S.V.G. MILTON CATO MEMORIAL HOSPITAL PLUMBING

	DESCRIPTION	QTY	UNIT	UNIT PRICE (excl. Tax)	TOTAL PRICE (excl. Tax)
1	**PRELIMINARIES:**				
(a)	Provision for the necessary working drawings.				
(b)	Provision for the necessary shop drawings and equipment details.				
(c)	Provision of the required coordinating effort with other trades.				
(d)	Insurances				
(e)	10% Performance Bond				
	TOTAL ITEM (1)				
2	**SUPPLY & INSTALLATION OF HOT WATER SYSTEMS:**				
(a)	80 Gallon Solar Systems Complete				
(b)	120 Gallon Gas System Complete				
(c)	Valves				
(d)	Miscellaneous				
	TOTAL ITEM (2)				
3	**SUPPLY & INSTALLATION OF SPECIAL ITEMS:**				
(a)	Floor Drains:				
	FD-1				
	FD-2				

	DESCRIPTION	QTY	UNIT	UNIT PRICE (excl. Tax)	TOTAL PRICE (excl. Tax)
3	**SUPPLY & INSTALLATION OF SPECIAL ITEMS CONT'D:**				
	Floor Drains:				
	FD-3				
(b)	Cleanout Covers				
(c)	Trap Seal Primers				
(d)	Valve Access Panels				
	TOTAL ITEM (3)				
4	**SAFE & LEGAL DISPOSAL OF EXISTING SANITARY WARE (See Technical Section 1.02)**				
5	**SUPPLY AND INSTALLATION OF SANITARY WARE FITTINGS:**				
(a)	Water Closets Complete				
(b)	Lavatory Basins Complete				
(c)	Urinals Complete				
(d)	Brassware Complete				
	TOTAL ITEM (5)				

	DESCRIPTION	QTY	UNIT	UNIT PRICE (excl. Tax)	TOTAL PRICE (excl. Tax)
6	**PIPEWORK**				
A	**Soil, Waste & Vent**				
	PVC Pipework				
(a)	1 1/4"				
(b)	1 1/2"				
(c)	2"				
(d)	3"				
(e)	4"				
	Galvanised Pipework				
(f)	3"				
(g)	Fittings				
(h)	Hangers & Supports				
(h)	Miscellaneous				
	TOTAL ITEM A				
B	**Water Supply**				
	External Galvanised Pipework				
(a)	1" CW				
(b)	1 1/4" CW				
(c)	1 1/2" CW				
	Internal PVC Pipework				
(d)	1/2" CW				
(e)	3/4" CW				
(f)	1" CW				
(g)	1 1/4" CW				

	DESCRIPTION	QTY	UNIT	UNIT PRICE (excl. Tax)	TOTAL PRICE (excl. Tax)
	Internal PVC Pipework cont'd:				
	cPVC Pipework				
(h)	1/2" HW				
(i)	3/4" HW				
	Copper Pipework (Internal & External)				
(j)	1" HW				
(k)	1 1/4" HW				
B	**Water Supply cont'd**				
(l)	Valves				
(m)	Fittings				
(n)	Access Panels				
(o)	Insulation				
(p)	Hangers & Supports				
(q)	Miscellaneous				
	TOTAL ITEM B				
	TOTAL ITEM 6 (A+B)				
7	**ITEMS SPECIFIED OR INDICATED ON DRAWINGS BUT NOT MENTIONED IN THE DETAIL OF TENDER**				
(a)					

	DESCRIPTION	QTY	UNIT	UNIT PRICE (excl. Tax)	TOTAL PRICE (excl. Tax)
7	**ITEMS SPECIFIED OR INDICATED ON DRAWINGS BUT NOT MENTIONED IN THE DETAIL OF TENDER CONT'D:**				
(b)					
(c)					
	TOTAL ITEM (7)				
8	**MAINTENANCE DURING TWELVE (12) MONTHS DEFECTS LIABILITY PERIOD**				
9	**PROJECT COMPLETION:**				
(a)	Complete system testing and adjusting,				
(b)	Provision of "as built" drawings,				
(c)	Provision of manuals and maintenance instructions.				
10	**SUB-TOTAL ITEM (1 TO 9)**				
11	**PROVISIONAL SUM FOR CONTINGENCY**				**15,000.00**

	DESCRIPTION	QTY	UNIT	UNIT PRICE (excl. Tax)	TOTAL PRICE (excl. Tax)
12	**TOTAL FOR PLUMBING WORKS (SUM OF ITEMS 10 & 11) CARRIED FORWARD TO SUMMARY**				
	Note: *Failure to complete this form may result in the disqualification of your tender.*				

MILTON CATO MEMORIAL HOSPITAL
ST. VINCENT AND THE GRENADINES

PLUMBING DRAWING LIST

P-1 GROUND FLOOR SOIL/WASTE LAYOUT

P-2 FIRST FLOOR SOIL/WASTE LAYOUT

P-3 GROUND FLOOR WATER LAYOUT

P-4 FIRST FLOOR WATER LAYOUT

R-1 ROOF PLAN

PART ACHITECTURAL DRAWING LIST

D-1 EXISTING GROUND FLOOR PLAN (DEMOLITION)

D-2 EXISTING FIRST FLOOR PLAN (DEMOLITION)

D-3 EXISTING ROOF PLAN (DEMOLITION)

A-2 PROPOSED GROUND FLOOR PLAN

A-3 PROPOSED FIRST FLOOR PLAN

PLUMBING SPECIFICATIONS

TABLE OF CONTENTS

1.01.0 **NOTICE:**

1. General conditions and schedule of drawings apply to and are hereby made of part this Section.

2. Contractor shall consult these Sections in detail as he will be responsible for and governed by conditions set forth therein and work indicated.

3. Nothing in this document is intended to conflict with the provisions of the Main Contractor and if any duplication or discrepancies should exist, the Main Contract documents hold precedence.

1.02.0 **SCOPE OF WORKS:**

The project under consideration consists of the provision of the Plumbing system for the Remodelling of the following existing areas to the Milton Cato Memorial Hospital, St. Vincent and the Grenadines.

GROUND FLOOR

- Kitchen and associated toilets
- Kitchen Food Storage
- Labour Ward Equipment Store
- Labour Ward Sluice and Pre-Scrub

FIRST FLOOR

- Recovery and I.C.U. and
- Female Surgical

ROOF

According to the European Union guidelines for procurement, the source and origin of all materials and equipment used for the project must be from an eligible member country of the European Union. Procurement guidelines detailed in the Main Contractors documents take precedence and, if at variance, supersede the above.

The Contractor will be required to visit the site and review the prevailing site conditions in order to have a true appreciation of the extent of the works.

The Contractor shall review the Architectural and Interior Design drawings. The Contractor shall exercise due diligence.

Except as otherwise specified, the work under this contract shall consist of furnishing all labour, materials and equipment for the complete execution of the works as shown on the accompanying drawings and generally described in these specifications to the satisfaction of the Engineer and all relevant public authorities. It is not intended that these specifications or accompanying drawings show every detail. It shall include all items necessary to make a finished installation, whether specifically indicated or not.

The costing and execution of the works include but not limited to:-

1. Removal, safe and legal disposal of existing plumbing fixtures inclusive of solar systems to:
   - Kitchen and associated toilets
   - Kitchen Food Storage
   - Labour Ward Sluice and Pre-Scrub
   - Recovery, I.C.U. and Female Surgical
   - Roof

2. Complete domestic water piping for all points, inside of the building; Water closets, and Faucets, etc.

3. Complete soil, waste and vent piping system within the buildings and extending beyond the foundation wall.

4. Installation of all plumbing fixtures and trim.

5. Provision of "as installed" and "record drawings"

6. Supply and installation of equipment including but not limited to grease traps and gas and solar water heaters.

1.03.00 CODES AND STANDARDS (PLUMBING):

All materials furnished and work done shall comply with Local Codes in current practice.

In the absence of Local Codes, Codes and Standards of the Caribbean Community, U.S.A, United Kingdom or Canada are acceptable unless specifically indicated otherwise in these documents.

1.04.00 MECHANICAL PLANS:

1. The mechanical plans are intended to be diagrammatic and are based on one manufacturer's equipment. They are not intended to show every item in its exact location, the exact dimensions, or all the details of the equipment. The contractor shall verify the actual dimensions of the equipment proposed to ensure that the equipment will fit in the available space.

2. Installation shall be within the limitations imposed by the architectural, structural, electrical and plumbing requirements, with adequate space for maintenance.

1.05.00 **GUARANTEES:**

1. All equipment, materials, and workmanship shall be guaranteed for a period of one year, beginning with the date of acceptance of the project in writing. Special warranties will be called for under some sections of EQUIPMENT. This warranty shall be in writing and shall include written copies of factory warranties with expiration dates on items of equipment where the warranty date might differ from the acceptance date, such as five-year warranty of sealed refrigerant systems. No warranty shall start before acceptance date.

2. The contractor's warranty shall include at least two inspections of the system to repair and replace any items found to be defective during this period. The first shall be approximately six months after the acceptance of the system and the second at the end of the first year.

1.06.0 **REQUIRED SUBMITTALS:**

1. Submittals shall be clearly marked to show the intended item, with identification as to unit number or other marking to show locations, service, and function. Submittals not marked to identify the equipment and application will be rejected.

2. Any equipment installed without prior acceptance shall be subject to rejection unless such items were identified by name and model number in the bid documents.

3. The supplier, by submitting, certifies that the materials or equipment proposed is satisfactory for the application intended, including adverse conditions that may prevail at the job site, and that the materials and equipment are in current production with no known plans to cease production.

4. Contractor agrees that submittals processed by the engineer are not change orders; that the purpose of submittals by the contractor is to demonstrate to the engineer that the contractor understands the design concept; and that this understanding is demonstrated by indicating which equipment and materials he or she intends to furnish and install and the fabrication and installation methods he or she intends to use.

5. Contractor further agrees that if deviations, discrepancies, or conflict between submittals and contract documents are discovered either prior to or after submittals are processed by the engineer, the contract documents shall control and shall be followed.

6. Submittals shall include:

    1. All equipment; pumps, heaters, etc.

2. Voltage, phase and amps of each electrical item such as motors, heaters, etc.

3. Pipe, valves, insulation, etc.

4. Working and Shop drawings.

1.07.00 **EQUIPMENT INSTALLATION:**

(a) All work shall be performed by competent mechanics using proper tools and equipment to produce first-quality work. All work shall be neatly installed, accessible for maintenance, and complete with all accessories required.

(b) Align, level and adjust equipment for satisfactory operation; install so that connecting and disconnection of piping and accessories can be done readily, and so that all parts are easily accessible for inspection, operation and maintenance.

(c) Install material and equipment in accordance with manufacturer's written instructions and recommendations; submit such data to Architect prior to installation and consider this data part of these specifications.

(d) The system is to be installed in the position shown on the drawings. The manufacturer shall supply details of upstands to which his system shall be securely fixed. Power will be provided up to a main isolator by the Client. The installer will do all wiring after the isolator to his equipment.

(e) Variations to the design can be proposed by the manufacturer based on the manufacturers experience and are welcomed. In all cases these variations are to be accompanied by cost figures showing the variation in relation to the initial solution. Each variation is to be accompanied by a clear statement of its benefit and how it is accomplished. The initial solution serves as a fair basis for comparison.

1.08.00 **PLUMBING FIXTURES AND TRIM:**

1. Install supplied plumbing fixtures shown on the drawings and as specified in the Bill of Quantities with the required supports, accessories and all drainage and water connections to make the fixtures complete.

2. Examine areas which are to receive the work of this Section and do not proceed until un-satisfactory conditions are corrected.

3. Protect the surfaces of all plumbing fixtures from damage before

during and after their installation and until the work is completed and accepted by the Architect, and leave all fixtures clean and in operation.

4. Fixtures of vitrified earthenware and porcelain shall be first grade ware when finished shall be free from warp and shall have fine, smooth, clean surfaces free from fire cracks, checks, discolouration or other defects. They shall be evenly glazed smooth and finished with a high gloss and absolutely impervious to moisture.

   All fixtures shall be guaranteed against crazing and other defects. All visible parts of the trimmings of all fixtures including faucets, escutcheons, wastes, strainers, traps etc shall be chrome-plated. Control/Stop Valves shall be provided at all fixtures.

1.09.00 AS INSTALLED AND RECORD DRAWINGS

The Sub-contractor shall keep one copy of all drawings, specifications and approved shop drawings of the work in good order, available to the Engineer and to his representatives.

As the work progresses, the sub-contractor shall record changes to the project as built. At the completion of the installation and before the final inspection the sub-contractor shall have completed an accurate set of "AS INSTALLED DRAWINGS."

The responsibility for the production of these drawings is that of the sub-contractor. The sub-contractor shall therefore allow in his pricing for keeping accurate records of his "AS INSTALLED" changes to the Contract Drawings, for liaison work, and for their production. The sub-contractor shall also allow for the cost of any reproducible sepia/mylar negatives of the Engineer's drawings he may require in order to facilitate him in the preparation of the "AS INSTALLED DRAWINGS" providing they indicate the actual installed conduit pipe and duct runs etc. and incorporate the changes to the project as installed.

1.10.00 PIPE MATERIALS AND ASSEMBLY:

.01 PIPE SLEEVES:

Generally where pipes pass through interior walls or floors 22-gauge galvanised sheet iron or PVC sleeves shall be used. In walls they shall finish with each finished surface. The pipes passing through concrete beams or walls and masonry exterior walls shall be provided with galvanised wrought iron or PVC pipe sleeves. The inside diameter of these sleeves shall be at least 1/2" greater than the outside diameters of the service pipe.

After the pipes are installed, in the case of pipes sleeving through exterior

beams or walls, the Contractor shall fill the annular spaces between the pipe and its sleeve with mastic or with shredded lead. Use packing as required to accomplish this.

The filler shall be suitable for the temperature of the pipe surface, shall not run and shall form a watertight joint. Insulation on the lines passing through these sleeves shall be omitted for the length of the sleeves.

It shall be the Contractor's responsibility to supply, install and fix all sleeves and water stops before concrete is poured.

.02 **PIPES AND FITTINGS:**

FITTINGS:

All elbows, tees and other fittings used with pipework under pressure shall be schedule 40.

PVC PIPES:

All PVC pipes shall be rigid polyvinyl chloride of uniform good quality and free from cracks, holes, notches, and other injurious defects. The pipe shall be reasonably round; the internal surfaces shall be smooth, clean and free of grooving. The pipe shall have a socket at one end for solvent welding.

All cold water pipe and fittings shall be manufactured to ASTM D 1785-68 or ASTM D2241-69 and be suitably marked longitudinally in the following order:-

1. ASTM D1785-68 Schedule_____/Pressure _____

2. Nominal Size and Class.

All soil and waste piping shall be PVC class-125SDR 32.5.

Notwithstanding the above the Engineer reserves the right to request samples of Pipe and Fittings for his approval.

JOINTS:

The Joint type used shall be subject to approval of the Engineer and the appropriate local authority but in general the following types will be acceptable.

a. Pipes smaller than 3" - Screwed or Solvent Welded.

b. Pipes larger than 3" - Solvent Welded or Sleeve Coupling with rubber gasket.

Transition to other materials shall be effected with one of the following

fittings: -

1. Stub Flange Assembly

2. Male Adaptor (2" and smaller)

Nominal Pipe Size (in.)	Maximum Support Interval Horizontal Pipe (ft)	Maximum Support Interval Vertical Pipe (ft)
Up to 1 1/4"	4	4
1 1/2 to 2"	4.5	4
3"	5	4
4"	6	6

cPVC – CHLORINATED POLYVINYL CHLORIDE PIPES AND FITTINGS

PIPES:

All cPVC pipes shall be of uniform good quality and free from cracks, holes, notches and other injurious defects.

All hot water piping and fittings shall be manufactured to ASTM D1784.

GALVANISED STEEL PIPE:

PIPE:

All galvanised steel pipe shall be Schedule-40 (or `Blue Band' to BS 1387:1967) galvanised mild steel, of uniform good quality. All underground piping shall be wrapped with a bituminous tape such as Densopol 60 NT.

Each length shall be marked with the Manufacturer's name and shall be free from injurious flaws, seams and other defects.

All galvanised steel pipe and fittings shall conform to the appropriate American or English standards.

JOINTS:

Joints in galvanised steel pipe shall be of the screw type. Screw Joints shall have all threads sharp, true and tapered removing all burrs by reaming smooth. An approved joint compound shall be applied to the male threads only. Lead compounds shall not be used.

The pipe ends shall be machined at right angles to the axis. Joints in pipes larger than 3" may be of the sleeve coupling type with an approved gasket.

INSTALLATION:

When installing galvanised steel pipe the distances between supports shall be as follows: -

Nominal Pipe (in.)	Maximum Support Interval Horizontal Pipe (ft)	Maximum Support Interval Vertical Pipe (ft)
1/2" to 3/4"	6	8
1 to 3"	8	10
4"	12	12

Piping shall be made up of a sufficient number of unions to permit dismantling for inspection and maintenance.

Piping shall be installed in a neat and workmanlike manner and lines outside of buildings shall be parallel to building walls wherever possible.

.03 **UNIONS:**

All equipment and fixtures shall be connected with the piping by unions accessible for easy removal of the equipment of fixture. Unions shall be suitable for the pressure and temperature to which they be subjected and for the type of pipe specified.

.04 **VALVES:**

Each item of equipment of fixture branch line shall be valved and valve location easily accessible. Valves shall also be installed where indicated on the drawings.

Valves shall comply with the requirements ASME and ASA Codes as to their dimensions, identifications, material and service for which they are required. All valves, unless noted otherwise, shall be of one Manufacturer and shall have the Manufacturer's name and pressure rating clearly marked n the outside of the body. All valves shall be rated at 125-psi or greater.

Unless otherwise noted valves 2" and smaller shall be ball valves made of

brass or bronze and have screwed ends. All screwed ends shall observe the same system of threading as that established for all pipes and fittings in this Project.

PVC Ball Valves may be used on PVC pipes up to and including 3" diameter for cold water services.

ACCESS TO CLEANOUTS AND VALVES IN WALLS:

See section 1.15.02

1.11.00 **BURIED PIPING**

(a) Pipe shall be laid accurately to line and grade. Joints shall not be `pulled' or cramped'. The Plumbing Contractor shall take all the necessary precautions to prevent flotation of the pipe from flooding.

(b) Trenches shall be excavated to such depth as will permit the pipe to be laid at the elevations, slopes or depths or cover indicated on the drawings and at uniform slopes between indicated elevations.

(c) Pipes shall be laid on a 3" sand bed and covered with minimum 6" sand above the top of the pipe before backfilling with selected backfilling material. Minimum burial depth for water mains shall be 18" and for branches 18". Burial depth for waste shall generally be below the water main.

(d) **General:** Backfill material shall be placed and compacted as specified below in so far as applicable Compaction shall be done by tamping.

(e) **Tamping:** The material to be tamped shall be deposited and spread in uniform layers parallel and not exceeding 12-inches thick before compaction. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass with power driven tampers, each weighing about twenty (20) pounds, for this purpose. Care shall be taken that the material in all portions of the trench is thoroughly compacted.

(f) Long lengths of cold water pipes may be snaked from one side of the trench to the other during laying to provide expansion relief.

(g) Under roadways or in heavy traffic areas pipe should be protected by oversize steel casings or encased in concrete at a minimum depth of two (2) feet.

(h) Place concrete thrust blocks between valves, tees, plugs, caps, bend, changes in pipe diameter, reducers, hydrant and fitting and undisturbed ground as indicated or as directed by engineer. The joints and

couplings are to be kept free of concrete. Do not back fill over concrete within 24 hours after placing.

1.12.00 **TESTING:**

On the satisfactory testing of the system or sections thereof the Contractor shall apply to the Engineer for issue of a Test Certificate of Approval for the test undertaken.
No Certificate of Practical Completion of the total Works can be issued prior to testing of the Works and its approval by the Engineer.

.01 **TESTS FOR WATER PIPES:**

The entire water supply shall be pressure tested before all such work is concealed and fixtures have been set.

The Contractor testing a potable water system or a section thereof shall:

(a) Conduct the test in the presence of the Engineer at a water pressure, not less than 125psi or 1 1/2 times the working pressure whichever is the greater. Solvent cement joints on PVC piping shall be permitted to set for the Manufacturer's recommended time prior to commencement of any Pressure Test. Ensure that all air is expelled from the system before the outlets are closed and that all outlets thereafter tightly closed.

(b) Subject the system to the Test Pressure for 4hours and satisfy the Engineer by visual examination and gauge test that no water is leaking or seeping out from any pipe, joint, or fitting, otherwise than at an outlet.

(c) After all fixtures are set and connected the Contractor shall adjust the various supply valves, fixtures, fittings etc so that the proper delivery of water is obtained at all fixtures.

Retesting, if necessary, shall be undertaken until the system is watertight.

.02 **TESTS FOR SANITARY DRAINAGE AND VENT SYSTEM:**

The entire sanitary drainage and vent system shall be tested in sections or in its entirety before all such work is concealed and fixtures have been set. Testing shall commence only after solvent cement joints on PVC pipes have been allowed to set for the Manufacturer's recommended time.

If the system is tested in sections each section shall be tested with not less than 3m head of water. In testing successive sections at least the upper 1.5m of the last preceding section shall be retested.

The water shall be kept in the system of the portion under test, for at least 24hours at the stated head before inspection, the system or portion shall then be tight at all points and free from leaks.

Retesting, if necessary, shall be undertaken until the system is watertight.

.03 **TEST FOR GAS PIPING:**

Gas installation shall be carried out only with the approval of the Company supplying the gas.

Before the system is finally put into service, it shall be carefully tested to assure it is gas tight.

To test, the system shall be filled with air or dry oil free inert gas. No other gas or liquid shall be used. **OXYGEN SHALL NEVER BE USED**. Test pressure shall be a minimum of 50-psi. Test pressure shall be maintained until each joint has been examined for leakage by means of soapy water or other approved means.

Matches, candles, flame or other sources of ignition shall not be used for this purpose. A 24-hour standing pressure test shall be made to check the completeness of previous joint tests on the system. Final testing before supply of gas must be done in the presence of a Representative of the Gas Company and to the Company's satisfaction.

1.13.00 **COLD WATER PIPING AND SYSTEMS:**

.01 **GENERAL:**

All fixtures and equipment requiring cold water shall be connected to the system as described herein and shown on the drawings.

All external pipework shall be in galvanised steel. Branch piping to the fixtures within the building shall be PVC schedule 40 to ASTM 1785. Final connection to cold water appliances in floors or wall should be by 12" minimum of galvanised steel. Where the final connection has to be exposed and is not concealed in wall etc., then the final connection shall be in copper except above ground piping to fire hose reels, which shall be schedule 40 galvanised steel.

All piping shall be installed with proper pitch to ensure drainage and avoid air pockets.

1.14.00 **HOT WATER PIPING AND SYSTEMS:**

Hot Water Piping for sizes up to ¾" shall be cPVC. Larger pipe sizes shall be copper. Installation should allow for thermal expansion.

.01 **PIPE INSULATION:**

This Sub-Contractor shall furnish and apply thermal insulation as indicated below on all hot water piping including all piping and connections to any Solar, Gas or Electric Water Heating Systems. Adhere to the Manufacturers recommendations in the application of insulation and coating.

(a) INTERNAL/EXTERNAL PIPING:

All hot water piping, in walls, floors, ceilings or exposed on roof shall be insulated with the flexible closed-cell elastomeric insulation in tubular form, to ASTM C534 specification, for preformed elastomeric cellular thermal insulation in sheet and tubular form. Insulation material shall have a maximum thermal conductivity of 0.27 Btu-in./h-ft^2-F^o, when tested in accordance with ASTM C177 OT ASTM 518. Insulation shall be **AP/Armaflex insulation or approved equal**. All joints should be sealed according to the manufacturers instructions.

Insulation should be ¾″ (19mm) thick minimum.

.02 **HOT WATER SYSTEMS:**

The system shall utilize solar heating in conjunction with gas heater.

The **solar hot water system** shall be of the thermo-siphon type

The system shall consist of:

(a) The emergency elements in the hot water storage tank,

(b) Hot water storage tanks,

(c) Panels

Additionally, the system shall incorporate temperature/pressure relief valves, isolating valves, check valves, insulated interconnecting piping and all necessary accessories to make a complete system

The **gas hot water system** shall utilize propane gas. The unit shall have an efficiency of 96% and an approximate storage capacity of 490 litres. The input rating shall be 146 kW.

1.15.00 SANITARY DRAINAGE AND VENT SYSTEM:

.01 GENERAL:

All fixtures, drains or any equipment requiring drainage shall be connected to the sanitary drainage and vent system as described herein and shown on the drawings.

Soil and waste piping shall be **PVC Class-125 SDR 32.5**. Vent piping may be same or of a lower grade approved use. Only approved D.W.V. fittings shall be used. Long radius bend shall be used at the base of all soil and waste stacks.
Cleanouts shall be installed at the base of stacks and at all changes in direction and at other points as indicated on plans or as directed.

Cleanouts shall be full size of pipe up to and including 4" and not less than 4" for larger sizes. "Y" and "T" branches shall be provided for cleanouts on house drains and branches.

Every fixture shall have a deep seal trap placed as near to this fixture as possible. Screw cleanout plugs shall be provided for all traps. Fixtures shall be vented as shown on the drawings and no vent shall be less than 1 1/4" diameter. All vents passing through the roof shall extend at least 6" and shall be properly flashed. Vent terminals shall be terminated with suitable PVC cowls (cages) at distances away from openable windows etc.

All branch vent lines shall be free from sag and so graded and connected to drip by gravity to the soil or waste line.

Where a vent pipe is connected to a nominally horizontal soil or waste pipe, the connection shall be above the horizontal centreline of the soil or waste pipe and the vent pipe shall be extended directly to the nearest wall or vertical member.

Where a vent pipe is connected to another vent pipe the connection shall be located at least 3-inches above the flood level rim of every fixture that is served by either vent pipe.

.02 CLEANOUTS:

a. Cleanouts located in floors with a waterproof membrane shall be provided with flashing clamp device at membrane level.

b. Floor cleanouts shall be square heavy duty nickel bronze top, with bronze plug and speediset outlet

c. Check on the type of floor finishes and verify type required with Architect/Engineer before ordering.

d. FLOORS:

All finished floors cleanouts shall be adjustable and shall have a round or square nickel bronze frame and scoriated cover.

e. EXPOSED AREAS AND ACCESSIBLE PIPE CLEANOUTS:

Cleanouts at the end of lines, base of stacks or changes of direction shall be PVC with PVC screw plug.

f. ACCESS TO CLEANOUTS AND VALVES IN WALLS:

Where access to cleanouts (or valves) in walls is required, the cleanouts shall be of the extended type and shall be installed so that the cover is within 1" of the finished wall. Access door opening shall be 12" x 12" or larger where necessary, stainless steel with screw driver latch.

.03 **GREASE TRAP:**

TO BE CONFIRMED BY CIVIL ENGINEER

1.16.00 **CONDENSATE DRAINS:**

Where indicated on the Drawings, the Contractor is to supply and install PVC drains to accept the condensate from air-conditioning units. All horizontal sections of drains (other than underground pipes) shall be insulated with at least 1/2" thick flexible closed-cell elastomeric insulation in tubular form (see piping installation for hot water piping and systems). AP/Armaflex pipe insulation or approved equal, installed in accordance with the Manufacturers Instructions. This applies to above ground floor drain traps serving Air-Conditioning Equipment.

1.17.00 **MANHOLE COVERS**

Access covers to manholes shall be internally recessed for concrete filling on site and supplied complete with rubber seals and locking bolts. A double seal shall be included in the cover design. In areas where a high quality finish is desired the visible edges shall have a stainless steel trim. Manhole cover shall be 24” x 24” unless otherwise mentioned on the drawings

1.18.00 **PIPES, HANGERS, SUPPORTS**

All pipes throughout the Building both horizontal and vertical shall be adequately supported from the construction. Vertical pipes shall be supported from the floor lines with riser clamps sized to fit the pipes and to adequately support their weight.

At the bases of the pipes where required for proper support, furnish and install anchor base fittings or other approved supports. Horizontal pipes individually

supported shall be provided with hangers, clamps or brackets.

Trapezes may be employed to provide a tidy installation where so specified or shown on the plans, or where required by particular conditions. In the latter case the hangers must be approved by the Engineer.

All hangers shall be so located as to properly support horizontal pipes without appreciable stress or sagging of these lines.

Perforated strap iron will under no circumstances be acceptable as hanger material. Each individual hanger shall be properly sized to fit the supported size.

Where pipes are supported under concrete construction threaded hanger rods shall be fitted to a suitable concrete insert. The Sub-Contractor shall supply and install all hangers and inserts at the appropriate time. Each hanger rod shall be properly sized to suit the supported pipe(s).

1.19.00 FLOOR DRAINS:

(a) Provide floor drains discharging into the drainage system as shown on the drawings. Floor shall be laid to falls in accordance with the Architect's Drawings and shall fall to floor drains.

(b) **Type FD-1**: Floor drains for general washrooms shall have an adjustable, nickel bronze, round strainer head, 2" speedi-set outlet and 1/2" trap primer connection.

(c) **Type FD-2**: Floor drains for kitchens shall be 150mm (6") deep with a 300mm square (12"sq) with 13mm acid resistant coated cast iron gate and aluminum sediment bucket. Floor drains shall be supplied with 75mm outlet and 13mmm trap seal primer connection.

(d) **Type FD-3**: Linear floor drains for kitchens at 30" long with sediment interceptor.

(e) The contractor shall supply and install drainage type trap seal primers to maintain the water seal in all floor drains.

1.20.00 FIRE PROTECTION SYSTEM:

LEFT INTENTIONALLY BLANK

1.21.00 WATER COOLERS:

(a) LEFT INTENTIONALLY BLANK

1.22.00 **REQUIRED CLOSEOUT SUBMITTALS:**

At the close of the job, prior to final review, five bound copies of the following shall be submitted by transmittal to the architect or engineer for review and acceptance.

1. Equipment warranties
2. Contractor's warranty
3. Parts list and manuals for all equipment
4. Balance and test readings
5. Operating instructions (in writing)
6. Written instructions on maintenance and care of the system.

1.23.00 **PROJECT CLOSEOUT:**

.01 **CLEANING:**

(1) This Contractor shall clean all exposed metal surfaces from grease, dirt or other foreign material.

Chrome fittings and trimmings shall be polished upon completion. Equipment shall be properly protected from damage during construction period, and shall be wiped or cleaned in accordance with manufacturer's instructions.

(2) On completion of the work, remove from the premises all surplus materials and all debris resulting from the operations and leave all in new clean condition and remove all labels, etc. Labels to be delivered to Engineer with instructions in care and operation of the fixtures are given.

.02 **FLUSHING AND DISINFECTING:**

(1) Flushing and disinfecting operations shall be witnessed by Engineer. Notify Engineer at least 4 days in advance of proposed date when disinfecting operations will commence.

(2) Flush water mains through available outlets with a sufficient flow to produce a velocity of 1.5 m/s, within pipe for 10 min, or until foreign materials have been removed and flushed water is clear.

(3) Provide connections and pumps as required.

(4) Open and close valves, hydrants and service connections to ensure thorough flushing.

(5) When flushing has been completed to satisfaction of Engineer, introduce a strong solution of chlorine into water main and ensure that it is distributed throughout entire system.

(6) Disinfect water mains to AWWA C601-68.

(7) Rate of chlorine application to be proportional to rate of water entering pipe.

(8) Chlorine application to be close to point of filling water main and to occur at same time.

(9) Operate valves, hydrants and appurtenances while main contains chlorine solution.

(10) Flush line to remove chlorine solution after 24 hours