

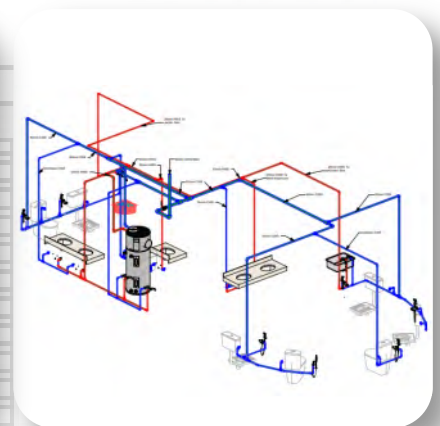
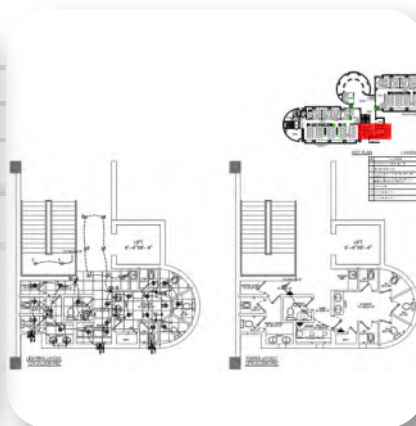
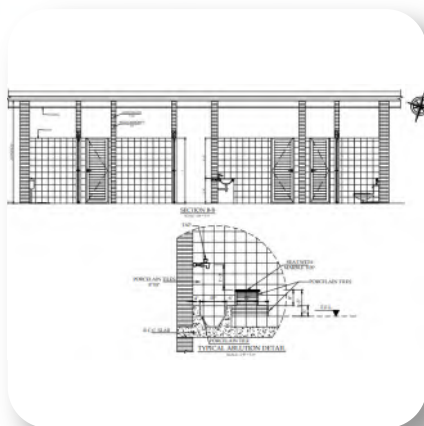
# BIDDING DOCUMENTS FOR RENNOVATION OF WASHROOMS OF PRCL (VOLUME IV)

NOVEMBER-2023



**PAKISTAN REINSURANCE COMPANY LIMITED**

## ENGINEERING CONSULTANCY SERVICES FOR RENOVATION OF PRCL OFFICE BUILDING AT KARACHI



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## SECTION – G PLUMBING WORKS – GENERAL

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### G – 1 GENERAL

The stipulated there in the direction as given below shall invariably be read with Section of the Special Provision of the Contract.

The materials used and workmanship shall be of highest quality and grade and shall conform to the latest specifications of British Standards and Codes of Practice "Water Supply", "Sanitary Pipe Work", "Building Drainage", Surface "Water and Sub-Soil Drainage" and applicable to details and work indicated on the Drawings and Bill of Quantities or otherwise approved.

### G – 2 DRAWINGS AND INFORMATION REQUIRED

- a) The Contractor shall submit shop drawings for the entire installation including installation details for all items required or asked for approval of the Consultants.
- b) Approval by the Consultants of shop drawing for any material, apparatus, devices and layout, shall not relieve the Contractor from the responsibility of furnishing same of proper dimension, size, quantity and all performance characteristic to efficiently perform the requirements and intent of the Contract Documents. Such approval shall not relieve the Contractor from responsibility for errors of any sort in the shop drawing.
- c) If the shop drawings deviate from the Contract Documents the Contractor shall advise the Consultants of the deviations in writing accompanying the shop drawings including the reasons for the deviations. At the start of the Project the Contractor shall periodically and thereafter submit to the Consultants a list of all shop drawings which will be submitted in the course of the project. The list shall show the disposition of each item including date of submission approval etc. The list shall be kept upto date through the entire course of construction.

### G – 3 CLEANING AND PROTECTION:

- a) The Contractor shall be responsible for his work until its completion and final acceptance, and shall replace any of the same which may be damaged, lost or stolen without any additional cost to the Owner.
- b) The openings left in floor for passage of lines of soil waste, vent and supply pipes shall be covered and protected.
- c) The pipes shall be protected with suitable covering as soon as set. All open ends of pipes shall be closed by a plug fitting to prevent obstruction and damage. The use of new permanent water closets and other new plumbing fixtures during the progress of work is prohibited.
- d) As soon as installed, all metal fixtures trimmings shall be thoroughly conversed by this Contractor with non-corrosive grease which shall be maintained until all construction work is completed.
- e) Upon the completion of the work, all fixtures and trimmings shall be thoroughly cleaned and polished and left in first class condition.
- f) Prior to delivering the plant to the Owner the Contractor shall thoroughly clean all equipment fixtures, fittings etc.
- g) Before final connections are made and before operation of equipment and piping, all piping interior shall be thoroughly blow out, or washed out at least twice in a manner as directed by the Consultants remove all accumulation of dirt chips or other deleterious materials. Make all temporary connections and furnish al appliance required for the purpose of cleaning at no extra expense to the Owner.
- h) Before erection, all pipes, tubing, valves and fittings shall be thoroughly cleaned of oil, grease or other combustible materials by washing in a hot solution of sodium carbonate or trisodium phosphate mixed on the proportions of one pond to three gallons of water.

### G – 5 RECORD DRAWING

- a) During construction the Contractor shall keep an accurate record of all deviations between the work as shown on the Contract Drawings and that which is actually installed.
- b) The Contract shall secure from the Consultants after approval of his Shop Drawings a complete set of drawings and note changes thereon in ink
- c) The Contractor shall make a complete record of all changes and revisions in the original design which exist in the completed work.

The cost of furnishing above prints and preparing these for record "shall be deemed to be included in the tendered cost and its effect spread over other items of work, and as such item shall not be a subject to payment "When all revisions showing the work as finally installed are made, the corrected Original Transparencies shall be submitted to the Consultants for review and delivered to the Engineer before final payment for the completed work will be made.





## **G – 5 OPERATING AND MAINTENANCE INSTRUCTIONS**

Three sets of operating and maintenance instruction covering completely the operation and maintenance of all plumbing equipment, controls, heaters, pumps and the like shall be furnished to the Owners.

## **G – 6 INSPECTION AND TESTING OF WATER MAINS AND WATER SUPPLY SYSTEMS**

The Main should be tested in sections as the work of laying proceeds and joints should be left exposed for inspection during testing. After completion of each section, the main should be carefully and solely charged with water so that all air is expelled, allowed to stand full of water for 1 – 2 days if possible and then tested under pressure plus 50% whichever is the greater.

The pressure should be applied by means of a manually operated test pump or, in case of long mains or mains of large diameter, by a power-driven test pump provided that the pump is not left unattended. Precaution must always be taken to see that in test pressure is not exceeded. Pressure gauges must be accurate and if necessary, should be re-calibrated before the test.

After the pump has been stopped, the test pressure should be maintained as long as is necessary to inspect the whole of the pipe work under test and in any event not less than half-an-hour. Open ends of mains should be temporarily closed for testing under moderate pressure by fitting watertight expanding plugs. The end of the main and any test plug must be well secured to resist the end thrust of the water pressure in the main, i.e. maximum test pressure x cross sectional area of pipe. If the section of main terminates with a sluice valve, the wedge of the valve should never be used to retain the water because this might lead to permanent distortion of the working parts of the valve. Instead, the valve should be fitted with a blank flange or socket plug and the valve left in the open position whilst testing. End support should be provided as explained previously.

### **Cold Water Systems**

When the installations are complete, they should be slowly and carefully charged with water, allowing all air to escape thus avoiding shock or water hammer. The system should be inspected under working conditions of pressure and flow and when all draw off taps are closed, should be absolutely watertight. Each draw off tap should be opened and tested for rate of flow. Certain specifying authorities may require pressure testing of internal pipe work in which case, systems should be tested in accordance with the pressure test previously described. In such cases it may be necessary to isolate items of equipment from the pressure test if they are not capable of withstanding the test pressure. Where these items are removed, blanking flanges or plugs must be used or a make-up piece of pipe work installed temporarily.

All piping, fitting and appliances should be inspected and checked for satisfactory support and protection from physical damage corrosion and frost.

Because of the possibility of damage in transit, it is always advisable to re-test cisterns, tanks and cylinders for water-tightness on arrival at site and before fixing.

### **Hot Water Systems**

Hot water systems should be thoroughly flushed out and then tested in the same manner as described for cold water systems. Where thermal insulation is used, the hydraulic test should be made before the insulation work is completed and whilst all joints are exposed.

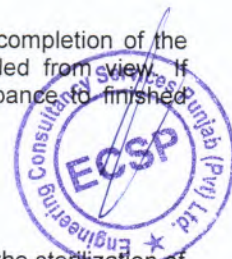
Where a pressure test is employed, boiler and clarifier relief valves should be removed and these valves should be tested later. The test pressure should be one and half times the normal working pressure and this should be maintained for thirty minutes after making good any leaks.

It is necessary to carry out the hydraulic pressure test on sections of pipe work prior to completion of the whole installation where these are fixed in ducts, chases, trenches, etc. and are concealed from view. If rectification of faulty materials or workmanship on such sections is likely to involve disturbance to finished structural features, the test pressure should be twice the normal working pressure.

### **Sterilization of Cold-Water Systems**

The whole of the system should be sterilized to eliminate possible traces of bacteria. Sterilization of public water mains is carried out by the Water Authority who may also carry out the sterilization of new private mains. Where this is not standard practice, the plumbing contractor should carry out the sterilizing process as described below.

After cleaning the cistern of all debris, the cistern and pipe work should be filled with water and the whole thoroughly flushed out. The system should be then filled with water a second time, but as the cistern is filled, sterilizing chemical containing chlorine should be added to ensure thorough mixing of the chemical and water. If





ordinary bleaching powder is used, the proportion should be 150g of powder to 1000 liters of water, the powder first being mixed with water to creamy consistency before being added. Proprietary brands of sterilizing chemicals should be added in the proportions as instructed by the manufacturers.

After filling the system, the incoming water supply should be shut off and each tap on the distributing pipes opened successively, starting with that nearest the cistern. As the water which issues from each tap begins to smell of chlorine, the tap should be closed. The cistern should then be filled again to water-line with water to which has been added the correct dose of chemical.

The whole system should be allowed to stand charged with treated water for a period of at least 3 hours, after which a test should be made by smell for residual chlorine. If none is found, the sterilization should be repeated. Before any water is used for domestic purposes, the whole system must be emptied and thoroughly flushed out with clean water.





## SECTION – 1 WATER SUPPLY WORK (G.I WORK)

### 1.1 DESCRIPTION

Work in this section shall include supply and installation of all the G.I pipe work up to 6" (150 mm) including all material, plants, equipment, labour etc. to complete the work in closed conformity with the plans and in accordance with the provisions included herein.

### 1.2 MATERIAL REQUIREMENTS

All un-installed pipes and fittings used in the building work whether hidden in block/concrete work or running underground shall be of Galvanized Iron hot dipped in bitumen, wrapped around with bituminous Hessian with final two coats of brush applied bitumen.

It shall be insured that the fittings shall be tested by jointing at least 5% of them to straight pipes in pipe vices with sufficient pressure, to the satisfaction of the Engineer. Defective fittings invariably crack on application of the pressure. The fittings shall also be examined to detect blisters and minor cracks. The G.I pipe, fittings and specials shall conform to the following specifications: -

- a) **G.I Pipe**
- BS – 1387: Class – M
  - Test Pressure = 700 psi
- b) Malleable Iron (Galvanized Fittings (i.e. coupling, elbows, Tees etc.) for G.I Pipes 2 – 1/2" and below shall be of at least same thickness and quality a G.I Pipe.
- c) Cast Iron threaded flanges for joining G.I Pipe of dia 3" and above.
- BS-10: 1962, Table D.
- d) Cast Iron flanged fittings, for G.I. pipe 3" and above.
- BS-2035, 1953: Class-B
  - Working Pressure = 400 ft. of water.
- e) Expansion Joints in G. I. Pipes.
- Adequate provision for expansion shall be provided on all pipe work as shown on the drawings. The contractor shall obtain the Engineer's approval for the materials being used for a particular expansion joint. Expansion loop for Horizontal G. I. Pipe of dia. 3" or below.
- f) Cast Iron Sluice Valve (size 3" and above)
- Cast Iron body; Gummetal spindle and sealing rings.
  - BS-3464, flange to BS-10; 1962
  - Test Pressure = 225 psi.
- g) Copper alloy sluice valve (size 2 – 1/2" and below)
- BS – 1952; threaded ends.
  - Test Pressure = 225 psi
- h) Cast Iron Check Valve (Size 3" and above)
- Cast Iron body; Gummetal door.
  - Test Pressure = 225psi.
- i) Copper Alloy Check Valve (Size 2 – 1/2" and below). Threaded ends.
- Test Pressure = 225 psi.
- C.I. globe valves (Size 2 – 1/2" and above). Similar to Cast Iron Sluice Valve.
- Copper alloy globe valve (Size 2 – 1/2" and below). Threaded, Test Pressure = 225 psi.

#### Fire Hydrant

Shall conform to BS; 750, with a body of Cast Iron and spindle of Manageness-bronze. The direction of closing shall be by Clock wise rotation and the outlet shall have screwed joints for accommodating 2 – 1/2" dia. hose connection.

#### Double Air Valve

Cast Iron body

Max. Working head.

Din	2	3	4	6
(in).				
Head				
(ft).	200	575	575	575

#### Pressure Reducing Valve

The valve shall maintain a constant downstream pressure regardless of changing flow rate and/or varying inlet pressures. It shall be spring loaded, hydraulically operated, pilot-controlled diaphragm-type globe valve. The valve shall have a single removable seat and seat and resilient disc. The body and cover of the valve shall be of cast iron for valves of size 3" or above and shall be of cast bronze for size 2 – 1/2" or below. The inlet and outlet of valve shall be threaded for size 2 – 1/2" or below and flanged for sizes 3" or above. The working pressure for valve shall be 175 psi minimum and the valve permit a convenient adjustment over a range of no less than 30 psi. The threaded valve shall be





installed with two unicons at its inlet and outlet end of facilitate its removal. All pressure reducing valve assemblies will be installed with bypass line having globe valve/gate valves so that removal of P.R. Valve for servicing/repair will not disturb the service of that circuit.

#### **Strainer**

The straight cast iron strainer shall be installed on the submerged end of suction pipe drawing water from ground water from reservoir. The strainer flange shall conform to the specifications of BS 10, 1962. Minimum length of strainer for the specified dia. shall be as follows: -

<b>Din</b>	<b>Length.</b>
3"	5 – 11/16
5"	7 – 1/2"

The strainers shall have cast iron or bronze bodies suitable to withstand the working pressure, removable screens of copper, brass, nickel or stainless steel, flanged bodies with tapings for size 1 – 2/2" and above and of such a design as to allow blowing out of accumulated dirt and easy removal and replacement of strainer screen without disconnecting the main piping.

#### **Puddle Plates**

Puddle plates of specified dia, shall be provided where G.I pipe crosses R.C.C. wall retaining water or soil. 3/8" thick M.S. square plate of size shown on plan. Cut with hole equal to external dia. of pipe, shall be welded with the pipe with both ends of G.I. pipe provided with flanges, and the whole assembly shall be hot-dipped galvanized before being cast in R.C.C wall.

#### **Float Valve, Level Controller, Flow Switch**

Tender to provide Specifications of items locally available.

##### **a) Float Valve**

The float valve shall be direct float operated valve having globe body. The valve shall close drop-tight, at pre-set maximum water level, against pressures of upto 70 psi and shall open and close in direct proportion to rise or fall of water level.

The valve shall be of all brass construction with copper float and replaceable rubber seat and shall be furnished with threaded inlet and outlet ports for sizes 1 – 1/2" and below. For sizes 3" and above, the valve body shall be of cast iron with copper float, replaceable rubber seat and flanged ends.

The space available for the float valve, above, maximum water level and location of valves shall be as shown in the Plans.

##### **b) Liquid Level Controller**

Liquid Level Controller, (float less type) comprising of control unit (if dual tank system) probe fittings complete with the electrodes and electrode holders suitable for operation on the Single Phase, 240V, 50 Hz supply shall be employed wherever shown on the Plans. The controller shall have built in surge arrestor. There guaranteed electrical life of the controller shall be 5x50000o operations minimum and the minimum tolerance of the rated voltage shall be + 15%.

##### **r) Pipe Sleeves for Iron Pipes**

The Contractor shall supply and install the pipe sleeves in partition walls, RCC walls, slabs and other structural elements slabs. The pipe sleeves shall be located accurately and they shall be properly aligned and tied with the reinforcement bars so that the alignment and level is not disturbed during construction.

The RCC wall pipe sleeves shall be fabricated from correct size Schedule 40 M.S. pipe. M.S. 3/8" thick sheet ring of sleeve size +6" shall be welded at the center line sleeve shall be heavily galvanized before installation. The inner galvanized surface shall be smooth.

RCC slab pipe sleeves shall be of construction as above but fabricated from 3", 4", 5" and 8" dia Schedule 40 M.S. pipes and anchor ring shall be of 9-1/2", 10-1/2" 11-1/2" and 14-1/2" dia respectively.

##### **u) Pipe Seal for Cast Iron Pipes.**

All exterior openings provided for the passage of piping shall be properly sealed with snugly fitting collars of metal or other approved rat-proof material securely fastened into place.

### **1.3**

## **CONSTRUCTION REQUIREMENTS**

### **1.4**

## **EXCAVATION & REFILLING OF TRENCHES FOR PIPE WORK**

The trenches shall be set out to suit alignment of the pipe lines. The trenches shall be carefully trimmed at sides and bottom compacted so that pipe lines when laid shall rest on the natural bed throughout the length. Shallow joint holes being left for the joint, where necessary. Where pipe line is to be laid in plains the depth of Cover, i.e. the normal distance from ground level to other top of the pipe be kept at about 80 cm (2'-9") and shall not be less than 75 cm (2'-6") except due to special reasons the Engineer directs in writhing to the contrary. The maximum depth of trench shall be taken as shown under:





I  
For pipes upto &  
Including 38 mm

II  
For pipes 50 mm  
to 75 mm (2" to 3')

III  
For pipes over  
75 mm (3") dia

50 cm Depth  
(20")

50 cm Depth  
(22")

60 cm Depth  
(24")

After the pipes have been laid, jointed and tested and proved to be water tight the trench will be filled in 15 cm (6") layers compacted and watered as required. Before that 6" thick sand cushion shall be provided around the pipe.

The various materials excavated to be separated and stacked, so that in refilling they may be again related in the same order, and thus least possible damage be done to public roads, cultivated fields, etc.

## 1.5 JOINTING SCREWED JOINTS

### 1.6 LAYING & JOINTING G. I. PIPES

All screwed joints, shall be examined before jointing to ensure that the threads are perfect. In case of any flaw proper dies be used to make threads before they are jointed. The screwed ends of the pipes or specials to be jointed, shall be very slightly tapered so that as the jointed is screwed up, the threads shall bind together more and more tightly to ensure water tightness. The jointing work shall be so arranged in case of every joint that the two ends of pipes or specials jointed thereby shall be equidistant from the middle of the socket and shall have a space of not more than about a quarter of an inch between them in the center of the socket. Before any joint is made all burrs from the ends of the threaded joints shall be removed. For ensuring this purpose, hemp or jute or any material other than that described above shall no account be allowed to be used. The pipes shall be screwed up tightly with pipe fitter's tongs or wrenches to ensure that each and every joint is perfectly water tight against the test head of water.

### 1.7 FLANGES

Flanged joints shall be provided at intervals of not more than 152m (500 Ft). Each flanged joint shall be made by inserting an accurately cut disc of tough multiply rubber insertion about 3.2 mm (1/8 mm) thick of approved quality between the flanges. The bolt holes in the rubber insert as well in the flanges shall be drilled to template. The bolts and nuts for all flanged joints shall consist of British Standard mild steel, hexagonal, round and hexagonal. The bolts shall be pulled up gradually and evenly by the use of standard spanners, so as to ensure a perfect joint.

### 1.8 BENDS, TEES AND OTHER SPECIALS

Bends tees and reducers and other special shall be provided and jointed at points as shown on the drawings or as directed by the Engineer. All changes in direction shall be effected by means of bends wherever practicable and the use of elbows shall be restricted only to cases where there is no room for bends. In such cases only round elbows will be allowed.

### 1.9 TEST

All pipe lines in course of or after laying and jointing but before being covered, shall be tested hydraulically, using a test pump fitted with accurate pressure gauge to be approved by the Engineer to test pressure of at least 1.5 times their normal operating pressure. All pipes, specials and fittings with their joints shall remain perfectly water tight under the full test head for a period of not less than two hours after the whole length of the pipe line has been examined and demonstrated to be water tight.

### 1.10 PIPES ATTACHED TO WALLS OR CEILINGS

- a) Provide suitable and substantial mild steel duly enamel coated hangers and supports for all horizontal and vertical line of approved types and made special vibration eliminating and flexible hanger shall be provided for all pipe work affected by moving machinery or expansion and contraction including building expansion joints.
- b) Hot and Cold horizontal piping shall be supported in accordance with the following schedule:

	Pipe Size Spacing	Minimum Hangers	Rod Size
1-	1-1" and smaller	8 feet-0-inch	3/8"
2-	1-1/4"-2 inch	9 feet-0-inch	3/8"
3-	2-1/4" inch	10 feet-0-inch	1/2"
4-	6" and larger	12 feet-0-inch	1/2"

- c) Hanger shall be supported from approved concrete inserts in concrete slabs for all pipes 2" and above. Insert shall be as approved by the Engineer, and shall have space for nuts of all size. All inserts shall have a reinforcing rod of specified diameter to be installed through slot provided for this purpose, and





the Contractor shall be responsible for its being in place when concrete is poured. The Contractor shall place all inserts in pour for all pipes which are to be hung, in ample time to allow the Contractor for general consideration to perform his work on schedule. If any pipe has to be hung in space where no inserts have been provided, the Contractor shall drill holes from below through concrete slabs and provide rods and hangers attached to not less than two approved type expansion shield each one capable of taking full maximum load. The rods and complete hangers shall be of adequate size to support the load which they carry.

- d) Provided approved roller supports, floor stands wall brackets, masonry, etc. for all lines running above the floors, and which can be properly supported by the floors or walls. Pipe lines near walls may also be hung by hangers, carried from approved wall bracket at a higher level than the pipe.
- e) No piping shall be hung from the piping of other trades or other piping except for small water branches in toilet where no other practical means of support can be found, in which case specific approval of the installation shall be obtained from the Engineer. Hangers shall not be fastened by means of vertical expansion bolts; hanger shall be of heavy construction suitable for the size of pipe to be supported. All materials, except roller shall be a malleable iron or steel. Rollers shall be cast iron. Hanger shall be swivel split ring, wrought pipe clamp, or adjustable type or as approved.
- f) Special care shall be taken in the placing of hangers at the top, bottom and in offsets of hot water risers, so as to allow for expansion of the vertical piping. Vertical risers shall be securely supported from the building construction by means of pipe clamps at every floor, or as too short to connect to the building construction.
- g) For cast iron hub and spigot pipe and fittings hangers shall be provided on not more than 5 feet centers or a minimum of one hanger per each length of pipe. Where excessive number of fittings is installed between hangers, the Contractor shall provide additional hanger or reinforcing as required and to the satisfaction of Engineer. Securely anchor fittings to the building construction changes of direction to eliminate all horizontal movement. The Contractor shall furnish and install steel channels and angles for piping support. These supports will be required at those floors which are not slabbed over and/or where the building structure is not directly useable for pipe support.

#### **1.11 PIPES SLEEVE**

Every pipe line laid through any RCC walls, floor, ceiling or roofs shall be arranged to pass through proper hot dipped galvanized sleeve pipes as approved by the Engineer or ample diameter embedded therein to enable the pipe lines to pull easily and freely. The length of every such sleeve pipe shall be of the full width or thickness of the wall and in the case of roof, ceiling or floor, shall be at least 4cm (1-1/2") longer than the thickness thereof and shall project to that extent above the upper surface thereof unless the Engineer orders to the contrary.

#### **1.12 INSULATION FOR HOT WATER LINES**

All hot water lines shall be insulated with sectional fiber glass insulated properly wrapped by 4-ounce canvas in the approved manner and as directed by the Engineer. The hot water circulation and hot water main and branches of sizes 2" and above shall be insulated with 1-inch-thick insulation, while all other hot water pipes and fixtures branches shall have minimum thickness of 1/2" insulation.

All fiber glass insulation shall be of sectional type having a minimum density of 4 lbs. per Cft.

After insulation, buried or embedded hot water pipes and branches, shall be wrapped with bituminized Hessian with final two coats of brush applied bitumen to make the entire insulated piping totally water proof. All pipes insulation exposed to the sun shall be protected with G.I cladding.

#### **1.12 DISINFECTION FOR WATER SUPPLY**

After the testing of the pipe work has been satisfactorily completed and when approved by the Engineer, the Contractor shall disinfect the pipe lines by dispensing chlorine solution through the entire pipe network to obtain a minimum chlorine content of 50 mg/liter for a contact period of at least 30 minutes the procedure and equipment used to introduce, disperse and test the chlorine in the pipe shall be subject to approval by the Engineer.

#### **1.13 MEASUREMENT**

The pipe work 150 mm (upto 6" dia) shall be measured in running foot and no separate measurement will be done for tees, bends, elbow, unions and other fittings. Unit of measurement for pipe work shall be taken along the centerline and unit of measurement will be one linear Ft.

#### **1.14 RATE AND PAYMENT**

The rate shall include all cost of material i.e. pipe, fittings, jointing material, lubricant, sleeve pipes, hangers and clamps, fiber glass insulation and labour or every type and incidentals.





## SECTION-1-A WATER SUPPLY WORK (PPRC WORK)

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### 1.1 DESCRIPTION

Work in this section shall include 2 ½ supply and installation of all the Polydex PPRC pipe lines for cold and hot water supply work as per DIN 8077/8078 and DIN 16992 for fitting including all materials, plants, equipment, labour etc. to complete the work in close conformity with the plans and in accordance with the provisions included herein.

### 1.2 MATERIAL REQUIREMENTS

All un-installed pipes and fittings used in the building work whether hidden in block/concrete work or running underground shall be of polydex PPRC pipe lines and fitting as specified above and jointed with socket fusion method at 260 C as approved by the Engineer and as per instruction of the manufacturer. It shall be ensured that the fittings shall be tested by jointing at least 5 % of them to straight pipes in pipe vices with sufficient pressure, to the satisfaction of the Engineer. Defective fittings invariably crack on application of the pressure. The fittings shall also be examined to detect blisters and minor cracks. The pipe, fittings and specials shall conform to the following specifications: -

- a) Polydex PPRC pipe
  - o DIN 8077/8087: Class-B
  - o Test Pressure = 300 ft
- b) Fittings (i.e. coupling, Elbows, Tees etc.) for polydex PPRC Pipes 2 – 1/2" and below shall be of at least same thickness and quality as per DIN 16963 ISO 3633 & PS 3214.

### 1.3 LAYING & JOINTING POLYDEX PPRC PIPES

All fittings shall be examined before jointing to ensure that are perfect. In case of any flaw shall be replace properly. The pipes shall be screwed up or fitted tightly with pipe fitter's tongs etc. to ensure that each and every joint is perfectly water tight against the test head of water.

### 1.4 CONSTRUCTION REQUIREMENTS

#### 1.4.1 Excavation & Refilling Of Trenches for Pipe Work

The trenches shall be set out to suit alignment of the pipe lines. The trenches shall be carefully trimmed at sides and bottom compacted so that pipe lines when laid.

#### 1.4.2 Bends, Tees and other Specials

Bends, tees and reducers and other specials shall be provided and jointed at points as shown on the drawings or as directed by the Engineer. All changes in direction shall be effected by means of bends wherever practicable and the use of elbows shall be restricted only to cases where there is no room for bends. In such cases only round elbows will be allowed.

#### 1.4.3 TEST

All pipe lines in course of or after laying and jointed but before being covered, shall be tested hydraulically, using a test pump fitted with accurate pressure gauge to be approved by the Engineer to test pressure of at least 1.5 times their normal operating pressure. All pipes, specials and fittings with their joints shall remain perfectly water tight under the full test head for a period of not less than two hours after the whole length of the pipe line has been examined and demonstrated to be water tight.

The Contractor shall furnish and install steel channels and angles for piping support. These supports will be required at those which are not slabbed over and / or where the building structure is not directly useable for pipe support.

#### 1.4.4 PIPES SLEEVE

Every pipe line laid through any RCC walls, floors, ceilings or roofs shall be arranged to pass through proper hot dipped galvanized sleeve pipes as approved by the Engineer or ample diameter embedded therein to enable the pipe lines to pass easily and freely. The length of every such sleeve pipe shall be of the full width or thickness of the wall and in the case of roof, ceiling or floor, shall be at least 4 cm (1-1/2") longer than the thickness thereof and shall project to that extent above the upper surface thereof unless the Engineer orders to the contrary.





## **1.5 MEASUREMENT**

The pipe work shall be measured in running foot or meter and no separate measurement will be done for tees, bends, elbows, unions and other fittings. Unit of measurement for pipe work shall be taken along the centerline and unit of measurement will be one linear Ft/m.

## **1.6 RATE AND PAYMENT**

The rate shall include all cost of material i.e. pipe, fittings, jointing material, lubricant, sleeve pipes, hangers and clamps and labour of every type and incidentals.





## SECTION – 2 PLUMBING AND SANITARY WORK

### 2.1 DESCRIPTION

Work under this Section includes supplyi8ng and fixing all sanitary works including English type W.C., squatting, or Asiatic W.C. wash hand basins, urinals sinks, low down- and high-level cistern, automatic flushing tank showers, Taps, Valves and Fire Hydrant. Also, any special fixtures called for on the plans and mentioned in the Bill of Quantities.

#### 2.1.1 MATERIAL REQUIREMENTS

#### 2.1.2 PLUMBING FIXTURES AND FITTINGS

- 1- European type water closet of not less than 19" (475 mm) clear opening between flushing rims in white earthenware best quality (local made) "P" or "S" trap 3 gallons (13.5 liters) enameled, wall type flushing tank, enameled flush bend, PVC symphonic type fittings complete with corrosion resistant alloy ball valve of best quality manufacture in Pakistan. Standard seat and cover with PVC rings and nuts and rubber buffers, etc. complete.
- 2- Asia/Orrisa type water closet of not less than 19" (475 mm) clear opening as measured between flushing rims with raised foot rest in white earthen where best quality (local made) with back or front flush, specified dia. C.I. trap of the same make, 3 gallons (13.5 liters plastic/ceramic cistern flushing tank plastic ball valve of Asia or equivalent 1-1/4" (31 mm) dia. telescopic flush C.P pipe of the same size fixed to wall with PVC/C. P saddle.
- 3- Wash basin of specified size in white colour earthen ware best quality mounted on C.I. brackets fixed to wall, (local made) with 1/2" (15 mm) C.P. waste chain plug, local made heavy counter sunk screws, C.P. type cock heavy duty with 1/2" (15 mm) C.P. inlet connection 1/2" (15mm) C.P. brass union nuts washers, including pedestal 2 coats of approved enamel paint to C.I. brackets.
4. Urinal size 17" (425 mm) in white earthen ware best quality (local made) with pull/push valve globe valve chrome plated.
5. The shower roses shall be chromium finish universal type with adjustable spray of best quality local made as per approval.
6. The sink shall be of stainless-steel best quality local made with all accessories as shown on drgs.

#### NOTE

1. European type W.C., Asian type W.C., Wash Hand Basin and Urinals shall be approved make.
2. C.P. brass waste and union 1-1/2" 1-1/4" (38 mm/31mm) dia. with PVC/C.P. down pipe to be provided for sinks and wash hand basins.

#### 2.1.3 Showers

The shower head shall be chromium plated with fountains of size specified in the B.O.Q. or as approved by the Engineer.

Each shower shall be connected through a control valve to the hot and cold mixing valve. This shall be best quality manufactured approval shall be given by the Engineer.

#### 2.1.4 Taps

All taps shall be of heavy-duty type, chromium plated or brass as applicable and be of approved manufacture.

#### 2.1.5 Gas Heating Equipment

The gas water heater shall be gas fired, direct, storage type with dual wall construction and be made of galvanized steel sheet. The heater shall be furnished with 1" dia. drain pipe at bottom.

Eclectic water heaters, wherever specified, shall be direct type, fitted with electric immersion element and 3/4" dia. drain plug. The body of heater shall be made of galvanized steel sheet.

The gas and eclectic water heater shall be locally manufactured and be above to sustain working pressures upto 50 psi without any leakage. The rated heat capacity of all the heating equipment in terms of BTU per hour or kE shall be such as to raise temperature of volume of water equal to the specified capacity of heater, by 55 degrees centigrade, l one hour.

The heaters shall be furnished with temperature indicator, thermostat to control switch ON/OFF operation and pressure relief valve.

The Contractor shall submit following information about heating equipment, before installation.

- a. Manufacturer's technical Bulletin.
- b. Storage capacity (gallons), rated heat input capacity (BTU per hr./Kw), Thermal efficiency etc.

#### 2.1.5.2 Thermostatic Control Water Mixer Unit

Where indicated on plans, thermostatic control water mixer unit shall be installed on hot and cold-water popes, near outlet of water heater to control the temperature of supply at source. The mixer unit shall be of import quality and made of stainless steel. The mixer unit shall operate satisfactorily for the following ranges of temperature.

Output	temperature	41 – 45 degrees centigrade
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Input	temperature	
	Hot water	55 – 60 degrees centigrade
	Cold water	10 – 20 degrees centigrade

The Contractor shall submit manufactures technical bulletins, for the suggested mixer unit, for approval.

#### 2.1.6 Hose Reel Cabinet

The hose cabinet shall be of 18-gauge heavy stock steel with joint. The face of cabinet metered, welded, ground finish and smooth with no visible seems or joints on face of cabinets. All joints shall be electrically welded. Doors to be furnished with full face wired plate glass panel, removable and secured with extruded vinyl glazing finish hinges shall be special alloy forged bronze, finished to exterior of cabinet. Knobs shall be semi-recessed, cam action latch, forged bronze with chrome plate finish set in stainless steel cup. No screw or bolts heads shall be used on face of cabinet. All concealed surface of cabinet shall be prime coated after fabrication to prevent corrosion. All interior exposed surface shall be finished in baked enamel to be confirmed by the Architect through Engineer for colour scheme. The exterior shall be prime coated and left in condition for finished painting. Cabinet shall be surface mounted as indicated or approved. The cabinet includes Hose-pipe 100 feet length with brass nozzle and coupling complete in all respects. The Cabinet includes 2-1/2" dia. with 1" dia. brass nozzle on discharge end. The hole assembly including hose pope shall be tested for a minimum test pressure of 140 psi.

## 2.2 CONSTRUCTION REQUIREMENTS

### 2.2.1 Water Closets

The work shall consist of providing and fixing in position squatting type water closet or European type water closet of an approved manufacturer white/light coloured (Prime/Export Quality). The squatting types and shall be of white vitreous China, glazed fire clay, or any other approved non-absorbent material with specified diameter trap of the same material and foot rest. The surface shall have a glazed finish with minimum of fouling area and a seal depth greater than 50 mm. The outlet shall be placed well back and the pan shall be sufficiently long to meet the design requirement. The flushing water connection shall be from the rear end.

The European type water closet shall also be of vitreous China made of an approved manufacturer with low level flushing cistern and with double seat cover. The W.C. shall be symphonic type with large water area and deep seal, the cleaning being effected by symphonic action. It shall have a low trap at the floor line so that the closet cannot be untrapped by the emptying water

The low-level flushing cistern shall be of 13.6 liters capacity of Ceramic as specified in the BOQ. The Cistern shall be provided with a corrosion resistant alloy or plastic ball value with float of dia. not smaller than 100 mm and an additional 13mm cock and shall be provided with an over-flow pipe at least one size larger than the supply pipe, with a minimum internal diameter of 18mm and it shall be fixed on mild steel or cast-iron cantilever brackets, if required and as shown on the Plans.

The flush pipe be 'plastic' PVC or chromium plated steel pope. The holes for inlet, outlet and overflow in the cistern shall be made water tight by inserting rubber washes or other means of providing a water tight joint. The position of water closet shall be so arranged that it shall not face Qibla.

Every water closet shall be provided with a water supply bid tap for filling the small water cans on the site down position. A chromium plated toilet paper holder close to each water closet shall also be installed.

### 2.2.2 Sink

Sink shall be of enameled iron or 18-gauge stainless steel of size as specified in the BOQ with self-contained drain boards of approved manufacturers. The sink shall be fitted with rubber plug and washers, 38mm dia. chromium plated bottle or S trap with waste pope with all necessary accessories for making the sink a complete unit. The internal angles shall be of a design to facilitate cleaning with a fall towards outlet to drain the contents completely.

### 2.2.3 Service Sink

If required shall be made of stainless steel of 16 gauge as approved by Engineer. The sink shall be used for drawing water for scrubbing and cleaning and to dispose off the contents of scrub buckets and vessels containing slops. The edge of the sink shall be placed about 600 mm above the floor to minimize lifting and to leave room for the trap beneath.

The water supply and drainage equipment for such sinks shall be similar to that floor kitchen sinks, except that no hot water supply or mixer will be installed.





#### 2.2.4 Water Pump Pumps for Domestic Water, Fire Fighting, Drainage and Sewage Life Satiation

The centrifugal pump-motor sets shall be heavy duty industrial type suitable for continuous and quiet operation.

The centrifugal pumps shall be single stage, small size of vertically split casting and large sizes of horizontally split casing as specified in the Schedule of Equipment.

The pumps to be volute type, cast iron body, fully bronze fitted, bronze impeller of radial type with double curvature vanes, stainless steel shaft or shaft sleeve, properly lubricated bearings, readily accessible stuffing box with packing and seal cage, flanged suction for the pump and the motor and the pump shafts covered with approved guard, pump casing to be complete to be completed with drain and vent plugs and designed, tested and proven tight for a test pressure at-least equal to 1.5 times the maximum working pressure.

The pumps shall be to have the gate valves and strainers on the suction side, globe valves on the discharge side and pressure gauges on suction and discharge sides. If pumps are operating in parallel then a check valve to be installed on the discharge side of each pump.

The pumps shall be direct driven by a constant speed motor and provided with a suitable starter. The pump motor HP has been given for each system for guidance but it is intended that motor of higher HP shall be provided if required to ensure that it is not overloaded under any possible operating conditions of the pump.

Each pump shall be guaranteed for circulating the specified water quantity against specified net discharge head under the specified conditions of operation when operating continuously without overheating the motor, bearings, etc. However, the CONTRACTOR will check and confirm the actual discharge head required before placing orders for the pumps.

The pump shall be selected for quiet operation so that pump noise is not audible outside the plant room. The pump sound shall not be transmitted to the Building Structure.

The pumps installed for one system should be suitable for parallel operation in all respects. The pump impeller and motor should be so selected that these are not overloaded when only one pump is operating and increased water flow is to be handled due to reduced system head.

The CONTRACTOR shall supply anti-vibration foundation material (Both pads for isolator of main foundation and spring mountings for inertia mass) for isolating the pump foundations from the building structure.

The number, size and conditions of operation for pumps required for different systems are specified in the Schedule of Equipment and the pumps location shown in the drawings.

Certified performance data and curves shall be submitted by the CONTRACTOR for approval to confirming the purchase order on the manufacturer/supplier.

The Tender to give following information for the pump:

- a. Pump capacity in US GPM against net discharge head, RPM, HP of motor, and pump maximum HP requirement.
- b. Construction and other technical details.
- c. Overall dimensions and operating weight.
- d. Manufacturer's Performance Guarantee Certificate and performance data and curves and technical bulletin.

The sewage ejector submersible centrifugal pump motor sets shall be vertical heavy duty industrial type with non-clogging impeller suitable for continuous operation. The pump capacity rating shall be as specified in the Schedule of Equipment.

The pump shall be vertical single entry single stage non-self-priming. The pumps casting shall be radically split open towards the discharge end sealed off by a cover, suction end with a renewable wear plate and nozzle, impeller suitable for mixture of contaminated fluids, solid particles and sedges. The shaft length shall suit the installation depth shown in the drawings and shaft pieces joined together by threaded shaft coupling. The weight of the rotor and axial thrust will be absorbed by deep groove ball bearing in the vertical hollow shaft motor. A grease pump mounted on the pump mounting plate shall continuously feed grease individually to every bearing during pump operation. The pump shall be fitted with soft packet stuffing box fed with sealing grease. The pump base plate shall be sized large enough to enable the pump to be pulled out/lowered into the pit without the necessity of enlarged pit roof opening. The pump discharge line will be terminated above the base plate. The wear plate shall be of cast iron, shaft protecting sleeve of stainless steel, shaft of carbon steel, base plate of steel, motor stool of steel/cast iron and bearing of lead bronze.

The pump motor sets to be of local manufacture, KSB type KVP or approved equal.





### **Level Controllers**

Each group of the above pumps shall have a control system as detailed below: -

A three-position level controller shall automatically control the pump operation. The level controller shall start the pump at high level and stop the same at low level. A highest level, the level controller shall energize an audio-video alarm.

#### **2.2.5 Unions**

Provide accessible unions in supply and return connections at all equipment fixtures, fixtures, specialists automatic valves, screwed end valves and at all other points in the system where required, in order to facilitate removal of specialties of equipment for repairs.

#### **2.2.6 Expansion Joints for C.I. Soil or Waste Pipe**

Expansion joint in C.I. soil or waste pipe shall be provided as per plans, where the pipe crosses building expansion joint. These will be of non-pressure type, similar to imported Jossam Series.

### **2.3 MEASUREMENT**

Measurement shall be made for the number of fixtures and toilet accessories acceptably provided and fixed in position.

### **2.4 RATE AND PAYMENT**

Payment shall be made for the number measured as provided above at the contract unit rate for the respective items in the Bill of Quantities and shall constitute full compensation for all labour, material, use of equipment and tools required for work related to the item including providing and fixing all other work to complete. The item in all respects as specified or as directed by the Engineer.





## **SECTION – 2 –A      SEWERAGE/ DRAINAGE WORK - uPVC**

### **2.1      DESCRIPTION**

#### **2.1.1      Sewerage Pipes**

All sewerage/drainage pipe work inside the houses and buildings and upto the connection to the trunk sewer shall be covered under this section. The pipes shall be UPVC as specified including soil, waste, vent and anti-siphonic pipes.

### **2.2      MATERIAL REQUIREMENTS**

UPVC Soil and Waste etc piping shall conform to BS EN 1329-1 2000 marked as BD or other equivalent specifications with solvent cement joints as specified.

Where required UPVC pipes conforming to the specifications ISO 3633/ PS 3214/ BS-3505/ ASTM D-1785 i/c fitting and as specified in this section may be used in outside underground conditions.

### **2.3      SOIL, WASTE, VENT AND ANTI-SYPHONIC PIPES**

The pipes shall run exposed or embedded in wall and floors as specified or shown on drawings. Where embedding in walls or floors is required, the necessary instruction and route of pipe work shall be approved by the Engineer. Pipes running exposed on walls and ceiling shall be properly clamped with Hangers, supports and clamps for passage of pipes through masonry wall and RCC beams, slab and walls, pipe sleeves shall be embedded and properly caulked and water proofed.

Horizontal soil and waste pipes unless otherwise specified shall be given a grade of 6.4 mm (1/4") and 3.2 mm (1/32") 1/ft. respectively. All main vertical soil stacks shall extend full size to above the roof line, except where otherwise indicated. The part of the soil stacks carried up as vent pipe shall not have any bend or angle except when unavoidable, in which case, the angle shall be as small as possible. The vent stack shall joint the soil stack at a point not less than 3 feet (900 mm) above the highest connection to the soil stack. Horizontal waste lines receiving the discharge from two or more fixtures on the first floor shall be provided with end vents, unless separate venting of fixtures is called for.

Changes in pipe size on soil, waste and drain lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of 45-degree Wyes, long or short sweep 3 mm to 1.5 mm bends etc. or equivalent fittings as approved. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweep not less than 75 mm (3") in diameter may be used where the change in direction of flow is either in plan or vertical to horizontal and may be used for making necessary offsets between the ceiling and the next floor above. The use of short sweep bends or fittings, where deemed necessary because of installation conditions, shall be subject to the approval of the Engineer.

Contractor shall provide offsets in the pipe where required or directed by the Engineer to avoid interference with other work, or to increase the headroom under piping, or to improve the appearance of the pipe work. Piping shall be installed in such a manner that will permit freedom of movement during expansion and contraction without causing the pipes to be warped and adequately insulated against noise transmission through pipe work in habitable rooms.

All piping shall be installed in such a manner as to prevent delay or interference with the work of others working in the same area. All openings in pipes shall be kept closed during construction working in the same plugs.

Slip joints shall be permitted only in trap seals or on the inlet side of the traps. Tucker or hub drainage fittings shall be used for mating union connections wherever practicable.

The use of long screws and bushing is prohibited.

Clean-out shall be of the same size as the pipe except that clean-out plugs larger than 100 mm (4") will not be required. Clean-out installed in connection with spigot and socket pipe shall consist of long sweep 1/4" bend or one or two 1/8" bends extended to any easily accessible place, or where indicated on the drawings. An extra heavy cast-brass ferrule or as specified with outer sunk trap screw cover shall be caulked into the hub of the fitting and shall be flush with the floor. In addition, clean-outs shall be provided at all changes of direction in excess of 45 degree, and at distance not exceeding 15 meter (50 feet) in horizontal drain lines larger than 100 mm (4"). Underground clean-outs shall be extended to an accessible location, to the surface of the floor above, or to grade, subject to approval of the Engineer. Panels and plates for access to clean-outs shall be provided.

Each fixture and piece of equipment, including floor drain, requiring connections to the drainage system shall be equipped with a trap. Traps are to be supplied with the fixtures. Each trap shall be placed as near to the fixtures as possible, and no fixture shall be double-trapped.

### **2.4      TESTING OF PIPELINES**

No work shall be covered over or surrounded with concrete until it has been inspected, tested and approved by the Engineer.

### **2.5      INSPECTION AND TESTING OF DISCHARGE PIPES**





Work should be inspected and tested during installation; care being taken that all work which is to be concealed is tested before it is finally enclosed. Final tests should be applied on completion of the installation both for soundness and performance. Normally, the air test is used for soundness, but if the water test is applied, it should be used only upto the level of the lowest sanitary appliance connected to the system and then only in new system.

When testing old systems, it may be necessary to limit the pressure applied because of shallow trap seals; the water test should not be used. Any defects revealed by the test should be made good and the test repeated until a satisfactory result is obtained.

Reference should be made to Local Authority and other enforcing authority requirements, particularly where pipe work passes through areas where blockages and leaks cannot be detected. In general, sufficient access should be provided to enable complete systems to be tested.

Access points should be carefully sited to allow the entry of cleaning and testing equipment and consideration also be given to adjacent services. Traps and joints that are easily disconnected can be an advantage so additional access is required only under exceptional circumstances.

The discharge from urinals can give rise to heavy deposits, especially in hard water areas. Regular maintenance is therefore required and access should be provided so that all parts of the stack, branch, discharge pipe and trap can be readily cleaned. Where the vertical discharge pipe had a long connection to a manhole, access should be provided at ground floor near the foot of the stack.

In multi-storey domestic buildings, access should be provided at 3 storey intervals or less. In public and commercial buildings and more complex, drainage systems, access should be provided at each floor level.

The discharge from appliance produces pressure fluctuations and the system must be designed to retain adequate water seal in all traps under excessive working conditions. Pressure effects that occur may be due to self-siphon age or positive pressure. It may be necessary to use a ventilating pipe to limit the pressure fluctuations in the system within the acceptable limits.

The effect of the flow of water from an appliance into a branch discharge pipe must be considered taking account of:

- a) The design of the appliance (funnel shaped appliances increase the possibility of self siphon age)
- b) The length, slope and diameter of the branch discharge pipe.

Seal losses produced by effluent flow down the discharge stack depend on:

- a) The flow load which in turn depends on the number of appliances connected and frequency of use.
- b) The diameter of the discharge stack.

#### Air Test

An air test should apply a pressure equal to 3.8 mbar (38 mm) (50 mbar (50 mm) Scotland) water gauge and should remain constant for a period of not less than three minutes (five minutes Scotland). The water seals of all sanitary appliances which are installed should be fully charged and a test plug inserted into open ends of the pipe work to be tested, each plug being sealed with a small quantity of water. One testing plug should be fitted with a tee-piece, with a cock on each branch, one branch being connected by a flexible tube to a manometer.

To apply the test, air or smoke is introduced into the system through the other branch of the tee-pipes until the desired pressure is shown on the manometer scale. Alternatively, the pressure may be applied by passing a flexible tube from a tee-pipes attached to a manometer through the water seal of the trap of a sanitary appliance, the test then being carried out as previously described.

Defects revealed by an air test may be located by the following:

- a) A smoke producing machine may be used which will introduce smoke under pressure into the defective pipe work. Leakage can be observed as the smoke escapes.
- b) Soap solution can be applied to the pipes and joints, under test, leakage can be detected by the formation of Bobbies.

#### Performance of Testing Systems

In addition to test for air or water-tightness, every discharge pipe installation should be tested for stability of the trap seals on the system. When subjected to the appropriate discharge tests, every trap must retain not less than 25 mm of water seal. Each test should be repeated three times, traps being recharged before each test and the maximum loss of seal in any one test should be taken as the significant result.

The number of appliances to be discharged simultaneously for the test depends upon the number of appliances installed and the use and occupancy of the building. Suitable figures are given in Table C9 for dwellings. For other types of buildings e.g. hotels and hospitals, the service conditions lie somewhere between these two. The number of appliances to be discharged simultaneously to simulate these conditions should be estimated from the figures given in Table C9 the expected service conditions.

#### Dwellings

To test for the effect of self siphonage, waste appliances should be filled to over flowing level and discharged in the normally way. The seal remaining in the trap should be measured when the discharge is finished.





To test for the effects of probable maximum simultaneous discharges of sanitary appliances, the number of appliances to be discharged together is given in Table C9. For the purpose of this test, baths are ignored as their use is spread over a period and they do not normally add materially to the peak flow.

Where a stack services baths only, the number to be discharged simultaneously in a test should be the same as for sinks. The worst conditions occur when appliances on the upper floors are discharged. A reasonable test therefore is to discharge up to one WC, one basin and one sink from the top floor of the building with any other appliances to be discharged on the floor immediately below.

**Table : C9      Number of appliances to be discharged simultaneously for testing g stability of seals; Dwellings**

Number of appliances of each kind on the stack	WC 9 litres	Number of appliances discharged simultaneously Wash Basin	Kitchen Sink
1-9	1	1	1
10-24	1	1	2
25-35	1	2	3
36-50	2	2	3
51-65	2	2	4

## 2.6 MEASUREMENT

All pipe work shall be measured in running foot / meter of finished length. No wastage or length consumed in joints shall be measured for payment. Bend, Tee, Sockets, spigot and collars etc shall not be measured separately.

## 2.7 RATE AND PAYMENT

The rate for all items under this section shall cover the cost of all materials, labour, tools, equipment and appliance and performing all operations for laying, fixing and jointing and all work as specified in accordance with drawings, bill of Quantities and as directed by the Engineer. Rate for pipe work shall also include making and repairing cut holes and chases in wall, floors and slabs etc. painting pipes, supports and accessories cleaning and clearing pipe lines and testing till approved by the Engineer.





## SECTION – 3 SEWERAGE/DRAINAGE WORK – RCC & C.I.

### 3.1 DESCRIPTION

#### 3.1.1 Sewerage Pipes

All RCC & C.I. sewerage/drainage pipe work inside the houses and buildings and up to the connection to the trunk sewer shall be covered under this section. The pipes shall be RCC or C.I. as specified including soil, waste, vent and anti-symphonic pipes.

#### 3.1.2 MATERIAL REQUIREMENTS

For Cast Iron Pipes, the joints shall be lead caulked. The packing material shall be pure jute, hemp or hemp yarn. All exposed C.I. pipes and fittings shall be painted with 2 coats of black enamel over one prime coat.

For RCC pipes the cement mortar to be used on joints shall be of 1:1 ratio or as per Plans along with rubber ring. Material specifications for sewerage and drainage shall be as follows: -

- a) Cast Iron spun Pipe, socket and spigot (6' length)  
 0 Minimum Weights  
 Dia. (in) 2 3 4 6 72.9  
 Weight (Lb.) 24.9 37 48  
 0 Test Pressure against leakage = 20 psi
- b) Cast Iron Fittings  
 0 Minimum Weights (Lb.)

TABLE – (BENDS)

Fittings (Inches)	2	3	4	5
87 – 1/2 degree and 45 degree Bend with out access	6.8	11	15	24.9
87 – 1/2 degree and 45 degree bend with access	29.9	7 11.9	18	29.9

TABLE (WYES & REDUCERS)

Fittings (Inches)	2x2	2x3	3x3	2x4	3x4	4x4
87 – 1/2 degree and 45 degree with out access	9	15	16	17	20	24
87 – 1/2 degree and 45 degree Why with access	11	16	18	20	24	26
Eccentric Reducer with smaller side socketted.	-	7.9	-	11	11	-

- c) R.C.C. Pipe  
 0 BSS 556 : Class – M < 9"  
 0 6" dia pipe with collar  
 0 9" pipe, spigot and socket  
 0 ASTM C76-72-a > 12"

### 3.2 CAST IRON FLOOR TRAP. MANHOLE FRAMES AND COVER, GRATING

These shall be cast from a mixture of cast iron scrap and suitable grade of pig-iron. and resultant metal shall be of strong grey structure, free from chips, air bubbles and sand holes and shall be smooth and even both inside and outside.

#### 3.2.1 Grease Trap

Grease Trap shall be made of SS-304/ SS-316, for specified flow capacity and inlet/outlet dia. and provided where shown on plans. Grease trap shall be embedded in raised floor and inlet shall be submerged.

#### 3.2.2 Glazed Earthen Ware

Shall be best and approved quality and the water seal shall not be less than 63.5 mm (2-1/2") deep.





### 3.3 CONSTRUCTION REQUIREMENTS

#### 3.3.1 Laying of RCC Pipe

Pipes and accessories shall be carefully examined before being laid and defective damaged pipes shall not be used. The pipes shall be brushed clean inside and outside to remove any soil or foreign matter that may have accumulated, including inside of the sockets and outside of spigots, before being lowered into the trench and shall be kept clean during laying operation by plugging or other approved method.

The bottom of the trench shall be shaped to give substantially uniform circumferential support to the lower fourth of each pipe. Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe pointing in the direction of flow. Each pipe shall be laid true to line and grade and in such manner as to form close concentric joint with the adjoining pipe. If the width of the trench at the pipe is exceeded than necessary, due to any reason other than under direction from Engineer, the Contractor shall install at no additional cost to the Owner, such concrete cording pipe encasement or other bedding as may be required to satisfactorily support the added load of the backfill.

Trenches shall be kept free from water until the pipe jointing material has set, and pipe shall not be laid when the condition of the trench or the weather condition is unsuitable for such work at time when work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no trench water, earth, or other substance will enter the pipe and fittings.

As the work progresses, the interior of the sewer shall be cleaned of all dirt and superfluous materials of every description. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed.

Where sewers cross above water line the sewer pipe for a distance of 3-meter (10 feet) each side of the crossing shall be of cast iron steel or other acceptable pressure pipe and with no joint closer than 3 feet (900 mm) to the crossing, or shall be fully encased in concrete of min. 15 cm. (6") thickness.

Any section of the pipe found to be defective before and after laying, shall be replaced with sound pipe without additional expense to the Owner.

The jointing of pipes with collars shall be done first with spun yarn rope (dipped in hot maphalt composition) fitted in between the ends of pipes and pressed together. The dia. of rope shall not exceed 19 mm (3/4") or as joint. Wooden wedges uniform gap all-round the pipe for pressing pipes together. At a time five or six pipes shall be jointed together. After putting bitumen soaked hemp rope, suitable jacks and wedges or any other approved method shall be used. The inside of the collar and outside portion of the pipe shall be cleaned with brush and cement of 1:1 proportion shall then be inserted from both ends of the collar. The mortar containing as little quantity of water as possible shall be carefully inserted by hand into the joints and tightly pressed with caulking tool. The mortar shall be finished off on the outside at an angle of 45 degree. The wooden wedges shall be carefully removed and mortar filled in the cavity before finishing. The joints shall be protected from weather and maintained wet for at least ten days and shall not be covered with backfill until the joints have been tested and approval given by the Engineers.

For jointing of pipes with spigot and socket joints, the first pipe shall be bedded with the socket end upstream. The interior surface of the socket shall be carefully cleaned with a wet brush and its lower portion filled with mortar to such a depth as to bring together the inner surfaces of the abutting pipes flush and even. All further joints shall be made in this manner. The remainder of the socket joint shall be filled in with mortar and well pressed with the help of caulking tool. The mortar shall be finished smooth on the outside at an angle of 85 degree. The joints shall be protected and cured as for collar joints.

#### 3.4 SOIL, WASTE, VENT AND ANTI-SYPHONIC PIPES

Examination and preparation of pipes shall be as for RCC pipes.

The pipes shall run exposed or embedded in wall and floors as specified or shown on drawings. Where embedding in walls or floors is required, the necessary instruction and route of pipe work shall be approved by the Engineer. Pipes running exposed on walls and ceiling shall be properly clamped with Hangers, supports and clamps for passage of pipes through masonry wall and RCC beams, slab and walls, pipe sleeves shall be embedded and properly caulked and water proofed.

Horizontal soil and waste pipes unless otherwise specified shall be given a grade of 6.4 mm (1/4") and 3.2 mm (1/32") 1/ft. respectively. All main vertical soil stacks shall extend full size to above the roof line, except where otherwise indicated. The part of the soil stacks carried up as vent pipe shall not have any bend or angle except when unavoidable, in which case, the angle shall be as small as possible. The vent stack shall joint the soil stack at a point not less than 3 feet (900 mm) above the highest connection to the soil stack. Horizontal waste lines receiving the discharge from two or more fixtures on the first floor shall be provided with end vents, unless separate venting of fixtures is called for.

Changes in pipe size on soil, waste and drain lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of 45 degree Wyes, long or short sweep 3 mm to 15 mm bends etc. or equivalent fittings as approved. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweep not less than 75 mm (3") in diameter may be used where the change in direction of flow is either in plan or vertical to horizontal and may be used for making necessary offsets between the ceiling and the next floor above. The use of short



sweep bends or fittings, where deemed necessary because of installation conditions, shall be subject to the approval of the Engineer.

Contractor shall provide offsets in the pipit where required or directed by the Engineer to avoid interference with other work, or to increase the headroom under piping, or to improve the appearance of the pipe work. Piping shall be installed in such a manner that will permit freedom of movement during expansion and contraction without causing the pipes to be warped and adequately insulated against noise transmission through pipe work in habitable rooms.

All piping shall be installed in such a manner as to prevent delay or interference with the work of others working in the same area. All openings in pipes shall be kept closed during construction working with plugs.

Slip joints shall be permitted only in trap seals or on the inlet side of the traps. Tucker or hub drainage fittings shall be used for mating union connections wherever practicable.

The use of long screws and bushing is prohibited.

Clean-out shall be of the same size as the pipe except that clean-out plugs larger than 100 mm (4") will not be required. Clean-out installed in connection with cast iron spigot and socket pipe shall consist of long sweep 1/4" bend or one or two 1/8" bends extended to any easily accessible place, or where indicated on the drawings. An extra heavy cast-brass ferrule with outer sunk trap screw cover shall be caulked in to the hub of the fitting and shall be flush with the floor. Where clean-outs in connection with threaded pipe or indicated and or expectable, they shall be cast iron drainage T-pattern 90 degree branch fitting with extra – heavy brass screws plugs of the same size as the pipe upto and including 100 mm (4"). Test tees with cast iron clean-outs shall be installed at the footing of all soil, waste, and drain stacks and on each building drain outside the building. In addition, clean-outs shall be provided at all changes of direction in excess of 45 degree, and at distance not exceeding 15 meter (50 feet) in horizontal drain lines larger than 100 mm (4"). Underground clean-outs shall be extended to an accessible location, to the surface of the floor above, or to grade, subject to approval of the Engineer. Panels and plates for access to clean-outs shall be provided.

Each fixture and piece of equipment, including floor drain, requiring connections to the drainage system shall be equipped with a trap. Traps are to be supplied with the fixtures. Each trap shall be placed as near to the fixtures as possible, and no fixture shall be double-trapped. Except as otherwise indicated traps installed on bell and spigot pipe shall be cast iron. Traps installed on threaded pipe shall be recess drainage pattern.

### **3.5 FLOOR TRAPS**

Floor traps with gratings shall be made of high grade, strong, tough, and even grained metals; Castings shall be free from blow holes porosity, hard spots, excessive shrinkage cracks, or other defects, shall be smooth and well cleaned both inside and other side. Castings shall not be repaired, brazed, or burned. The wall thickness of iron casting shall be not less than 6.4 mm (1/4").

Joints for Cast Iron soil waste and vent pipes shall be made with lead, jute, hemp or hempen spun yarn. The packing material shall be well placed into the annular space so as to prevent the entrance of lead into the pipe. Run lead joints shall be applied to perfectly dry pies. Under wet condition lead fiber joints shall be made both with quantities and depth of jointing materials and by method as per B.S. Code C.P. 301 (1950). The remainder of the space shall be filled with molten lead that is hot enough to show a rapid change in colour when stirred. The lead shall be caulked to from a tight joint without over straining the bell.

### **3.6 TESTING OF PIPELINES**

No work shall be covered over or surrounded with concrete until it has been inspected, tested and approved by the Engineer.

### **3.7 INSPECTION AND TESTING OF DISCHARGE PIPES**

Work should be inspected and tested during installation; care being taken that all work which is to be concealed is tested before it is finally enclosed. Final tests should be applied on completion of the installation both for soundness and performance. Normally, the air test is used for soundness, but if the water test is applied, it should be used only upto the level of the lowest sanitary appliance connected to the system and then only in new system.

When testing old systems, it may be necessary to limit the pressure applied because of shallow trap seals; the water test should not be used. Any defects revealed by the test should be made good and the test repeated until a satisfactory result is obtained.

Reference should be made to Local Authority and other enforcing authority requirements, particularly where pipe work passes through areas where blockages and leaks cannot be detected. In general, sufficient access should be provided to enable complete systems to be tested.

Access points should be carefully sited to allow the entry of cleaning and testing equipment and consideration also be given to adjacent services. Traps and joints that are easily disconnected can be an advantage so additional access is required only under exceptional circumstances.

The discharge from urinals can give rise to heavy deposits, especially in hard water areas. Regular maintenance is therefore required and access should be provided so that all parts of the stack, branch, discharge pipe and trap can be readily cleaned. Where the vertical discharge pipe had a long connection to a manhole, access should be provided at ground floor near the foot of the stack.





In multi-storey domestic buildings, access should be provided at 3 storey intervals or less. In public and commercial buildings and more complex, drainage systems, access should be provided at each floor level. The discharge from appliance produces pressure fluctuations and the system must be designed to retain adequate water seal in all traps under excessive working conditions. Pressure effects that occur may be due to self-siphon age or positive pressure. It may be necessary to use a ventilating pipe to limit the pressure fluctuations in the system within the acceptable limits. The effect of the flow of water from an appliance into a branch discharge pipe must be considered taking account of:

- a) The design of the appliance (funnel shaped appliances increase the possibility of self-siphon age)
- b) The length, slope and diameter of the branch discharge pipe.

Seal losses produced by effluent flow down the discharge stack depend on:

- a) The flow load which in turn depends on the number of appliances connected and frequency of use.
- b) The diameter of the discharge stack.

#### Air Test

An air test should apply a pressure equal to 3.8 mbar (38 mm) (50 mbar (50 mm) Scotland) water gauge and should remain constant for a period of not less than three minutes (five minutes Scotland). The water seals of all sanitary appliances which are installed should be fully charged and a test plug inserted into open ends of the pipe work to be tested, each plug being sealed with a small quantity of water. One testing plug should be fitted with a tee-piece, with a cock on each branch, one branch being connected by a flexible tube to a manometer.

To apply the test, air or smoke is introduced into the system through the other branch of the tee-pipes until the desired pressure is shown on the manometer scale. Alternatively, the pressure may be applied by passing a flexible tube from a tee-pipes attached to a manometer through the water seal of the trap of a sanitary appliance, the test then being carried out as previously described.

Defects revealed by an air test may be located by the following:

- a) A smoke producing machine may be used which will introduce smoke under pressure into the defective pipe work. Leakage can be observed as the smoke escapes.
- b) Soap solution can be applied to the pipes and joints, under test, leakage can be detected by the formation of Bobbies.

#### Performance of Testing Systems

In addition to test for air or water-tightness, every discharge pipe installation should be tested for stability of the trap seals on the system. When subjected to the appropriate discharge tests, every trap must retain not less than 25 mm of water seal. Each test should be repeated three times, traps being recharged before each test and the maximum loss of seal in any one test should be taken as the significant result.

The number of appliances to be discharged simultaneously for the test depends upon the number of appliances installed and the use and occupancy of the building. Suitable figures are given in Table C9 for dwellings. For other types of buildings e.g., hotels and hospitals, the service conditions lie somewhere between these two. The number of appliances to be discharged simultaneously to simulate these conditions should be estimated from the figures given in Table C9 the expected service conditions.

#### Dwellings

To test for the effect of self siphonage, waste appliances should be filled to over flowing level and discharged I the normally way. The seal remaining in the trap should be measured when the discharge is finished.

To test for the effects of probable maximum simultaneous discharges of sanitary appliances, the number of appliances to be discharged together is given in Table C9. For the purpose of this test, baths are ignored as their use is spread over a period and they do not normally add materially to the peak flow.

Where a stack services baths only, the number to be discharged simultaneously in a test should be the same as for sinks. The worst conditions occur when appliances on the upper floors are discharged. A reasonable test therefore is to discharge up to one WC, one basin and one sink from the top floor of the building with any other appliances to be discharged on the floor immediately below.

**Table: C9**      **Number of appliances to be discharged simultaneously for testing stability of seals; Dwellings**

Number of appliances of each kind on the stack	WC 9 litres	Number of appliances discharged simultaneously Wash Basin	Kitchen Sink



1-9	1	1	1
10-24	1	1	2
25-35	1	2	3
36-50	2	2	3
51-65	2	2	4

RCC pipes below 300 mm dia. shall conform to B.S. 5911 Class-C and dia. 300 mm or above to ASTM C 76-88.

### 3.8 MEASUREMENT:

All pipe work shall be measured in running foot of finished length. No wastage or length consumed in joints shall be measured for payment. Sockets, spigot and RCC collars shall not be measured separately.

For cast iron pipe line the length consumed in valves, fittings and specials shall be measured along with pipe line.

Cast Iron specials and fittings such as Tees, tapers, Bends, Shoes, Crosses, Offsets, flanged sockets and spigot, plugs and caps etc. shall be measured along with the pipeline.

### 3.9 RATE AND PAYMENT:

The rate for all items under this section shall cover the cost of all materials, labour, tools, equipment and appliance and performing all operations for laying, fixing and jointing and all work as specified in accordance with drawings, bill of Quantities and as directed by the Engineer. Rate for pipe work shall also include making and repairing cut holes and chases in wall, floors and slabs etc. painting pipes, supports and accessories cleaning and clearing pipe lines and testing till approved by the Engineer.





## **SECTION – 4 CONSTRUCTIONS OF MANHOLES**

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### **4.1 DESCRIPTION**

The work consists of constructing manholes for sewerage of positions shown on the plans or where otherwise directed by the Engineer and in accordance with the detailed drawings supplied from time to time, complete in all respects.

### **4.2 MATERIAL REQUIREMENTS**

Brick masonry, Portland cement concrete, and other materials shall meet the specified requirement of the relevant sections of the specifications for RCC given Sections "Portland Cement Concrete" Manhole steps shall be of mild steel as shown on the drawings.

### **4.3 CONSTRUCTION REQUIREMENTS**

Manholes shall be constructed with brick masonry of specified wall thickness laid in 1:4 sand cement mortar and R.C.C. concrete slab. The cover slab shall be Class-C reinforced cement concrete, fitted with cast iron frame which shall have weight  $\frac{1}{2}$  CWT 18" (450 mm) diameter cast iron cover as shown in the plan. The inside of the walls shall be plastered with 1:4 sand cement mortar. At the bottom of manholes for sewers a proper channel as per drawings, shall be constructed in the whole length of the manhole along the centerline of the sewers to lead the swage from one sewer to the other. Mild Steel bar steps shall be installed inside the manhole, during the construction of the manhole walls. Cutting holes into the wall for the steps after construction will not be permitted. Top rung shall be 18" (450 mm) below the manhole cover and the lowest not more than 12" (300 mm) above the benching (Floor). Manholes shall have cement concrete Class-C benching as per drawings/specs. Manholes shall be connected with the nearby sewerage manholes through a reinforced cement concrete pipe as per details provided. Manholes along the central and primary drains shall also act as over-flow structures. The existing over-flow pipes shall be securely connected with these manholes.

### **4.4 MEASUREMENT**

Measurement shall be made for the actual number of manholes as shown in BOQs of the appropriate type constructed at site as per drawings and specifications laid down in this section and to the approval of the Engineer.

### **4.5 RATE AND PAYMENT**

The unit rate quoted in the priced Bill of Quantities for the construction of manholes shall be considered full compensation to cover the cost of all materials including framework and concrete, brick masonry, excavation, backfilling, steps frame and cover, and connecting pipe with the manhole, and all labour including curing, plastering, trenching, etc. and all incidentals to completely construct them at site, as per drawings and specifications laid down in this section.





## SECTION – 5 STORM WATER DRAINAGE

### 5.1 DESCRIPTION

The work under this section consists of all drainage work and related items necessary to complete the work indicated on the drawings and described in the specifications. The work includes but is not limited to the following:-

- 1- All storm water drainage piping shall be C.I. or PVC within and RCC outside building as shown on the plans with connections to catch pits and open drains plus all related items to complete the work.
- 2 - Provide all catch pits wherever shown on the drawings with C.I. Grating and hinged grating (if required).
- 3 - Provide C.I. grating at the roof inlet of all vertical rain water rain water drop pipes, as shown on the plans.
- 4 - Gravel bedding shall be provided wherever called for on the drawings or directed by the Engineer.
- 5 - Testing cleaning, adjusting and placing in operation all piping installed.
- 6 - Pipe culverts of sizes indicated on the drawings.

### 5.2 MATERIALS

Materials for C.I. and RCC pipe shall conform to the respective specifications specified under Section 3.2. The PVC pipe shall conform to the requirements of BSS 3505, Class-B, for which the working pressure shall be 87 psi minimum. The PVC pipes used shall be with integral parallel socket and shall be joined by solvent welding method.

### 5.3 CONSTRUCTION REQUIREMENTS

Construction Requirements of pipe work shall meet the relevant specifications appearing else-where in the documents.

#### 5.3.1 Protection of Works

The installation shall be adequately protected against damage and deterioration particular care must be taken during the course of construction of seal all open ends of pipe work with a temporary cover. Wood shavings or paper will not be accepted for this purpose.

#### 5.3.2 Concreting of Pipes

Catch pits shall be constructed of brick masonry with Plain Cement Concrete Class-D base of 4" thick. Catch pit shall be of the dimensions indicated on the drawings. Cast iron frame and grating shall be provided as indicated on the drawing directed by the Engineer.

#### 5.3.3 Drains

Drains shall be provided in accordance with drawings. Brick drains shall be constructed of brick masonry with a Plain Cement Concrete Class-E base. Internal walls of the drain shall be plastered in a (1:4) cement sand mortar of thickness, shown on the plans.

Drains in concrete shall be constructed of Class-D concrete and shall be provided at positions and sizes shown on the drawings.

The drains shall be laid in straight lines and to slopes indicated in the drawings. They shall be kept free from mud debris, superfluous cement or other obstructions.

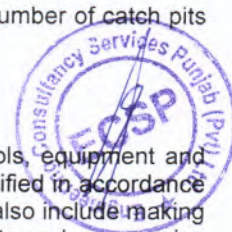
### 5.4 MEASUREMENT

All pipe work shall be measured in Running M/Ft. of finished length. No. wastage or length consumed in joints shall be measured for payment. Sockets, spigot and RCC collars shall not be measured separately. Holder bats/sleeve pipes required for pipes attached to walls and ceilings going through walls shall not be measured separately.

Measurement for drains shall be in Running M/Ft. Catch pits shall be measured for the number of catch pits acceptably provided.

### 5.5 RATE AND PAYMENT

The rate for all items under this section shall cover the cost of all materials, labour, tools, equipment and appliance and performing all operations for laying, fixing and jointing and all work as specified in accordance with drawings, bill of quantities and as directed by the Engineer. Rate for pipe work shall also include making and repairing cut holes and chases in walls, floors and slabs etc. painting pipes, supports and accessories cleaning and clearing pipe lines and testing till approval by the Engineer. Rate for catch pits, drains and piping shall include excavation backfilling masonry/concrete work frame and hinges wherever called for, complete as per plans or directed by the Engineer.





## **SECTION – 6 EXCAVATIONS FOR WATER SUPPLY LINES AND APPURTENANCES**

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### **6.1 DESCRIPTION**

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances, and materials and performing all operations in connection with excavations, trenching and back filling for water lines and appurtenances in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

### **6.2 CLEARING AND GRUBBING**

The sites of all excavations shall be cleared of all shrubs, plants, bushes, large roots, rubbish and other surface materials. All such materials shall be removed and disposed off in a manner satisfactory to the Engineer. All trees and shrubbery that are designated by the Engineer to remain shall be adequately protected and preserved in an approved manner.

### **6.3 EXCAVATION**

#### **6.3.1 General**

All excavation of whatever substance encountered shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner at a sufficient distance from the banks of the excavation to avoid overloading and to prevent sides from caving. All excavated material unsuitable or not required for backfill shall be removed and wasted at a location approved by the Engineer. Excavation in the streets shall be done in such a manner that street passage is not blocked by excavated material. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulated therein shall be removed by pumping or by other approved methods. Unless otherwise indicated or approved by the Engineer, excavation shall be open cut.

#### **6.3.2 Trench Excavation**

Unless otherwise directed or permitted by the Engineer not more than 500' of any trench in advance of the end of the pipeline already laid shall be opened at any time, unless otherwise directed or permitted by the Engineer not more than 1000' of any one trench shall be worked on at a time from removal of pavement bottom, not exceeding 6 feet in depth shall be a maximum of 20 inches plus the external diameter of the pipe barrel and the width of the trench exceeding 6 feet in depth shall be maximum 30" plus external diameter of the pipe barrel. The banks of the pipe trench shall be as nearly vertical as practicable. Bell holes and depressions for joints shall rest on the prepared bottom for its full length. Bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joints. Stones shall be removed to avoid point bearing. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe as determined by the Engineer is encountered in the bottom of the trench, such material shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, or other suitable approved granular material. Such replacement of unsuitable material shall be paid for at the contract unit price for that item of work. Trenches shall be of a depth to provide a maximum cover, over the top of the pipe, of 30" from the existing ground surface or finished grade whichever is closer except those trenches for pipe laid in lanes and alleys of narrow traveled way (average width of 8 feet) or less between structures shall be of a depth to provide a minimum cover, over the top of the pipe, of 18" from the existing ground surface or finished grade whichever is closer.

#### **6.3.3 Excavation for Appurtenances**

Excavation for appurtenances shall be sufficient to leave at least 12" but not more than 24" between the outer surface and the embankment or timber that may be used to hold and protect the banks, any over-depth excavation below such appurtenances that has not been directed the Engineer will be considered unauthorized and shall be refilled with compacted sand gravel or concrete, as directed by the Engineer at no additional cost to the Owner.

#### **6.3.4 Maintenance of Excavation**

All excavation shall be properly maintained while they are open and exposed. Sufficient suitable barricades, warning lights, flood lights, signs, and similar items shall be provided by the Contractor. The Contractor shall be responsible for any damage due to this negligence.

#### **6.3.5 Removal of Water**

The Contractor shall build all drains and do ditching, pumping, well pointing, bailing, and all other work necessary to keep the excavation clear of ground water, sewage and storm water during the progress of the





work and until the finished work is safe from injury. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer and necessary precautions against flooding shall be taken.

#### **6.3.6 Sheeting and Bracing**

If ordinary open-cut excavation is not possible or advisable, sheeting and bracing shall be finished to the work and to provide working conditions which are safe. The Contractor shall furnish and place all sheeting, shoring, wall braces, timbers and similar items, necessary for the safety of the work, the general public and adjacent property. Sheeting shoring and bracing shall be removed as the working progresses and in such a manner as to prevent damage to finished work and adjacent structures and property. As soon as withdrawn, all voids left by the sheeting and bracing shall be carefully filled with sand and compacted. The Contractor shall be fully responsible for the safety of work in progress, for the finished work; the workmen, the public and adjacent property.

#### **6.3.7 Protection of Facilities**

Existing subsurface facilities likely to be encountered during the execution of work require special precaution for the protection, such as sewers, drain pipes, water main, conduits and electric cables and the foundations of adjacent structures. The Contractor shall be responsible for the damage of any such facility and shall repair the same at his expense whether or not this facility has been shown on the drawings.

#### **6.3.8 Surplus Materials**

All surplus materials shall be disposed off at locations approved by the Engineer disposal of surplus material shall not interfere with other works and shall not damage or spoil other material. When it is necessary to haul earth or the material over street or pavement, the Contractor shall prevent such material from on the street or pavement.

#### **6.3.9 Cutting Payment**

In cutting or breaking street surfacing, the contractor shall not use equipment which will damage the adjacent pavement. Existing paved surfaces shall be cut back beyond the edges of the trenches to form neat square cuts. The road ballast, brick pavement, and other materials shall be placed on one side and shall be preserved for reinstatement when the trench is filled. Wherever necessary or required for the convenience of the public or individual residents, at street crossings and at private driveways, the Contractor shall provide suitable temporary bridges over unfilled excavations. All such bridges shall be maintained in service until backfilling has been completed. The Contractor shall keep the road crossings manned 24 hours per day. During night time, enough red lights shall be provided to warn traffic. If detour is necessary, the Contractor shall make proper detour for the traffic and shall be install signs 3 feet by 4 feet in size indicated the detour.

### **6.4 BACKFILLING**

The trenches shall not be completely backfilled until all required pressure tests are performed and until the water lines as installed conform to the requirements of specifications. Where in the opinion of the Engineer, damage is likely to result from withdrawing sheeting, shoring the same shall be left in place and cut off at a level 12" below ground surface. Trenches shall be backfilled to the ground surface with selected excavated material or other material that is suitable for proper compaction. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted to the specified density. The surface shall be restored to be original or better condition. Pavement and base course disturbed by trenching operations shall be required.

#### **6.4.1 Lower Portion of Trench**

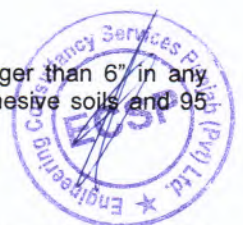
Backfill material shall be deposited in 6" maximum thickness layers and compacted with suitable and hand tampers to ninety five percent of maximum density until there is a cover of not less than 12" over the water lines. The backfill material in this portion of trench shall consist of sandy clay or other approved materials free from stones and lumps.

#### **6.4.2 Remaining of Trench**

The remainder of the trench shall be backfilled with material that is free from stones larger than 6" in any dimension. Backfill material shall be compacted to 90 percent of maximum density for cohesive soils and 95 percent of maximum density for others.

### **6.5 BORROW**

Where suitable material for backfill is not available in sufficient quantity from required excavations, suitable material shall be obtained from approved sources at the contractor's responsibility. The necessary clearing and grubbing or borrow areas disposal and burning of debris therefrom the developing of sources including any





access roads for hauling and the necessary right-of-way, and the satisfactory drainage of the borrow shall be considered as incidental items to be borrow excavation.

#### **6.6 GRADING**

After completion of all backfilling operations, the Contractor shall grade the work areas to the lines, grades and elevation shown on the drawings. Finished grading shall not be done until the installation of all water lines has been completed and tested. The top surface after completion shall be "in level" to the adjacent existing surface. Prior to final acceptance all damage due to settlement shall be repaired by and at the expense of the Contractor.

#### **6.7 TESTING DENSITY OF SOIL IN PLACE**

The Engineer may make tests using the calibrated sand cone method/core cutter method to determine the density of soil in place. If soil in place fails to meet the specified degree of compaction the areas represented by the failing tests shall be removed, replaced and compacted to the specified density in the manner directed by the Engineer and at no additional cost to the Owner.

#### **6.8 MEASUREMENT**

The measurement shall be made for the actual quantity of the work in cubic feet. The maximum width of the trenches allowed for payment for various pipe sizes will be as under: -

- a) Upto 2" diameter pipe, the trench width will be 15"
- b) Upto 3" diameter pipe, the trench width will be 18"
- c) Upto 4" diameter pipe, the trench width will be 18"
- d) Upto 6" diameter pipe, the trench width will be 21"
- e) Upto 8" diameter pipe, the trench width will be 24"
- f) Upto 10" diameter pipe, the trench width will be 26"
- g) Upto 12" diameter pipe, the trench width will be 28"
- h) Upto 16" diameter pipe, the trench width will be 32"

#### **6.9 RATE**

The unit rate tendered in the priced Bill of Quantities for excavation of trenches for water supply lines shall be considered as full compensation for the work specified in this section and shall include constructing and removing of all temporary arrangements pumping and dewatering, removal of soft soil from bottom of trenches, removing the surface material and all incidentals to complete this work.

#### **6.10 PAYMENT**

Payment shall be made for this item of work at the unit rate quoted in the priced Bill of Quantities.





## **SECTION – 7 EARTH WORK FOR SEWERS**

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### **7.1 DESCRIPTION**

Work under this section shall consist of furnishing all materials, equipment and labour for excavation, trenching and backfilling for sewers, drainage facilities, structures and all other appurtenances of sewage collection system, in accordance with drawings to proper line and grade refilling the trenches and dressing them to proper surface.

### **7.2 CLEARING AND GRUBBING**

The sites of all excavations shall be cleared of all shrubs, plants, bushes, large roots, rubbish and other surface material. All such materials shall be removed and disposed of in a manner, satisfactory to the Engineer all trees and shrubbery, that are designated by the preserved in an approved manner.

### **7.3 EXCAVATION**

#### **7.3.1 General**

The Contractor shall do all excavation of whatever substance encountered to the depth shown on the drawings or as otherwise specified. Excavation shall include without classification the removal and disposal of all material of whatever nature that would interfere with the proper construction and completion of the work and shall include the furnishing, placing and maintenance of supports for the sides of the excavations. The work shall also include all pumping; ditching, dewatering and other measures required for the removal and exclusion of water. During excavation, material suitable for backfilling shall be stock-piled in an orderly manner at a sufficient distance from the bank of the excavation to avoid over-loading and to prevent sides from caving. Top soil should be stockpiled separately for subsequent reuse as necessary. All excavated material unsuitable or not required for backfilling shall be removed and disposed of at a location approved by the Engineer.

For contract purposes hereunder, the earth excavation work has been classified into two categories, earth excavation in trenches, and earth excavation for structures.

#### **7.3.2 Earth Excavation in Trenches**

Except as otherwise provided herein, excavation for a sewer line shall be open cut trenches with vertical side and not more than 150 feet of any trench in advance of the end of the built sewer shall be opened at any time and unless written permission to the Contractor is given by the Engineer. The trench shall be excavation to its full depth for a distance permitted for the sewer to be laid. Trenches for sewer-lined and appurtenances shall be to the lines and grades shown on the drawing or as ordered in writing by the Engineer as necessary for the proper completion of the work. Bell holes and depressions for joints shall be dug after the trench bottom has been graded. The pipe except for joist shall rest on the prepared bottom for its full length. Bell holes and depressions shall be only of such length, depth and width as required for properly making the particular type of joint. Stones shall be removed to avoid point bearing.

Where the bottom of the excavation is in material which in the judgment of the Engineer by reason of its hardness cannot be excavated to provide a uniform bearing for the pipe, said material shall be removed to minimum of 6 inches below the grade of the bottom of the pipe, and the trench backfilled to the required pipe sub-grade with river sand or other material acceptable to the required depth with concrete grade of so ordered. In no case material removed from such excavation shall be used as backfill material unless approved by the Engineer. All instruction shall be in writing by the Engineer.

#### **7.3.3 Earth Excavation for Structures**

All earth excavation under this contract, which is not included under the classification of "Earth Excavation in Trenches" shall be classified and paid for as earth excavation for structures.

The Contractor shall provide adequate timbering or shoring for excavations. Should the sides and ends of any excavation give way the contractor shall, at no extra cost, remove all disturbed ground. Any excavation carried outside the limits shown on drawings and specified herein as the payment limits, shall not be treated as excavation and shall not be paid for.

When foundation level is reached, the Engineer representative will inspect the exposed ground and give directions as to what further excavation, if any, be considers necessary. The excavations should be done in such a manner, as to ensure that the work rests in solid and perfectly clean foundations. If the Contractor allows any portion of such foundation to deteriorate due to exposure, he shall made good the foundation to the satisfaction of the Engineer without extra cost.

#### **7.3.4 Alignment and Grade**

The sewers are to be laid to the alignment and gradient shown on the drawings, but subject to such modifications as shall be ordered by the Engineer from time to time to meet the requirements of the works. No



deviations from the lines, depths of cutting or gradients of the sewers shown on the drawings and sections shall be permitted except by express directions on writing of the Engineer.

### **7.3.5 Setting of Sight Rails**

The sewers shall be constructed and laid to a true grade and in straight lines between curves as shown on the plan. The sewer shall be laid and constructed to their proper levels with the aid of suitable boning rods and sight rails which shall be fixed according to the requirements of the Engineer at intervals not exceeding 10 feet and also by leveling along the invert with leveling instruments. The sight rails and boning rods shall be provided, fixed and maintained by the Contractor who shall also provide and maintain suitable leveling instruments and equipment and shall set the positions and levels of the sewers and other work according to the drawings and any instructions which he may receive from the Engineer, all sight rails and posts shall be well seasoned deodar timber of ample size and strength. The rails and boning rods shall be suitably and accurately planned and no warped or otherwise defective or damaged sight rails or boning rods shall be used. Sight rails shall be secured to the posts by strong steel clamps to the approval of the Engineer and in such a manner that they shall be fixed as immovable, in relation to the correct lines and levels. All boning rods and sight rails shall have the center line accurately marked thereon by a fine saw cut and shall be painted black and white to the requirements of the Engineer. All boning rods shall suitably be showed with iron. At least four separate sight rails shall always be maintained in correct level and alignment along the line of sewer at every place where construction work is proceeding and the alignment and level of the sight rails shall be checked by the level and line at least twice every day to ensure that no disturbance or interference of the alignment and level have taken place. Whenever required Contractor shall erect and maintain such additional sight rails as the Engineer shall direct. The Contractor shall, at all times, see that his workmen or other unauthorized persons are not allowed accidentally or otherwise, to tamper or interfere with sight rails or other alignment or level marks.

All bends and curves shall be set out mathematically in a manner approved by the Engineer and the Contractor shall provide and maintain for the purpose such additional sight rail posts and other wrought and rough timber work, steel wire and other articles as the Engineer shall require from time to time.

### **7.3.6 Sheet piling and Bracing**

If ordinary open-cut excavation is not possible or advisable, sheet piling and bracing shall be furnished and installed in excavation to prevent damage and delay to the work and to provide working conditions which are safe. The Contractor shall furnish and place all shoring, sheet piling, walls, bracing, timbers and similar items necessary for the safety of work, the general public and adjacent property. Sheet piling, shoring and walls bracing shall be removed as the work progresses and in such manner as to prevent damage to the finished work and adjacent structures and property. As soon as it is withdrawn all voids left by the sheet piling and bracing shall be carefully filled with selected material and compacted. The Contractor shall be fully responsible for the safety of work in progress, for the finished work, the workmen, the public expenses, as part of the work under the excavation items and at no extra cost.

### **7.3.7 Dewatering of Trenches**

As part of the work under the excavation items and at no extra cost, the Contractor shall build drains and do ditching, pumping, well-pointing, dewatering and all other work necessary to keep the excavation clear of ground water, sewage and storm water during the progress of the work and until the finished work is safe from injury, the Contractor shall provide all necessary pumping equipment for the dewatering work as well as operating personnel, maintenance, power etc. all at no extra cost. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer. Necessary precautions against flooding shall be taken.

### **7.3.8 Maintenance of Excavations**

All excavation made hereunder shall be properly maintained while these are open and exposed. Sufficient suitable barricades, warning lights, signs and similar items shall be provided by the Contractor. The Contractor shall be responsible for any personal injury or property damage due to his negligence.

### **7.3.9 Protection of Existing Facilities**

The Contractor shall take special care of existing sub-surface facilities likely to be encountered during the excavation for their protection, such as sewers, drain pipes, water main conduits, electric cables, communication cables and the foundations of adjacent structures. The Contractor shall be responsible for any damage to any such facility and shall repair the same at his expense whether or not the facility has been shown on the drawing.

### **7.3.10 Disposal of Surplus Excavated Material**

All surplus material excavated by the Contractor shall be disposed of at locations approved by the Engineer. The disposal of surplus material shall not interfere with other works and shall not damage or spoil other



materials. When it is necessary to haul earth material over streets or pavements, the Contractor shall prevent such material from falling on the streets or pavements.

#### **7.4 BACKFILLING**

##### **7.4.1 General**

After the completion of sewer line, drainage facilities foundations, walls and other structures below the elevation of the final grade all voids shall be backfilled with suitable materials specified below.

##### **7.4.2 Backfilling for Structures**

Backfilling operations for structures shall be performed as part of the Contractor's work under the payment items for earth excavation and at no extra cost. Backfilling material for foundations, walls and other structures shall consist of excavated soil which is free from stones and hard clods not larger than 3 inches in any dimension, and also free from trash, lumber and other debris. Backfill material shall have enough moisture for proper compaction and shall be compacted in and approved manner to 90 percent of maximum density for cohesive soils and 95 percent of maximum density for cohesion less soils. Backfill shall not be placed against foundation walls earlier than 4 days after placing of concrete or brick masonry.

##### **7.4.3 Backfilling for Trenches**

After the sewers have been constructed and proved to be water tight as per direction of the Engineer the trench shall be backfilled. Utmost care shall be taken in doing this so that no damage shall be caused to the sewer and other underground utilities. After this has been laid the trench and other excavation shall be backfilled carefully in 6" layers with earth as approved by the Engineer, each layer being watered to assist in the compaction unless the Engineer shall otherwise direct.

#### **7.5 MAXIMUM DENSITY DETERMINATION FOR COMPACTED SOIL**

The maximum density of the soil shall be determined in accordance with the latest revision of "American Society for Testing Materials (ASTM) Standard D 1557 Density Relations of Soils, using 15 lbs. Rammer and 18 inches Drop".

##### **7.5.1 Testing Density of Soil**

The Engineer may make tests using the calibrated sand cone method/core cutter method to determine the density of soil in place in accordance with ASTM Designation D 2558, latest revision. If soil in place fails to meet the specified degree of compaction the areas represented by the failing tests shall be re-excavated and compacted to the specified density in the manner directed by the Engineer at no extra cost.

##### **7.5.2 Top Soil**

Top soil which has been stockpiled during excavation shall be used for the top 6" of backfill, in locations as ordered by the Engineer. Top soil shall be saturated with water and after it has dried, shall be spread to the required final grade and of required density. The work shall be performed at no extra cost.

##### **7.5.3 Proximity to Buildings**

Where buildings in the opinion of the Engineer near excavation are likely to be affected, the Contractor shall provide proper shoring to protect such buildings in addition to timbering of trenches. The Contractor shall be required to leave timbering inside trenches if so, required by the Engineer for protection of these buildings at no extra cost.

#### **7.6 LENGTH OF TRENCHES IN ADVANCE OF CONSTRUCTION**

Unless otherwise directed in writing by Engineer of the work not more than 200 feet in advance of constructed or laid sewer shall be left open at any time. The trench shall, however, be excavated to full width to minimum length of 16 feet in advance of the constructed laid sewer unless otherwise directed by the Engineer.

#### **7.7 DISPOSAL OF FILTH AND GARBAGE**

No night soil filth and garbage met with during the excavation shall be allowed to be deposited on side of road/street so as to cause nuisance or obstruction to traffic. The same shall be disposed of by the Contractor to a place to the satisfaction of the Engineer.

#### **7.8 DISPOSAL OF SURPLUS EARTH**





The Contractor shall dispose of all surplus excavated materials not required to be used on the work. This shall include surplus earth after refilling and compaction.

## **7.9 TUNNELING**

### **7.9.1 Formation of Soil**

Tunneling shall only be permitted in strong hard and homogeneous, clay formation which are not likely to collapse under normal working conditions. The work shall not be permitted in running sand. In weaker formation such as mixture of clay and sand which are liable to collapse when exposed to atmosphere. The roof shall be protected by adequate timbering and shoring of roof and the walls, irrespective of any type of alluvial strata. If the tunnel is subject to any sort of traffic, it shall be provided with adequate timbering and shoring for its roof and walls.

### **7.9.2 Length of Tunnel**

Normally the length of tunnel without adequate support shall not exceed 3'. This length shall, however, may be exceeded under the directions of Engineer, where depth of tunnel below ground level is considerable to avoid any danger of collapse. The tunnel, however, shall be driven in longer lengths upto 150 feet, if drive casing is provided as the tunnel is being excavated.

### **7.9.3 Horizontal Boring Machines**

When considered necessary by the Engineer, horizontal boring machines shall be employed for crossing sewers underneath highways and canals. Whenever such machinery is used, drive casing of steel popes shall be drive to avoid any collapse of the tunnel.

### **7.9.4 Backfilling of Tunnels**

Tunnels shall be filled in with sand or selected material as directed by the Project Manager.

## **7.10 MEASUREMENT**

Measurement shall be made for the actual quantity in 3' of excavated trenches. The maximum width of trenches allowed for payment will be as follows: -

- a) Trenches not exceeding 6 feet in depth 24" plus external diameter of the barrel for pipe sewers.
- b) Trenches exceeding 6 feet and not exceeding 12' in depth 30" plus external diameter of the barrel for pipe sewers.
- c) Trenches exceeding 12 in depth 36" plus external diameter of the barrel for pipe sewers.

## **7.11 RATE**

The unit rate tendered in the priced Bill of Quantities for excavation and back filling of trenches for sewer lines, shall be the full compensation for the cost materials, labour, equipment, tools and all incidentals necessary completely to execute this item of work strictly as per specifications laid down in this section.

## **7.12 PAYMENT**

Payment shall be made at the unit rate quoted in the priced Bill of Quantities.





## **SECTION-8 BEDDING**

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### **GENERAL**

Wherever specifically called for by means of notes on the contract drawings or by written order of the Engineer the Contractor shall furnish and place sand or pea gravel bedding under water lines, sewer lines, drain pipes and other structures as a separate item of payment.

#### **8.1 SOURCE OF BEDDING MATERIAL**

Sand or pea gravel for bedding shall be from a source and of specifications approved by the Engineer.

#### **8.2 PURITY AND STACKING**

the sand and gravel shall be free from clay, salt, alkali, organic matter, shale, loam, soft flaky particles and other deleterious substance. It shall be stacked at the place designated by the Engineer and kept free from the admixture of deleterious materials mentioned herein.

#### **8.3 PLACING OF BEDDING MATERIAL**

The material for bedding shall be placed to the specified thickness and compacted by rammers of approved weight.

#### **8.4 MEASUREMENT**

the measurement shall be made by volume for the actual quantity of the work done and the unit of measurement shall be one cubic foot.

#### **8.5 PAYMENT**

Payment for this item of work shall be made for the actual quantity of work done as specified in this section, at the unit rate quoted in the priced Bill of Quantities.





## **SECTION-9 DISMANTLING & RESTORATION OF PAVEMENT**

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### **9.1 DESCRIPTION**

The work covered by this section of the specifications consists in furnishing all labour, equipment, appliances and materials and in performing all operation in connection with cutting and restoration of road/street surface and pavement, cut or damaged as a result of work accomplished under this contract in strict accordance with this section of the Specifications and the applicable drawings and to the satisfaction of the Engineer.

### **9.2 CUTTING OF ROAD/STREET SURFACE AND PAVEMENT**

In cutting and breaking road or street surface and pavement, the contractor shall not use such equipment and appliances which shall damage the adjacent surface. Existing paved surface shall be cut back beyond the edges of the trenches to form neat square cuts. The dismantled materials shall be placed on one side of the trench for reuse after backfilling, for the restoration of the road surface. Not more than 500 feet of continuous road/street surface shall be out or disrupted at a time for laying the drains. The Contractor shall take all safety measures against traffic hazards and shall provide proper diversion for the traffic where necessary. The diversion shall be indicated by suitable street signs 3 feet by 4 feet in size. During night enough red lights shall be provided to warn the traffic.

### **9.3 CUTTING IN EXCESS OF THE WIDTH OF TRENCH**

The cutting of the road/street surfaces and pavement shall be limited to the width of the trench. Where the contractor has cut the road surface or pavement in excess of the width of the trench, he shall not be paid for the excess cutting and the excess cutting shall be restored by the contractor at his own expenses.

### **9.4 RESTORATION OF ROAD/STREET SURFACE AND PAVEMENT**

After backfilling of trenches, the cut road/street surface and pavement shall be restored as quickly as possible to original foundations and grade and line in such a manner as to provide acceptable surface for traffic. Intersections shall be restored within 24 hours after being cut.





## **SECTION-10 MISCELLANEOUS WORKS**

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### **10.1 DESCRIPTION**

The work covered by this section of the specification consists in furnishing all labour equipment appliances and materials and in performing all operation in connection with providing water, sewerage and drainage and gas connections to the existing lines.

This Section of the Specifications is intended to cover all miscellaneous items which are not specifically called for in other section of these specifications. Item shown or called for on the drawing, but not itemized herein, shall be furnished under the conditions of this sections and shall generally conform, as closely as possible to these specifications unless otherwise directed by the Engineer.

### **10.2 MATERIAL REQUIREMENT**

#### **10.2.1 Structural Steel**

For screen grating, & I beam steel shall be carbon ASTM A-36, minimum strength of which shall be 36,000 psi. Except where otherwise shown all structural steel shapes and sizes shall be shown on the plans.

The bar steps in sewage lift station O/H, U/G Reservoir manholes shall be malleable iron steps (galvanized), designed with non-solid tread and shall comply with BS 1247/75. The steps shall be hot dipped galvanized with overall length, width, tread length and minimum weight of 10,6,5 lbs. respectively.

### **10.3 CONSTRUCTION REQUIREMENT**

#### **10.3.1 Fabrication of Screen**

Screen and gratings for sewage lift stations shall be constructed in accordance with the details as shown on the Plans.

Metal shall be well formed to shape and size with sharp line or angles. Shearing and punching shall leave clean, true lines and surfaces. Permanent connections shall be welded. The use of screws or bolts shall be avoided but where used, heads shall be counter sunk screwed on-tight, and the threads nicked to prevent loosening. Necessary rabbits, lugs and brackets shall be provided so that work can be assembled in a neat and substantial manner. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. All the work shall be installed in an approved and rigid manner, and where possible, shall be secured with galvanized bolts or welded where shown.

#### **10.3.2 Painting**

Screen surface shall receive one coat of rust inhibitive metal primer to red lead paint for which no separate payment shall be made to the contractor.

#### **10.3.3 Welding**

Welding shall be continuous along entire line of Contract, except where spot welding is indicated on the drawings or is authorized by the Engineer. Exposed welds shall be ground smooth except otherwise directed by the Engineer.

#### **10.3.4 Bolting**

Bolting where permitted shall be done with proper size bolts. Nuts shall be drawn tight and threads nicked.





#### **10.4 MEASUREMTNT**

Measurement for screen will be made for the actual work executed at the unit rate entered in the Bill of Quantities. Bar steps shall be measured per unit acceptable placed in the wall completed and approved. All connections to the specified lines. (i.e., water sewerage and drainage) shall be Lump sum.

#### **10.4 RATE AND PAYMENT**

Payment shall be made at the unit rate stated in the Bill of Quantities. Such payment shall constitute full compensation for furnishing all materials equipment and labour including testing and all other incidentals necessary to complete the work according to the applicable drawings and directions of the Engineer.





## **SECTION - 11 WATER RETAINING STRUCTURES**

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### **11.4 DESCRIPTION**

The work covered by the sections of specification & consist of construction of overhead. Underground water tanks and swimming pool.

### **11.2 MATERIAL REQUIREMENT**

All materials such as cement, sand, aggregate & steel etc. shall conform to the specifications given in respective e section (Material) or given elsewhere.

### **11.3 CONSTRUCTION REQUIREMENT**

The Contractor shall carry out the work according to design /drawing/instructions of Engineer Incharge. Work shall include the following.

1. Columns/pillar raised/constructed upto required height RCC 1:1-1/2:3
2. Bed and side walls of tanks shall be constructed in RCC 1:1-1/2:3 mixed with pudlo as per manufacturer's directions.
3. Inside of the tank shall be finished with ½" thick terrazzo over ½" thick 1:2 cement sand mortar or ceramic tiles as specified on drawings.
4. Roof slab shall be in RCC 1:2:4 with manhole cover with frame and vent pipes.
5. In joint water stopper 9" wide will be used.
6. For pipes, rising mains, delivery, overflow & washout, puddle collars of specified size will be fixed during pouring of side wall concrete.
7. Necessary gauge and float valve shall be provided
8. Stairs shall be provided inside & outside the tanks as per plans
9. Inside of the tank will be lime washed for dis-infections.
10. If anywhere brick work is used, it will be 1<sup>st</sup> class brick work set in cement sand mortar 1:3
11. If any plaster is done that will be in cement sand mortar 1:3 with pudle
12. External sides of walls of underground water tank will be provided vertical DPC as per specifications in section DPC.

### **11.4 MEASUREMENT**

Measurement will be taken in capacity of water tank. For calculating capacity. Free board will not be accounted for i.e height. From bottom to water level will be taken.

### **11.5 RATE AND PAYMENT**

Rate shall include all material form work & labour etc. complete in all respect design/drawing/instructions of Engineer In charge





# **SPECIAL PROVISIONS**

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## SPECIAL PROVISIONS

### 1 GENERAL

1.1 Specifications - Special Provisions shall form an integral part of Bid and the Contract documents.

1.2 The Contractor shall notify all sub-contractors of the provisions of these Special Provisions.

### 2 DESCRIPTION OF PROJECT, WORKS INVOLVED AND SITE

Capital Development Authority, Islamabad hereinafter called "the Employer" wishes to receive bids for the **"Supply and Installation of Firefighting System at PRCL Tower, Karachi under Upgradation of Firefighting System at PRCL, HOK "**, as mentioned in BOQ and specified in Technical Specifications

### 3 CODES, STANDARDS AND CERTIFICATES

#### A. Applicable Standards

Except as otherwise provided by these Specifications or the Drawings, all materials, equipment and fabrication and testing thereof shall conform to the latest applicable standards and codes referred in the Specifications by use of the abbreviations explained below:

Abbreviation:	Full Form:
ASCE	American Society of Civil Engineers
ASA	American Standard Association
BCP	Building Code of Pakistan
NFPA	National Fire Protection
IEC	International Electrotechnical Commission
NEC	National Electrical Code





ICAO	International Civil Aviation Organization
PS	Pakistan Standards (Pak)
BSICP	British Standard Institute Code of Practice
PSI	Pakistan Standard Institute
IPC	International Plumbing Code

If the Contractor, at any time and for any reason, wishes to deviate from the above standards or desires to use material or equipment not covered by the above standards, he shall state the exact nature of the changes, the reason for making the change and shall submit complete specifications of the materials and equipment to the Engineer for approval.

#### **B. Standards other than those Specified**

Where requirements for materials or equipment are specified by reference to a standard which has its origin in one country, it is not the intention to restrict the requirements solely to that standard and that country. Other standards, including standards of other countries, will be accepted provided the requirements thereof, in the sole opinion of the Engineer, are at least equal to the requirements of the standard specified. The Contractor may propose to the Engineer an equivalent standard other than that specified, in which case he shall submit the proposed standard and all other information required and shall submit written proof that his proposed standard is equivalent in all significant respects to the standard specified. All submissions must be made in the English language.

#### **C. Codes and Standards at Site**

The Contractor shall supply and have at his site office:-

- Copies of all latest editions of codes and standards referred to in these Specifications or equivalent codes and standards as approved by the Engineer.
- Catalogues and published recommendations from manufacturers supplying products and materials for the project.





- c) The Contractor shall provide manufacturer's or supplier's materials which must meet the requirements of a specific code or standard as stated in these Specifications.

#### **4 MANUFACTURER'S RECOMMENDATIONS**

Installation of manufactured items shall be in accordance with procedures recommended by the manufacturer or as approved by the Engineer.

#### **5 UNITS OF MEASUREMENTS**

The units as described in schedule of prices (Volume-II & III of bidding documents) throughout the Project.

#### **6 EXISTING CONDITION AT SITE**

Drawings and information pertaining to existing project conditions are furnished for reference. Neither the Employer nor the Engineer warrants the adequacy or correctness of these. The Bidders are encouraged to visit the project site to assess the existing site conditions.

#### **7 PROTECTION AND PRECAUTIONS**

The Contractor and his sub-contractors shall afford all necessary protection to existing structures and will be required to make good at his own expense any damage done to such structures through his own or his representatives or subcontractors' fault and negligence.

The Contractor and his sub-contractors shall afford all necessary protection to existing roads in the area. He will clear and make good at his own expense any damage to or debris on these roads through his own fault and negligence. He must at all-time ensure the free and normal flow of traffic and shall not cause obstruction to the traffic system. The Contractor and his sub-contractors shall provide and maintain necessary protection and precautionary measures such as warning signs, warning lamps and barricades etc. to prevent accidents.

The Contractor shall promptly correct all such damage to original condition at no additional expense to the Employer. The Contractor shall cooperate with trades performing work under other Contracts as necessary for completion.

#### **8 SEQUENCE OF CONSTRUCTION**

The Contractor shall submit his proposal for approval of the Engineer the sequence of Construction, prior to starting the works. The works shall be executed as per approved sequence of construction with due consultation of the Employer.





## **9 LINES AND LEVELS**

Survey control points will be established by the Engineer. The Contractor shall be responsible for verifying these and shall be responsible for all requirements necessary for the execution of any work to the locations, lines, and levels specified or shown on the drawings, subject to such modifications as the Engineer may require as work progresses.

## **10 PLANT, EQUIPMENT AND TOOLS**

The Contractor shall provide at his cost modern plant, equipment and tools, adequate and befitting to the nature, magnitude and size of this Contract, in strict compliance with the requirements of the General Conditions of Contract, Conditions of Particular Applications and Technical Specifications.

## **11 PARTIAL POSSESSION**

Whenever, as determined by the Employer any portion of work performed by the Contractor is in a condition suitable for use, the Employer may take possession of or use such portion. Such use by the Employer shall in no instance be construed as constituting final acceptance, and shall neither relieve the Contractor of any of his responsibilities under the Contract, nor acts a waiver by the Employer of any of the conditions thereof, provided that the Contractor shall not be liable for the cost of repairs, re-work, or renewals which may be required due to ordinary wear and tear resulting from such use. However, if such use increases the cost or delays to the completion of remaining portions of work, the Contractor will be entitled to an equitable adjustment.

If, as a result of the Contractor's failure to comply with the provision of the Contract, such use proves to be unsatisfactory, the Employer will have the right to continue such use until such portion of the work can, without injury to the Employer, be taken out of service for correction of defects, errors, omissions, or replacement of unsatisfactory materials or equipment, as necessary for such work to comply with the Contract; provided that the period of such operation or use pending completion of appropriate remedial action shall not exceed twelve months unless otherwise mutually agreed upon in writing between the parties.

## **12 EXISTING SERVICES**

The Contractor shall search for, find, locate and protect any wiring, cable, duct, pipework, etc., within or immediately adjoining the site area. The Contractor shall take full responsibly





for safety of existing service lines, utilities and utility structures uncovered or encountered during excavation and construction operations.

The Contractor shall take full responsibility for damaging any such service lines, utility/utility structure and any cost and/or expense that arises or issues from any such damage shall be borne directly by himself. Should any damage to any such service occur the Contractor shall forthwith take remedial action, initiate safety precautions, install temporary services and carryout repair all at his own cost and expense and inform the Engineer and notify all relevant authorities.

Existing utilities which are to remain in service for or after the works are to be determined by the Contractor. If any existing service lines, utilities and utility structures which are to remain in service are uncovered or encountered during these operations, they shall be safeguarded, protected from damage, and supported. The Contractor shall preserve, maintain and keep in perfect working conditions, any existing facilities required to be preserved by the Employer/the Engineer.

### **13 CONSTRUCTION AREA AND ACCESS**

The Employer will provide the Contractor possible space within or nearby the area of site of works for the storage of plant, equipment and materials and for Contractor's temporary office, during the currency of the Contract. In case the adjacent area as required by the Contractor is not available within the Project boundary for storage of plant, equipment and machines then the Contractor shall arrange at his own expense possible space for storage of plant, equipment and machines at his own cost and expense. On no account shall such temporary installations conflict/interfere with any of the permanent installations, services and any operational function of the Employer. The handling and storage of all plants, equipment and materials at site shall be the sole responsibility of the Contractor and at no risk and cost to the Employer. The Contractor shall protect all material against corrosion, mechanical damage or deterioration during storage and erection on site. The protection methods shall be to the approval of the Engineer

### **14 CONSTRUCTION & CHECKING AT SITE**

The Contractor shall submit to the Engineer in due time for approval and discussion, his proposals and plans as to the method and procedure to be adopted for the temporary and permanent works involved.





The submitting to these suggestions and arrangements, and the approval thereof by the Engineer shall not relieve the Contractor of his responsibilities and duties under the Contract. The carrying out of all work included in the Contract is to be supervised by a sufficient number of qualified representatives of the Contractor and full facilities and assistance are to be afforded by the Contractor for the Engineer or his Representative to check & examine the execution of the work.

The Engineer reserves the right to inspect all parts of the works but may at his discretion waive inspection on certain items. This shall in no way absolve the Contractor from his responsibilities. This particularly applies to the checking of materials, the accurate setting out of foundations, and to the leveling, setting and aligning of the various parts, and to the proper fitting and adjustment of manufactured and finished materials and fixtures in position.

If the Engineer or his Representative find that the work progress is slow in such a way that the works or parts thereof will not be completed in the time specified, then he shall order the Contractor to work overtime or in shifts and the Contractor shall comply. These arrangements of contractor will be free of all financial encumbrances and at no additional costs to the Employer.

In the event of night work, the Contractor shall provide sufficient and adequate lighting to the satisfaction of the Engineer or his Representative and shall supply the necessary manpower for satisfactory continuation of the work after normal hours.

## **15 STORAGE & HANDLING FACILITIES**

The Contractor shall make his own arrangements for providing the necessary space for the storage of plant, equipment and materials and for Contractor's temporary office, in and around the site of works, during the currency of the Contract.

## **16 PRODUCT DATA**

**Manufacturer's standard schematic drawings shall be modified or deleted to indicate only information which is applicable to the project. Such standard information shall be supplemented to provide all additional applicable information.**

**Manufacturer's catalogue sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive literature shall be clearly marked to identify pertinent materials products or models. Dimensions and required clearances shall be indicated. Shop performance characteristics and capacities shall be noted.**





## **17 PRODUCT QUALITY AND HANDLING**

Suppliers of local and foreign products and installations specified shall have been regularly engaged in the business of manufacturing, fabricating, installing and / or servicing work required for a period not less than 5 years. In addition, the Engineer may request as appropriate a:

- list of similar installations that describes project, scope and date of completion.
- complete literature, performance data, and technical data.
- list of services records within Pakistan.
- location of the service office from which this installation could be maintained.
- For the actual fabrication, installation and testing of the specified work use only thoroughly trained and experienced workmen completely familiar with the items required and with the manufacturers recommended methods of installation. In acceptance or rejection, no allowance will be made for the lack of skill on the part of workmen

Use all means necessary to protect materials before, during and after installation and to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs and replacement necessary for approval and at no additional cost to the Employer.

## **18 INSPECTION & TESTS REPORTS**

All equipment and materials furnished under these specifications and all work performed in connection therewith will be subject to rigid inspection by the Engineer or the Engineer's Representative. Acceptance of equipment and material or the waiving off inspection thereof shall in no way relieve the Contractor of his responsibility for meeting the requirements of the Contract.

The Contractor shall furnish the Engineer with certified true copies of test reports of all materials used in the manufacture and fabrication of all equipment and material including metal work, steel pipes, fire bricks etc. The result of these test shall be in such form as to show compliance with the applicable Specifications, standards and codes for the material used.



## **19 FIELD LABORATORY AND TESTING**

### **19.1 General**

The Contractor shall provide and maintain a field laboratory equipped with approved equipment to perform all the tests required by the Engineer. The quality control testing shall be performed by the Contractor's competent personnel in accordance with a site testing and quality control programme to be established by the Contractor and approved by the Engineer. The Engineer may however, require certain tests to be performed.

### **19.2 Testing Laboratory Certificates**

The Engineer may accept a certificate from central engineering lab or reputable commercial testing laboratory, satisfactory to him, certifying that the product has been tested within a period acceptable to the Engineer and that it conforms to the requirements of these specifications.

## **20 SURVEYING INSTRUMENTS**

### **20.1 General**

The minimum quantity of survey equipment is stated below which shall be available with the Contractor at site of Works along with qualified Surveyors and Survey Helpers. The equipment shall be maintained throughout the Contract Period and replaced by the Contractor in case of damage or loss. The survey equipment shall be made available to the Engineer when requested. All surveying equipment shall be in good working condition.

## **21 APPROVAL OF MATERIALS AND PLANT**

### **21.1 Quality of Materials**

All materials, fixtures, fittings, supplies and plant furnished under the Contract shall be new and unused, standard first grade quality and of the best workmanship and design. No inferior or low-grade materials, supplies or articles will be either approved or accepted, and all work of assembly and construction shall be done in a first-class and workmanlike manner. In asking for prices for materials intended for delivery to the Site and incorporation in the Works under any portion of these Specifications, the Contractor shall provide the manufacturer or supplier with complete information as may be necessary to secure compliance to this Clause and, in every case, he shall quote this Clause in full to each such manufacturer or supplier.



## **21.2 Submission of Samples and Data**

21.2.1 The Contractor shall furnish for approval of the Engineer with reasonable promptness all samples as directed by the Engineer or specifically called for in the Specifications and in accordance with the time schedule provided in the schedule of submittals. The Engineer shall check and approve such samples with reasonable promptness only for conformance with the design concept of the Works and for compliance with the information given in the Contract Documents. All work shall be in accordance with approved samples.

21.2.2 Samples shall be furnished so as not to delay fabrication, allowing the Engineer reasonable time for consideration of the sample submitted.

21.2.3 Each sample shall be properly labeled with the name and quality of the material, manufacturer's name, name of the project, the Contractor's name and the date of submission, and the Specifications Article number to which the sample refers.

21.2.4 The manufacturer's installation directions shall be provided with each sample. The Contractor shall pay all transportation costs and deliver samples to the Engineer's office, Site or testing laboratory as directed by the Engineer.

21.2.5 Samples shall be of adequate size to permit proper evaluation of the material by the Engineer. Where variations in colour, texture, dimensions or other characteristics are to be expected, the Contractor shall submit samples showing the maximum range of variation. Materials exceeding the range of variation of the approved samples shall not be used on the Work.

21.2.6 In order to permit coordinated selection of colours and finishes, the Contractor shall deliver samples of all related items to the Engineer at one time. Samples of such materials will not be approved until all related samples have been submitted.

21.2.7 If both Shop Drawings and samples are required for the same item, the Engineer may require both to be submitted before approving either.

21.2.8 The Contractor shall erect Mock-up samples of finished items where specifically called for in the documents or as directed by the Engineer. The Mock-up samples shall be preserved/protected by the Contractor till the end of the project or as directed by the Engineer.



21.2.9 No acceptance or approval of any Shop Drawings or sample, or any indication or request by the Engineer on any Shop Drawings shall constitute an authorization for any increase in the Contract Sum.

### **21.3 Inspection**

All material and Plant furnished, and all work performed under this Contract will be subject to inspection by the Engineer at all times and in all states of completion both off-Site and on-Site. The Contractor shall furnish promptly without additional charge, all facilities, labour and materials reasonably needed for performing such inspection and testing as may be required by the Engineer.

### **21.4 Approved Sample at Site**

The Contractor shall, at all times, keep on the Site approved samples. All such samples shall be made available to the Engineer as and when required.

## **22 DRAWINGS**

### **22.1 Bid Drawings**

Bid Drawings issued with the Bid Documents, called the Bid Drawings, show scope of the work to be performed by the Contractor. The Drawings issued with bidding documents are conceptual and showing employer requirement.

### **22.2 Definition of Term Drawings**

The term Drawings as used in the Specifications means the Drawings referred in Clauses 12.1 and 12.2 above.

### **22.3 Drawings to Be Furnished By the Contractor**

The Contractor shall submit to the Engineer for review, such drawings as are required under the Contract, sufficiently in advance of the work intended to be executed.

#### **22.3.1 Reinforcement Drawings**

Reinforcement placement drawings and bar bending schedules (to be provided by the Contractor as per clause 11 above) of all RCC work shall be prepared by the Contractor and submitted in triplicate to the Engineer for approval, sufficiently in advance of the works in which they are intended to be used.



### 22.3.2 Shop Drawings

- (a) The Contractor shall submit to the Engineer for review two (2) copies of all drawings to be issued for setting out, fabrication, supply order and construction; based on data, requirements, dimensions, details, codes, standards and design provided in the drawings issued by the Employer. Such drawings shall be submitted at least Fourteen (14) days before they are required for use. If within a period of fourteen (14) days after submission, the Engineer notifies the Contractor that a drawing fails to comply with the relevant requirement of the Contract, it shall be rectified and resubmitted for approval **at the Contractor's cost. Fabrication or construction shall not commence** on any part of the Works until the shop drawings or construction drawings for that part of the Works have been approved by the Engineer.

The Works shall be executed in accordance with the drawings as approved by the Engineer. If the Contractor wishes to modify any approved drawings, he shall immediately notify the Engineer and submit revised drawings for approval. If the Engineer instructs that further drawings are necessary for executing the Works, the Contractor shall prepare such drawings and submit them for approval.

The Contractor at his cost shall rectify errors, omission, ambiguities, inadequacies and other defects.

Approval by the Engineer, in accordance with this paragraph, shall not relieve the Contractor of any of his responsibilities under the Contract.

- (b) The shop drawings shall be properly identified indicating the part of the Works, the name of the contractor / supplier etc., the date of preparation and the dates of all revisions. The Shop Drawings shall be complete and shall show the design dimensions, proposed materials to be used, finishes, type of shop paint and all other details in connection thereto.

- (c) Where adjoining work requires shop drawings, the Contractor shall prepare and submit composite shop drawings, which shall show and define the work under all affected trades. If the Contractor executes work before coordinating with other trades so as to cause interference with work of those trades, he shall make changes necessary to correct the conditions without extra cost to the Employer.



(d) No changes shall be made by the Contractor in the resubmitted shop drawings in excess of the corrections spelled out by the Engineer and in a separate note on the shop drawings.

(e) No work in the shop shall be started and no material or plant ordered until the Engineer has approved the shop drawings. It shall be the responsibility of the Contractor to submit the shop drawings on a schedule that allows reasonable time for checking and approval and subsequent fabrication. Failure to submit shop drawings in ample time for checking, correcting, and rechecking will not justify extension of time for completion of the Works.

(f) The Contractor shall also check and verify all site measurements whenever requested by other Specialist Contractors or by other Sub-Contractors to enable them to prepare their own shop drawings and pass on the information with

sufficient promptness, so as not to delay the work in any way. A copy of all such information passed on shall be given to the Engineer.

### 22.3.3 As-Built Drawings

The Contractor shall, at all times, keep on Site a separate set of prints of all drawings on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. The Subcontractor(s) shall, at all times, keep on Site, a separate set of prints of the drawings (showing their parts of the Works) on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. Such drawings shall show the exact physical location and configuration of the works as actually installed.

The Contractor shall, within fourteen (14) days of issuance of Taking-Over Certificate for whole of the Works, furnish to the Engineer for his approval two (2) copies of such marked up drawings. One (1) copy of each of the marked-up drawings approved by the Engineer shall be returned to the Contractor by the Engineer and these shall be used for the preparation of the As - Built Drawings.



The Contractor shall furnish to the Engineer six (6) complete sets and one reproducible copy of all As -Built Drawings within twenty-eight (28) days of receipt of drawings stated above, from the Engineer.

### **23 PROTECTION OF THE WORKS**

The Contractor shall whenever necessary cover up and protect the works from weather and damage by his own or other workmen performing subsequent operation. The Contractor shall provide all necessary dustsheets, barriers and guard rails and clear away the same at completion.

### **24 RESTORATION AND CLEANING**

Upon completion of the works the Contractor shall restore all items covered by the Contract to the satisfaction of the Engineer.

The Contractor shall do regular cleaning and clear away all rubbish and excess materials that may accumulate from time to time on completion and before handing over. Upon completion of the works, he shall obliterate all signs of temporary construction facilities such as work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction, as directed by the Engineer. All working areas shall be cleaned; floors and paving scrubbed and the works and site shall be left in a clean and satisfactory state for immediate use and occupation. Care shall be taken not to use any cleaning materials, which may cause damage to the surface to be cleaned.

The Contractor shall also take all necessary precautions to keep the works and site free from vermin during construction and he shall leave the works vermin free on completion. Application of pest control agents shall not commence until the specific product, name, method and extent of application have been submitted to and approved of by the Engineer.

### **25 SITE OFFICE AND TEMPORARY FACILITIES TO BE PROVIDED BY THE CONTRACTOR**

#### **25.1 Contractor's Office, Facilities Etc.**

The Contractor shall establish and maintain a Site office. The Contractor shall provide all facilities in connection with the execution, completion, of the Works, remedying defects therein and maintenance of the utility services. The facilities shall not be limited to the Contractor's Site Office, labour camps, work yard and storage areas, temporary water supply, waste water



disposal, temporary electricity, medical unit, temporary roads, fire protection and firefighting equipment etc. The Contractor shall be solely responsible for arranging all utilities and the Contractor shall setup, maintain and operate an architectural and engineering facility at site with adequate number of technical and support staff as well as equipment required for particular nature of job covered under the Contract to prepare drawings/shop drawings for approval of the Engineer.

The Contractor shall arrange his labour camp, work yard, storage area and site office.

## **25.2 Temporary Services**

### **25.2.1 Temporary Water Supply**

The Contractor shall supply in sufficient quantity all necessary potable and other water for construction purposes for all trades at points within a reasonable distance of any working area being constructed. The Contractor shall make arrangements and pay charges for water service installation, maintenance and removal thereof, and pay the costs of water for all trades.

At completion of the work, the temporary water services equipment and piping shall be removed by the Contractor at his own expense.

### **25.2.2 Temporary Electricity**

The Contractor shall make all the necessary arrangements for a temporary electricity service, pay all expense in connection with the installation, operation and removal thereof and pay the costs of electricity consumed by all trades. The Contractor shall arrange and furnish an Electric Power Generating set at site and maintain the generating set in perfect working condition through-out the duration of Contract. The generating power of the set shall be sufficient to operate all plant and equipment as well as the camps and offices of the Contractor and the offices of the Engineer/Employer, during construction at site. Should the set fail to meet the required demand at site or fail to function or operate, the Contractor shall immediately replace the same with other generating set/sets to the satisfaction of the Employer as well as the Engineer.

A temporary lighting system shall be furnished, installed and maintained by the Contractor as required to satisfy the minimum requirements for safety and security and to the satisfaction of the Engineer.



When the permanent electrical power and lighting systems are in an operating condition, they may be used for temporary power and lighting for construction purposes provided that the Contractor obtains the written approval of the Engineer and the Employer and assumes full responsibility for the entire power and lighting system and pays all costs for operation and maintenance of the system.

At completion of construction work, or at such time as the Contractor makes use of permanent electrical equipment and devices, temporary electricity services shall be removed by the Contractor at his own expense.

### **25.2.3 Waste Disposal**

The Contractor shall make such temporary provisions as may be required in order to dispose of any chemicals, fuels, oils, grease, bituminous materials, waste and soil waste and the like without causing pollution to either the site or the environment. Disposal of any materials, wastes, effluent, garbage, oil, grease, chemicals and the like shall be in areas specified by the concerned local authority proposed by the Contractor and subject to the approval of the Engineer. If any waste material is dumped in unauthorized areas the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed off as directed by the Engineer and replaced with suitable fill material compacted and finished with topsoil all at the expense of the Contractor.

### **25.2.4 Fire Protection**

The Contractor shall provide and maintain adequate fire protection in the form of barrels of water with buckets, fire bucket tanks, fire extinguisher, or other effective means ready for instant use, distributed around the project and in and about temporary inflammable structures during construction of the works.

Gasoline and other flammable liquids shall be stored in and dispensed from safety containers approved by the Engineer and storage shall not be within working area.

Torch-cutting and welding operations performed by the Contractor shall have the approval of the Engineer before such work is started and a chemical extinguisher is to be available at the location where such work is in progress.

The Contractor shall follow the instructions and specifications of the Civil Defense Department or any other local department concerned with such activities.



## 26 CONSTRUCTION SCHEDULE

A Construction schedule shall be maintained in accordance with the provisions of the General Conditions of Contract.

The schedule shall be accompanied with sufficient data and information including all necessary particulars of constructional plant, equipment machinery, temporary Works, arrival of plant, equipment at site and their installation, method of operation, work forces employed, etc., for activities of the Works.

Should the Engineer consider any alteration or addition in the programme and time schedule, the Contractor shall conform thereto without any cost to the Employer.

Whenever necessary and wherever the progress of the actual work shows departure, the programme and time schedule shall be undated and submitted to the Engineer for his approval.

## 27 SUBMISSION REQUIREMENTS

Schedule submission at least **sixty days** before the dates when reviewed submittals will be needed.

Submit Shop Drawings as per provision given in Sub-Clause 19.5 (a) and number of copies of Product Data which the Contractor requires for distribution plus four copies which will be retained by the Engineer.

Submit three samples unless otherwise specified.

Accompany submittals with transmittal letter, in duplicate, containing:

- i. Date
- ii. Project title and number
- iii. Contractor's name and address
- iv. The number of each Shop Drawing, Product Data and the Sample submitted.
- v. Notification of deviations from Contract Documents.
- vi. Other pertinent data.

## 28 RESUBMISSION REQUIREMENTS

**Shop Drawings:**



Revise initial drawings as required and resubmit as specified for initial submittal. Indicate on drawings any changes which have been made by the Engineer.

Product Data and Samples: Submit new data and samples as required for initial submittal.

## **29 WEEKLY PROGRESS REPORT AND PHTOGRAPHS**

**30.1** During the continuance of the Contract, the Contractor shall submit weekly progress on forms as approved by the Engineer. Such weekly reports shall show the actual progress completed as of date of the report plotted against the schedule as given by the Contractor at the start of work and shall be broken down so as to indicate status of all activities associated with mobilization, material procurement, manufacture, surveys works, tests with regard to the agreed contract programme.

**30.2** The Employer and the Engineer reserve the right to coordinate the schedules of this Contractor and other Contractors working at the Site, and to adjust and/or change any and all such schedules as required during the course of construction in order to achieve a coordinated project in harmony with the Employer's completion date.

**30.3** Commencing after the first week of construction, and continuing every week until completion, the Contractor shall take and submit photographs to the Engineer's Representative, to show progress of his work and completion of each structure or major feature.

## **30 CONTRACTOR TO NOTIFY DELAYS ETC.**

Any delay which will affect the completion of Works shall be detailed by the Contractor who shall state the action he is taking for effective completion of the Contract programme.

The Contractor shall submit a report in respect of the various sections of the Works, the equipment in use or held in readiness, a return of labour and supervisory staff, and details of any matters arising which may generally affect the progress of the work. The Contractor shall give a summary of the detailed progress report giving the position with regard to the agreed Contract programme. The progress reports shall be set out in a format to the approval of the Engineer and forwarded promptly so that on receipt the information contained therein is not more than 21 days out of date. If during execution of the Contract, the Employer considers the progress position of any section of the work to be unsatisfactory, or for any other reason relating to the Contract, he will be at liberty to convene **a meeting and the Contractor's Representatives** are to attend such meeting.



The Contractor's Site Office shall prepare and submit 6 copies of a weekly progress report to the Employer and Engineer's Site Office. This report shall summarize site activities and record and details where difficulties in maintaining the agreed programme are being experienced or are likely to cause subsequent delay. The Contractor's Site Office shall also prepare and submit to the Engineer's Site Office 2 copies of Daily Activity Report summarizing the main activities to be undertaken each day, noting special activities such as tests, alignment checks, etc. The Contractor shall be responsible for expediting the delivery of all material and equipment to be provided by him and his subcontractors.

### **31 PHOTOGRAPHS**

As soon as work commences on Site, the Contractor shall provide at least 10 to 12 photographs (soft copy) of the works from positions to be selected by the Engineer.

The negatives/soft copy of all photographs shall be held at the Contractor's Site Office, numbered and handed over to the Employer at the completion of the Contract.

### **32 SIGN BOARD**

The Contractor shall erect and maintain at the Site in a location to be approved by the Engineer two (2) Sign Boards of dimensions approved by the Engineer. The Sign Boards shall be made of metal. It shall be mounted on steel posts securely anchored and braced. The Contractor shall paint on the Sign Boards, the name of the Works, and the names of the Employer, Engineer and the Contractor both in English and Urdu Language.

### **33 COORDINATION OF WORK AT SITE**

The Contractor shall take cognizance that during the execution of the project, other Contractor will be working concurrently on this site.

All works of his responsibility shall be coordinated by the Contractor so as to give the necessary facilities to other Contractor or their workman or any other employ, who execute or supervise any work on the site.

The Contractor shall ensure that the necessary safety precaution will be observed and interferences shall be avoided specially for the works executed side by side by different Contractors.



Due consideration must be given to permit access to sections of the work as required by other Contractors for the extension of their works. With a view to coordinate the works, the Engineer may from time to time direct the order of the works to be carried out.

No payment shall be made to the Contractor for the works involved under this sub clause.

### **34 SITE FACILITIES TO BE PROVIDED BY THE CONTRACTOR**

#### **34.1 General**

Without prejudice to the generality of the various clauses of the Contract, particular attention is drawn to the obligation of the Contractor to make his own arrangement at his own expense for the following

#### **34.2 Labour Camps and Staff Residences**

The Contractor shall provide, operate and maintain labour camps and staff residences and are required for the proper and efficient progress of the work to house his own employees. For the purposes of operation and maintenance of the Camps and Residences, the Contractor shall comply with the rules of Pakistan Labour Camp Rules 1960 and all other applicable provisions of the Pakistan Labour Laws.

#### **34.3 Administrative and Field Office**

The Contractor shall provide, operate and maintain administrative and field offices required for his staff and would be responsible for Operation and Maintenance, furniture, equipment, appliances, janitor services and security of the same.

#### **34.4 Work yards and Storage Areas**

The Contractor shall provide, operate and maintain all sheds, fencing, foundations and all above ground structures required to store material or equipment brought on to the site by him. The Contractor shall be responsible for the security of his entire camps, residence, site and field offices work yard and storage area.

#### **34.5 Water Supply, Sewerage System and Electricity (if required)**

The Contractor shall make his own arrangement, at his own expense for provision, operation and maintenance of electric supply, reasonable supplies of raw and potable water and sewerage system at the site of works and his labour camps, staff residences and offices. The Contractor shall pay all fees, and charges (including bills) of whatsoever nature to the concerned



departments (if any) in order to procure connections of the above facilities and thereafter using these facilities.

#### **34.6 Medical Care**

The Contractor shall arrange provision of adequate medical facilities for his employees.

Adequately equipped and properly staffed first aid stations or dispensaries shall be provided by the Contractor at camps and other strategic locations, to administer first aid treatment at all times free of charge to all persons on the Site, including personnel of the Engineer and the Employer. The nature, number and location of facilities furnished and the Contractor's staff for administering first-aid treatment shall meet the requirements of the Health Services of the Government of Pakistan and of Section III of the Manual "Safety Requirements for Construction by Contract", published by the Employer, and shall be subject to approval by the Engineer.

#### **34.7 Other Facilities**

The Contractor shall also be responsible for providing at his own cost other facilities for his own staff and labour such as educational, recreational, transport, telephone and catering if required.

### **35 CONSTRUCTION PROCEDURES**

The Contractor shall advise the Engineer of proposed construction procedures in accordance with the General Conditions of Contract.

If the Engineer shall see that the work progress is slow in such a way that the work will not be completed in the time specified, then he shall order the Contractor to work overtime or in more shifts and the Contractor shall obey these orders without any additional payments and without any objections or request for compensation.

### **36 NOTIFICATION TO ENGINEER**

The Engineer shall be notified daily in writing of the nature and location of the Works the Contractor intends to perform the next day so as to enable necessary inspection and measurement to be carried out. The Engineer may, if necessary, direct that longer notice be given of certain operations.



### **37 NIGHT WORK**

When work is done at night the Contractor shall maintain from sunset to sunrise such lights on or about his work and plant as the Engineer may deem necessary for the proper observations of the work and the efficient execution thereof.

### **38 WEATHER**

No work is to be undertaken when, in the opinion of the Engineer, the weather is so unsuitable that proper protection of the work cannot be ensured.

### **39 CO-ORDINATION WITH OTHER CONTRACTORS**

It shall be the responsibility of the Contractor to keep-up good relations with other Contractors employed on site by the Employer. The Contractor shall cooperate and coordinate his work with that of the other Contractors working at the Site, to whatever extent may be necessary to complete the Project in accordance with the approved programme of the Works and in accordance with the Engineer's instructions. Should a disagreement or dispute arise between the Contractor and other contractors, the same shall be referred without delay to the Engineer for his decision. Upon such decision, the Contractor shall proceed with the work in accordance therewith. In case the access to the works of other contractors is through the Site area of the Contractor, the Contractor shall coordinate with and permit all reasonable access to other Contractors.

### **40 ACCIDENT PREVENTION, SAFETY MEASURES AND PROTECTIVE EQUIPMENT**

The Contractor shall comply and enforce compliance by all his sub- contractors with the highest standards of safety and accident prevention in accordance with international standards and in compliance with all applicable laws, ordinances and statutory provisions.

All requisite barriers, fences, warning signs, lights and other safety precautions as required for the protection of persons and property on or adjacent to the site shall be provided at the Contractor's cost.

All false work, scaffolding and handrails shall be well constructed and secured at all times. Where overhead work is being carried out, warning signs shall be installed at ground level clearly warning of the overhead work.



All warning signs shall be in two languages, English and Urdu, and shall at all times be maintained in a clean and legible condition, to the satisfaction of the Engineer. Trash shall be removed at frequent intervals to the satisfaction of the Engineer. Netting shall be provided at all levels where work is in progress, all around the working area.

#### **41 SETTING OUT OF WORK AND SURVEY**

##### **41.1 Reference Points, Lines**

The Contractor shall establish benchmarks and / or reference line at the Site in accordance with the instructions of the Engineer. The Contractor shall set out its work from these benchmarks and lines. The Contractor shall supply plant, equipment, materials and labour for checking if required of the survey control by the Engineer. Slope stakes will be set by the Contractor before commencement of excavation and will be re-established as required during progress of work using established bench-marks and reference points.

##### **41.2 Verification**

The Engineer may make checks as the work progress to verify lines and grades established by the Contractor and to determine the conformance of the work as it progresses with the requirements of the Drawings and Specifications. Such checking by the Engineer shall not relieve the Contractor of his responsibility to perform all work in accordance with the Drawings and Specifications and the lines and grades given therein.

Based upon the basic control, the Contractor shall provide his own primary control points, as needed for the Works, and shall preserve and maintain them until otherwise authorized.

The Contractor shall be responsible for maintaining all survey markers/monuments, and property corners. If any markers/monuments are destroyed by the Contractor, the Contractor shall arrange, at his own cost, to retrace and replace them to the entire satisfaction of the Engineer. If a monument cannot be replaced in its original position, the Contractor shall install a witness corner. The Contractor shall complete and file monument reference cards on all monuments as per instructions of the Engineer.

The Contractor shall provide experienced construction surveyors with adequate experience in the construction surveys similar in nature as required by this Contract.



Based upon established basic control monuments the Contractor shall establish all lines and grades necessary to control the Works, and shall be responsible for all measurements that may be required for execution of the Works to the tolerance prescribed below.

The Contractor shall perform such surveys and computations as are necessary to determine quantities of work performed or placed during each progress payment period, and shall also perform all surveys necessary for the Engineer to determine final quantities of work in place. The Engineer will determine final quantities based on original ground levels determined by the Contractor and agreed by the Engineer.

The Contractor shall notify the Engineer at least 24 hours before performing a quantity survey and, unless specifically waived, quantity surveys shall be performed in the presence of an authorized representative of the Engineer.

Degree of accuracy for the survey works shall satisfy the following specified tolerances:

- (a) Structure points shall be set within 0.01 foot accuracy from point to point, except where tighter tolerances are required.
- (b) Cross-section points shall be located within 0.10 foot, horizontally and 0.01 foot vertically.
- (c) Permissible closing error for a levelling line meant for establishing Temporary Bench Mark (TBMs) shall not exceed  $0.045 \times \sqrt{M}$  foot, where M is in miles. The permissible closing error shall be duly adjusted.

The Contractor shall provide all materials, equipment and labour required for surveying work, including, but not limited to, instruments, stakes, spikes, steel pins, templates, platforms, and tools, and except as required to be incorporated in the work or left in place, all such materials and equipment, shall remain the property of the Contractor. Surveying instruments shall be in perfect working condition and shall be subject to rigid inspection for proper operation at least after every two weeks of use. Defective instruments shall be promptly replaced or repaired and adjusted to the satisfaction of the Engineer.

#### **42 PAYMENT OF WORK**

No payment shall be made for the works involved within the scope of this section of specification unless otherwise specifically stated in the Bills of Quantities or herein. The cost



thereof shall be deemed to have been included in the total price quoted by the Contractor. The payment will be made on monthly basis on actual work done.

#### **43 SPECIFICATION EPILOGUES**

(To remain in force during the entire completion/Contract period).

i. The Work(s) comprising the Contract, shall be constructed, completed and guaranteed, strictly conforming to and in accordance with the stipulated specifications for execution of such works, providing of materials/services and etc.as provided in the Contract Documents and or as directed by the Engineer.

ii. In the event of missing / non-availability of particular specification (s) applicable to or to govern the execution of such item(s) of works/ contract hereof, having no effect or bearing upon the rate/price or valuation of the contract, the relevant standard specifications of particular application from the following sources/standards/codes shall be consulted/ applied thereto, as required and the contractor shall be obliged to strictly follow the instructions issued by the Engineer, in this regard:

a) Except as otherwise provided in the Contract Documents, all material, fabrication, execution and testing thereof shall conform to the applicable standards, codes/specifications contained in the following list to equivalent applicable British standard and specifications established and/or as approved in the country of manufacture or supply:

AASHTO American Association of State Highway and Transportation Officials.

ASTM American Society of Testing Materials

ASME American Society of Mechanical Engineers

AISC American Institute of Steel Construction

ASA American Standards Association

AWS American Welding Society

AWWA American Water Works Association

BSS British Standard Specifications & Materials)

CDA Capital Development Authority, Islamabad



MES For schedule items and for non-schedule works the standard specifications/ as per the direction of the Engineer shall be followed.

PSI Pakistan Standards Institute

If the Contractor, at any time and for any reason, wishes to deviate from the above standards or desires to use material or equipment not covered by the above

b) standards/codes, he shall state in writing the exact nature of change/substitution/ replacement, the reason for making such change, and shall submit complete detailed (illustrated) specifications of the materials/services and the equipment and etc. to the Engineer for his express approval, at least thirty days before the actual use at the site, subject to such rate/price or valuation adjustments, decided by the Engineer. Such cost decision/adjustment shall be conclusive and binding on the Contractor.

#### **44 WASTAGE**

No Payment shall be made under any circumstance for wastage of materials, supplies and /or fixtures supplied by the Contractor. In all cases payment shall be made only on the basis of the net quantities of work done. It is up to the Contractor to calculate and make allowance for any or all such wastage (e.g. cut ends of reinforcement bars, spillage of Cement and the like) in establishing the unit rates or price for the items of the Works.

#### **45 ENVIRONMENTAL PROTECTION**

The Contractor shall exercise care to protect the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of works. Except where clearing is required for the Permanent works, approved construction roads and the Temporary Works, and for excavation operations, all trees and native vegetation shall be preserved and shall be protected from **damage which may be caused by the Contractor's construction operations and equipment.** On completion of the works, all work areas shall be smoothed and graded in a manner to confirm to the natural appearance of the landscape. Where unnecessary destruction, scarring, damage or defacing may occur as a result of the Contractor's operations, it shall be repaired, replanted, or otherwise corrected as directed by the Engineer at no additional cost to the Employer.



#### **46 QUARRY OPERATIONS**

The Contractor shall obtain materials from licensed and government approved quarries only. The quarry operation shall be undertaken within the purview of the rules and regulations in force.

#### **47 SOIL EROSION AND SEDIMENTATION CONTROL**

The Contractor shall carry out the works in such a manner that soil erosion is fully controlled, and sedimentation and pollution of natural watercourses, ponds, tanks and reservoirs is avoided. At suitable places sedimentation basin with impervious linings will be constructed for containing, stopping and trapping any silt run off for premature siltation of downstream watercourses and reservoirs.

#### **48 FUEL AND CHEMICAL STORAGE**

All fuel and chemical storage shall be sited on an impervious base within an embanked area and secured by fencing. The storage area shall be located away from any watercourse or wetland. The base and walls of the embankment shall be impermeable and of sufficient capacity to contain 110% of the volume of tanks.

Filling and refueling shall be strictly controlled and subjected to formal procedures. All valves and trigger guns, shall be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use. The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contamination happens or discharges enter any drain or water courses.

#### **49 WATER QUALITY**

The Contractor shall prevent any interference with the supply to or abstraction from polluted water sources (including underground percolating water) as a result of execution of the works.

Areas where water is regularly or repetitively used for dust suppression purposes shall be laid to fall to specially constructed settlement tanks to permit sedimentation of particulate matter. After resettlement, the water may be re-used for dust suppression.

All water and liquid waste products arising on the sites shall be collected and disposed off at location outside or off site and in a manner that shall not cause nuisance or pollution.



The Contractor shall not discharge or deposit any matter arising from the execution of the works into any place except with the permission of the Supervisor Engineer and the regulatory authorities concerned.

The Contractor shall protect all watercourses, water ways, ditches, canals, drains, lakes and the like from pollution, silting, flooding or erosion as a result of the execution of the works.

The Contractor shall submit the details of his temporary drainage works system (including all surface channels, sediment traps, washing basins and discharge-pits) to the Supervisor Engineer for approval prior to commencing work on its construction.

## **50 AIR QUALITY**

The Contractor shall devise and arrange methods of working to minimize dust, gaseous or other air borne emissions and carry out the works in such a manner as to minimize adverse impacts on air quality.

Bituminous hot-mix plants and concrete batching plants shall be located sufficiently away from habitation, agricultural operations or industrial establishments.

The Contractor shall utilize effective after sprays during the delivery and handling of materials when dust is generated and dampen stored material during dry weather.

Stockpiles of materials should be sited in sheltered areas or within hoarding, away from sensitive areas. Stockpiles of friable materials shall be covered with clean tarpaulins with application of sprayed water during dry and windy weather. Stockpiles of debris shall be dampened prior to their movement, except where this is contrary to the specifications.

Any vehicle with an open load carrying area used for transport of potentially dust producing materials shall have properly fitting side and tailboards. Materials having potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulin in good condition. The tarpaulin should be properly secured and extended to at least 280 mm over the edges of the sideboard and tailboard.

During high wind, no dust generating operations shall be permitted within 200 m of residential areas having regard to the prevailing direction of the wind.

Construction vehicles and machinery shall be kept in good working order and engine turned off when not in use. Appropriate measures shall be taken to limit exhaust emissions from



construction vehicles, machinery and plant and The Contractor shall include details of such proposed measures in the mitigation and monitoring plan to be submitted to the Supervisor.

In residential areas or other sensitive areas, such as nurseries, schools, hospitals, etc. advance warning shall be given to potentially affected persons so that some measures can be taken by them before commencement of the works.

Any open vehicle carrying a load of freshly mixed asphalt concrete for transportation and laying the pavement must have a full cover of tarpaulin sheet. In this manner its toxic fumes will be reduced against any atmospheric contamination.

### **51 NOISE**

The Contractor shall consider noise as an environmental concern in his planning and during execution of the works.

The Contractor shall use plant and equipment conforming to applicable standards and directives on noise, vibrations and emissions shall include the details of measures for abating noise at source in the mitigation and the monitoring plan to be submitted to the Supervisor Engineer.

### **52 SAMPLING**

It shall be the responsibility of The Contractor to take samples as required by The Engineer and to provide all necessary transport, labour, tools, containers, wrappings and so forth for **uplifting and dispatching samples to The Engineer's Laboratory.**

### **53 ENVIRONMENT ENHANCEMENT**

All existing highways and roads used by vehicle of The Contractor or suppliers of materials or plant, and similarly any new roads which are part of the works and which are being used by traffic, shall be kept clean and clear of all dust/mud or other extraneous materials dropped by the said vehicles or their tyres. Similarly, all dust/mud or other extraneous materials from the works spreading on these highways shall be immediately cleared by The Contractor.

Clearance shall be effected immediately by manual sweeping and removal of debris, or, if so directed by The Engineer, by mechanical sweeping and clearing equipment, and all dust, mud and other debris shall be removed entirely from the road surface. Additionally, if so directed by the Supervisory Engineer, the road surface shall be hosed or watered using suitable equipment.



Any structural damage caused to the existing roads by The Contractor's construction equipment shall be made good without any extra cost.

On completion of the works, The Contractor shall reinstate all areas with proper vegetation to the satisfaction of the Supervisor Engineer.

The Contractor shall remove all old tyres and internal rubes from within the limits of right of way and subject to the agreement of adjacent landowners for additional areas of 75 m on either side of the road centreline. The Contractor shall dispose of all materials in a manner approved by the Supervisor Engineer.

Where directed by the Supervisor Engineer, The Contractor shall improve and reinstate the land on which informal roadside service area has been established, by removing all debris and contaminated soils, regarding to natural ground levels and re-establishing the original vegetation where appropriate. All debris and contaminated materials shall be disposed off on site as approved by the Supervisor Engineer.

#### **54 MEASUREMENT AND PAYMENT**

The work under this clause shall neither be measured nor be paid separately. The cost incurred in this respect shall be deemed to have been covered in the quoted rates by the bidder at page 08.

In case of failure of The Contractor to comply with all or any provision(s) of this clause the damage(s) caused shall be attributable towards The Contractor, and The Engineer shall assess the amount of such damage(s) which shall be deducted from the monies due or to become due to The Contractor. However, the said amount may be reimbursed to The Contractor on rectification of all damage caused and subsequent certification by The Engineer that the said damage has been rectified by The Contractor at his own cost as per the requirements specified herein above.

Where directed by The Engineer, The Contractor shall improve and reinstate the land on which informal roadside service area has been established, by removing all debris and contaminated soils, regarding to natural ground levels and re-establishing the original vegetation where appropriate. All debris and contaminated materials shall be disposed off site as approved by The Engineer.

- a. **Provision of Printer + photocopier (A3)** = 01 No.



Panasonic (DP-8045)/Konica Minolta or equivalent: within 14 days of the Engineer's Order to Commence the Works.

b.

#### **55 PAYMENT FOR WORK REQUIRED BY SPECIAL PROVISIONS**

Unless otherwise specifically stated in the Contract, the price of all works required by the Special Provisions shall be considered to be included in the Contract Price.