAGEWAY No.2 DOUBLE TRIANGULAR TYPE	1
4	GRATING SUMP No.2A	1
5	IRONS ANCHOR No.4	2
6	STEP MANHOLE No.1	1
7	GRIDS SAFETY CARRIAGEWAY No.2	2
8	REINFORCEMENT BAR 10 DIA X 200mm	14
9	10 DIA X 770mm	14
10	10 DIA X 900mm	8
11	10 DIA X 1390mm	12

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. ALL CONCRETE TO BE SRC 28 N/mm^2 (MIN.)
3. ALL STEELS HIGH YIELD WITH Fy 410 N/mm^2
4. THE NUMBER AND TYPE OF DUCTS USED TO BE AS PROPOSED BY THE WORK ORGINATOR.
5. COVER TO MAIN REINFORCEMENTS TO BE 40mm.
6. REINFORCEMENTS REPOSITIONED SLIGHTLY TO CLEAR DUCTS WHEN NECESSARY
7. IN UNMADE GROUND THE FRAME AND COVER ENCASED ALL ROUND WITH Min.150x150mm CONCRETE "35N/mm^2 " SURROUND
8. ALL EXTERNAL CONCRETE SURFACES TO BE PAINTED WITH TWO COATS OF BITUMINOUS WATER PROOFING PAINT
9. ALL WORKS TO BE CARRIED OUT AS PER Ooredoo STANDARDS & SPECIFICATION.
10. ALL DUCT ENDS MUST BE IN LINE.
11. ALL DUCT ENTRIES TO THE JOINT BOX TO BE PERPENDICULAR TO THE WALL. THE DUCTS TO BE CUT FLUSH WITH THE INNER WALL AND EDGES TO BE ROUNDED OFF.
12. IN CASE OF JOINT BOX BUILT ON EXI. DUCTS, EXI.DUCTS TO BE CUT FLUSH WITH INT.WALL.
13. ITEM No.8 SPACED AT 250mm. PITCH IN LONG WALL & 360mm IN END WALL.



SECTION A–A



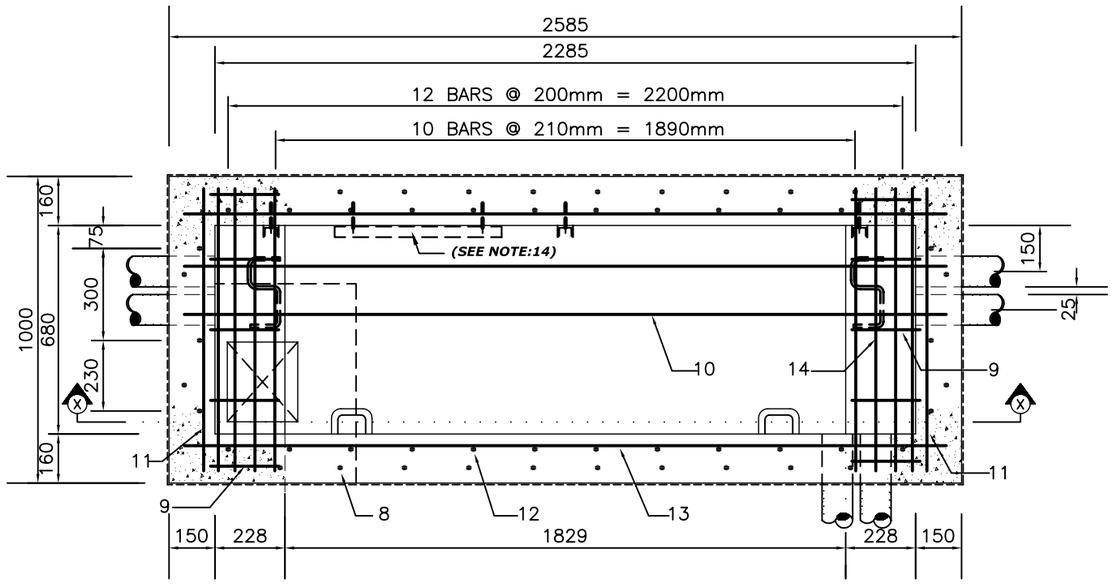
SECTION B–B

ooredoo PO.BOX.217 DOHA–QATAR

TITLE

STANDARD DETAILS FOR JOINT BOX –JRC 12

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:15
DWG. NO. CN 9108	SH. 1OF1



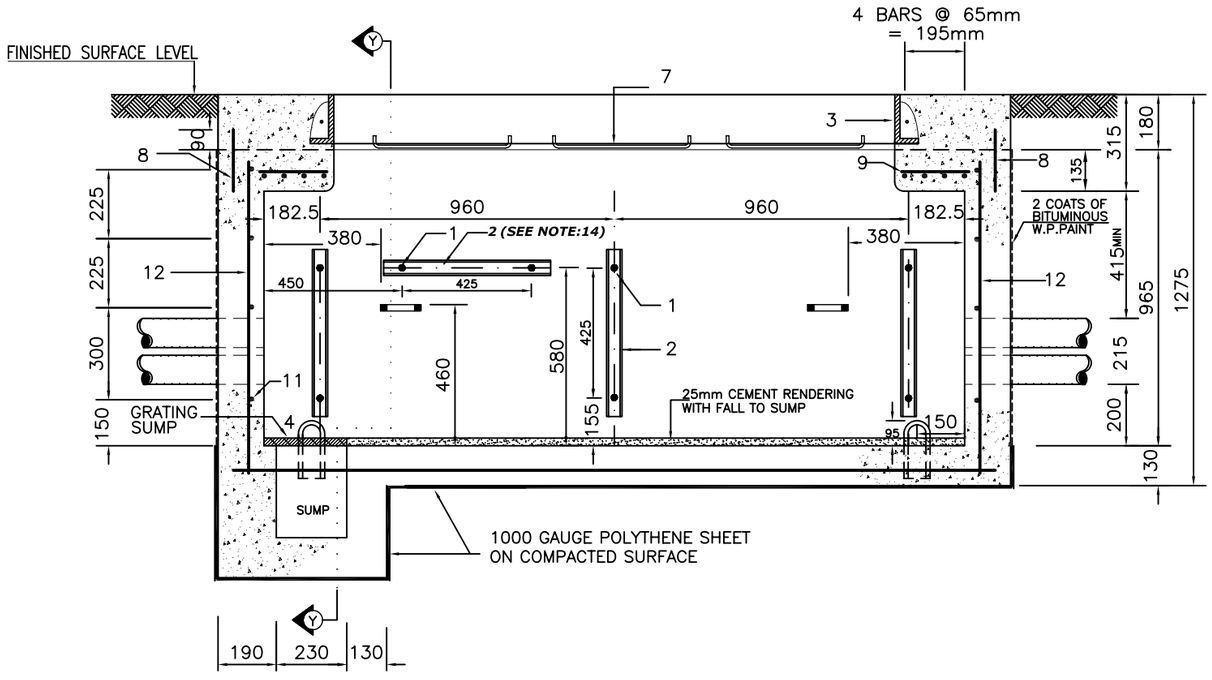
PLAN – JRC14

SCHEDULE JRC14

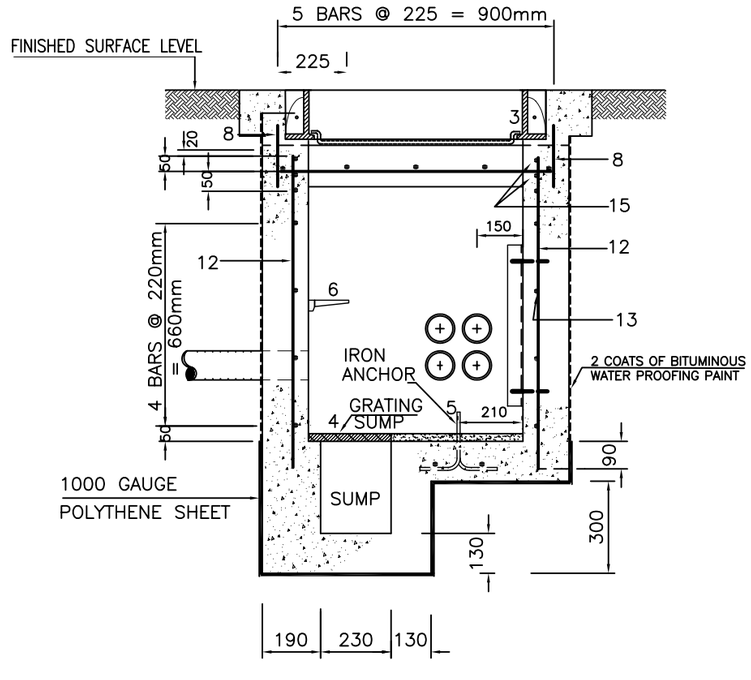
ITEM	DESCRIPTION	Nos.
1	BOLTS FOUNDATION INDENTED NO. 2	6
2	CABLE BEARERS WALL TYPE NO. 3	3
3	FRAME & COVER C/W NO. 3 DOUBLE TRIANGULAR TYPE	1
4	GRATING SUMP NO. 2A	1
5	IRON ANCHOR NO. 4	2
6	STEP MANHOLE NO. 1	2
7	GRID SAFETY C/W NO. 3	3
8	REINFORCEMENT BAR 10 DIA x 200mm	24
9	" 10 DIA x 230mm	10
10	" 10 DIA x 2500mm	2
11	" 10 DIA x 920mm	8
12	" 10 DIA x 1015mm	30
13	" 10 DIA x 2500mm	8
14	" 12 DIA x 920mm	8
15	" 12 DIA x 2500mm	6

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. ALL CONCRETE TO BE SRC 28 N/mm^2 (MIN.)
3. ALL STEELS HIGH YIELD WITH Fy 410 N/mm^2
4. THE NUMBER AND TYPE OF DUCTS USED TO BE AS PROPOSED BY THE WORK ORGINATOR.
5. COVER TO MAIN REINFORCEMENTS TO BE 40mm.
6. REINFORCEMENTS REPOSITIONED SLIGHTLY TO CLEAR DUCTS WHEN NECESSARY
7. IN UNMADE GROUND THE FRAME AND COVER ENCASED ALL ROUND WITH Min.150x150mm CONCRETE "35N/mm^2" SURROUND
8. ALL EXTERNAL CONCRETE SURFACES TO BE PAINTED WITH TWO COATS OF BITUMINOUS WATER PROOFING PAINT
9. ALL WORKS TO BE CARRIED OUT AS PER Ooredoo STANDARDS & SPECIFICATION.
10. ALL DUCT ENDS MUST BE IN LINE.
11. ALL DUCT ENTRIES TO THE JOINT BOX TO BE PERPENDICULAR TO THE WALL. THE DUCTS TO BE CUT FLUSH WITH THE INNER WALL AND EDGES TO BE ROUNDED OFF.
12. IN CASE OF JOINT BOX BUILT ON EXI. DUCTS, EXI.DUCTS TO BE CUT FLUSH WITH INT.WALL.
13. ITEM No.8 SPACED AT 210mm. PITCH IN LONG WALL & 360mm IN END WALL.
14. ***ADDITIONAL CABLE BEARER WALL TYPE NO.3 TO BE PROVIDED HORIZONTALLY WHERE JRC14 IS BUILT TO CONNECT CABINET BASE.***



SECTION X–X



SECTION Y–Y

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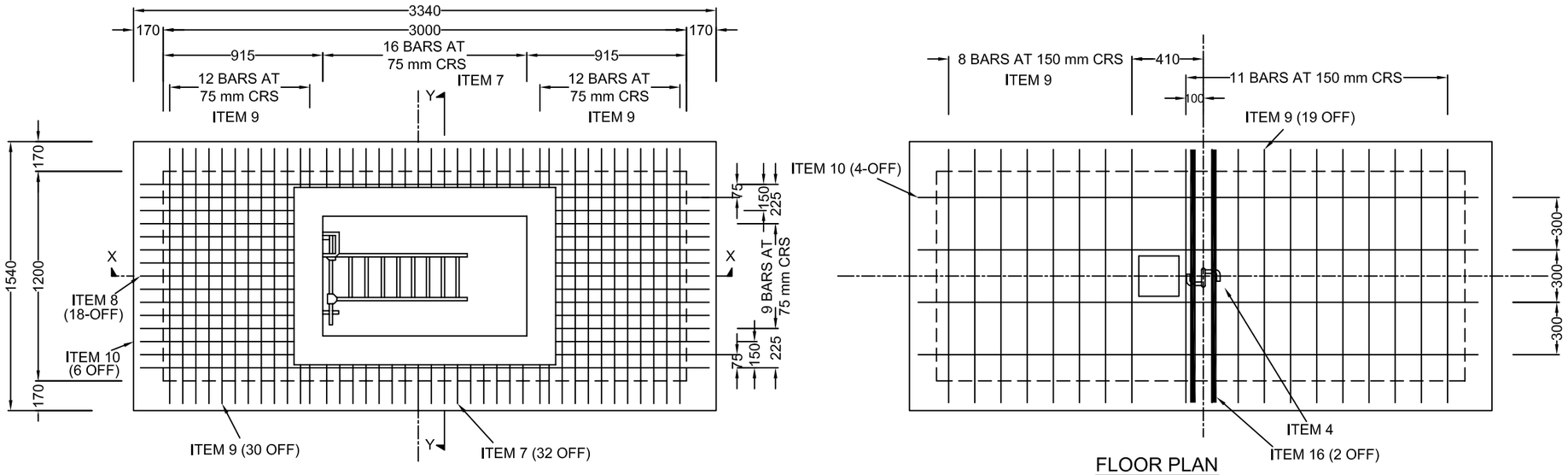
TITLE

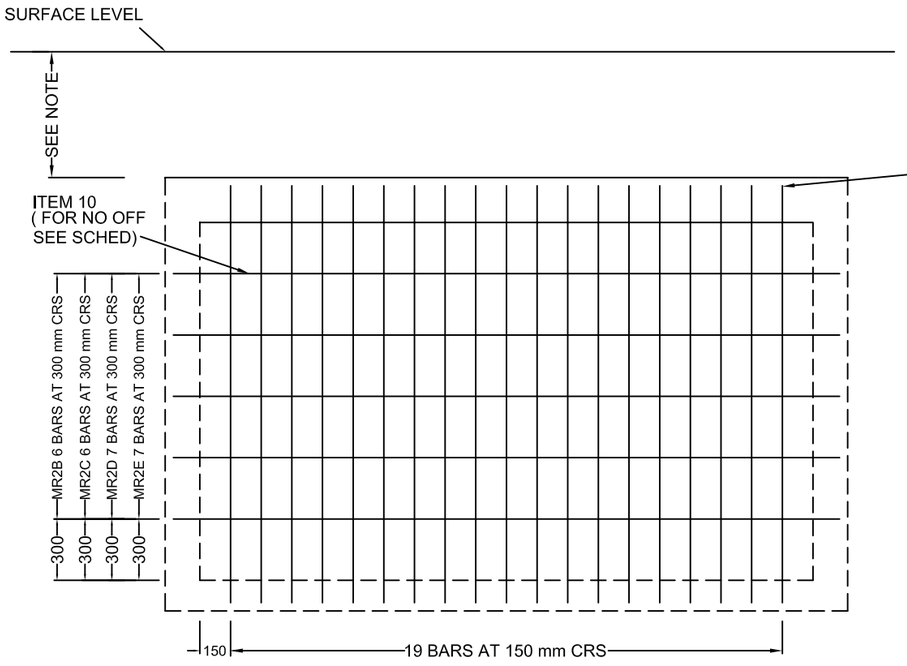
STANDARD DETAILS FOR JOINT BOX –JRC 14

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:15
DWG. NO. CN 9109	SH. 1OF1

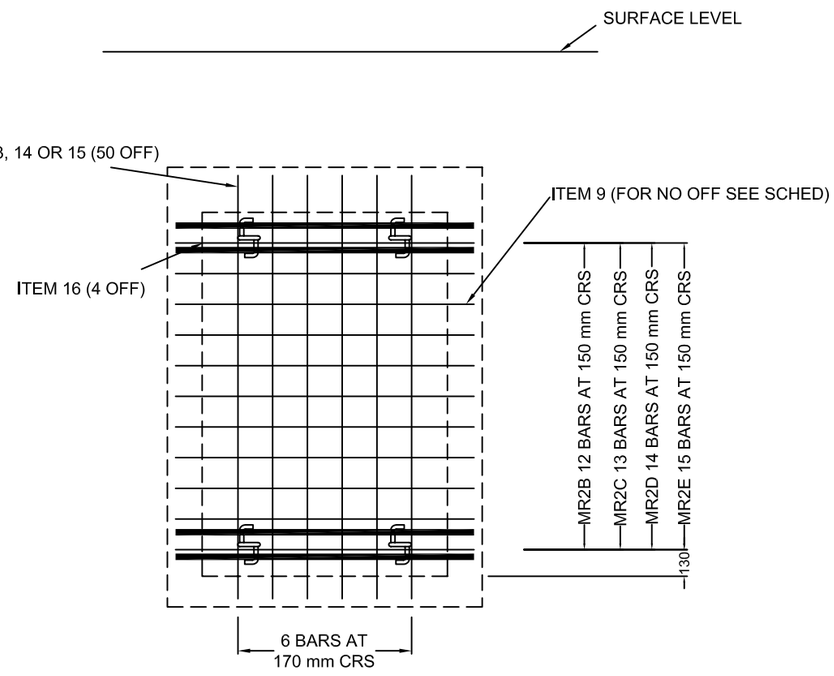


ROOF PLAN (TOP REINFORCING BARS NOT SHOWN)

FLOOR PLAN



WALL 'B'
VIEW SHOWING REINFORCING BARS



WALL 'A'
VIEW SHOWING REINFORCING BARS
(SEE NOTE 4)

NOTES:

1. * FOR REFERENCE ONLY
2. DIMENSIONS IN MILLIMETRES
3. FOR SECTION VIEWS, NOTES AND SCHEDULE SEE SHEET 2

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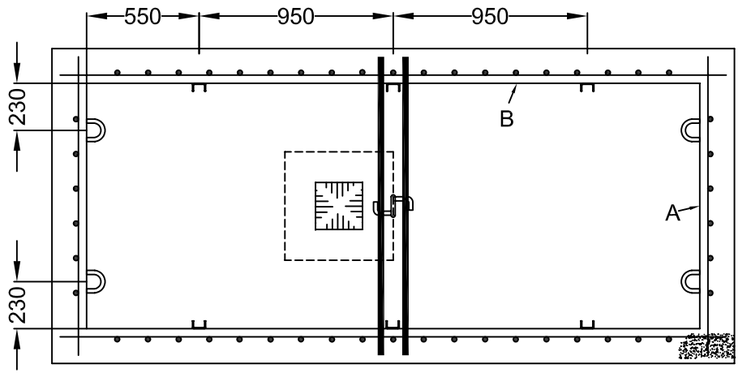
PO.BOX.217
DOHA–QATAR

TITLE

MANHOLE MR 2

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1 : 30
DWG. NO. CN 1938-A	SH. 1OF2

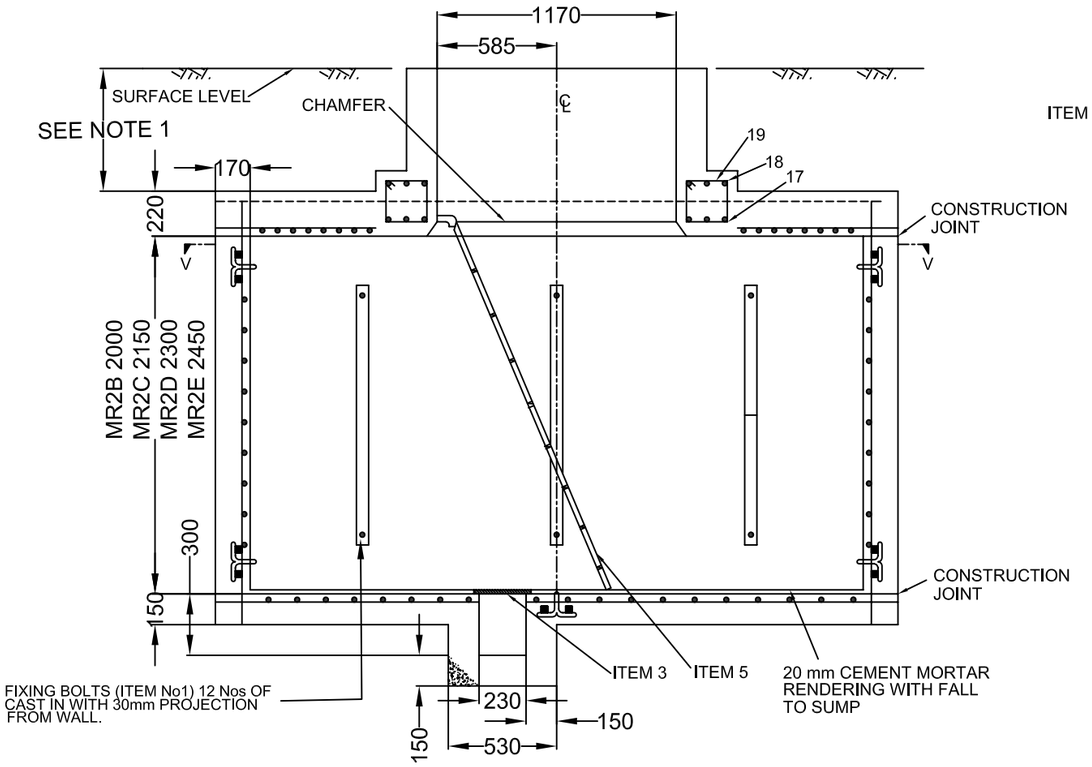


SECTION V-V

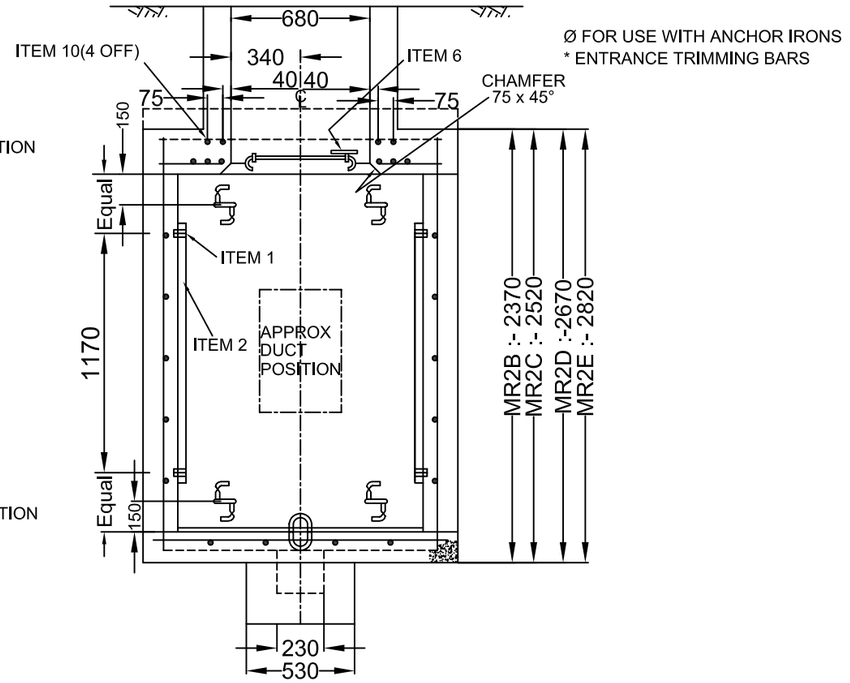
SCHEDULE						
ITEM	DESCRIPTION					NO. OFF
1	BOLTS, FOUNDATION INDENTED NO 2					12
2	CABLE BEARERS, WALL TYPE NO 8					6
3	GRATING SUMP NO 2A					1
4	IRONS ANCHOR NO 4					9
5	LADDERS, STEEL WITH HOOKS & BAR	MR2B 2150 mm	MR2C 2300 mm	MR2D 2450 mm	MR2E 2600 mm	1
6	STEPS, MANHOLE NO 1					1

SCHEDULE REINFORCEMENT BAR														
ITEM	LENGTH & DIA mm	NO OFF								TOTAL				
		ROOF	FLOOR		WALLS					MR2B	MR2C	MR2D	MR2E	
					MR2B	MR2C	MR2D	MR2E						
7	320 X 12	32								32	32	32	32	
8	1005 X 12	18								18	18	18	18	
9	1440 X 12	24 X	19		24	26	28	30		71	73	75	77	
10	3240 X 12	6.4*	4		12	12	14	14		26	26	28	28	
11														
12	2290 X 12				50					50				
13	2440 X 12					50					50			
14	2530 X 12						50					50		
15	2740 X 12							50					50	
16	1440 x 32		2Ø		8Ø	3Ø	8Ø	8Ø		10	10	10	10	

ITEM	Re_ bar	SHAFT
17	1440 x 25 mm	6 OFF
18	1440 x 12 mm	6 OFF
19	STIRRUPS 6 mm	300 mm. C/C



SECTION X-X



Ø FOR USE WITH ANCHOR IRONS
* ENTRANCE TRIMMING BARS

SECTION Y-Y
(LADDER NOT SHOWN)

NOTES:

1. THIS DRG TO BE READ IN CONJUCTION WITH DRG CN1961A & 1153A
2. 40mm MIN. COVER ON ALL REINFORCEMENT
3. THE ENTRANCE POSITION MAY BE ALTERED PROVIDED THE REINFORCEMENT IS REARRANGED TO MAINTAIN A 75mm GRID OF 12mm DIA BARS.
4. WALL BARS MAY BE REARRANGED BUT NOT OMITTED TO CLEAR DUCTS.
5. IMPORTANT:- THE CENTER OF EVERY ANCHOR IRON MUST BE AT LEAST 230 mm FROM ANY DUCT OR WALL OPENING. ANCHOR IRONS MAY BE REPOSITIONED OR ADDITIONAL ANCHOR IRONS FITTED, BUT EACH MUST BE SITED 150mm FROM ANADJACENT WALL ROOF OR FLOOR
6. FOR SHAFT & UPSTAND BEAM DETAILS REFER DRG. CN 1961A & 1153A
7. ALL STEEL TO BE HIGH YIELD WITH FY 415N/mm^2
8. ALL CONCRETE TO BE SRC 28N/mm^2

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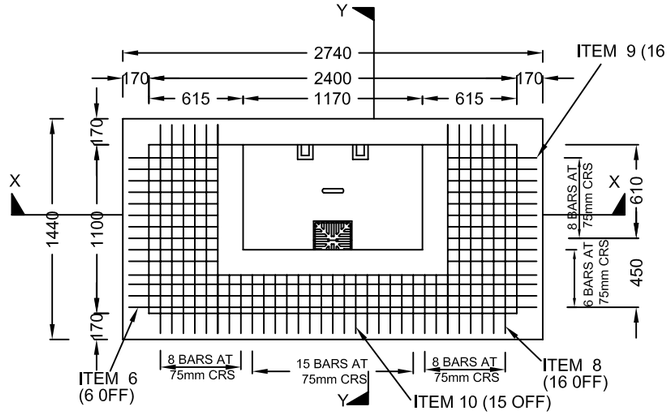
PO.BOX.217
DOHA–QATAR

TITLE

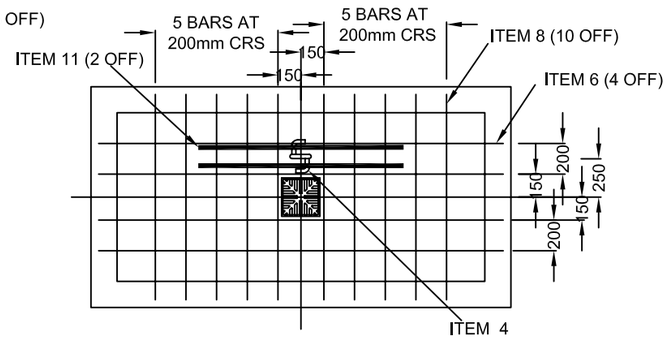
MANHOLE MR 2

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1 : 30
DWG. NO. CN 1938-A	SH. 2OF2

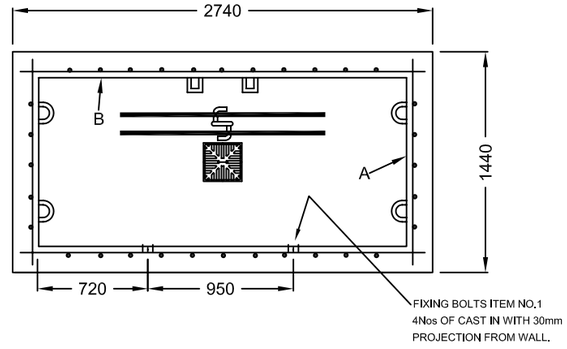


PLAN

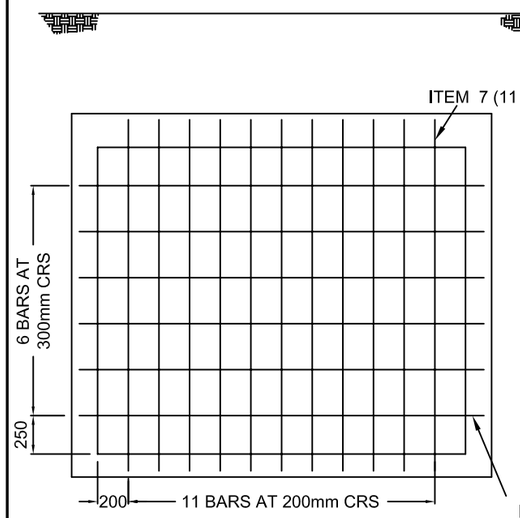
(TOP REINFORCING BARS NOT SHOWN)



FLOOR PLAN

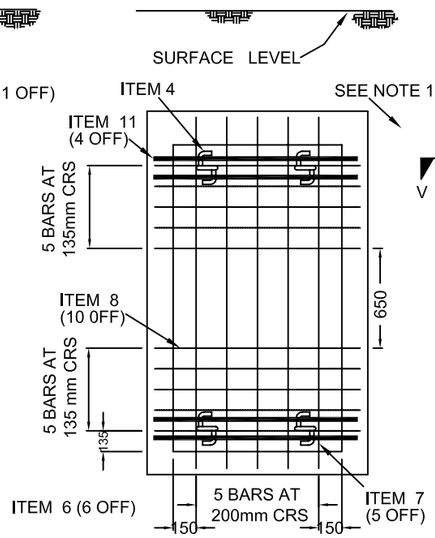


SECTION V-V



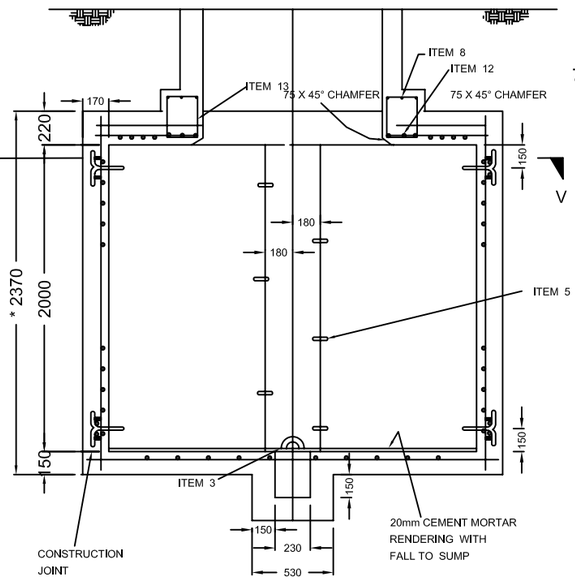
WALL 'B'

VIEW SHOWING REINFORCING BARS

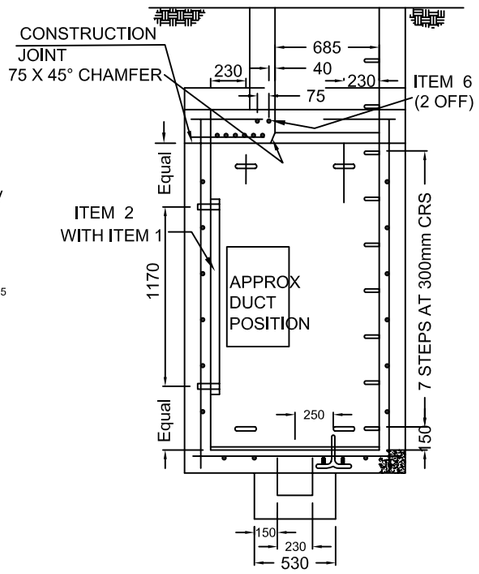


WALL 'A'

VIEW SHOWING REINFORCING BARS
(SEE NOTE 4)



SECTION X-X



SECTION Y-Y

	SCHEDULE	
ITEM	DESCRIPTION	NO OFF
1	BOLTS, FOUNDATION, INDENTED NO. 2	4
2	CABLE BEARERS, WALL TYPE NO. 8	2
3	GRATING SUMP NO. 2 A	1
4	IRONS , ANCHOR NO.4	9
5	STEPS , MANHOLE NO. 1	7+

SCHEDULE					
REINFORCEMENT BAR					
ITEM	DIA & LENGTH	NO OFF			
		ROOF	FLOOR	WALLS	TOTAL
6	12 DIA x 2640	6+2 *	4	12	24
7	12 DIA x 2300	-	-	32	32
8	12 DIA x 1340	16+6 *	10	20	52
9	12 DIA x 730	16	-	-	16
10	12 DIA x 530	15	-	-	15
11	32 DIA x 1340	-	2 Ø	8 Ø	10
12	25 DIA x 1340	6			6
13	STIRRUPS 6mm. DIA.	10			10

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. THIS DRG TO BE READ IN CONJUNCTION WITH DRG CN 1153A.
3. 40mm MIN. COVER ON ALL REINFORCEMENT.
4. THE ENTRANCE POSITION MAY BE ALTERED PROVIDED THE REINFORCEMENT IS REARRANGED TO MAINTAIN A 75mm GRID OF 12 MM DIA BARS.
5. WALL BARS MAY BE REARRANGED BUT NOT OMITED TO CLEAR DUCTS.
6. IMPORTANT:THE CENTRE OF EVERY ANCHOR BE AT LEAST 230mm FROM ANY DUCT OF WALL OPENING.
   ANCHOR IRONS MAY BE REPOSITIONED OR ADDITIONAL ANCHOR IRONS FITTED BUT EACH MUST BE SITED 150 MM FROM AN ADJACENT WALL, ROOF OR FLOOR.
7. STEEL TOBE HIGH YIELD WITH FY 410N/mm^2(min)
8. CONCRETE TO BE SRC 28N/mm^2(min)

Ø FOR USE WITH ANCHOR IRONS.
* ENTRANCE TRIMMING BARS.

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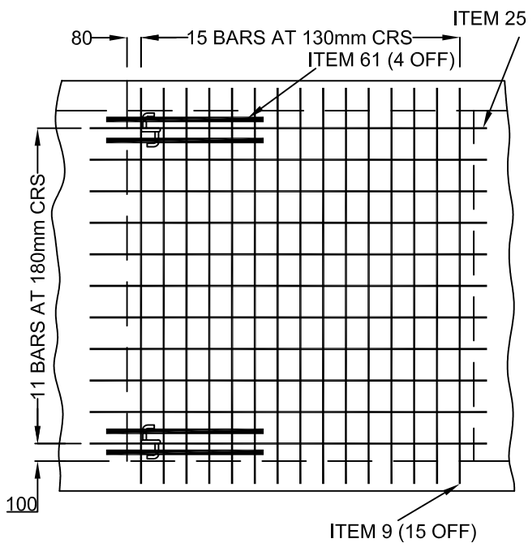
PO.BOX.217
DOHA–QATAR

TITLE

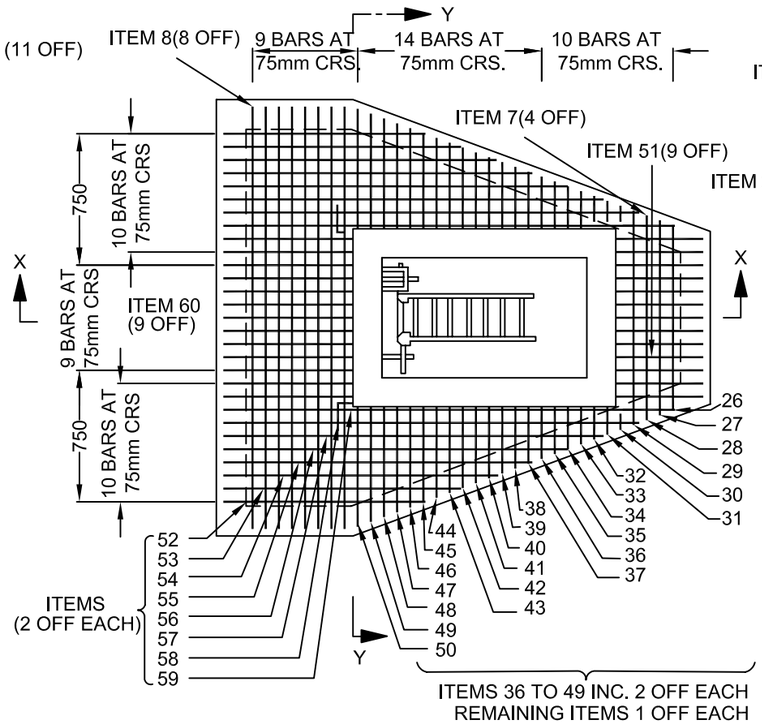
MANHOLE MR4

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1: 40
DWG. NO. CN 1953-A	SH. 1OF1



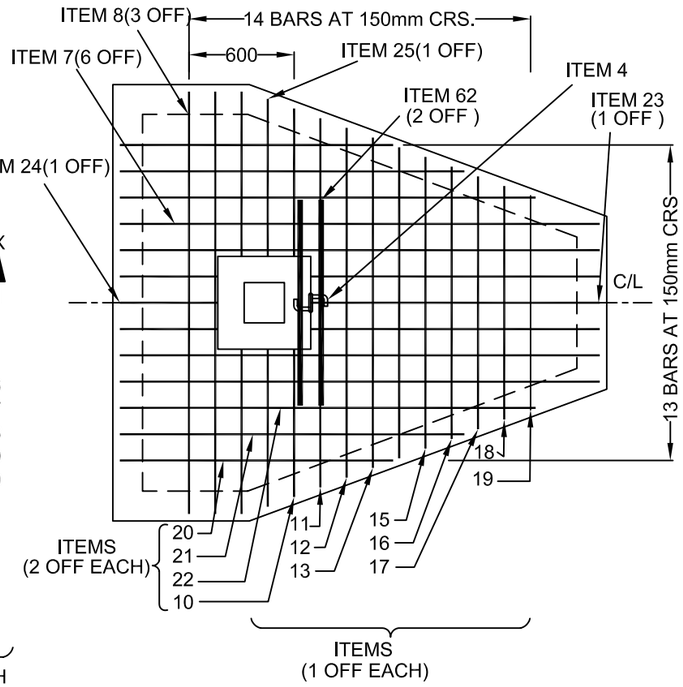
WALL 'B'

VIEW SHOWING REINFORCING BARS



PLAN VIEW

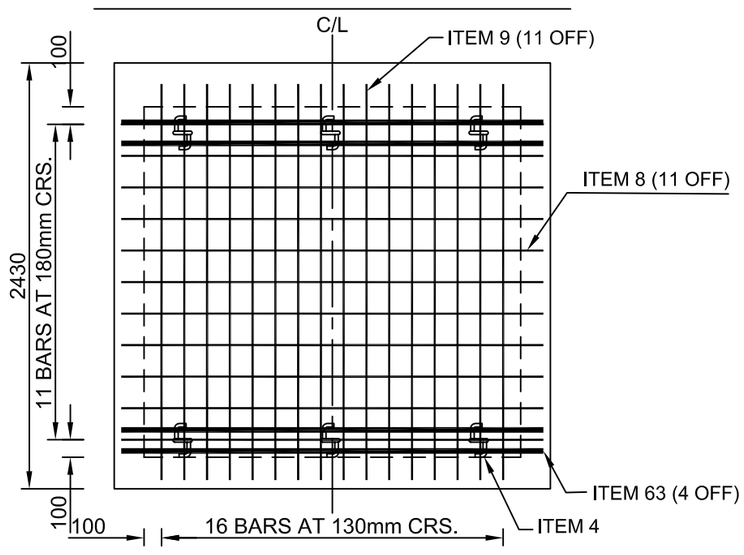
(TOP REINFORCING BARS NOT SHOWING)



FLOOR PLAN

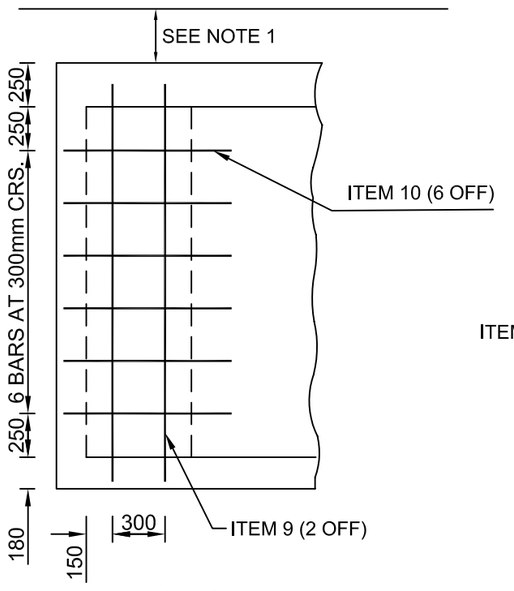
NOTES:

1. FOR SECTIONS, NOTES, SCHEDULE & LOCATION OF WALLS A,B,C,D. SEE SHEET 2



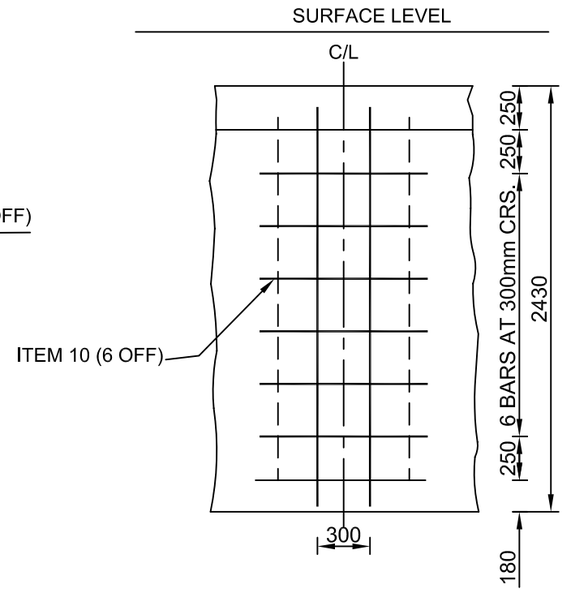
WALL 'D'

VIEW SHOWING REINFORCING BARS



WALL 'C'

VIEW SHOWING REINFORCING BARS (SEE NOTE 4)



WALL 'A'

VIEW SHOWING REINFORCING BARS (SEE NOTE 4)

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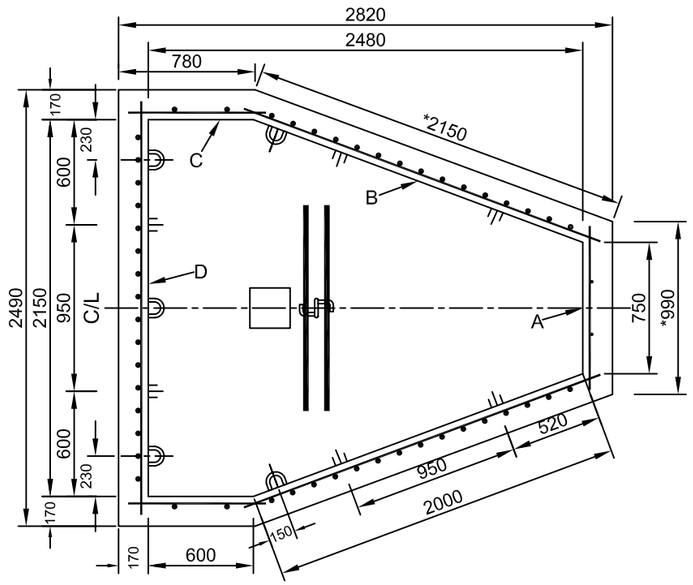
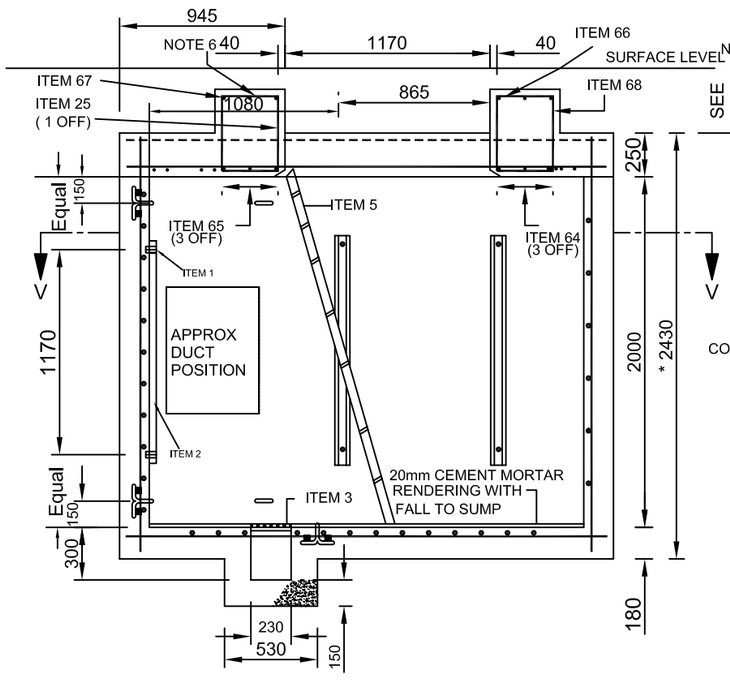
MANHOLE MRT 7

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1 : 35
DWG. NO. CN 1955-A	SH. 1OF2

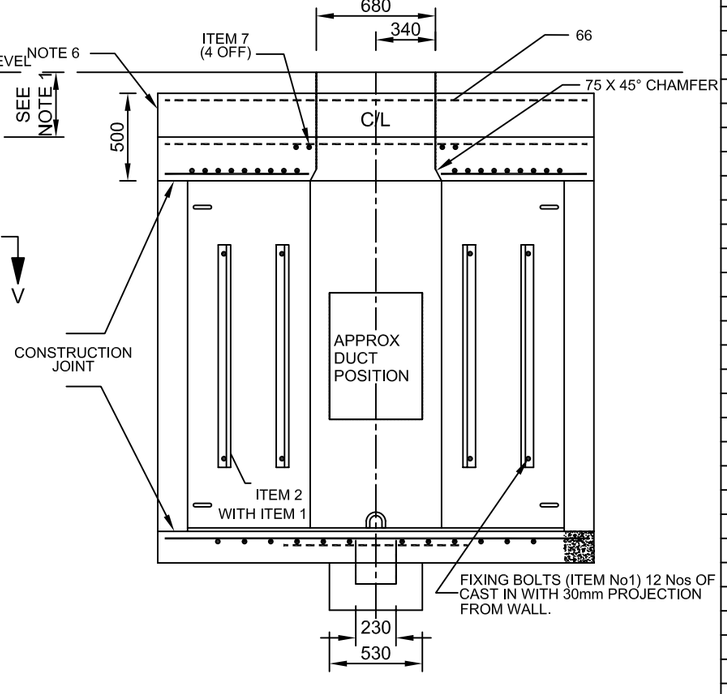


SECTION V-V

SCHEDULE		
ITEM	LENGTH & DIA mm	NO OFF
1	BOLTS, FOUNDATION INDENTED No.2	12
2	CABLE BEARERS, WALL TYPE No.8	6
3	GRATING SUMP No 2A	1
4	IRONS ANCHOR No 4	11
5	LADDERS, STEE 2300mm WITH HOOKS & BAR	1
6	STEPS, MANHOLE No1	1



SECTION X-X



SECTION Y-Y

SCHEDULE					
REINFORCEMENT BAR					
ITEM	LENGTH & DIA mm	NO OFF			
		ROOF	FLOOR	WALLS	TOTAL
7	2720 X 12	4 + 4 *	6	---	14
8	2390 X 12	8	3	11	22
9	2350 X 12	---	---	52	52
10	960 X 12	---	2	20	20
11	2110 X 12	---	1	---	1
12	2000 X 12	---	1	---	1
13	1890 X 12	---	1	---	1
14	1780 X 12	---	1	---	1
15	1660 X 12	---	1	---	1
16	1550 X 12	---	1	---	1
17	1440 X 12	---	1	---	1
18	1330 X 12	---	1	---	1
19	1220 X 12	---	1	---	1
20	1520 X 12	---	2	---	2
21	1920 X 12	---	2	---	2
22	2320 X 12	---	2	---	2
23	1620 X 12	---	1	---	1
24	810 X 12	---	1	---	1
25	2340 X 12		1	22	23
26	1020 X 12	1	---	---	1
27	1070 X 12	1	---	---	1
28	1130 X 12	1	---	---	1
29	1190 X 12	1	---	---	1
30	1240 X 12	1	---	---	1
31	1300 X 12	1	---	---	1
32	1350 X 12	1	---	---	1
33	1410 X 12	1	---	---	1
34	1470 X 12	1	---	---	1
35	1520 X 12	1	---	---	1
36	410 X 12	2	---	---	1
37	430 X 12	2	---	---	1
38	460 X 12	2	---	---	2
39	490 X 12	2	---	---	2
40	520 X 12	2	---	---	2
41	550 X 12	2	---	---	2
42	580 X 12	2	---	---	2
43	610 X 12	2	---	---	2
44	640 X 12	2	---	---	2
45	660 X 12	2	---	---	2
46	690 X 12	2	---	---	2
47	720 X 12	2	---	---	2
48	750 X 12	2	---	---	2
49	780 X 12	2	---	---	2
50	2360 X 12	1	---	---	1
51	618 X 12	9	---	---	9
52	1100 X 12	2	---	---	2
53	1300 X 12	2	---	---	2
54	1500 X 12	2	---	---	2
55	1700 X 12	2	---	---	2
56	1900 X 12	2	---	---	2
57	2100 X 12	2	---	---	2
58	2300 X 12	2	---	---	2
59	2500 X 12	2	---	---	2
60	840 X 12	9	---	---	9
61	900 X 32		---	8Ø	8
62	1240 X 32		2Ø	---	2
63	2390 X 32		---	4Ø	4
64	1390 X 25	3	---	---	3
65	2390 X 25	3	---	---	3
66	1390 X 12	3	---	---	3
67	2390 X 12	3	---	---	3
68	STIRRUPS 6mm	13	---	---	13

NOTES:

1. THIS DRG TO BE READ IN CONJUNCTION WITH DRG CN1961A & 1153A
2. 40mm MIN. COVER ON ALL REINFORCEMENT
3. THE ENTRANCE POSITION MAY BE ALTERED PROVIDED THE REINFORCEMENT IS REARRANGED TO MAINTAIN A 75mm GRID OF 12mm DIA BARS.
4. WALL BARS MAY BE REARRANGED BUT NOT OMITTED TO CLEAR DUCTS.
5. IMPORTANT THE CENTRE OF EVERY ANCHOR IRON MUST BE ATLEAST 230mm FROM ANY DUCT OR WALL OPENING. ANCHOR IRONS MAY BE REPOSITIONED OR ADDITIONAL ANCHOR IRONS FITTED BUT EACH MUST BE SITED 150mm FROM AN ADJACENT WALL ROOF OR FLOOR.
6. UPSTAND BEAMS 400 X 500 SHOULD BE PROVIDED ON EITHER SIDES SPANNING BETWEEN THE END WALLS.
7. FOR SHAFT & BEAM DETAILS REFER DRAWING CN1153A
8. * FOR REF ONLY
9. DIMENSIONS IN mm.
10. * ENTRANCE TRIMMING BARS
11. Ø FOR USE WITH ANCHOR IRONS
12. ALL STEEL TO BE HIGH YIELD WITH Fy 410N/mm^2
13. ALL CONCRETE TO BE SRC 28 N/mm^2

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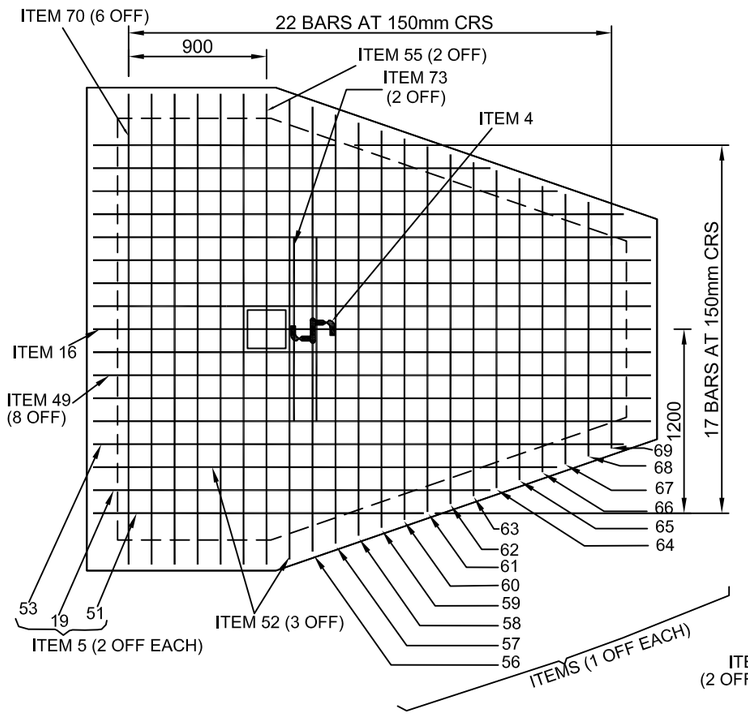
PO.BOX.217
DOHA–QATAR

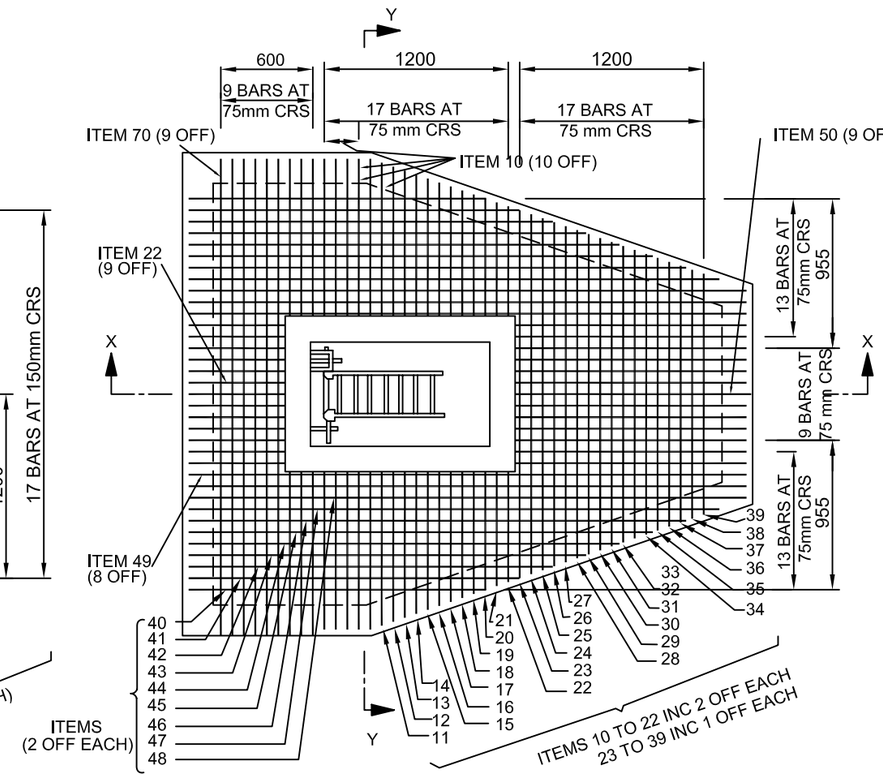
TITLE

MANHOLE MRT 7

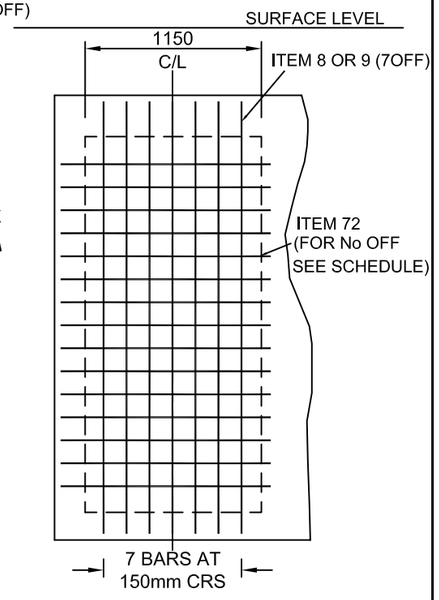
DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:35
DWG. NO. CN 1955-A	SH. 2OF2



FLOOR PLAN



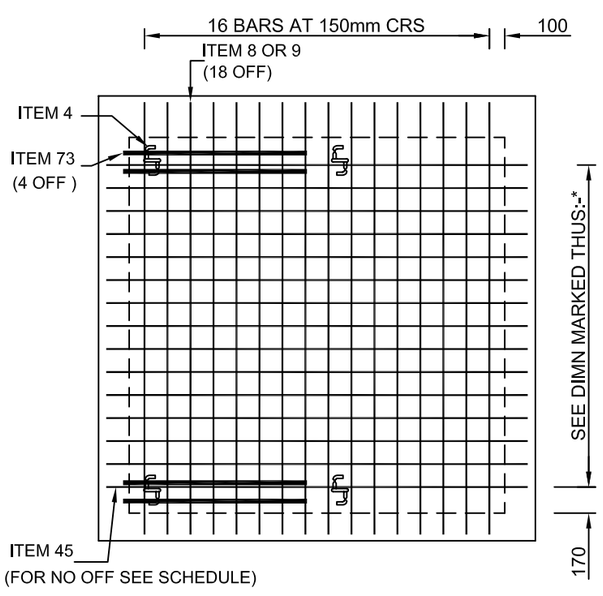
PLAN VIEW
(TOP REINFORCING BARS NOT SHOWN)



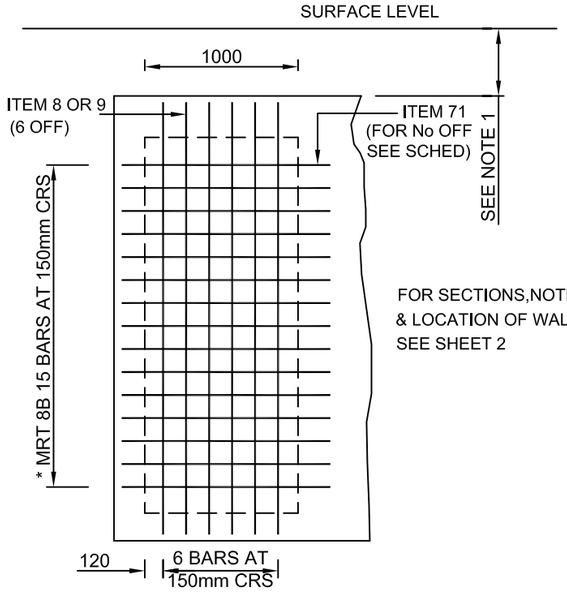
WALL'A'
VIEW SHOWING REINFORCING BARS (SEE NOTE 4)

NOTES:

1. FOR SECTIONS, NOTES, SCHEDULE & LOCATION OF WALLS A,B,C,D. SEE SHEET 2
2. DIMENSIONS IN mm

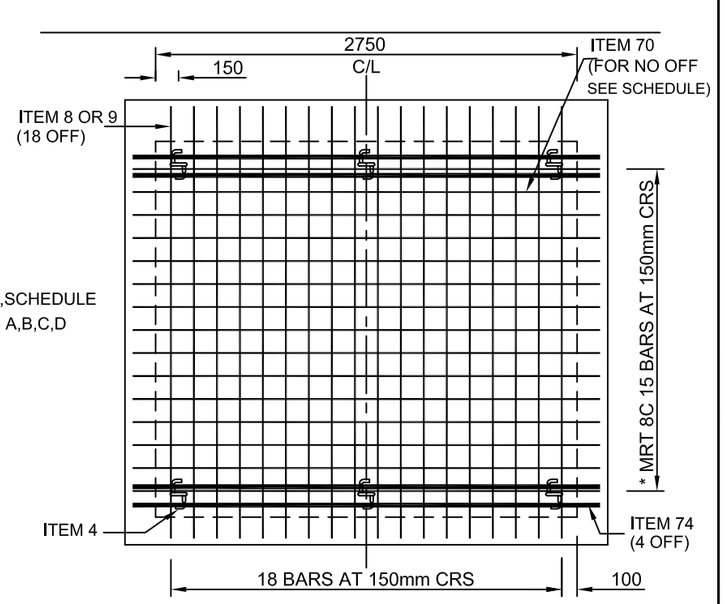


WALL 'B'
VIEW SHOWING REINFORCING BARS.



FOR SECTIONS,NOTES,SCHEDULE
& LOCATION OF WALLS A,B,C,D
SEE SHEET 2

WALL'C'
VIEW SHOWING REINFORCING BARS
(SEE NOTE 4)



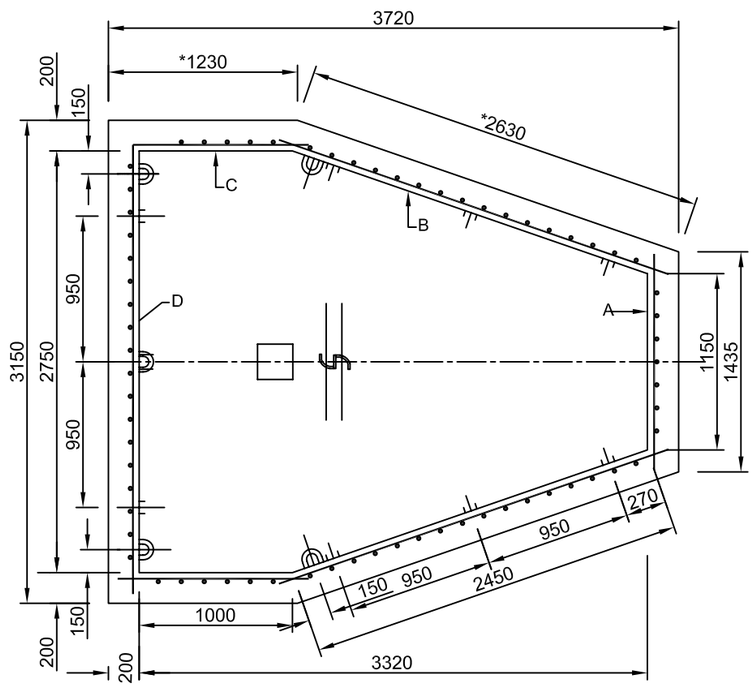
WALL 'D'
VIEW SHOWING REINFORCING BARS

ooredoo
PO.BOX.217
DOHA–QATAR

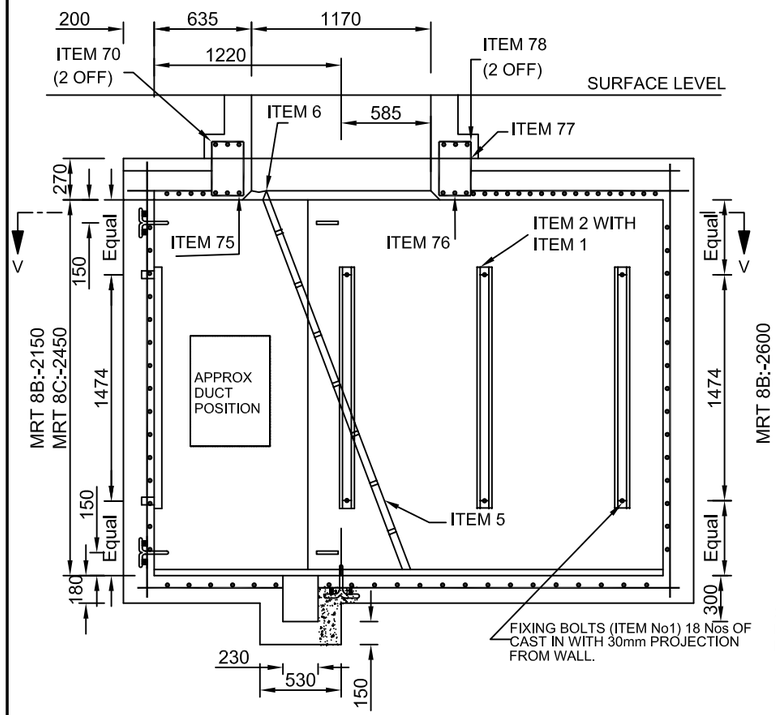
TITLE

MANHOLE MRT 8

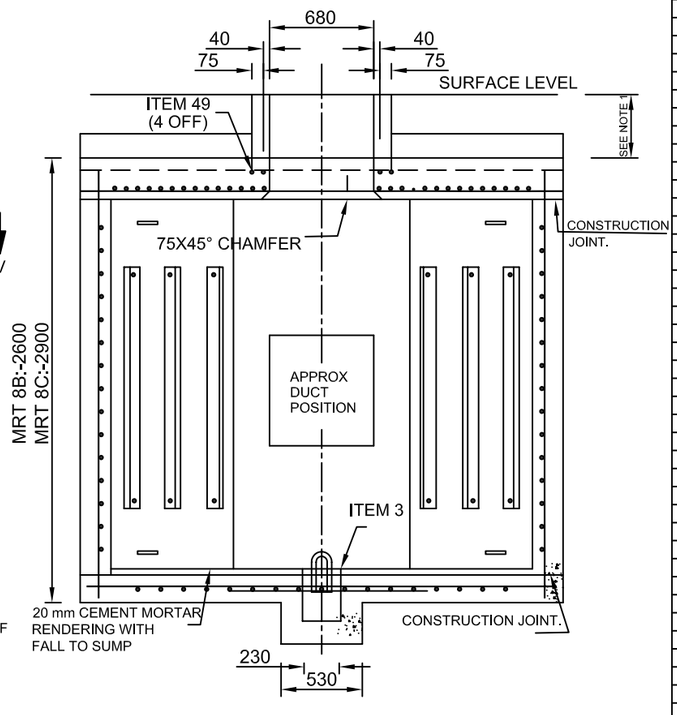
DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:40
DWG. NO. CN 1956-A	SH. 1OF2



SECTION V-V



SECTION X-X



SECTION Y-Y

SCHEDULE		
ITEM	LENGTH & DIA mm	NO OFF
1	BOLTS, FOUNDATION INDENTED No.2	18
2	CABLE BEARERS, WALL TYPE No . 10	9
3	GRATING SUMP No 2A	1
4	IRON ANCHOR No 4	11
5	LADDERS, STEE 2300mm WITH HOOKS & BAR	1
6	STEPS, MANHOLE No1	1

SCHEDULE									
REINFORCEMENT BAR									
		NO OFF							
ITEM	LENGTH & DIA mm	ROOF	FLOOR	WALLS			TOTAL		
				-	MRT8B	MRT8C	-	MRT8B	MRT8C
7		-	-	-	-	-	-	-	-
8	2520 X 12	-	-	-	69	-	-	69	-
9	2820 X 12	-	-	-	-	69	-	-	69
10	1090 X 12	10	-	-	-	-	-	10	10
11	1060 X 12	2	-	-	-	-	-	2	2
12	1030 X 12	2	-	-	-	-	-	2	2
13	1000 X 12	2	-	-	-	-	-	2	2
14	970 X 12	2	-	-	-	-	-	2	2
15	930 X 12	2	-	-	-	-	-	2	2
16	900 X 12	2	1	-	-	-	-	3	2
17	870 X 12	2	-	-	-	-	-	2	2
18	850 X 12	2	-	-	-	-	-	2	2
19	820 X 12	2	2	-	-	-	-	4	4
20	800 X 12	2	-	-	-	-	-	2	2
21	780 X 12	2	-	-	-	-	-	2	2
22	750 X 12	11+2	-	-	-	-	-	13	13
23	2340 X 12	1	-	-	-	-	-	1	1
24	2290 X 12	1	-	-	-	-	-	1	1
25	2230 X 12	1	-	-	-	-	-	1	1
26	2180 X 12	1	-	-	-	-	-	1	1
27	2130 X 12	1	-	-	-	-	-	1	1
28	2080 X 12	1	-	-	-	-	-	1	1
29	2030 X 12	1	-	-	-	-	-	1	1
30	1970 X 12	1	-	-	-	-	-	1	1
31	1920 X 12	1	-	-	-	-	-	1	1
32	1870 X 12	1	-	-	-	-	-	1	1
33	1820 X 12	1	-	-	-	-	-	1	1
34	1770 X 12	1	-	-	-	-	-	1	1
35	1710 X 12	1	-	-	-	-	-	1	1
36	1660 X 12	1	-	-	-	-	-	1	1
37	1610 X 12	1	-	-	-	-	-	1	1
38	1560 X 12	1	-	-	-	-	-	1	1
39	1500 X 12	1	-	-	-	-	-	1	1
40	1840 X 12	2	-	-	-	-	-	2	2
41	2060 X 12	2	-	-	-	-	-	2	2
42	2270 X 12	2	-	-	-	-	-	2	2
43	2490 X 12	2	-	-	-	-	-	2	2
44	2710 X 12	2	-	-	-	-	-	2	2
45	2930 X 12	2	-	-	26	30	-	28	32
46	3150 X 12	2	-	-	-	-	-	2	2
47	3360 X 12	2	-	-	-	-	-	2	2
48	3580 X 12	2	-	-	-	-	-	2	2
49	3620 X 12	8+4*	8	-	-	-	-	20	20
50	1585 X 12	9	-	-	-	-	-	9	9
51	2120 X 12	-	2	-	-	-	-	2	2
52	2990 X 12	-	3	-	-	-	-	3	3
53	3420 X 12	-	1	-	-	-	-	2	2
54	2360 X 12	-	2	-	-	-	-	1	1
55	1660 X 12	-	1	-	-	-	-	2	2
56	2590 X 12	-	1	-	-	-	-	1	1
57	2780 X 12	-	1	-	-	-	-	1	1
58	2680 X 12	-	1	-	-	-	-	1	1
59	2580 X 12	-	1	-	-	-	-	1	1
60	2470 X 12	-	1	-	-	-	-	1	1
61	2370 X 12	-	1	-	-	-	-	1	1
62	2270 X 12	-	1	-	-	-	-	1	1
63	2160 X 12	-	1	-	-	-	-	1	1
64	2060 X 12	-	1	-	-	-	-	1	1
65	1960 X 12	-	1	-	-	-	-	1	1
66	1850 X 12	-	1	-	-	-	-	1	1
67	1750 X 12	-	1	-	-	-	-	1	1
68	1650 X 12	-	1	-	-	-	-	1	1
69	1550 X 12	-	1	-	-	-	-	1	1
70	3050 X 12	9	6	-	33	35	-	33	35
71	1480 X 12	-	-	-	26	30	-	26	30
72	1440 X 12	-	-	-	13	15	-	13	15
73	1200 X 32	-	2Ø	-	8Ø	8Ø	-	10	10
74	3050 X 32	-	-	-	4Ø	4Ø	-	4	4
75	3050 X 25	3	-	-	3	3	-	3	3
76	2250 X 25	3	-	-	3	3	-	3	3
77	STIRRUPS 6mm dia 300mm C/C.								
78	2250 X 12	3	-	-	3	3	-	3	3

NOTES:

1. THIS DRG TO BE READ IN CONJUNCTION WITH DRG CN1961A.
2. 40mm MIN. COVER ON ALL REINFORCEMENT
3. THE ENTRANCE POSITION MAY BE ALTERED PROVIDED THE REINFORCEMENT IS REARRANGED TO MAINTAIN A 75mm GRID OF 12mm DIA BARS.
4. WALL BARS MAY BE REARRANGED OR CUT IF NECESSARY BUT NOT OMITTED TO CLEAR DUCTS.
5. IMPORTANT-THE CENTRE OF EVERY ANCHOR IRON MUST BE AT LEAST 230mm FROM ANY DUCT OR WALL OPENING.ANCHOR IRONS MAY BE REPOSITIONED OR ADDITIONAL ANCHOR IRONS FITTED BUT EACH MUST BE SITED 150mm FROM AN ADJACENT WALL ROOF OR FLOOR.
6. * ENTRANCE TRIMMING BARS.
7. Ø FOR USE WITH ANCHOR IRONS.
8. * FOR REF ONLY
9. DIMENSIONS IN mm
10. ALL STEEL TO BE HIGH YIELD WITH Fy 410N/mm^2
11. ALL CONCRETE TO BE SRC 28 N/mm^2

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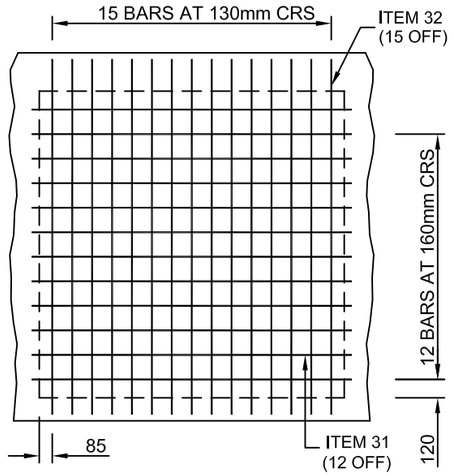
DOHA–QATAR

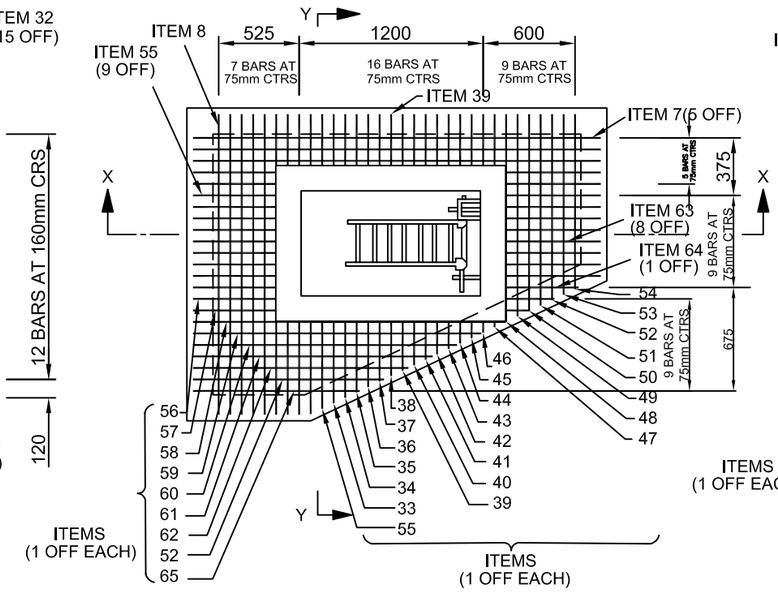
TITLE

MANHOLE MRT 8

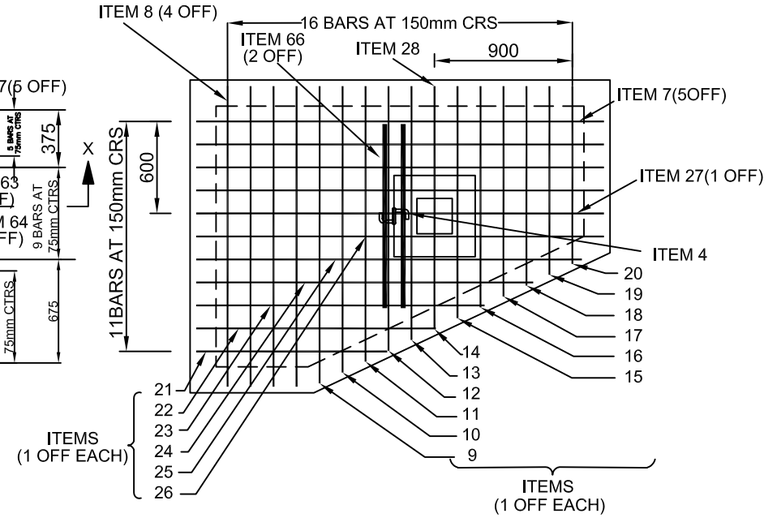
DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:40
DWG. NO. CN 1956-A	SH. 2OF2



WALL 'E'
VIEW SHOWING REINFORCING BARS.



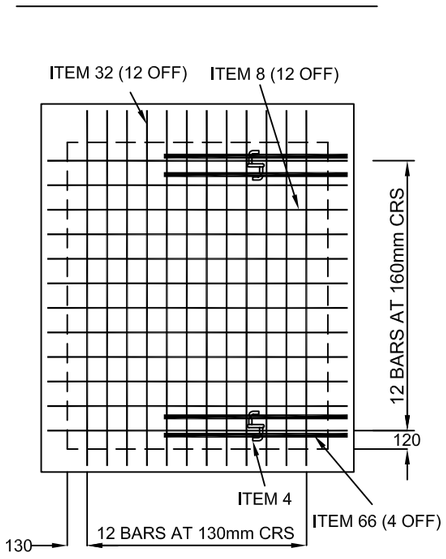
PLAN VIEW
(TOP REINFORCING BARS NOT SHOWN)



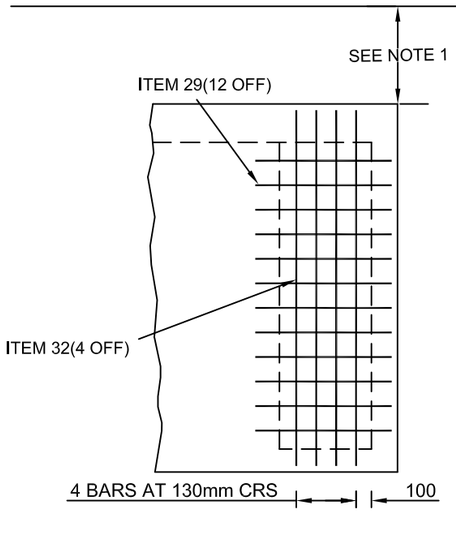
FLOOR PLAN

NOTES:

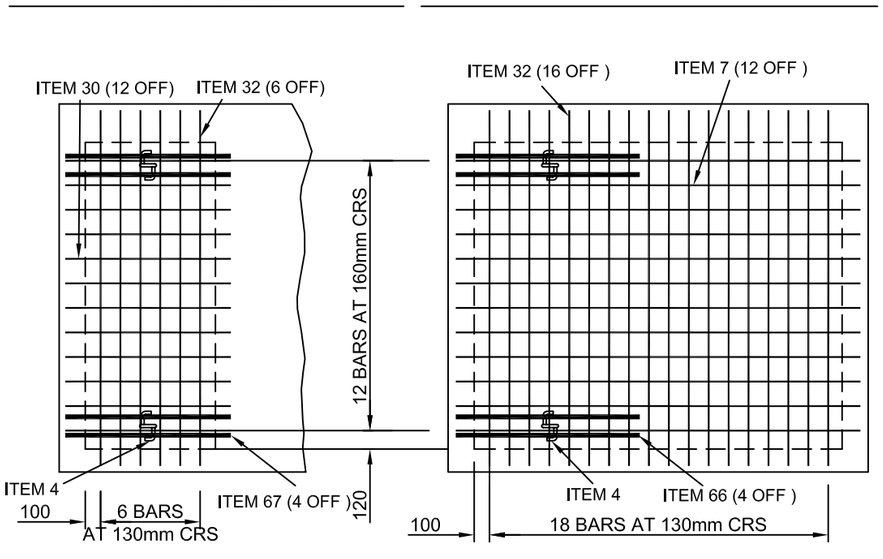
1. FOR SECTIONS, NOTES, SCHEDULE & LOCATION OF WALLS A,B,C,D. SEE SHEET 2
2. ALL DIMENSIONS ARE IN mm



WALL 'C'
VIEW SHOWING REINFORCING BARS
(SEE NOTE 4)



WALL 'D'
VIEW SHOWING REINFORCING BARS
(SEE NOTE 4)



WALL 'A'
VIEW SHOWING REINFORCING BARS
(SEE NOTE 4)

WALL 'B'
VIEW SHOWING REINFORCING BARS

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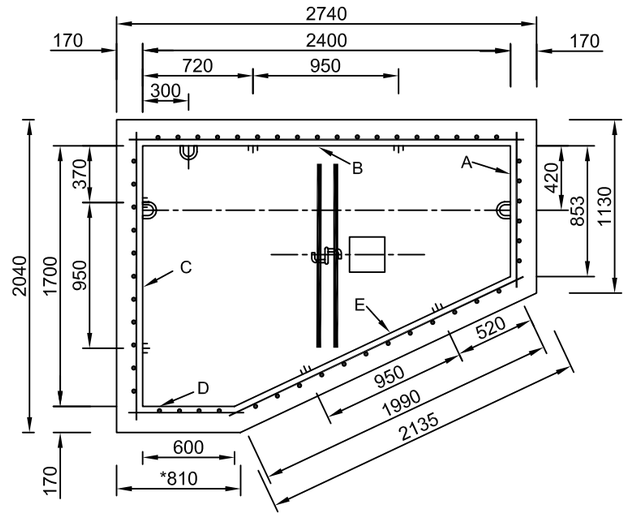
PO.BOX.217
DOHA–QATAR

TITLE

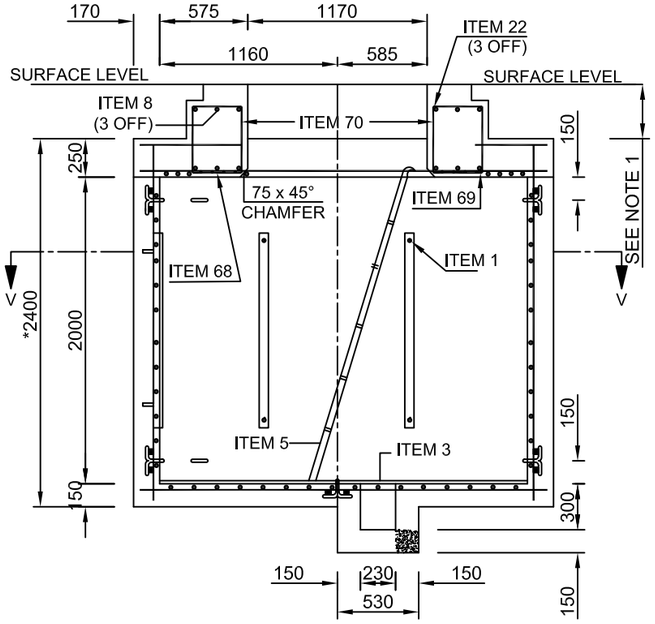
MANHOLE MRT 9

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:40
DWG. NO. CN 1957-A	SH. 1OF2

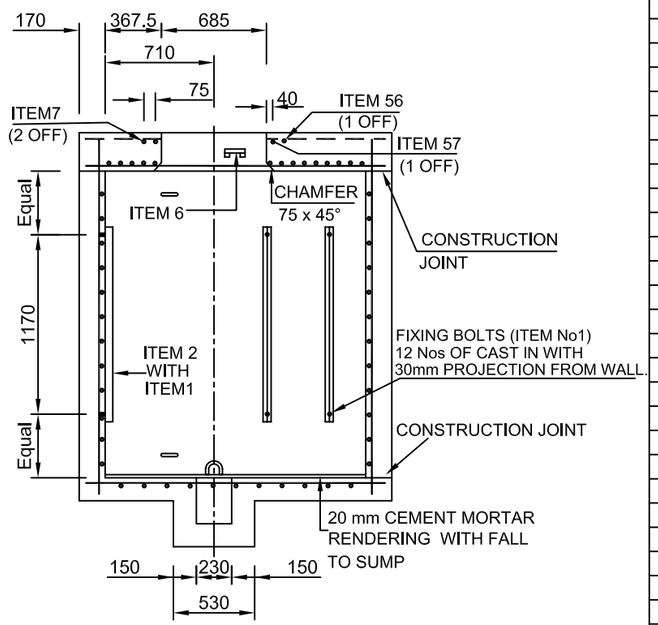


SECTION V-V

SCHEDULE		
ITEM	DESCRIPTION	NO OFF
1	BOLTS, FOUNDATION INDENTED NO.2	12
2	CABLE BEARERS WALL TYPE No. 8	6
3	GRATING SUMP No 2A	1
4	IRONS ANCHOR No 4	7
5	LADDERS, STEEL 2150mm WITH HOOKS & BAR	1
6	STEPS, MANHOLE No1	1
7	STIRRUPS 6 mm DIA. 300 mm .C/C	11



SECTION X-X



SECTION Y-Y

SCHEDULE					
REINFORCEMENT BAR					
ITEM	LENGTH & DIA mm	NO OFF			
		ROOF	FLOOR	WALLS	TOTAL
7	2640 X 12	5+2 *	5	12	24
8	1940 X 12	7+3	4	12	26
9	1900 X 12		1		1
10	1840 X 12		1		1
11	1770 X 12		1		1
12	1700 X 12		1		1
13	1620 X 12		1		1
14	580 X 12		1		1
15	1480 X 12		1		1
16	1410 X 12		1		1
17	1340 X 12		1		1
18	1270 X 12		1		1
19	1200 X 12		1		1
20	1130 X 12		1		1
21	1180 X 12		1		1
22	1300 X 12	3	1		4
23	1810 X 12		1		1
24	2130 X 12		1		1
25	2450 X 12		1		1
26	1390 X 12		1		1
27	940 X 12		1		1
28	680 X 12		1		1
29	890 X 12			12	12
30	1080 X 12			12	12
31	2090 X 12			12	12
32	2320 X 12			55	55
33	630 X 12	1			1
34	590 X 12	1			1
35	560 X 12	1			1
36	520 X 12	1			1
37	490 X 12	1			1
38	450X 12	1			1
39	420 X 12	16+1			17
40	380 X 12	1			1
41	340 X 12	1			1
42	310 X 12	1			1
43	270X 12	1			1
44	240 X 12	1			1
45	200 X 12	1			1
46	170 X 12	1			1
47	140 X 12	1			1
48	1330 X 12	1			1
49	1300 X 12	1			1
50	1250X12	1			1
51	1220X12	1			1
52	1190X12	2			2
53	1150 X12	1			1
54	1120X12	1			1
55	670X12	9+1			10
56	2300X12	1+1*			2
57	2140X12	1+1*			2
58	1980X12	1			1
59	1820X12	1			1
60	1670X12	1			1
61	1510X12	1			1
62	1350X12	1			1
63	800X12	8			8
64	650X12	1			1
65	770X12	1			1
66	1200 X 32		2Ø	8Ø	10
67	1080 X 32			4Ø	4
68	1940 X 25	3			3
69	1300 X 25	3			3

NOTES:

1. THIS DRG TO BE READ IN CONJUNCTION WITH DRG CN1961A & 1153A
2. 40mm MIN. COVER ON ALL REINFORCEMENT.
3. THE ENTRANCE POSITION MAY BE ALTERED PROVIDED THE REINFORCEMENT IS REARRANGED TO MAINTAIN A 75mm GRID OF 12mm DIA BARS.
4. WALL BARS MAY BE REARRANGED BUT NOT OMITTED TO CLEAR DUCTS.
5. IMPORTANT THE CENTRE OF EVERY ANCHOR IRON MUST BE AT LEAST 230mm FROM ANY DUCT OR WALL OPENING.

   ANCHOR IRONS MAY BE REPOSITIONED OR ADDITIONAL ANCHOR

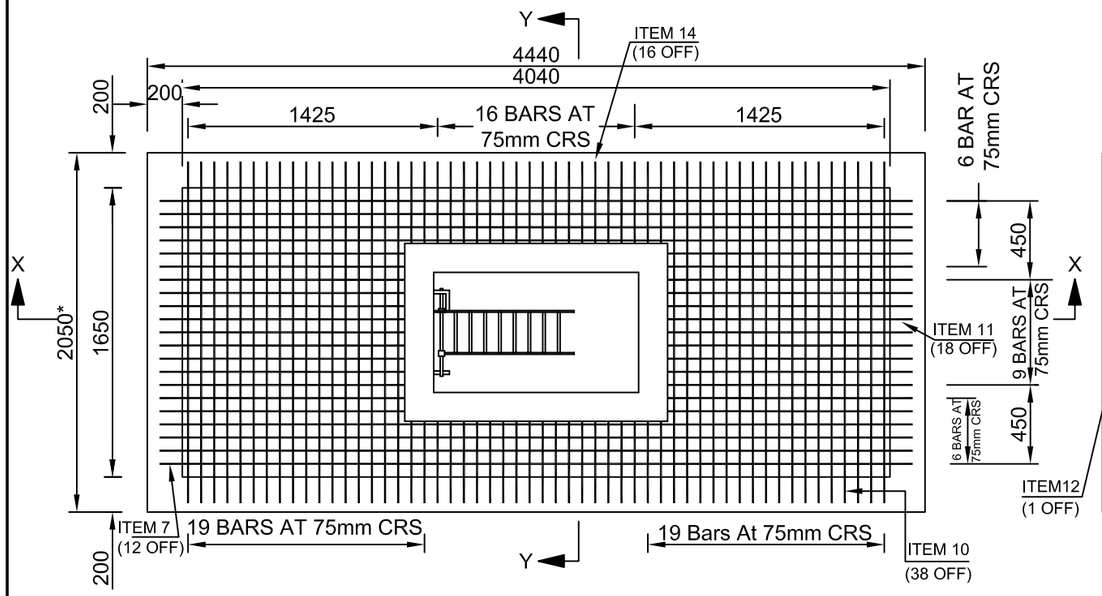
   IRONS FITTED BUT EACH MUST BE SITED 150mm FROM AN ADJACENT WALL, ROOF OR FLOOR.
6. FOR UPSTAND BEAM DETAILS REF. DRG. CN 1153A
7. DIMENSIONS IN mm
8. * FOR REF ONLY
9. Ø FOR USE WITH ANCHOR IRONS
10. * ENTRANCE TRIMMING BARS
11. ALL STEEL TO BE HIGH YIELD WITH Fy 415N/mm^2
12. ALL CONCRETE TO BE SRC 28 N/mm^2

ooredoo PO.BOX.217 DOHA–QATAR

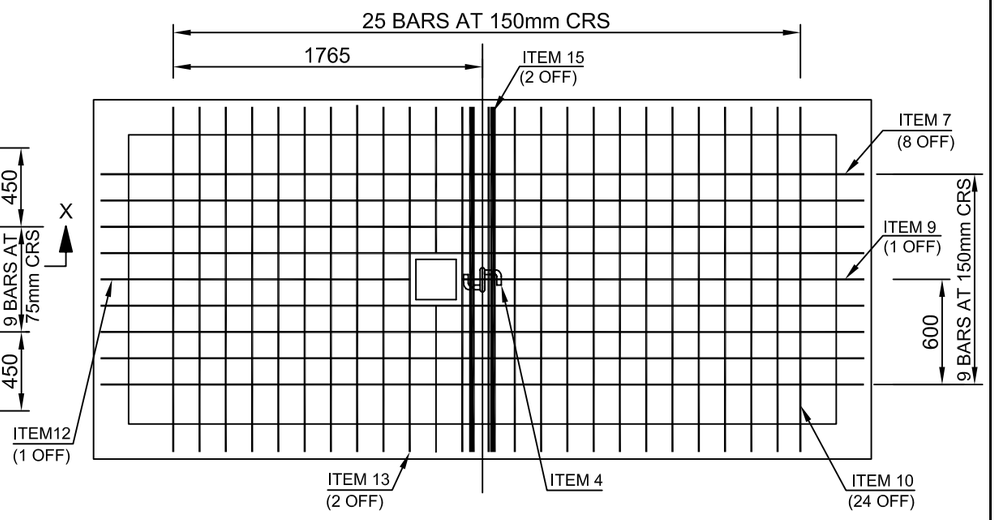
TITLE

MANHOLE MRT 9

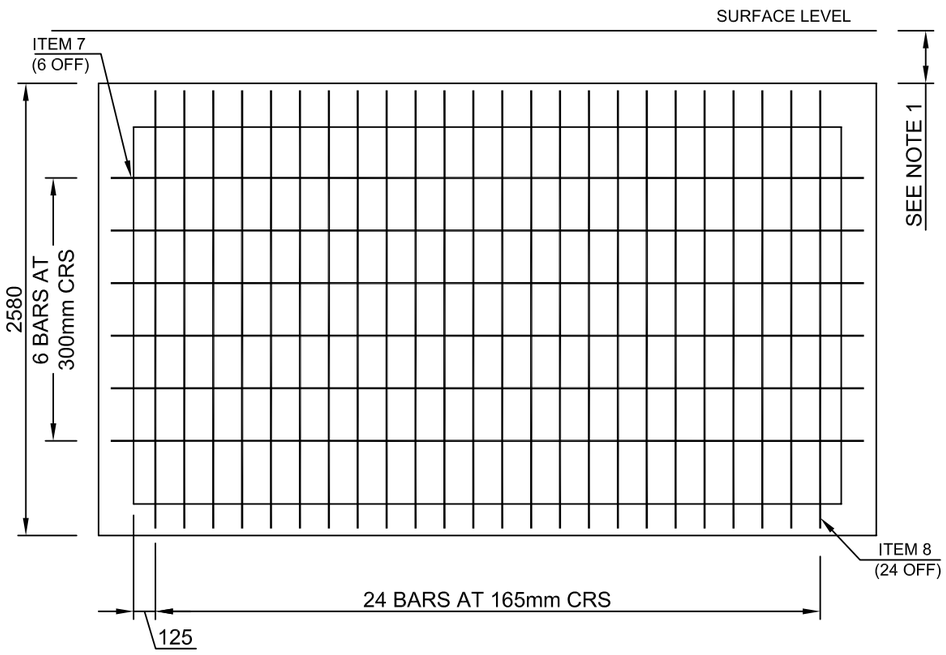
DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:40
DWG. NO. CN 1957-A	SH. 2OF2



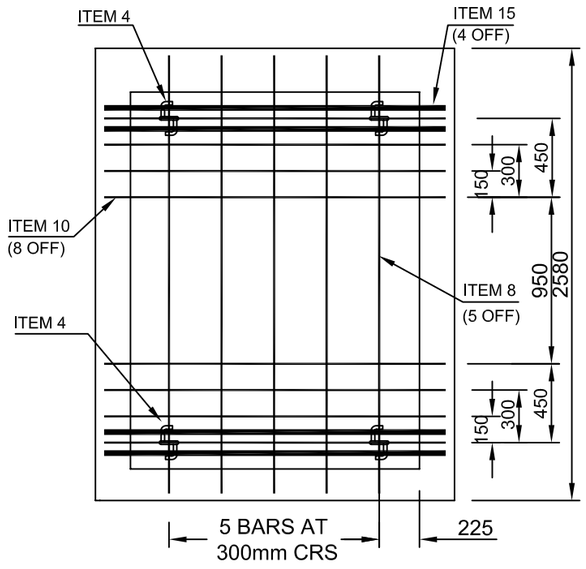
ROOF PLAN
(TOP REINFORCING BARS NOT SHOWN)



FLOOR PLAN



WALL 'B'
VIEW SHOWING REINFORCING BARS



WALL 'A'
VIEW SHOWING REINFORCING BARS
(SEE NOTE-4)

NOTES:

1. FOR SECTIONS, NOTES, SCHEDULE & LOCATION OF WALLS A & B SEE SHEET 2
2. DIMENSIONS IN mm
3. * FOR REFERENCE ONLY

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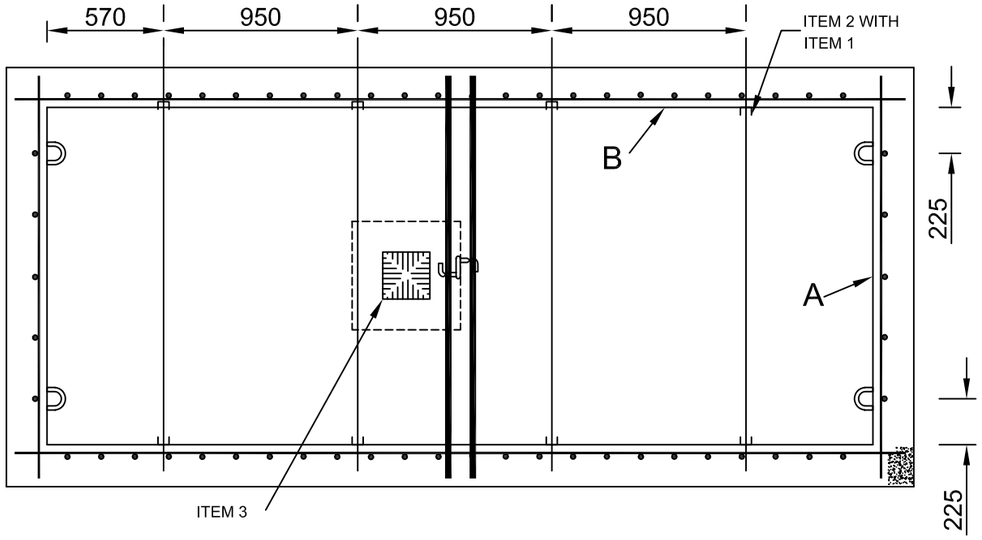
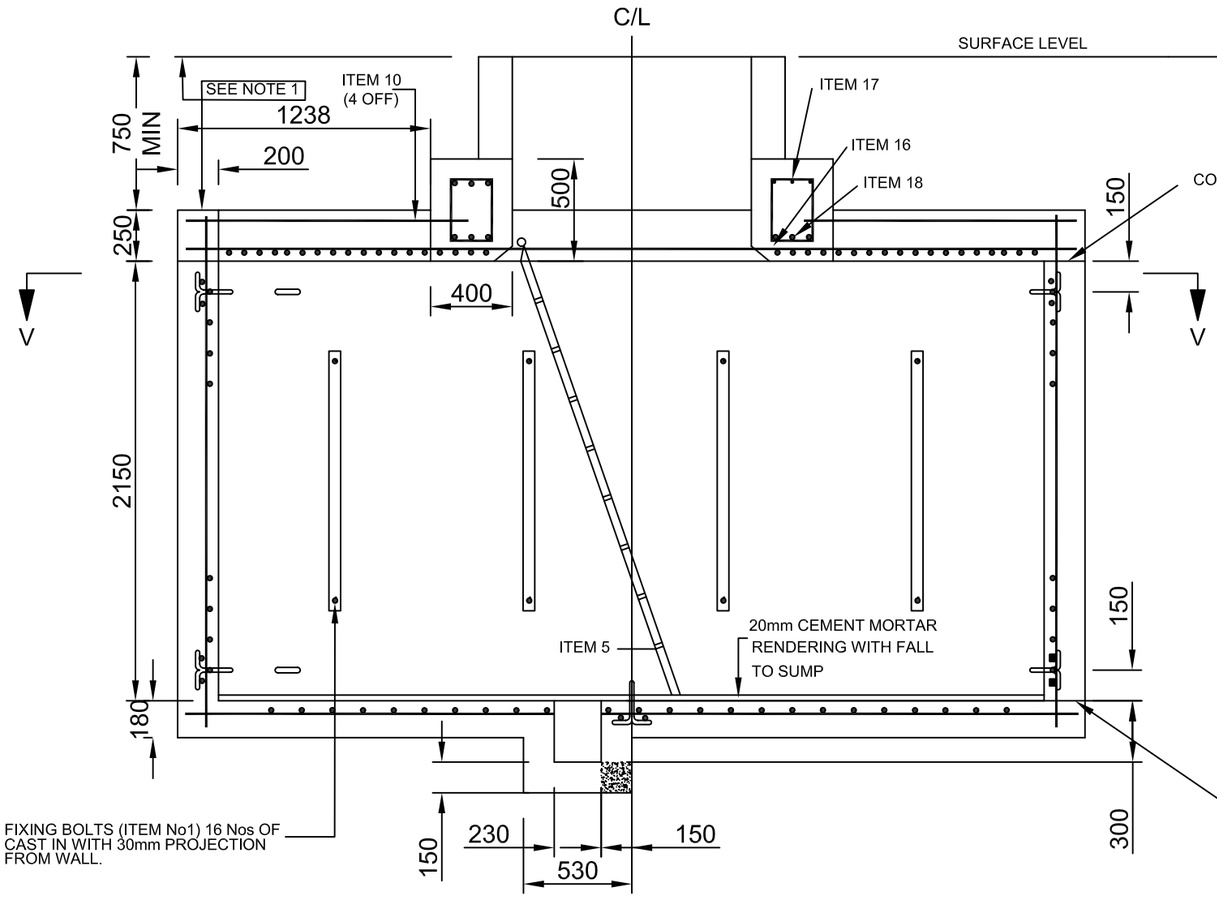
TITLE

MANHOLE MR 11

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:35
DWG. NO. CN 1954-A	SH. 1OF2



SECTION V - V



SECTION X - X

SECTION Y - Y

ITEM	SCHEDULE	
	DESCRIPTION	NO OFF
1	BOLTS, FOUNDATION INDENTED NO.2	16
2	CABLE BEARERS, WALL TYPE No. 8	8
3	GRATING SUMP No 2A	1
4	IRONS, ANCHOR No 4	9
5	LADDERS, STEEL 2300mm WITH HOOKS & BAR	1
6	STEPS. MANHOLE NO 1	1

S C H E D U L E R E I N F O R C E M E N T B A R					
ITEM	DIA mm & LENGTH	NO OFF			
		ROOF	FLOOR	WALLS	TOTAL
7	REINFORCEMENT BAR 12 DIA x 4300	12+4 *	8	12	36
8	REINFORCEMENT BAR 12 DIA x 2500	--	--	58	58
9	REINFORCEMENT BAR 12 DIA x 2270	--	1	--	1
10	REINFORCEMENT BAR 12 DIA x 1950	38	24	16	78
11	REINFORCEMENT BAR 12 DIA x 1370	18	--	--	18
12	REINFORCEMENT BAR 12 DIA x 1730	--	1	--	1
13	REINFORCEMENT BAR 12 DIA x 830	--	2	--	2
14	REINFORCEMENT BAR 12 DIA x 600	32	--	--	32
15	REINFORCEMENT BAR 32 DIA x 1950	--	2Ø	8Ø	10
16	REINFORCEMENT BAR 25 DIA x 1950	6	--	--	6
17	REINFORCEMENT BAR 12 DIA x 1950	6	--	--	6
18	STIRRUPS 6mm DIA 30cm C-C	14	--	--	14

NOTES:

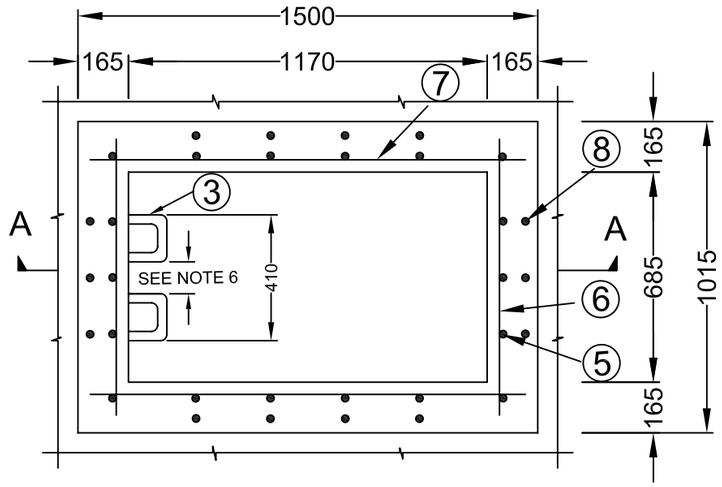
1. THIS DRG TO BE READ IN CONJUNCTION WITH DRG CN 1961A & CN1153A
2. 40mm MIN. COVER ON ALL REINFORCEMENT
3. THE ENTRANCE POSITION MAY BE ALTERED PROVIDED THE REINFORCEMENT IS REARRANGED TO MAINTAIN A 75mm GRIDS OF 12mm DIA BAR.
4. WALL BARS MAY BE REARRANGED BUT NOT OMITTED TO CLEAR DUCTS.
5. IMPORTANT : THE CENTRE OF EVERY ANCHOR IRON MUST BE AT LEAST 230mm FROM ANY DUCT OR WALL OPENING. ANCHOR IRONS MAY BE REPOSITIONED OR ADDITIONAL ANCHOR IRONS FITTED BUT EACH MUST BE SITED 150mm FROM AN ADJACENT WALL , ROOF OR FLOOR.
6. UPSTAND BEAMS 400 x 500 SHOULD BE PROVIDED ON EITHER SIDE OF THE SHAFT SPANNING BETWEEN THE END WALLS.
7. FOR SHAFT AND BEAM DETAILS REFER DRG. CN1153A
8. * FOR REF ONLY
9. ENTRANCE TRIMMING BARS.
10. Ø FOR USE WITH ANCHOR IRONS.
11. DIMENSIONS IN mm
12. ALL STEEL TO BE HIGH YIELD WITH Fy 415N/mm ^{2}
13. ALL CONCRETE TO BE SRC 28 N/mm ^{2}

ooredoo PO.BOX.217 DOHA–QATAR

TITLE

MANHOLE MR 11

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1 : 30
DWG. NO. CN 1954-A	SH. 2OF2



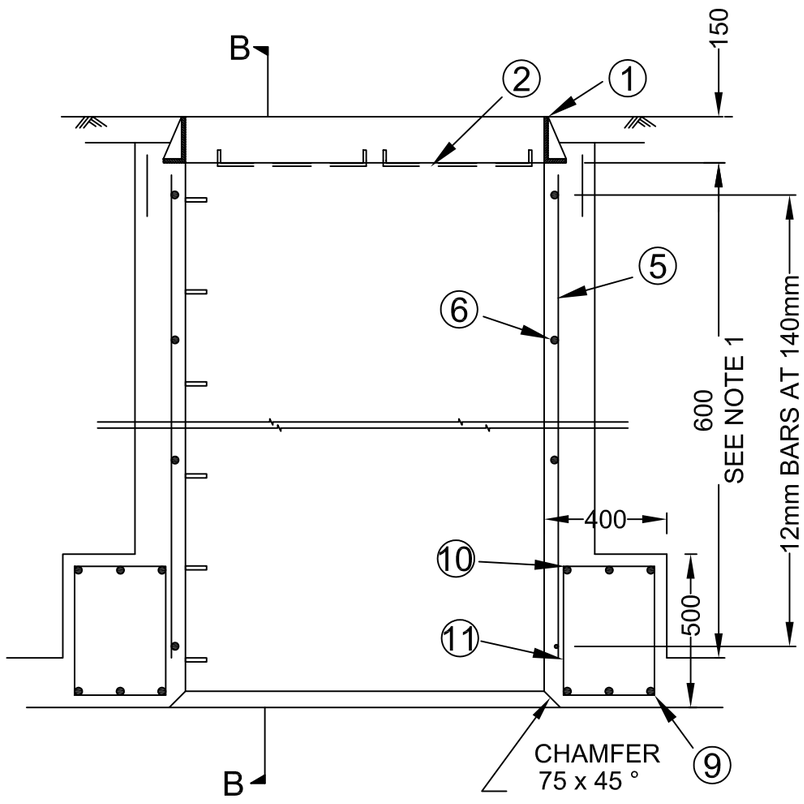
PLAN

SCHEDULE:

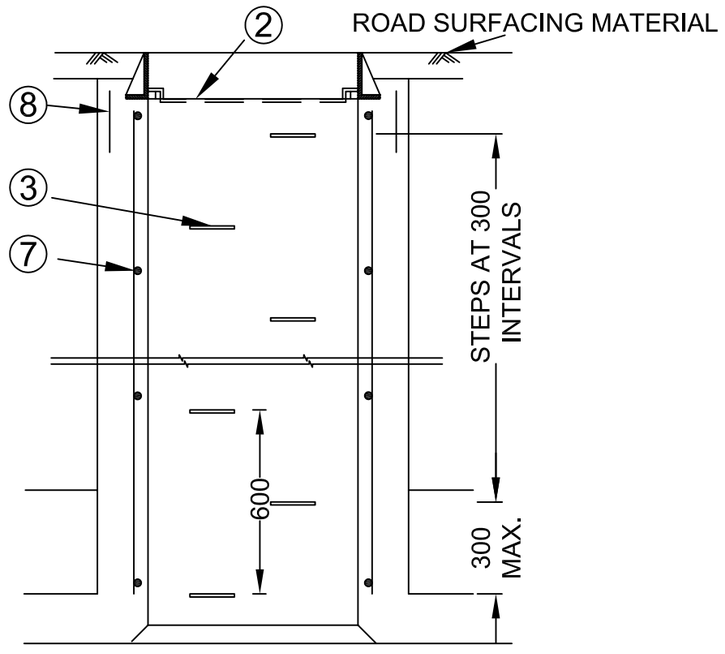
ITEM	DESCRIPTION	NO. OFF
1	FRAME & COVER CARRIAGEWAY No. 2	1
2	GRIDS SAFETY NO.2	2
3	STEPS MANHOLE	QTY TO SUIT DEPTH OF SHAFT
5	REINFORCEMENT BAR 12mm Ø x 590mm* * VARIABLE TO SUIT DEPTH	18
6	" " 12mm x 900mm	8 VARIABLE TO SUIT DEPTH OF SHAFT
7	" " 12mm x 1480mm	8 " " "
8	" " 12mm x 200mm	14
9	" " 25mm Ø x LENGTH TO SUIT SPAN OF BEAM	6
10	" " 12mm Ø x LENGTH TO SUIT SPAN OF BEAM	6
11	STIRRUPS 6mm TO SUIT SIZE OF BEAM AT 300 C/C.	

NOTES:

1. DEPTH OF SHAFT VARIABLE TO SUIT SITE CONDITIONS, MINIMUM DEPTH 600MM.
2. UPSTAND BEAMS 400MM X 500MM SHOULD BE PROVIDED ON EITHER SIDE OF THE SHAFT SPANNING BETWEEN THE END WALLS.
3. THIS DRAWING TO BE READ IN CONJUCTION WITH DRAWING CN1961A.
4. 40MM MIN COVER SHOULD BE PROVIDED FOR ALL REINFORCEMENTS.
5. FOR UNMADE SURFACE 150mmX150mm CONCRETE SURROUNDING THE F&C SHOULD BE PROVIDED.
6. POSITIONING OF STEPS VARIES ON M/H MR4; SEE DRAWING CN1953A.



SECTION AA



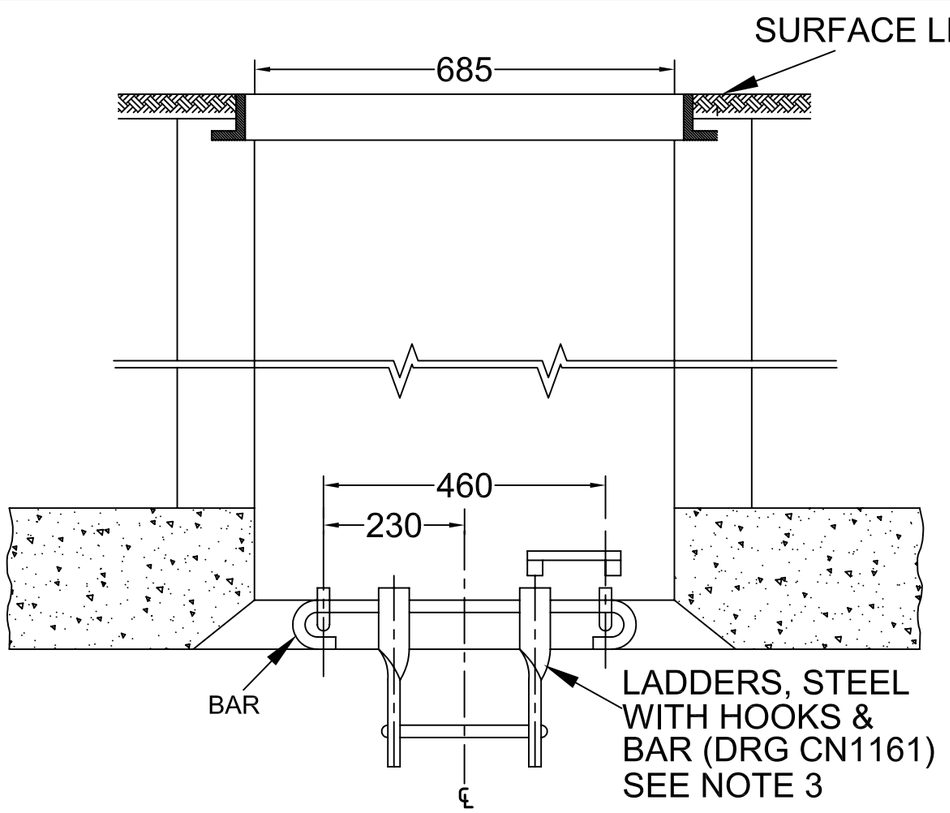
SECTION BB

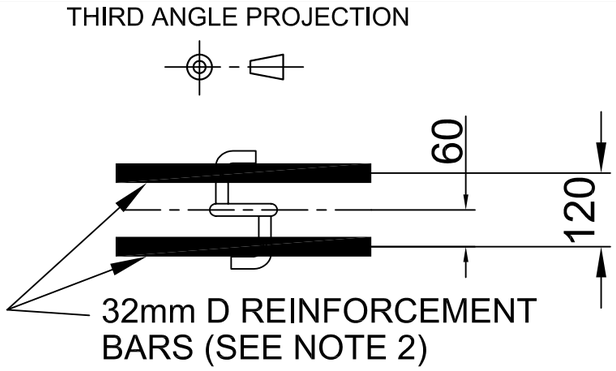
ooredoo PO.BOX.217 DOHA–QATAR

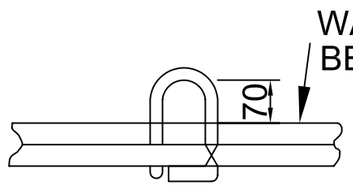
TITLE

MANHOLE SHAFT FOR USE IN CARRIAGEWAY OR FOOTWAY

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1: 20
DWG. NO. CN 1153 A	SH. 1OF1

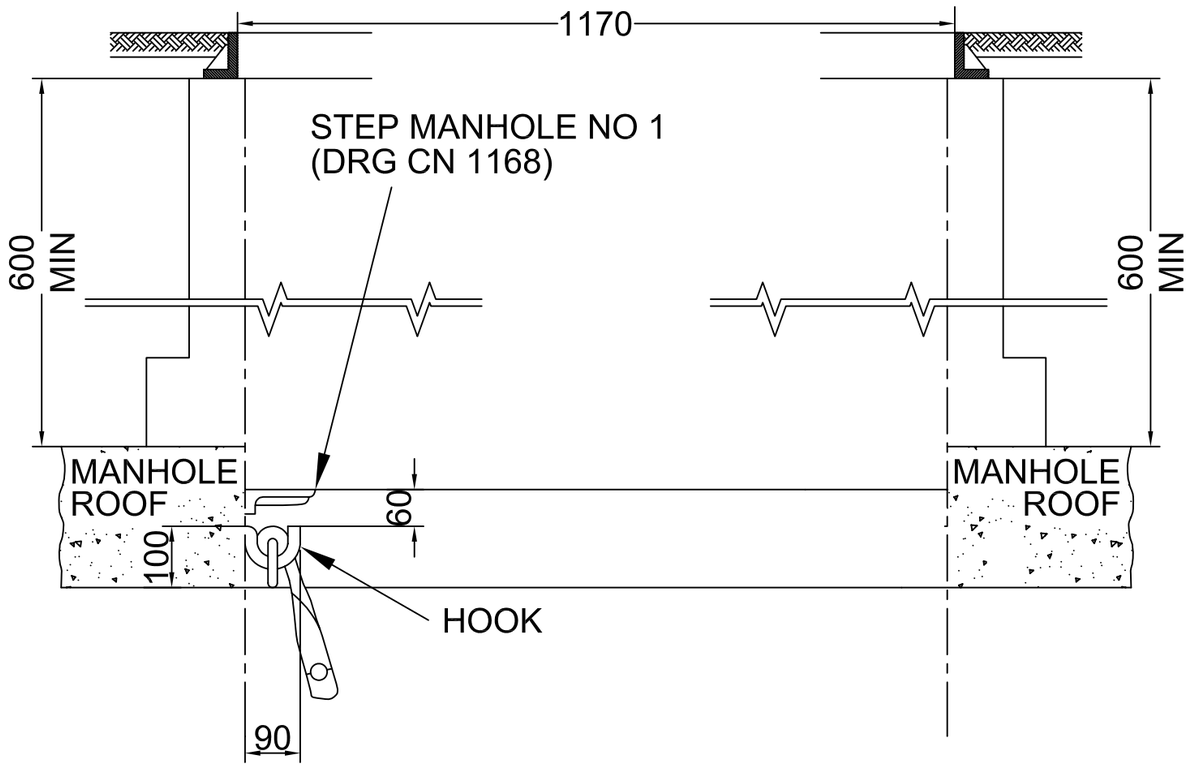






IRON ANCHOR NO 4

(DRG CN1162)



MANHOLE ENTRANCE ARRANGEMENT

NOTES:

1) THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH CN1153A

2) REINFORCEMENT BARS MUST EXTEND A MINIMUM OF 600mm ON EACH SIDE OF THE ANCHOR IRON, OR TO 30mm OF THE OUTSIDE OF AN ADJACENT WALL & MUST BE SECURED TO THE LEGS OF THE ANCHOR IRON & THE WALL REINFORCEMENT WITH WIRE TIES TO PREVENT DISPLACEMENT. FOR ANCHOR IRONS IN JOINT BOXES SEE RELEVANT CONSTRUCTION DRAWINGS.

3) THE LADDER MUST BE 50mm LONGER OVERALL THAN THE HEIGHT OF THE TOP OF THE LADDER HOOKS ABOVE THE MANHOLE FLOOR: IF NECESSARY, THE LADDER MUST BE CUT ON SITE TO THE CORRECT LENGTH.

4) * FOR REFERENCES PURPOSE ONLY

5) DIMENSIONS IN MM.

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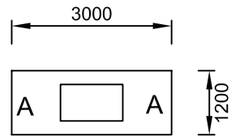
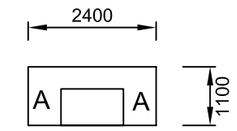
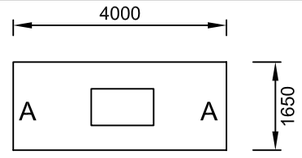
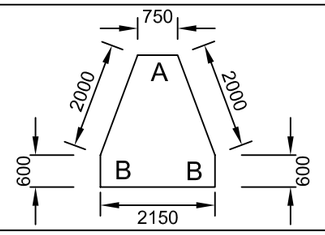
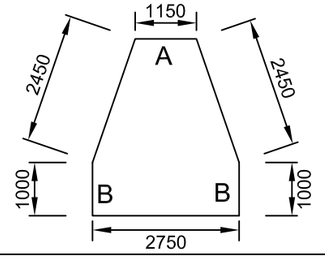
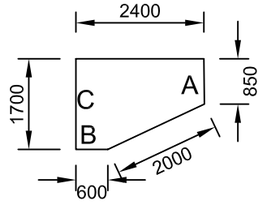
PO.BOX.217
DOHA–QATAR

TITLE

STANDARD ITEMS FOR JOINTING CHAMBERS

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1 : 10
DWG. NO. CN 1961 A	SH. 1OF1

MANHOLE		EXCAVATED VOLUME (m³)		EXCAVATED DEPTH		INTERNAL DIMENSIONS		MAXIMUM No. OF DUCTS TO ENTER THROUGH WALLS A,B&C
CODE	DRG	F/W	C/W	F/W	C/W	PLAN	HEIGHT	
MR2B	CN1938	12.37	13.08	2500	2640		2000	A 36
MR2C		13.11	13.81	2650	2790		2150	A 40
MR2D		13.87	14.55	2800	2940		2300	A 44
MR2E		14.60	15.30	2950	3090		2450	A 48
MR4	CN1953	9.45	9.98	2500	2640		2000	A 9
MR11	CN1954	23.75	24.98	2710	2850		2150	A 72
MRT 7	CN1955	13.57	14.31	2560	2700		2000	A 12 B 6
MRT8 B	CN1956	25.48	26.80	2730	2870		2150	A 36 B 18
MRT8 C		28.28	29.60	3030	3170		2450	A 48 B 24
MRT 9	CN1957	11.47	12.10	2530	2670		2000	A 24 B 18 C 24

NOTES:

1. ALL DIMENSIONS ARE IN MM

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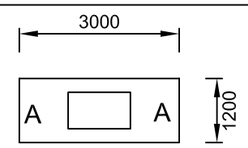
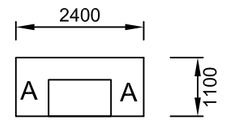
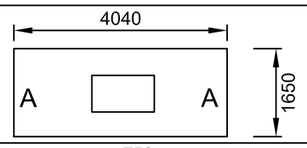
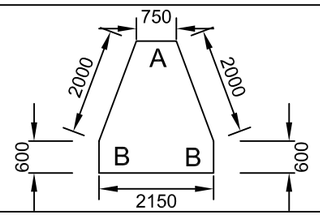
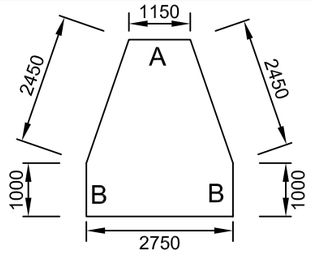
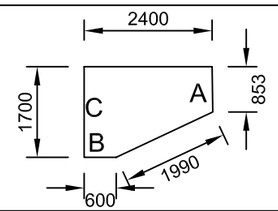
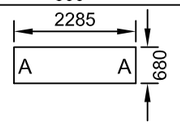
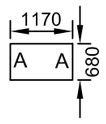
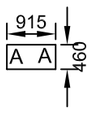
STANDARD SERIES OF MANHOLES & JOINT BOXES

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : NTS
DWG. NO. CN 1814 A	SH. 1OF2

MANHOLE / JOINT BOXE		EXCAVATED DEPTH WITH SHAFT		INTERNAL DIMENSIONS		MAXIMUM No. OF DUCTS TO ENTER THROUGH WALLS A,B&C	WALL THICKNESS	DUCT FORMATION	CLEARANCE FROM BELOW DUCT NEST/ COLUMN TO BASE	REMARKS
CODE	DRG	F/W	C/W	PLAN	HEIGHT					
MR2B MR2C MR2D MR2E	CN1938-A	3020 3170 3320 3470	3170 3320 3470 3620		2000 2150 2300 2450	A 36 A 40 A 44 A 48	170	4X9 4X10 4X11 4X12	450mm 450mm 450mm 450mm	
MR4	CN1953-A	3020	3170		2000	A 9	170	3X3	900mm	
MR11	CN1954-A	3230	3380		2150	A 60	200	6X10	450mm	
MRT 7	CN1955-A	3080	3230		2000	A 12 B 6	170	3X4 2X3	600mm 600mm	
MRT8 B MRT8 C	CN1956-A	3250 3550	3400 3700		2150 2450	A 36 B 18 A 48 B 24	200	4X9 2X9 4X12 3X8	600mm 600mm 450mm 450mm	
MRT 9	CN1957-A	3050	3200		2000	A 24 B 18 C 24	170	3X8 2X9 3X8	450mm 450mm 450mm	
JRC 14	CN9109	1125	1275		830	A 4	160	2X2	200mm	SHAFT NOT REQUIRED FOR ALL TYPE OF JRC BOXES
JRC 12	CN 9108	900	1050		740	A 2	150	1X2	200mm	
JRC 4	CN9106	840	990		780	A 1	100	1X1	195mm	

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. A MINIMUM CLEARANCE OF 450mm ABOVE THE DUCT NEST/COLUMN TO THE BOTTOM OF ROOF SHOULD BE ALWAYS MAINTAINED.

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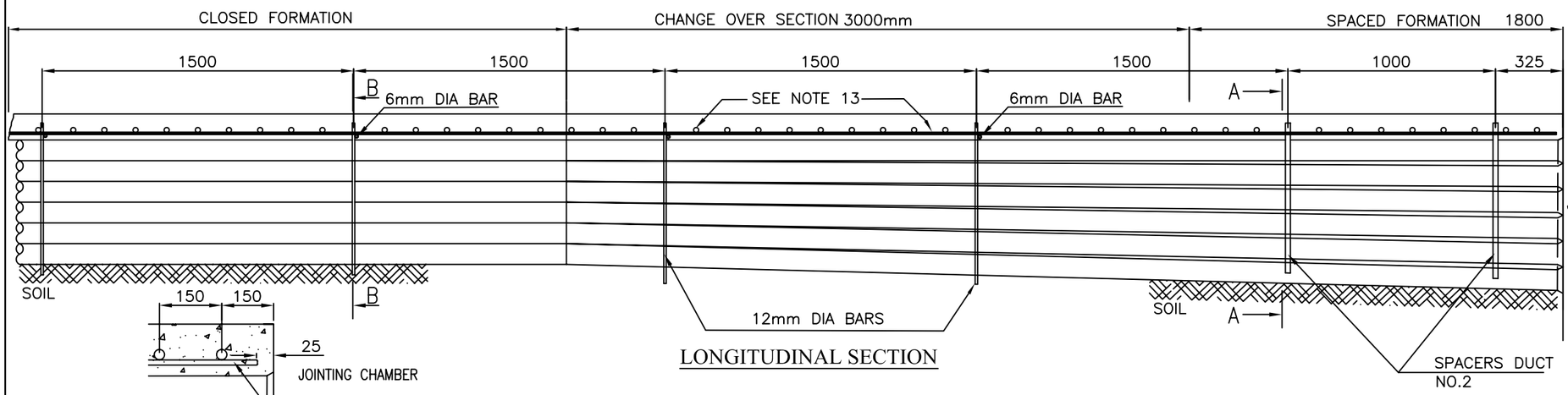
PO.BOX.217
DOHA–QATAR

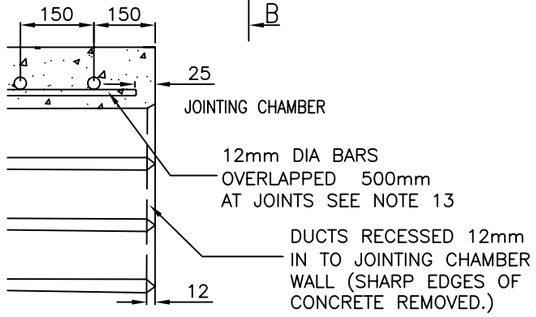
TITLE

STANDARD SERIES OF MANHOLES & JOINT BOXES

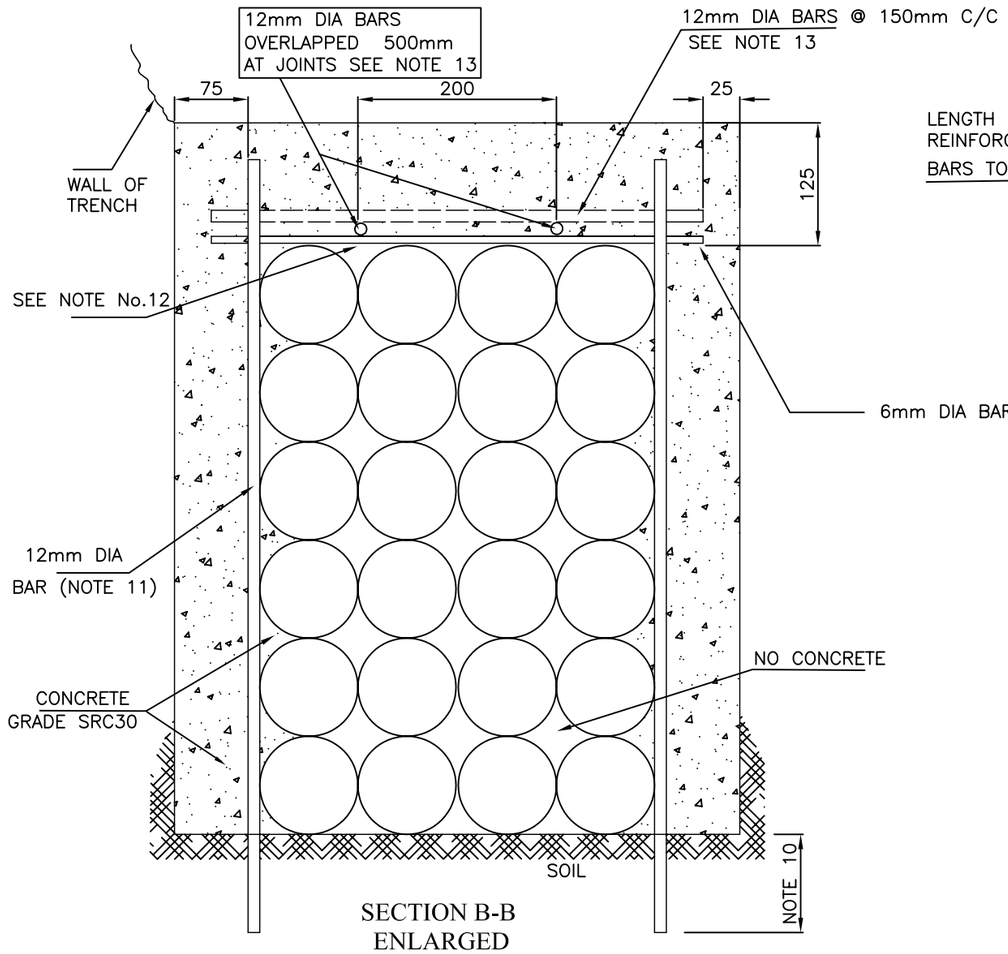
DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : NTS
DWG. NO. CN 1814-A	SH. 2 OF 2



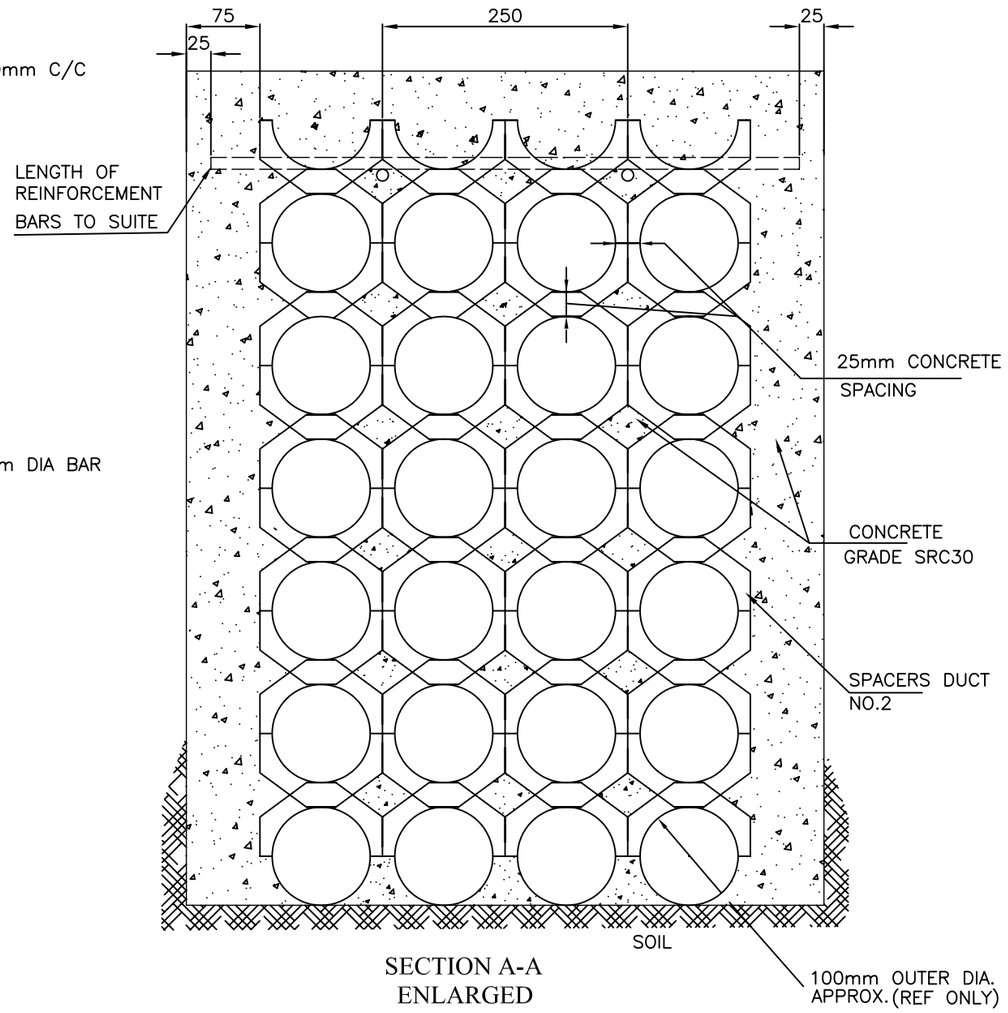
LONGITUDINAL SECTION



ENLARGED VIEW OF J/CHAMBER WALL



SECTION B-B
ENLARGED



SECTION A-A
ENLARGED

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. ALL WORKS TO BE CARRIED OUT AS PER Ooredoo STANDARDS & SPECIFICATION.
3. ALL DUCT ROUTE TO BE APPROVED BY Ooredoo SUPERVISOR PRIOR TO EXCAVATION.
4. SIDE OF TRENCH SHALL BE VERTICAL AND ADEQUATELY SUPPORTED ALL THE TIME.
5. WHERE DUCTS ARE LAID UNDER CARRIAGE WAY BOTTOM OF THE TRENCH TO BE COMPACTED 95% OF MDD. OR AS APPROVED BY SUPERVISOR.
6. DRAW ROPE 6mm ø TO BE PROVIDED THROUGHOUT ALL DUCTS.
7. THE MAX. NOMINAL PARTICLE SIZE OF FILL MATERIAL SHALL BE 75mm & FREE FROM ANY UNSUITABLE MATERIALS.
8. EXISTING ASPHALT SURFACE TO BE REINSTATED AS PER ROADS DEPARTMENT REQUIREMENTS.
9. ALL DUCTS TO BE TESTED WITH BRUSH AND MANDREL AS PER Ooredoo STANDARDS AFTER FINAL COMPACTION.
10. BAR TO BE DRIVEN IN FAR ENOUGH TO GIVE STABILITY.
11. SPACING OF 12mm DIA. BARS SUCH THAT DUCT ARE JUST RESTRAINED.
12. TIE AND/REINFORCEMENT BARS LASHED TO EACH OTHER WITH WIRE.
13. ROOF REINFORCEMENT OMITTED FROM DUCT FORMATION WITH LESS THAN 4 COLUMNS.

TECHNICAL DATA FOR DUCTS		
TYPE OF DUCT	DUCT– 54D	DUCT – 56A
INTERNAL DIA.	90 mm	50 mm
WALL THICKNESS	3.25 mm	3.25 mm
MATERIAL	UPVC	UPVC
COLOR	BLACK	BLACK
STANDARD	BS 3506	BS 3506

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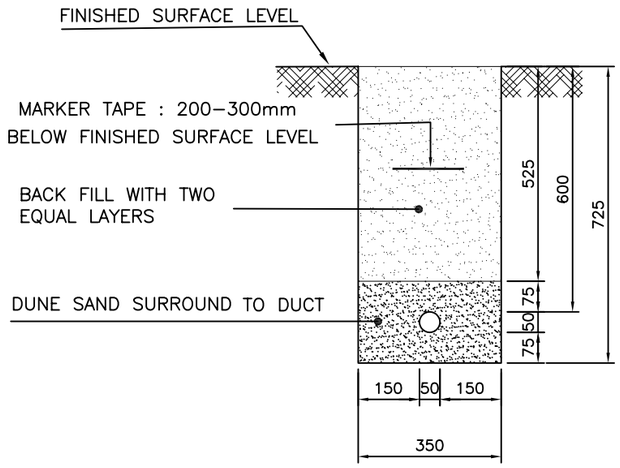
PO.BOX.217
DOHA–QATAR

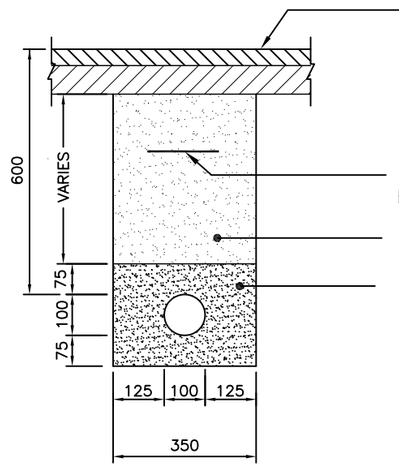
TITLE

DUCT 54D MULTIWAY CONSTRUCTION WITH CONCRETE (10 WAY & ABOVE)

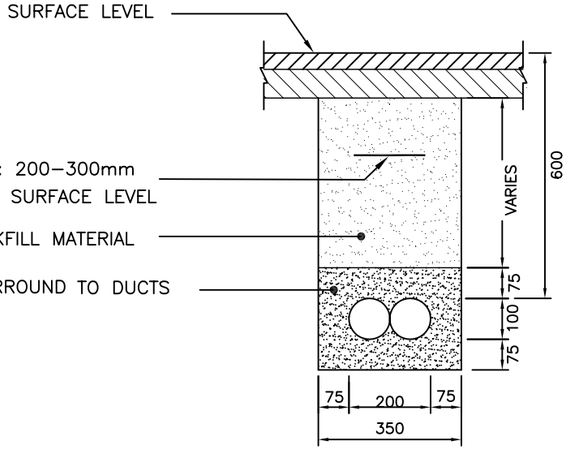
DRAWN : MOHD.RAFI	STATUS: APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE: A3
DATE : MARCH 2013	SCALE: N.T.S
DWG. NO. CN 10686	SH. 1OF1



DUCT LAYING IN UNMADE AREA(FOR D56 ONLY)



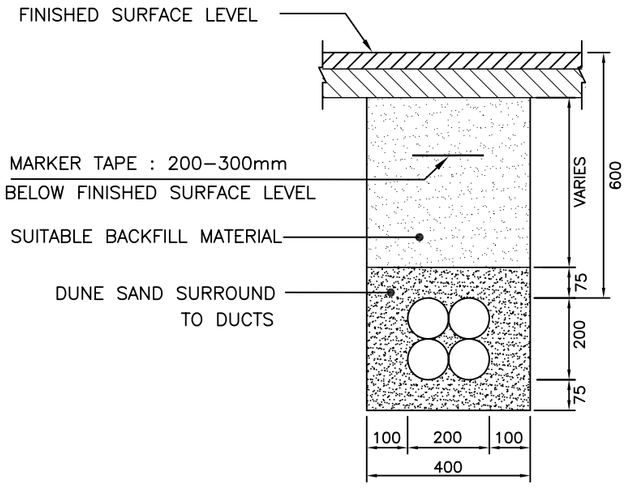
1 WAY DUCT (D54) IN FOOT WAY/VERGE



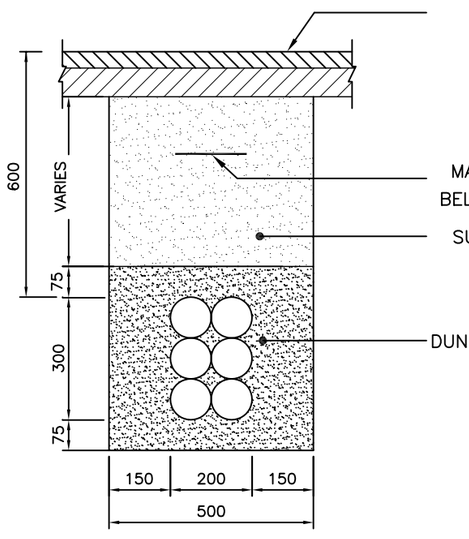
2 WAY DUCT (D54) IN FOOT WAY/VERGE

NOTES:

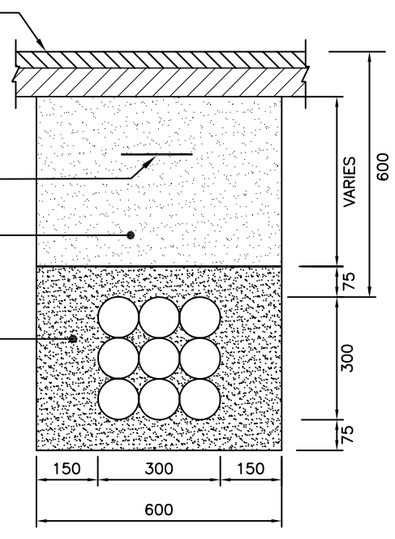
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. ALL WORKS TO BE CARRIED OUT AS PER Ooredoo STANDARDS & SPECIFICATION.
3. ALL DUCT ROUTE TO BE APPROVED BY Ooredoo SUPERVISOR PRIOR TO EXCAVATION.
4. SIDE OF TRENCH SHALL BE VERTICAL AND ADEQUATELY SUPPORTED ALL THE TIME.
5. WHERE DUCTS ARE LAID UNDER CARRIAGE WAY BOTTOM OF THE TRENCH TO BE COMPACTED 95% OF MDD. OR AS APPROVED BY SUPERVISOR.
6. DRAW ROPE 6mm ø TO BE PROVIDED THROUGHOUT ALL DUCTS.
7. THE MAX. NOMINAL PARTICLE SIZE OF FILL MATERIAL SHALL BE 75mm & FREE FROM ANY UNSUITABLE MATERIALS.
8. ALL DUCTS TO BE TESTED WITH BRUSH AND MANDREL AS PER Ooredoo STANDARDS AFTER FINAL COMPACTION.
9. DRAWING No. CN 10686 TO BE FOLLOWED FOR LAYING DUCTS OVER 9 WAY.
10. CUT–BACK & REINSTATEMENT OF EXISTING ASPHALT TO BE AS PER PUBLIC WORKS AUTHORITY'S(ROADS OPERATIONS & MAINTENANCE DEPARTMENT)REQUIREMENTS.



4 WAY DUCT (D54) IN FOOT WAY/VERGE



6 WAY DUCT (D54) IN FOOT WAY/VERGE



9 WAY DUCT (D54) IN FOOT WAY/VERGE

TECHNICAL DATA FOR DUCTS		
TYPE OF DUCT	DUCT– 54D	DUCT – 56A
INTERNAL DIA.	90 mm	50 mm
WALL THICKNESS	3.25 mm	3.25 mm
MATERIAL	UPVC	UPVC
COLOR	BLACK	BLACK
STANDARD	BS 3506	BS 3506

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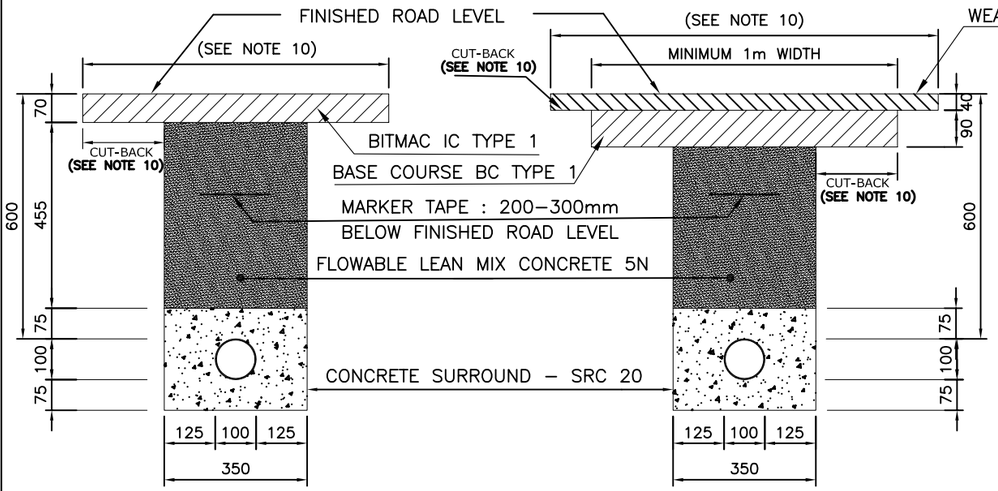
PO.BOX.217
DOHA–QATAR

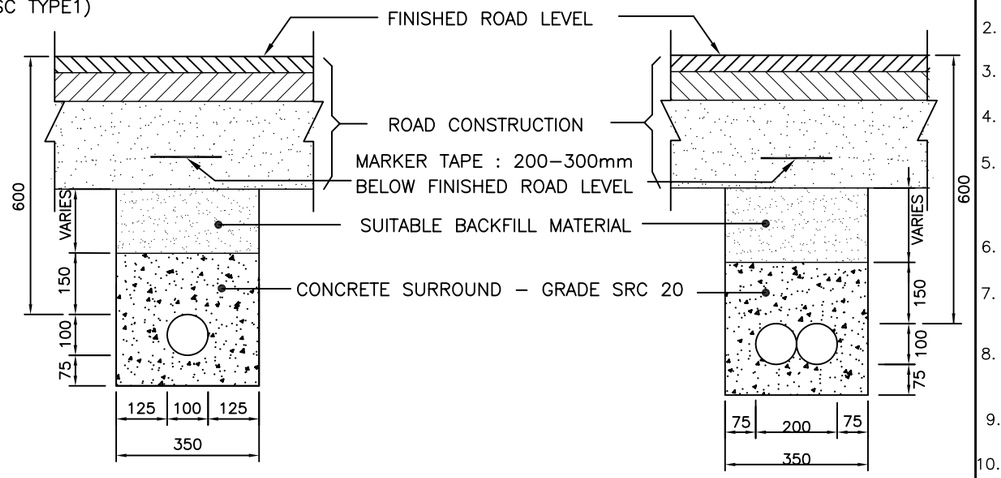
TITLE

STANDARD DETAILS FOR Ooredoo DUCT LAYING UNDER FOOT WAY & VERGE

DRAWN : MOHD.RAFI	STATUS: APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE: A3
DATE : MARCH 2013	SCALE: N.T.S
DWG. NO. CN 20010	SH. 1OF1

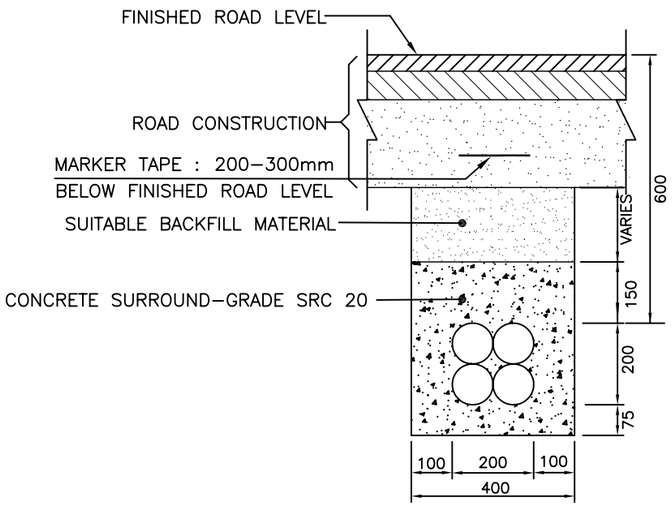


DUCT LAYING IN EXISTING CARRIAGE WAY

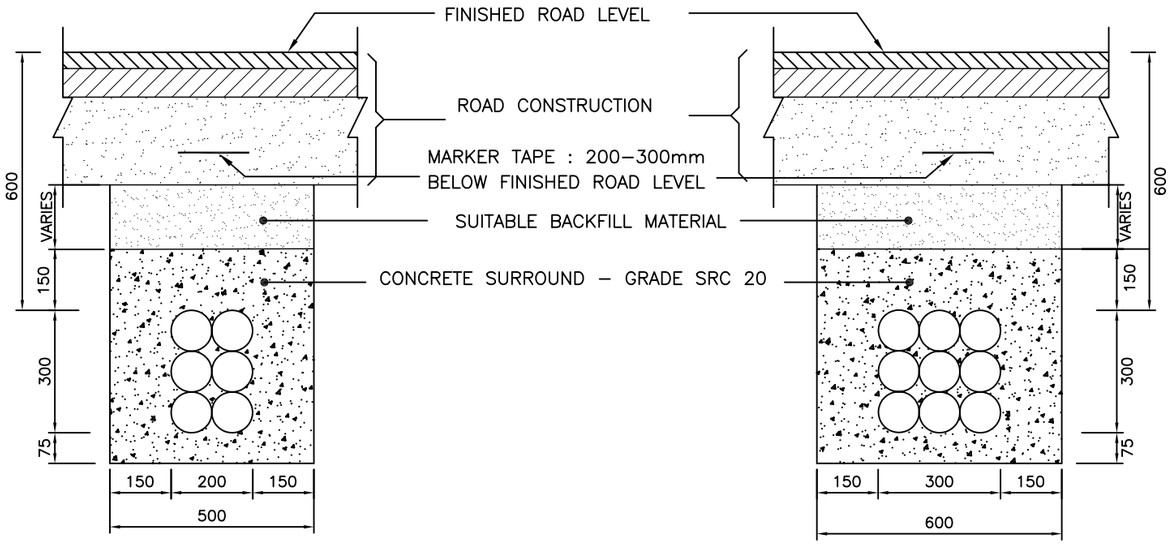


1 WAY DUCT (D54)
(IN PROPOSED CARRIAGE WAY)

2 WAY DUCT (D54)
(IN PROPOSED CARRIAGE WAY)



4 WAY DUCT (D54)
(IN PROPOSED CARRIAGE WAY)



6 WAY DUCT (D54)
(IN PROPOSED CARRIAGE WAY)

9 WAY DUCT (D54)
(IN PROPOSED CARRIAGE WAY)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. ALL WORKS TO BE CARRIED OUT AS PER Ooredoo STANDARDS & SPECIFICATION.
3. ALL DUCT ROUTE TO BE APPROVED BY Ooredoo SUPERVISOR PRIOR TO EXCAVATION.
4. SIDE OF TRENCH SHALL BE VERTICAL AND ADEQUATELY SUPPORTED ALL THE TIME.
5. WHERE DUCTS ARE LAID UNDER CARRIAGE WAY BOTTOM OF THE TRENCH TO BE COMPACTED 95% OF MDD. OR AS APPROVED BY SUPERVISOR.
6. DRAW ROPE 6mm ø TO BE PROVIDED THROUGHOUT ALL DUCTS.
7. THE MAX. NOMINAL PARTICLE SIZE OF FILL MATERIAL SHALL BE 75mm & FREE FROM ANY UNSUITABLE MATERIALS.
8. ALL DUCTS TO BE TESTED WITH BRUSH AND MANDREL AS PER Ooredoo STANDARDS AFTER FINAL COMPACTION.
9. DRAWING No. CN 10686 TO BE FOLLOWED FOR LAYING DUCTS OVER 9 WAY.
10. CUT–BACK & REINSTATING EXISTING ASPHALT TO BE AS PER PUBLIC WORKS AUTHORITY'S (ROAD OPERATIONS & MAINTENANCE Dept.) REQUIREMENTS.

TECHNICAL DATA FOR DUCTS		
TYPE OF DUCT	DUCT– 54D	DUCT – 56A
INTERNAL DIA.	90 mm	50 mm
WALL THICKNESS	3.25 mm	3.25 mm
MATERIAL	UPVC	UPVC
COLOR	BLACK	BLACK
STANDARD	BS 3506	BS 3506

ooredoo
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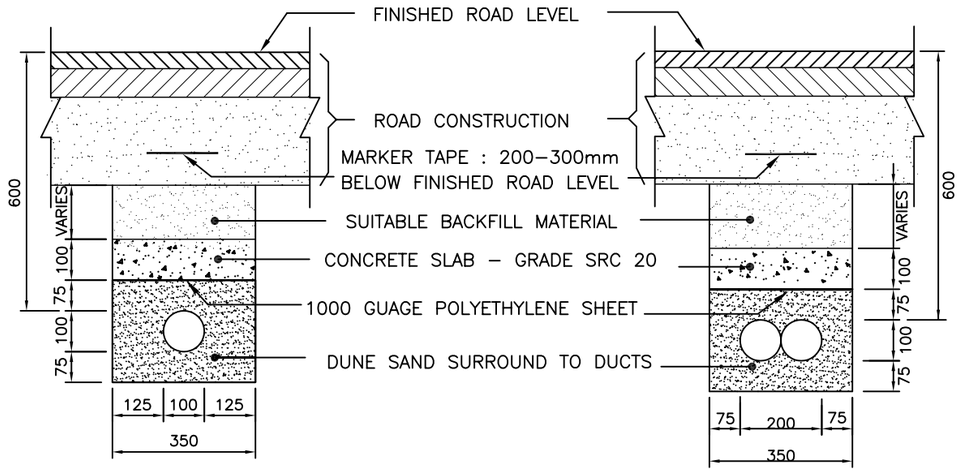
DOHA–QATAR

TITLE

STANDARD DETAILS FOR Ooredoo DUCT LAYING UNDER EXISTING & PROPOSED CARRIAGE WAY

DRAWN : MOHD.RAFI	STATUS: APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE: A3
DATE : MARCH 2013	SCALE: N.T.S
DWG. NO. CN 20011	SH. 1OF1

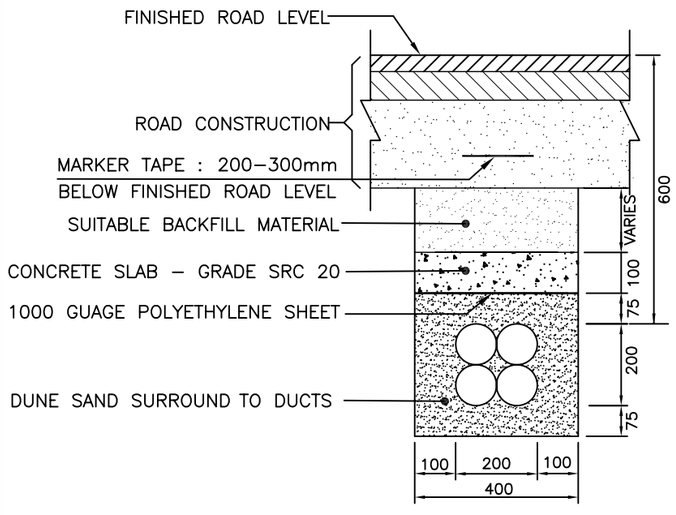


1 WAY DUCT (D54)

IN UNMADE CARRIAGE WAY

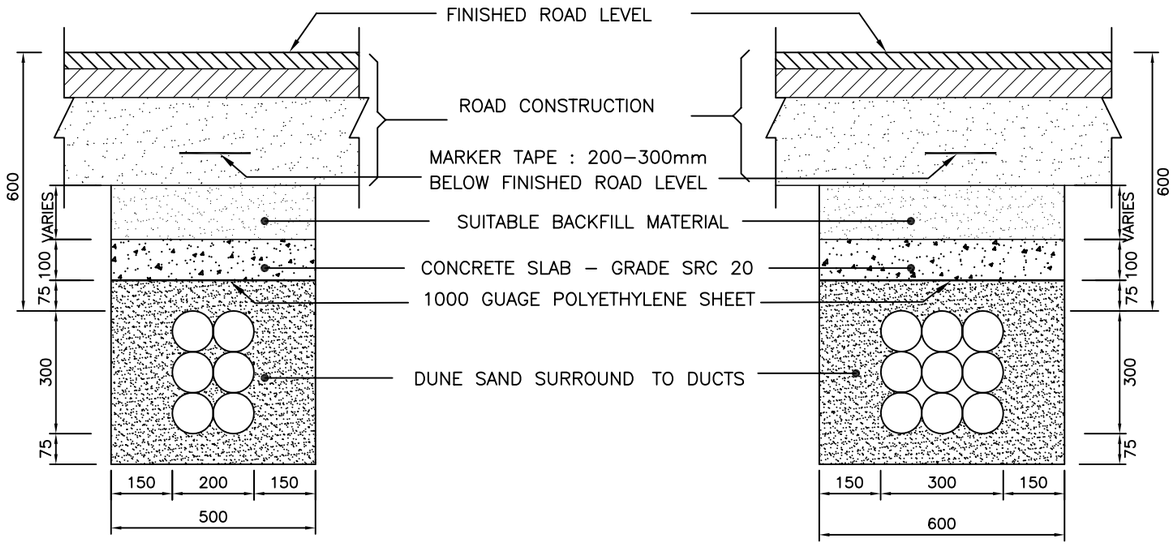
2 WAY DUCT (D54)

IN UNMADE CARRIAGE WAY



4 WAY DUCT (D54)

IN UNMADE CARRIAGE WAY



6 WAY DUCT (D54)

IN UNMADE CARRIAGE WAY

9 WAY DUCT (D54)

IN UNMADE CARRIAGE WAY

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2. ALL WORKS TO BE CARRIED OUT AS PER Ooredoo STANDARDS & SPECIFICATION.
3. ALL DUCT ROUTE TO BE APPROVED BY Ooredoo SUPERVISOR PRIOR TO EXCAVATION.
4. SIDE OF TRENCH SHALL BE VERTICAL AND ADEQUATELY SUPPORTED ALL THE TIME.
5. WHERE DUCTS ARE LAID UNDER CARRIAGE WAY BOTTOM OF THE TRENCH TO BE COMPACTED 95% OF MDD. OR AS APPROVED BY SUPERVISOR.
6. DRAW ROPE 6mm ø TO BE PROVIDED THROUGHOUT ALL DUCTS.
7. THE MAX. NOMINAL PARTICLE SIZE OF FILL MATERIAL SHALL BE 75mm & FREE FROM ANY UNSUITABLE MATERIALS.
8. ALL DUCTS TO BE TESTED WITH BRUSH AND MANDREL AS PER Ooredoo STANDARDS AFTER FINAL COMPACTION.
9. DRAWING No. CN 10686 TO BE FOLLOWED FOR LAYING DUCTS OVER 9 WAY.
10. CUT–BACK & REINSTATING EXISTING ASPHALT TO BE AS PER PUBLIC WORKS AUTHORITY'S (ROAD OPERATIONS & MAINTENANCE Dept.) REQUIREMENTS.
11. THIS DRAWING IS APPLICABLE ONLY TO Ooredoo DEPARTMENTAL CONTRACTORS EXICUTING WORK AT UNMADE CARRIAGE WAY.

TECHNICAL DATA FOR DUCTS		
TYPE OF DUCT	DUCT– 54D	DUCT – 56A
INTERNAL DIA.	90 mm	50 mm
WALL THICKNESS	3.25 mm	3.25 mm
MATERIAL	UPVC	UPVC
COLOR	BLACK	BLACK
STANDARD	BS 3506	BS 3506

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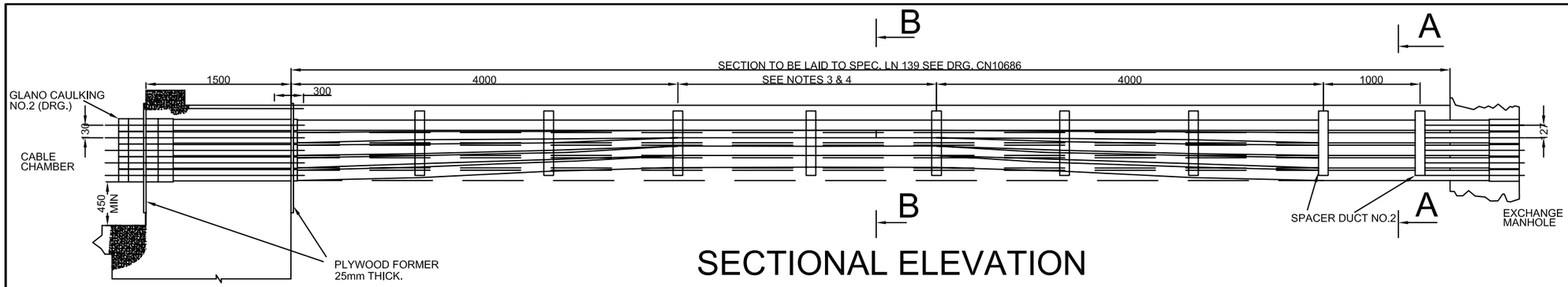
DOHA–QATAR

TITLE

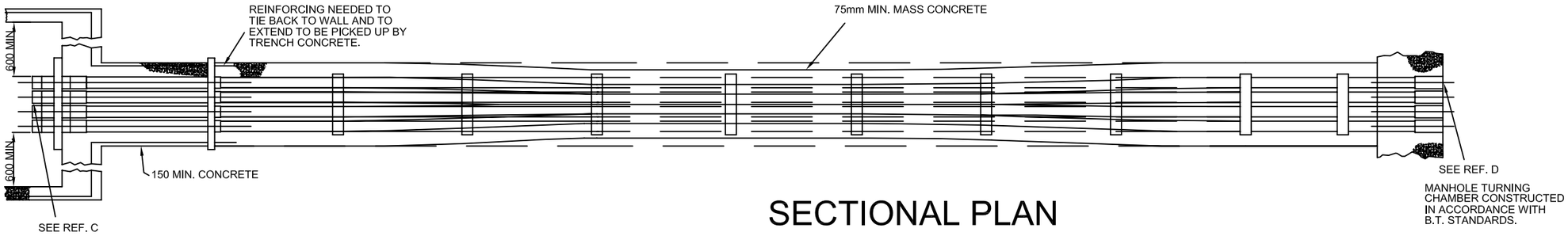
STANDARD DETAILS FOR Ooredoo DUCT LAYING UNDER UNMADE CARRIAGE WAY

(FOR Ooredoo DEPARTMENTAL USE ONLY)

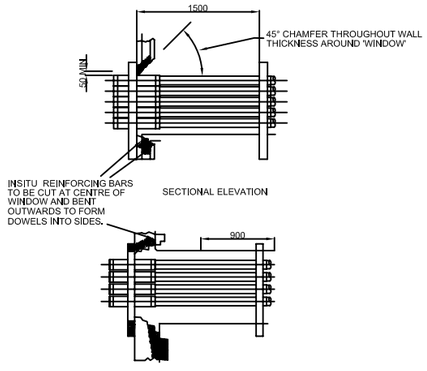
DRAWN : MOHD.RAFI	STATUS: APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE: A3
DATE : MARCH 2013	SCALE: N.T.S
DWG. NO. CN 20012	SH. 1OF1



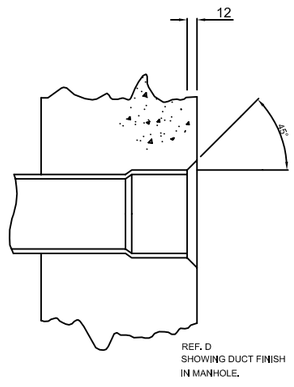
SECTIONAL ELEVATION

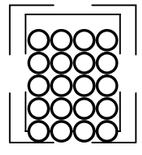


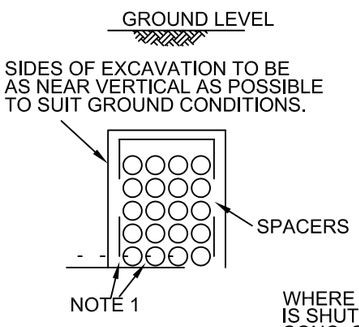
SECTIONAL PLAN



SECTIONAL PLAN
ALTERNATIVE FOR EXISTING EXCHANGES.

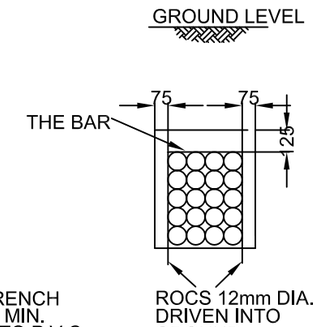




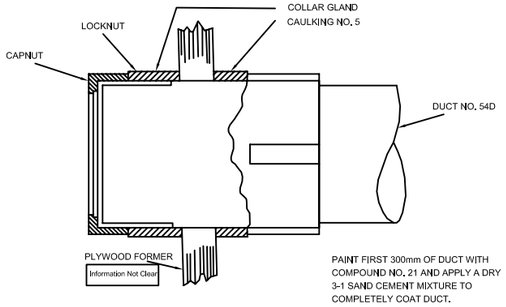


SECTION A-A

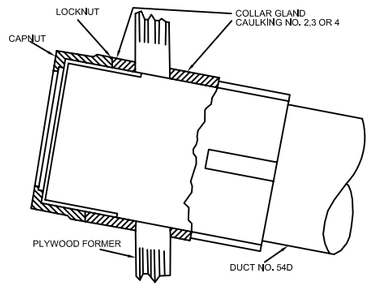
WHERE THE TRENCH IS SHUTTERED MIN. CONC. COVER TO P.V.C DUCTS. TO BE 75mm.



SECTION B-B



REF. C



ARRANGEMENT FOR ANGLED LEAD IN.

NOTES:

1.SEE SHEET2 FOR NEW BUILDING SEE SHEET 3.

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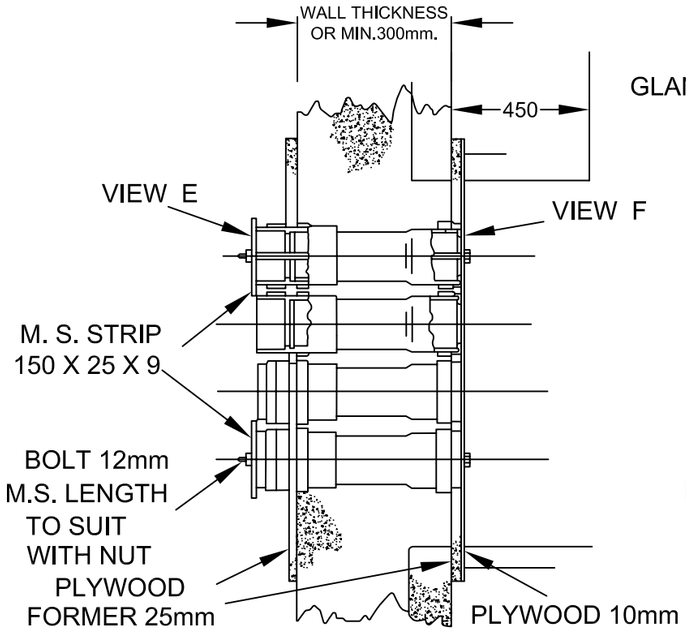
TITLE

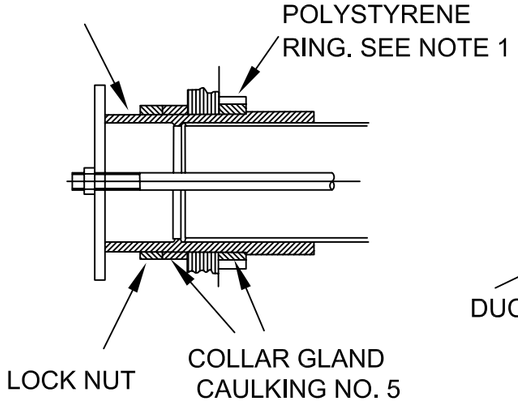
EXCHANGE LEAD IN USING DUCT No.54D

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : VARIES
DWG. NO. CN 10836	SH. 1OF2

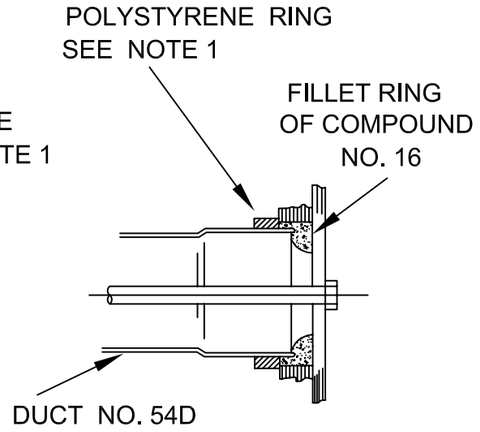


SECTION OF DUCT SEAL

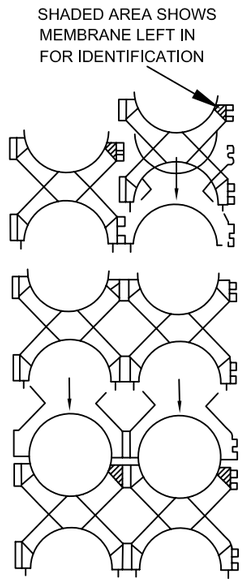
ALTERNATE METHOD TO SHEET 1-2



ENLARGED VIEW E

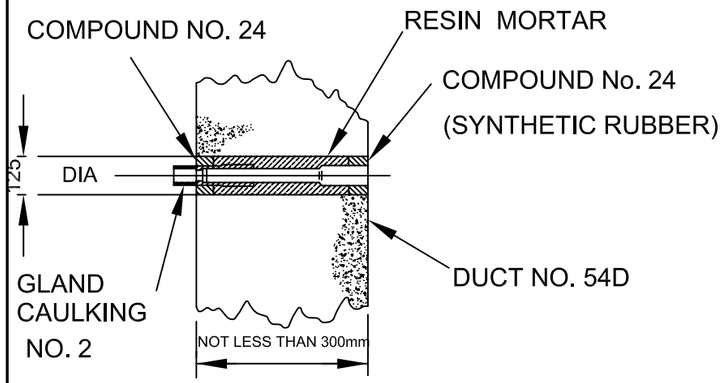


ENLARGED VIEW F



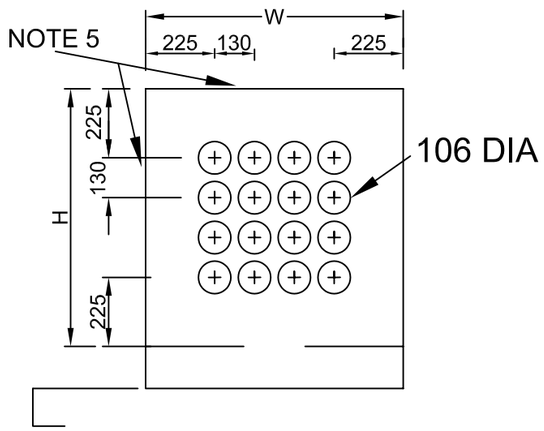
METHOD OF INTERLOCKING SPACERS DUCT NO. 2

SEE DRG CN10617



DIAMOND DRILLED HOLE FOR INDIVIDUAL DUCT ENTRIES.

SEE NOTE 2



PLYWOOD FORMER
W B P MULTIPLY 25mm THICK.

MATERIAL :-
NUMBER OFF :- 2 CUT TOGETHER
DRILL R/F HOLES IN OUTER SHEET

NUMBER OF WAYS		DIMENSIONS	
		W	H
1	(1W X 1H)	450	450
2	(2W X 1H)	580	450
4	(2W X 2H)	580	580
6	(2W X 3H)	580	710
9	(3W X 3H)	710	710
12	(3W X 4H)	710	840
18	(3W X 6H)	710	1100
20	(4W X 5H)	840	970
24	(4W X 6H)	840	1100
28	(4W X 7H)	840	1230
30	(5W X 6H)	970	1100
35	(5W X 7H)	970	1230
40	(5W X 8H)	970	1360
45	(5W X 9H)	970	1490
50	(5W X 10H)	970	1620

FIXING HOLE ARRANGEMENT

NOTES:

1. THE CONCRETE FILLING THE TRENCH & BETWEEN THE DUCTS IS TO BE DEPOSITED PROGRESSIVELY & EVENLY ALONG BOTH SIDES - NOT MORE THAN 2 - 3 DUCTS IN DEPTH AT A TIME & MUST BE PLACED & COMPACTED IN SUCH A MANNER AS TO AVOID UNEQUAL PRESSURE ON THE PVC DUCTS. THE POLYSTYRENE & INNER COLLARS ARE LATER REMOVED AND THE EXPOSED RECESSES FILLED WITH SYNTHETIC RUBBER SEALING COMPOUND. THE VIBRATOR SHOULD NOT BE ALLOWED TO TOUCH THE DUCT.
2. WHERE ONLY A SMALL NUMBER OF DUCTS ARE CONCERNED IT MAY BE PREFERABLE TO HAVE 125mm HOLES DIAMOND DRILLED IN THE WALL AT 150mm ERS AND INSTALL GLANDS, CAULKING AND DUCTS INTO HOLES WITH RESIN MORTAR TO WITHIN 25mm OF THE WALL SURFACES. THE RESULTING RECESSES SHALL BE FILLED WITH . SYNTHETIC RUBBER.SEE NOTE 6
3. IF DISTANCE FROM M/H TO CABLE CHAMBER IS LESS THAN 13.5m OPEN CONSTRUCTION MAY BE USED THROUGHOUT AS SHOWN IN DOTTED LINES, WITH SPACERS AT 1000mm.
4. IF DISTANCE ABOVE IS GREATER THAN 13.5mm. THE TOP ROW OF DUCTS SHOULD BE LAYED WITH THE LEAST DEPTH OF COVER CONSISTENT WITH LOCAL OR OTHER ENGINEERING REQUIREMENTS. THECOVER ROWS SHALL RISE SO THAT, OVER THE DISTANCE OF APPROX 5m BETWEEN POINTS FROM THE CABLE CHAMBER WALL & FROM THE M/H WALL . THE DUCTS ARE MADE TO TOUCH ADJACENT DUCTS.
5. IF THE ALTERNATIVE METHOD IS USED THE CENTRE TO CENTRE MEASUREMENTS ARE INCREASED TO 150MM & DIMENSIONS G&H INCREASED ACCORDINGLY.
6. AN APPROVED SYNTHETIC RUBBER IS "SILICONE SEALANT A" AND ASSOCIATED PRIMER FROM SIGMA SEALANTS LTD, BUCKINGHAM.
7. WALL THICKNESS TO BE ADVISED BY ARCHITECT.

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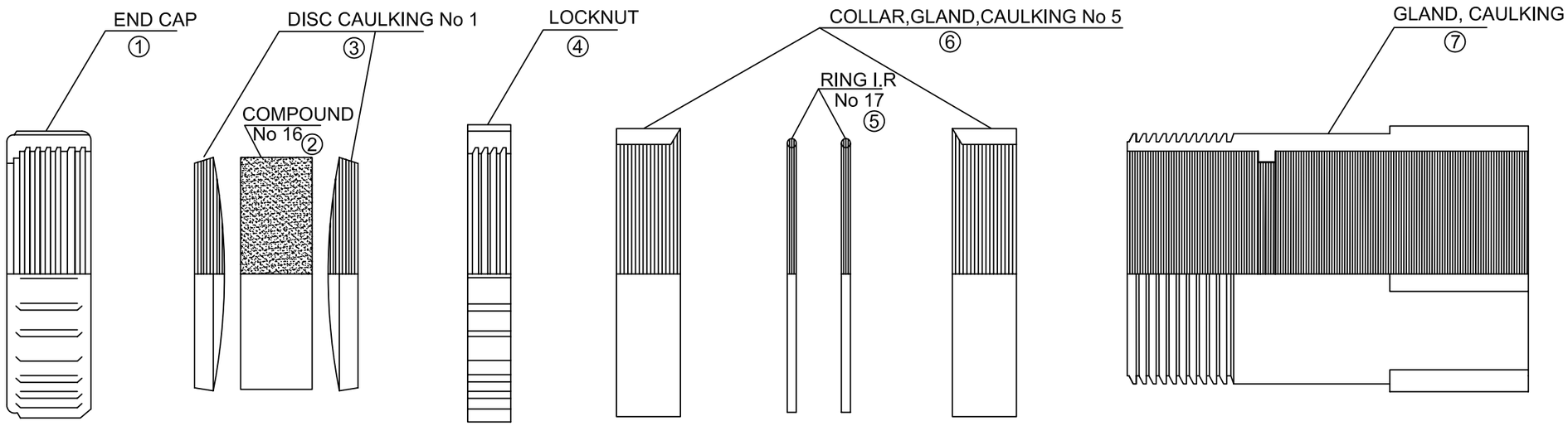
DOHA–QATAR

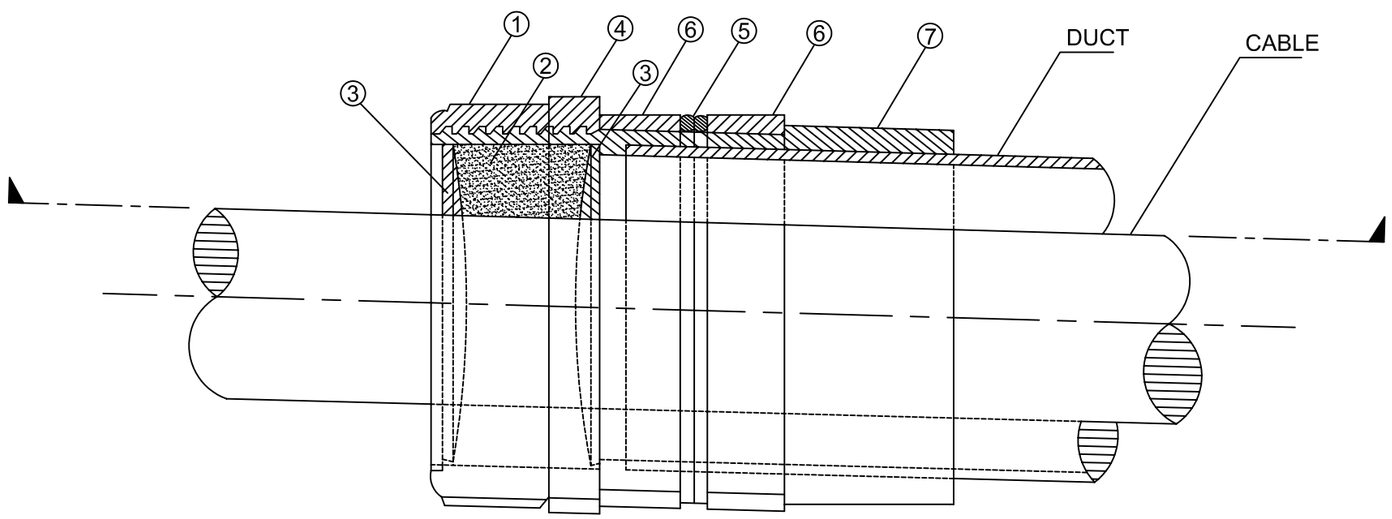
TITLE

EXCHANGE LEAD IN USING
DUCT No. 54D

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1 : 20
DWG. NO. CN 10836	SH. 2OF2

THIRD ANGLE PROJECTION





NOTES:

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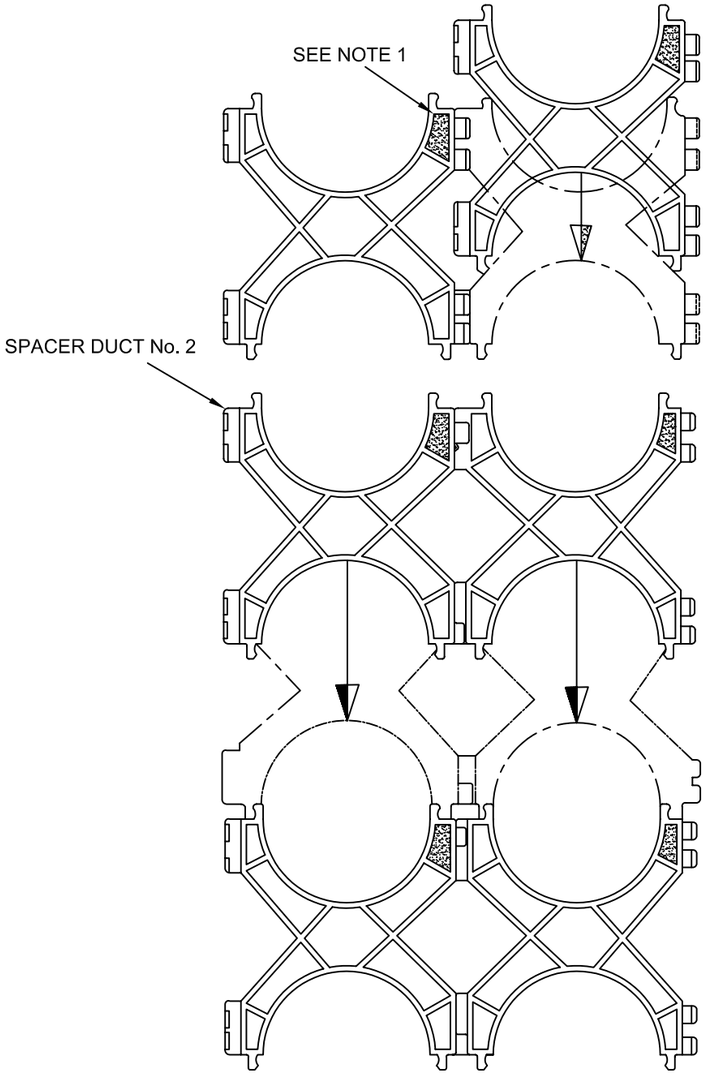
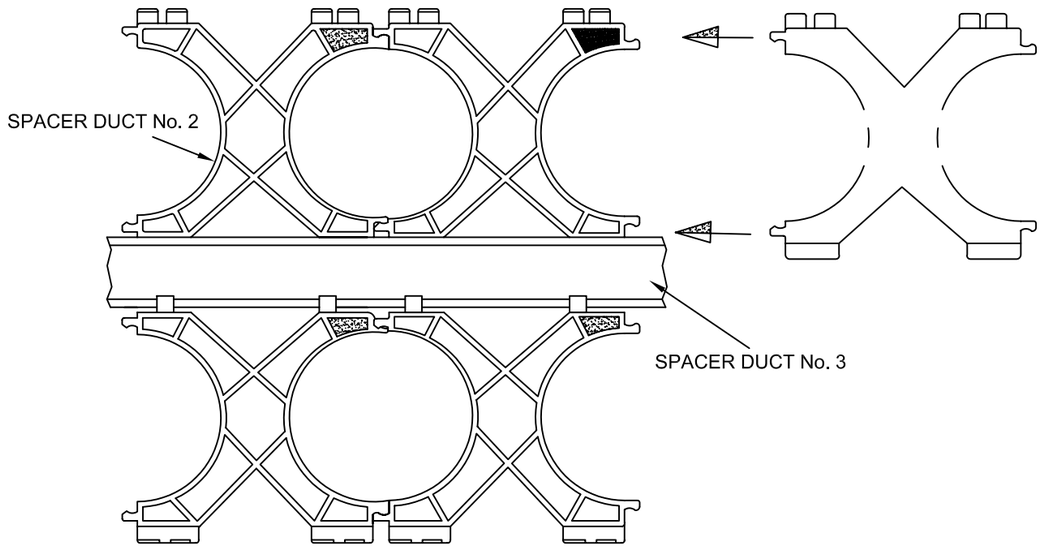
TITLE

PVC DUCT SEALS ASSEMBLY & FITTING OF GLAND FOR DUCT ENTRIES

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:30
DWG. NO. CN 1890	SHEET 2A



USING SPACER DUCT No. 2 (NOTE 2)



USING SPACER DUCTS Nos. 2 & 3 (NOTE 3)

NOTES:

1) SHADED AREA SHOWS MEMBRANE LEFT IN FOR IDENTIFICATION.

2) WHEN JOINING SPACERS NO. 2 TOGETHER JOIN IN HORIZONTAL ROWS. PLACE ONE ROW IN POSITION OVER BOTTOM ROW OF DUCTS LAY SECOND ROW OF DUCTS, PUSH NEXT ROW DOWN TO CLIP ON TO PREVIOUS ROW

3) WHEN USING SPACERS NO. 3 TO INCREASE THE CENTRE TO CENTRE SPACING BETWEEN SPACERS NO. 2, THE LATTER ARE USED ON THEIR SIDES.THE FORMATION MAY BE MADE UP AT GROUND LEVEL & LOWERED INTO THE TRENCH OR ALTERNATIVELY CONSTRUCTED IN THE TRENCH BY BUILDING UP EACH VERTICAL ROW OF DUCTS IN SUCCESSION WITH THEIR ADJACENT SPACERS NOS. 2 & 3.

4) THE SPACING BETWEEN ADJACENT DUCTS HELD APART BY SPACER NO. 2 IS 31.5mm. AN ADDITIONAL 25mm IS OBTAINED WITH A SPACER DUCT NO. 3, WHICH SHOULD NOT BE USED IN MULTIPLES OF MORE THAN 3 JOINED TOGETHER.

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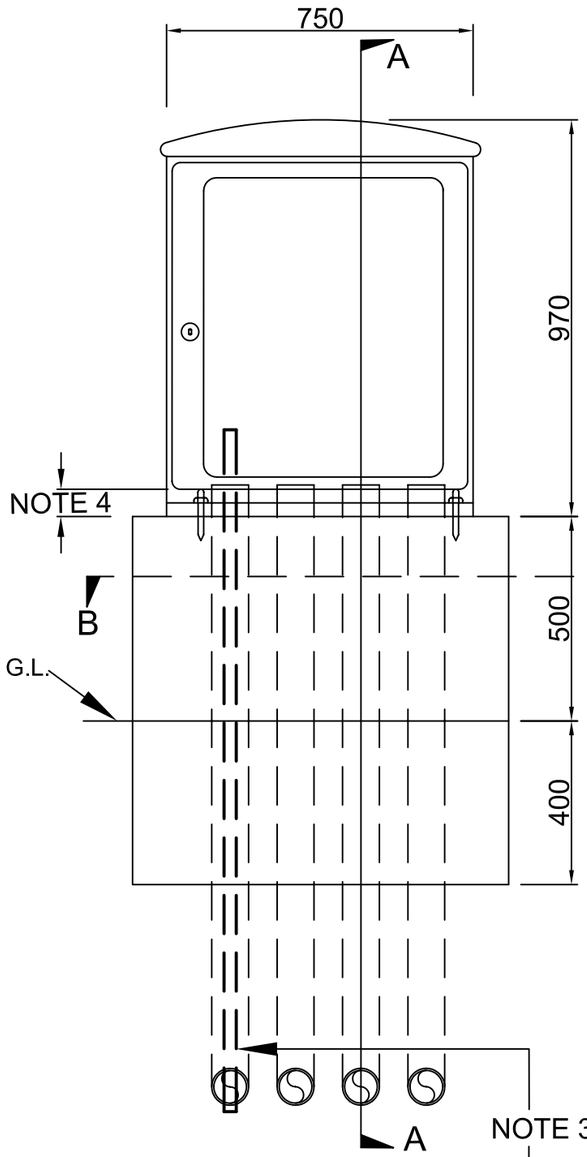
DOHA–QATAR

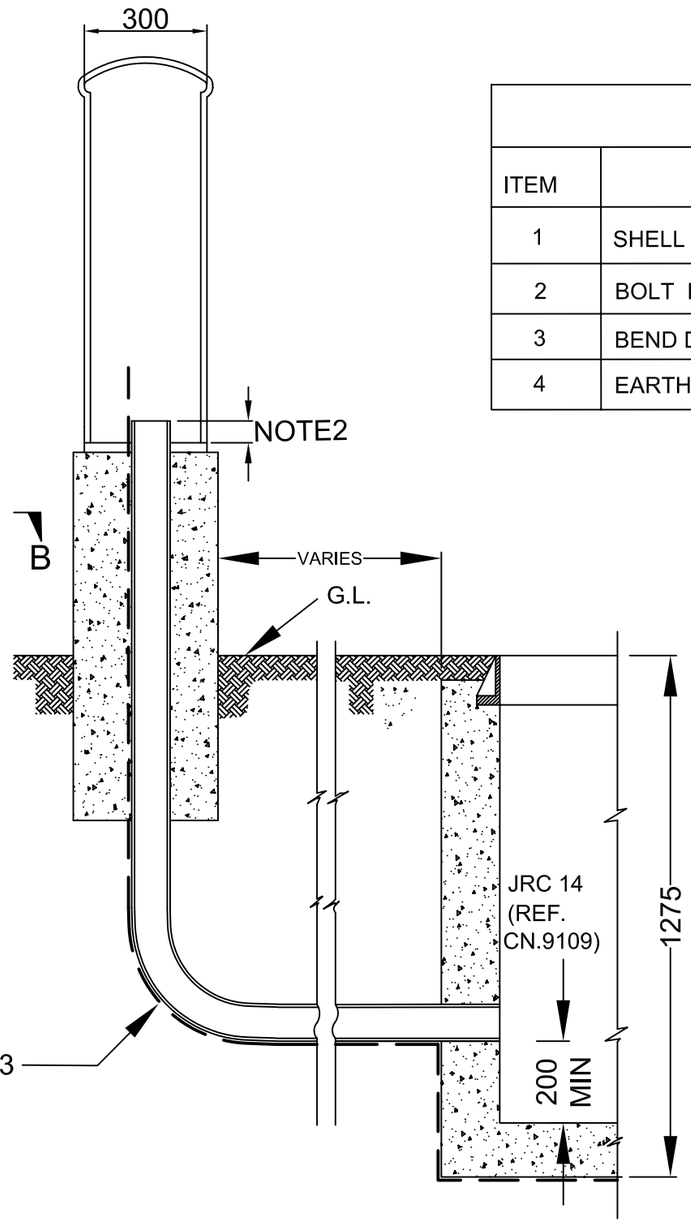
TITLE

SPACERS DUCT Nos. 2 & 3 METHOD OF INTERLOCKING

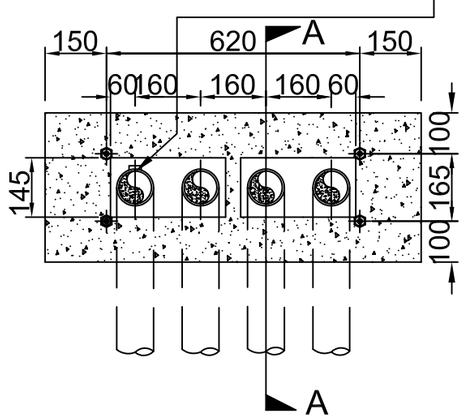
DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1:35
DWG. NO. CN 10617	SH. 1OF1



FRONT ELEVATION



SECTION A-A



SECTIONAL PLAN B - B

SCHEDULE		
ITEM	DESCRIPTION	NO.
1	SHELL KRONE CABINET	1
2	BOLT FOUNDATION INDENTED No. 1	4
3	BEND D54A	4
4	EARTHING STRIP,COPPER	1

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS.
2. DUCTS TO BE LEFT PROTRUDING. 70-100mm. ABOVE BASE CONCRETE LEVEL DURING CIVIL CONSTRUCTION & LATER CUT TO A SUITABLE HEIGHT BY Ooredoo EXTERNAL WORK STAFF.
3. 30 X 3 COPPER STRIP TO BE LAID DURING CONSTRUCTION AND UNDER BASE OF CABINET JOINT BOX TO ENTER THE CABINET, LEAVING APPROXIMATELY 150mm PROTRUDING.
4. BOLTS TO BE PROTRUDING 70mm ABOVE CONCRETE TOP.
5. DUCT ENTRY TO JOINT BOX CAN BE VARIED AS 1X4 OR 2X2, ACCORDING TO SITE CONDITION.

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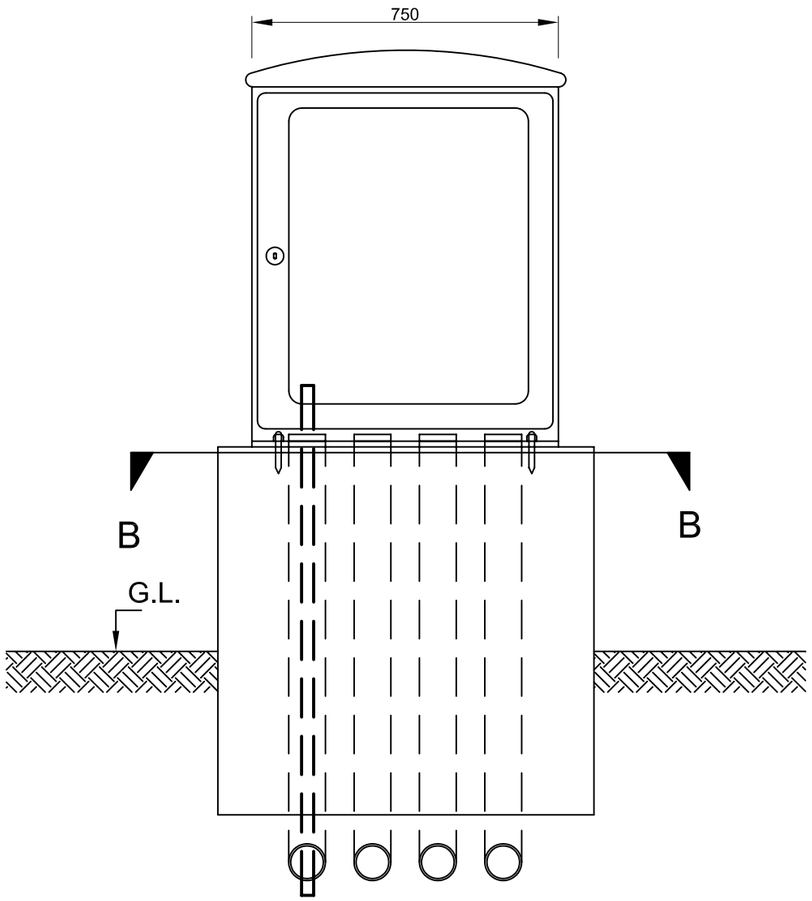
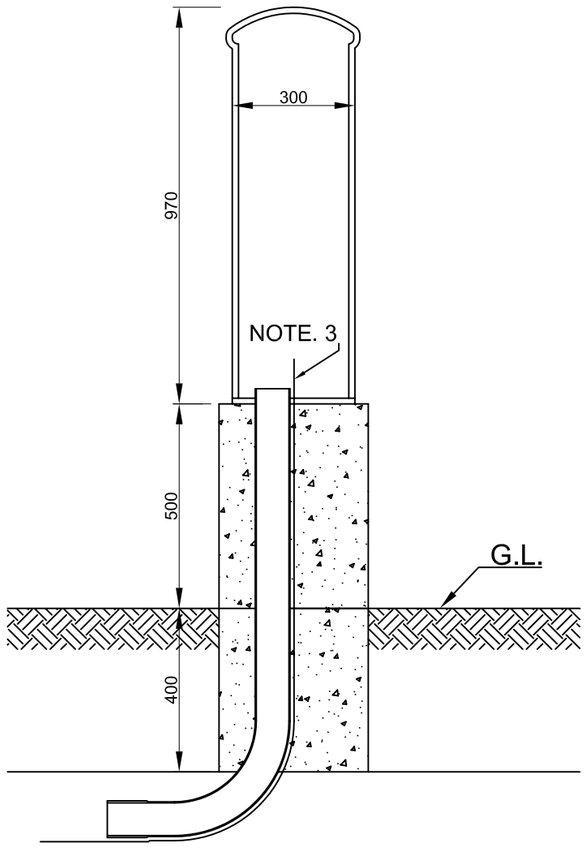
TITLE

BASE FOR KRONE CABINET

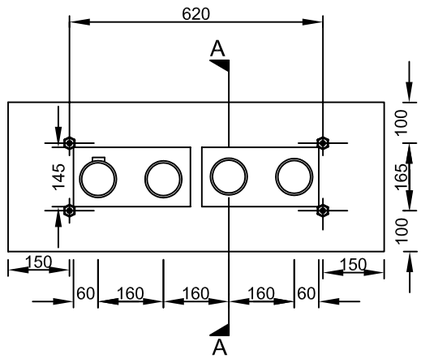
DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1: 15
DWG. NO. CN 1465 A	SH. 1OF2



FRONT ELEVATION



SECTIONAL SIDE ELEVATION A - A



SECTIONAL PLAN B - B

SCHEDULE		
ITEM	DESCRIPTION	NO. OFF.
1	SHELL KRONE CABINET	1
2	BOLT FOUNDATION INDENTED NO. 1	4
3	BEND D54 A	4
4	EARTHING STRIP COPPER	1

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS.
2. DUCTS TO BE LEFT PROTRUDING. 70-100mm. ABOVE BASE CONCRETE LEVEL DURING CIVIL CONSTRUCTION & LATER CUT TO A SUITABLE HEIGHT BY Ooredoo EXTERNAL WORK STAFF.
3. 30 X 3 COPPER STRIP TO BE LAID DURING CONSTRUCTION AND UNDER BASE OF CABINET JOINT BOX TO ENTER THE CABINET, LEAVING APPROXIMATELY 150mm PROTRUDING.
4. BOLTS TO BE PROTRUDING 70mm ABOVE CONCRETE TOP.
5. DUCT ENTRY TO JOINT BOX CAN BE VARIED AS 1X4 OR 2X2, ACCORDING TO SITE CONDITION.

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TITLE

BASE FOR KRONE CABINET

DRAWN : MOHD.RAFI	STATUS:APPROVED FOR CONSTRUCTION
CHECKED : CIVIL WORKS UNIT	ORGINAL DWG. SIZE : A3
DATE : MARCH 2013	SCALE : 1: 15
DWG. NO. CN 1465 A	SH. 2OF2