ANNEXURE C.1
TECHNICAL SPECIFICATION - SPRINKLERS

INDEX

TECHNICAL SPECIFICATIONS

1 DESIGN OF THE SPRINKLER SYSTEM

The design of the sprinkler protection system is in accordance with the rules and regulations of ASIB 10th Edition and SABS 0287.

All pipe sizes shall be hydraulically calculated.

Working drawings shall be submitted for approval, prior to installation of equipment on site. An As built of the existing mains shall be done on a floor by floor block by block basis. The hydraulics shall then be done to incorporate what exists on site.

All submissions shall be in accordance with ASIB rules as well as that specified in these tender documents.

2 PRESSURE TESTING

All mains exist, and it stands to reason that the contractor shall be relieved from guarantees regarding this. Due diligence however will require pressure testing before any water is turned on. Tests shall be first with compressed air at 700 kPa and then with water

All testing shall be done prior to ceilings installation.

Completion certificates shall be completed and submitted to engineer.

Tests should not be performed against closed valves.

Leakage, which occurs, shall be measured and calculated and shall be less than 5%.

For underground sections, if the completed section of pipe complies with all specifications and passes the tests and inspection, it will be approved and the Contractor may be instructed to backfill the open sections of trench at the joints and connections.

The Contractor shall then proceed to build the valve chambers and inspection chambers, etc.

3 PIPE

3.1 General

The sub-contractor shall be responsible for ensuring that the coating manufacturers instructions, including, but not limited to:

(a) Surface preparation and cleaning;
(b) Preparation and application of coating materials; and
(c) Shelf life and storage requirements are adhered to.

Only approved coating materials as detailed in the specification shall be used. These shall not

be mixed with materials from different manufacturers. The sub-contractor shall ensure that piping and proprietary equipment are adequately protected when stored on site to prevent internal corrosion.

The pipe network layout shall be such that length and directional changes are minimized.

All pipes are to be carefully examined for defects and flaws before installation and to be neatly fitted. They shall be run in such manner as to prevent the formation of air locks.

The ends of all pipes are to be cleaned free from burrs and rough edges and screwed together tightly. An approved pipe joint compound may be sparingly used with best quality hemp. All surplus or exposed hemp to be thoroughly cleaned off joints before the painting of pipes.

Pipes shall be installed in such a manner to allow for contraction and expansion.

During construction all pipe end shall be suitably plugged to prevent any ingress of dirt, rubble etc.

Galvanic action is unlikely to occur when the sequence of metals in relation to the normal direction of flow is; galvanised steel (zinc) to uncoated iron to copper.

Unless galvanic action is unlikely to occur, or unless effective measures are taken to prevent such deterioration, metal pipes of different materials shall as far as possible not be connected to one another.

3.2 Above ground piping.

3.2.1 General

All above ground sprinkler pipe work installed inside buildings up to and including 150mm diameter shall be of Medium Grade Black Piping to SABS 62. Where above-ground pipe work exceeds 150 mm diameter, this shall be of Medium Quality Black Piping to SABS 719 having a wall thickness of at least 6mm.

All fire hose reel and Hydrant piping shall be Medium Grade Galvanized Mild Steel Piping to SABS 62. Pipes 150 mm and above shall be flanged.

3.2.2 Installation (spacing of supports).

3.2.2.1 Provision for expansion shall be made in pipe runs by allowing freedom of movement at bends or branches.

Reference shall be made to the pipe manufacturer's recommendations and such provision for expansion shall include:

(a) a clear space to permit movement, and

(b) sufficient free length of tubing around the being or along the branch, to prevent overstressing of the tube.

3.2.2.2 When pipes are installed in open spaces are not otherwise held in place, they shall be securely fixed with pipe supports to any structural member of a building with which they come into contact.

3.2.2.3 Pipe supports shall be of a type and material appropriate to the pipe shall be capable of withstanding the applied loads and shall be corrosion resistant when pipes are installed in locations exposed to corrosive conditions.

3.2.2.4 Copper holder bats shall not be used for the fixing of steel piping.

3.2.2.5 Holder bats shall be either built into, or bolted to, the structure of a building.

3.2.2.6 Brackets and clips shall be securely fixed in one of the following ways;

(a) by drilling and bolting through

(b) by drilling and caulking with lead (wooden plugs are not permitted);

(c) by securing with a screwed or bolted masonry anchor;

(d) by percussive fasteners used in accordance with the manufacturer's instructions; or

(e) by other approved means

3.2.2.7 The spacing of pipe supports shall be determined as follows:

(a) the spacing is acceptable if, under normal operation conditions,

i) the permissible maximum stress for the material from which a pipe is manufactured is not exceeded, and

ii) the maximum deflection of the pipe from a straight line between neighbouring supports does not exceed 1/150 of the distance between the supports;

(b) if the requirements in (a) above are not met, then

i) in the case of metal pipes, the spacing of pipe supports shall not exceed the values given below:

Nominal pipe Diameter (mm)	Distance between pipe supports when Pipes are installed (m)	
	Non-vertically	Vertically
15 to ≤ 25	1.8	3.0
>25 to ≤ 40	2.7	3.0
>40 to ≤ 50	3.0	3.6
>50 to ≤ 65	3.6	4.5
>65 to ≤ 150	4.0	4.5

3.2.3 Hangers

Hangers used in the fire suppression systems shall be listed for the purpose. Pipe shall be substantially supported from the building structure, which must be capable of supporting the weight of the system when filled with water plus a minimum of 114 kg applied at each point of hanging.

Fire suppression system piping shall be supported from the building structure only. Where fire suppression system piping is supported from duct work supports, those supports shall be capable of supporting the duct work and the weight of the water filled pipe plus 114 kg applied at each point of hanging.

Pipe supports for fire suppression system piping shall never be used for non-fire suppression system components. At least one hanger shall be provided for each piece of pipe between two branches or sprinklers.

Spacing between hangers is limited to 3.7m for pipe diameters up to and including 32mm and 4.67m for larger diameters.

The length of an unsupported pipe between an end sprinkler and the last hanger shall not be in excess of 900mm for 25mm, 1.2m for 32mm and 1.5m for larger diameters. When these limits are exceeded the piping shall be extended beyond the last sprinkler and be supported by an additional hanger.

Hanger rod size shall be the same as that approved for use with the hanger assembly and the size of the rods shall not be less than the following.

3.2.3.1 Hanger Rod Sizes:

Up to and including 100mm - 10mm
125mm, 150mm and 200mm - 12mm
250mm and 300mm - 16mm

3.2.3.2 U-Hook Rod Sizes:

50mm - 8mm
65mm to 150mm - 10mm

200mm - 12mm

3.2.3.3 Eye Rod Sizes:

with bent eye:
Up to 100mm - 10mm
125mm and 150mm - 12mm
200mm - 19mm

with welded eye
Up to 100mm - 10mm
125mm and 150mm - 12mm
200mm - 12mm

3.2.4 Risers

Risers shall be supported by pipe clamps or by hangers located on the horizontal connections, close to the riser.

For multi storey buildings riser supports shall be provided at the lowest level and at each alternate level above and below offsets and at the top of the riser. There shall be at least one support for each section of the riser. When flexible couplings are used supports at the lowest level shall be designed to prevent upward thrust.

3.3 Underground piping.

3.3.1 General.

All piping below ground level smaller than 150 mm is to be of heavy grade back piping to SABS 62 (black steel for sprinklers, and galvanized for firewater) suitably protected against corrosion with two layers of fully overlapping Denso wrap or equally approved, or Class 16 uPVC may be used for pipes always under pressure as per SABS 966 Code of Practice.

Pipes in excess of 150 mm diameter shall be heavy grade quality black piping (6 mm minimum wall thickness) to SABS 719(Black steel for sprinklers and galvanized for fire water) with two layers of fully overlapping Denso wrap or equally approved or uPVC piping to SABS 966 as above.

3.3.1.1 Pipes shall have a soil cover and the outside, of at least:

(a) 450mm for any pipe of nominal diameter less then 75mm, or

(b) 750mm for any pipe of nominal diameter exceeding 75mm,

Keeping in mind that, if the soil cover is less than that required, appropriate steps shall be taken to protect any such pipes against the transmission of excessive superimposed loads direct to the pipe.

3.3.1.2 Unless otherwise approved, pipes shall have a soil cover of not more than 1m over the outside.

3.3.1.3 Where a sanitary drain pipe and a pipe that conveys potable water are laid underground horizontally next to each other, they shall be laid at least 500mm apart.

3.3.1.4 Trench excavations, bedding and backfilling shall be carried out in accordance with SABS 1200-LB and pipes shall be so laid that

(a) they are evenly supported throughout their lengths; and

(b) no pipes rest on their sockets, or on bricks, tiles or other makeshift supports.

3.3.1.5 In the case of pipework with flexible or lead caulked joints, adequate measures shall be taken to prevent movement of the pipework due to water pressure effects. Thrust blocks shall be designed and installed in accordance with SABS 1200-L.

3.3.1.6 The following precautions shall be taken to minimize the effects of ground movement on pipes and fittings:

(a) suitable types of pipework and fittings shall be used where ground is liable to move; and

continuous longitudinal support shall be provided where the pipes or the joints are not sufficiently flexible to accommodate movement of the pipeline.

3.3.2 Pipes laid under walls or under surface slabs.

Where any portion of a pipe passes under a building or under a surface slab, and unless otherwise approved, the following shall apply;

Such portion shall be installed inside a sleeve of internal diameter at least 15mm plus the outside nominal diameter of such portion;

such portion shall be protected against the transmission of any load to it;

such portion shall be laid without any change of direction, and without any junctions; and

the trench in which such portion is laid shall in no way impair the stability of any building, or interfere with, or affect, any existing services.

3.3.3 Pipes laid in or through floors, concrete slabs or walls.

3.3.3.1 Where any portion of a pipe is concealed in a floor, concrete slab or wall, the following shall apply:

(a) Adequate measures shall be taken to protect such portion from external pressure or from the transmission of any load to it:

(b) should a leak develop in such portion, the installation shall be such that the portion of the pipe can be removed without danger to the building structure; and

(c) plastic pipes shall not be rigidly encased in floors, concrete slabs or walls.

3.3.3.2 Where any portion of a pipe passes through a wall or under a floor, such portion should preferably be installed inside a sleeve of internal diameter at least 15mm plus the outside nominal diameter of such portion.

3.3.3.3 No pipe shall be installed within the cavity of any cavity wall, nor shall any pipe pass through concrete expansion or contraction joins.

3.3.3.4 Concealed piping in reinforced concrete structures shall be:

(a) housed in properly constructed builders' work ducts, or wall chases, and

(b) laid in continuous lengths without joints or fittings except where such joints or fittings are located within access ports of sufficient size to permit maintenance and inspection.

3.3.3.5 Where penetrated, compartment walls, floors and fire barriers shall be fire-stopped to prevent the passage of smoke and flame.

3.3.4 UPVC underground pipe installations.

Unless otherwise specified all underground pipework > 50mmø shall be Class 16 uPVC to SABS 966 with rubber ring type joints.

All bends shall be uPVC Class 16 type fittings with rubber ring joints.

All other fittings such as T-pieces, Reducers, Flanges etc. shall be bitumen dipped cast iron rubber ring jointed fittings to SABS 546.

No solvent weld type fittings will be allowed.

All pipes shall be laid on a 100mm sand bedding cradle and covered with 300mm sand before backfilling.

Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1100	Flexible pipe Bedding as per SABS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other area	900		90% MOD AASHTO

All thrust blocks shall be cast between the pipe and the undisturbed trench material.

No concrete shall come into direct contact with the uPVC pipe.

All pipe crossing under traffic areas shall be backfilled with solicrete and compacted as specified.

All pipework shall be pressure tested with all joints uncovered to the satisfaction of the Engineer.

Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

3.4 Surface preparation.

All sharp edges, burrs, rags and weld splatter shall be removed and weld areas shall be abraded and/or ground. The surface shall be degreased and rinsed with solutions supplied by the coating manufacturer prior to mechanical cleaning (Section 4.4 of SABS 064 Code of Practice). Surface preparation shall be in accordance with ISO 8501-1 and SABS 064 and shall be conducted before erection of pipes.

3.5 Priming of new pipework.

All concealed and exposed piping shall have a red oxide prime coat which is factory applied. All damaged areas are to be wire-brushed and re-primed where necessary. No unprimed pipes will be allowed on site. All pipework shall be primed in the workshop before being sent to site.

3.6 Use of denso type.

Where Denso protection is required, the following specifications must be adhered to:

- Piping to be prepared using Denso Primer, Denso HT Inner Wrap and Denso PVC Outer Wrap;
- Fittings and pipe work other than cast iron must be hot dip galvanised prior to wrapping;
- Denso HT shall be applied by hand and wrapped in a clockwise direction with a minimum 55% overlap; Two layers shall be applied.
- Denso PVC Outer Wrap must be wrapped in an anti-clockwise direction with a minimum 25% overlap, over the second denso layer;
- Buried flanges are to be encapsulated in Denso Mastic prior to the application of the Denso HT tape; and
- The wrapping of pipework must extend at least 150mm above finished ground level and be secured with bandit strapping. In such cases, the PVC tape must be painted with an appropriately compatible ultraviolet resistant paint.

3.7 Alternative products

Should the applicator or manufacturer wish to propose alternative products or coating materials, he shall submit a detailed motivation to Chimera Fire Protection Consultants.

The motivation shall include, but not be limited to the following:

- Benefit to the Client;

- Product licensor and technical back-up available;
- Location, experience and ISO quality rating of the production facility;
- Detailed case histories;
- Performance guarantee offered; and
- Manufacturer's data sheets for each product.

3.8 Finishing off of coating of pipework.

All exposed pipework is to be coated with two coats of high quality gloss enamel red colored paint of an exact specification acceptable to the Engineer. Piping in ceiling voids shall be primed only. It is preferred that all exposed piping be painted in the workshop and only touched up on site

3.9 Coating application.

The sub-contractor shall submit a quality plan to ensure that the application work is carried out in strict accordance with the most recent Product Data Sheet from the coating manufacturer. The product data sheet shall be deemed to be part of this specification.

Coatings shall not be applied when surface may become damaged due to rain, dust, condensation, surface temp or excessive humidity (>85%).

All surfaces shall be coated as specified. Successive coats shall be of distinctly different colour to the previous coat to ensure correct inter-coat coverage.

Special attention shall be given to cracks, crevices and edges to ensure complete coverage and paint thickness.

The primer shall be applied as soon as possible after the surface preparation operation, but within 4 hours.

Concealed surfaces shall be completely coated. All edges, corners, bolt holes and cut ends shall be stripe coated by brush application, prior to the application of the second coat.

No coating shall be applied to any surface containing traces of grit, grease, soil, loose rust, surface contaminants (i.e. dust) or loose corrosion product of any kind.

Surface rust on steelwork shall not exceed Grade B of ISO 8501-1.

3.10 Fasteners

All nuts and bolts shall be either hot dip galvanised or stainless steel unless otherwise specified. All galvanised nuts and bolts shall be de greased, patch primed and finish coated in accordance with the specification for the respective area of the plant.

3.11 Prevention of galvanic corrosion.

Care must be taken to prevent or mitigate the corrosion caused by dissimilar metal contact on

cooling coils, tubes and tube plates, pipes, flanges, frames etc.

Typical metals encountered would be copper, aluminum, zinc, mild steel and stainless steel. The junctions between dissimilar metals must be electrically insulated where possible.

Pipe flanges between dissimilar metals must be insulated using insulating gaskets for the flange faces and insulating sleeves and washers for all nuts and bolts.

Where the insulation of the junction between dissimilar metals is not practical, the cathode surface on the electrolyte or “wet” side must be coated for a minimum distance of 100 mm from the junction. The applied coating must effectively isolate the coated surface from the electrolyte.

3.12 Corrosion - inspection and testing.

The following inspections and tests shall be performed by the sub-contractor and witnessed by the design team in accordance with the approved Quality Plan on corrosion protection.

Visual inspection for paint film defects shall be performed after each coat is applied. All defects including pinholes, sags and runs shall be corrected before the next full coat is applied. Dry film thickness shall be measured in accordance with SABS Method 141 Clause 3.3 (smooth disc).The required dry film thickness given in “windows” for each coat in the relevant coating specification, i.e. required minimum and acceptable maximum.

Any reading outside this range is cause for rejection and may require the removal of the entire coating and reapplication thereof. Actual readings and not averages shall be recorded.

3.13 Quality assurance.

3.13.1 Sub-Contractor Qualification

The design team may, at its discretion, require a Quality Audit of the painting sub-contractor to ensure that he has the management, facilities, skilled staff and quality control facilities and staff, to carry out quality control during application of coatings to ensure compliance with specification. The sub-contractor shall accept full responsibility for the quality of his work and of materials used, irrespective of any quality surveillance that may be carried out by the design team.

<u>The sub-contractor shall keep at least the following records:</u>

- Material batch records
- Psychometric records
- Records of surface preparation
- Dry film thickness measurements per coat

3.14 Guarantees.

Performance guarantees for the applied coating systems shall be offered jointly by the coating manufacturer and coating applicator. Whilst the period of guarantee will vary from situation to situation, the criteria for failure will not exceed Re2 on the European Scale of Degrees of Rusting. All guarantees in the terms of protection against corrosion shall be ceded to the client.

4 PROTECTION

Special care shall be taken in transport, delivery, storage on site and installation to ensure that equipment and/or components are protected, installed and cleaned to ensure that the entire system is in 'as new' condition at start-up.

The Subcontractor shall be responsible for all hoisting and rigging of equipment/material into its final position in the building. Equipment enclosed packaging shall be of sufficient strength and/or temporarily reinforced during transport to - and handling on site, until installed in its final position, to ensure that it retains its structural and dimensional integrity during these phases of the contract.

No "repaired" equipment/components (after damage by either own or other parties/construction trades either prior to, during or after installation) will be accepted at handover.

Subcontractor shall remain responsible for equipment in 'as new condition' and is not allowed to install equipment in areas or spaces where it can be subjected to damage through weather or trades for which it has not been designed.

5 FITTINGS

5.1 General

Materials, components, fittings and fixtures shall be so selected that they are suitable for the expected conditions of use.

All materials, components, fittings and fixtures in every part of a water installation shall operate effectively under all normal conditions likely to be experienced when the water installation is in service, and

The use of dissimilar metals in below-ground installations shall be avoided wherever practicable, or special measures shall be taken to prevent corrosion where pipes, pipe joints or connected fittings are of dissimilar metals.

5.1.1 Iron and steel

5.1.1.1 The following shall be deemed to be acceptable:

a) Malleable cast-iron pipe fittings that comply with the requirements of SABS 509;
b) steel pipes and pipe fittings with a nominal bore up to 150mm that are suitable for screwing

to SABS 1109-1 pipe threads, and that comply with the requirements of SABS 62-2;

c) galvanized steel tubes, tubulars and fittings that have been galvanized in accordance with the requirements of SABS 763; and
d) galvanized iron pipes and fittings that comply with the requirements of SABS 62-1 for medium sized pipes.

5.1.1.2 Where buried galvanized steel tubes and fittings can suffer rapid corrosion in acidic soils, special precautions shall be taken to protect such pipes and fittings against external corrosion.

All pipe fittings must be listed by a nationally recognized testing agency, and in full compliance to the appropriate standard. No Eastern Block fittings shall be allowed.

Only Tupy or Crane fittings, or FM approved Mech fittings are allowed. The tender is given timeously and thus if import of fittings are required, there shall be no excuse for late delivery

6 WELDED PIPES

Sections of shop-welded piping shall be joined on site by approved fittings. All welding (off site) is to be SABS 044.

No welding will be allowed to take place on site. Welding shall be subject to X ray testing, at the expense of the contractor.

One out of every 10 welds shall be examined by X ray. Should any weld prove unsatisfactorily, the total installation shall be X rayed.

Only coded welders shall be allowed to weld sprinkler pipe work, and welders certification shall be submitted prior to commencing the installation.

When welding sprinkler piping special attention shall be given to the following:

- Holes in pipe for outlets shall be cut to the full inner diameter of the fitting prior to welding the fitting in place.
- Cut-out pieces shall be retrieved and stored for verification.
- There shall be no penetrations that will reduce the inner diameter of the pipe.
- Torch cutting and welding shall not be permitted as a means of modifying and repairing fire suppression system piping.
- Qualification of the welding procedure to be used and the performance of the welders shall meet or exceed the requirements of the welding standards required by the appropriate NFPA Standards.
- A welding procedure shall be prepared and qualified by the contractor or fabricator before any welding is done. Qualifications of the welding procedure to be used and the performance of all welders and welding operators is required and shall meet or exceed the requirements of American Welding Society Standards AWS DIO.9, Level AR-3.
- Contractors or fabricators shall be responsible for all welding they produce. Each contractor or fabricator shall have an established written quality assurance procedure ensuring compliance with the required standards.

7 JOINTS

When joints are made.:

a) All proprietary joints shall be made in accordance with the manufacturer's instructions.
b) such joints shall be made watertight and shall remain so during use,
c) all pipes, fittings and components to be jointed shall be internally clean,
d) care shall be taken to ensure that no jointing material projects inside the bore of the pipe.
e) all burrs shall be removed from the ends of pipes, and
f) care shall be taken to prevent jointing material from entering the waterways.

Since some flexibility is desirable where there is a possibility of movement in the pipeline or between pipes and fittings, provision shall, where necessary, be made in the assembly of the pipework to accommodate and control thermal movement.

Pipes shall be so joined to one another as to maintain the continuity of the bore.

Jointing materials shall comply with the following:

a) Bronze welding filter rods shall contain at least 57% copper;
b) silver brazing alloys shall contain at least 1.8% silver;
c) lead used for jointing shall be commercially pure;
d) soft solder shall be nominally one part lead to one part tin; and
e) rubber rings used for jointing shall be of the dimensions, composition and hardness suitable for the particular application.

Threaded joints shall be formed on metal threads by the use of polytetrafluoroethylene (PTFE) tape, hemp, or piping jointing compound, and on uPVC threads by the use of PTFE tape only.

8 DRAINAGE.

Fire suppression system piping shall be installed such that all system piping can be drained.

Wet pipe sprinkler systems may be installed level.

Dry pipe systems shall be sloped with a pitch of 4 mm/m for branch lines and 2 mm/m for cross and feed mains.

Drainage to the system alarm valve is preferred although it is recognized this may not be achieved in all circumstances.

System supply risers shall be provided with drain connections sized at a minimum of 20mm for pipes up to 50mm, 32mm for pipes 65mm to 100 mm and 50mm for pipes 150mm and larger. For isolated trapped sections in wet systems the auxiliary drain shall consist of a 25 mm or larger pipe into an easily accessible location preferably in the vicinity of a draining facility of the sewer system.

For dry-pipe systems the size of the drain valves is 25mm but the arrangement for drainage shall include a condensate nipple 50mm diameter by 300mm fitted between 2 drain valves.

Drains other than the system's main drain shall always be provided with a drain plug. A hose coupling shall be provided for future use.

9 SYSTEM COMPONENTS

9.1 Valves

9.1.1 Gate Valves:

Gate valves on fire pump suction and discharge headers, pump test line and internal risers shall be OS&Y (outside screw and yoke) type. The valves shall be equipped with hand wheels and be of a rising stem type. They shall have a cast iron flanged body, bronze mounted, double disc, and parallel seat type and be listed by a recognized national agency (UL, FM, etc.).

9.1.2 Supervisory Switches:

The supervisory tamper switches shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

The mechanism shall be contained in a weatherproof die-cast aluminium housing, which shall provide a 19mm tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.

Switch housing to be finished in red baked enamel.

The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed. or if the unit is removed from its mounting.

Valve supervisory switches shall be provided and installed under this section by the fire suppression system contractor and connected by the fire detection and alarm system contractor.

9.1.3 Wafer Butterfly Valves:

Wafer butterfly valves on nominal pipe diameters of 65mm to 150mm shall be provided as sprinkler zone control valves and shall be a component of the sprinkler zone control valve and flow switch arrangement. The wafer butterfly valves shall be rated for 15 bars working pressure and designed to fit between ANSI B16.5 Class 150 flanges. The valves shall be right angle, gear driven from a hand wheel, and have a high visibility position indicator, and built-in supervisory switch and be listed by a recognized national agency (UL, FM, etc.).

9.1.4 Gate Valves 50.4mm N.B. And Below:

Gate valves of 50.4mm and below used for system test and draining purposes shall be provided with screwed ends. They shall be of the rising stem type, and equipped with provided hand wheels, and be listed by a recognized national agency (UL, FM, etc.),

9.1.5 Check Valves:

Check valves shall be provided on, but not limited to, the fire pump discharge and bypass line, standpipe risers, and on the fire department connections. They shall be of the swing check design, and manufactured with a cast iron Hanged body, and suitable for a working pressure of 15 bars. The hinge pin mechanism shall be manufactured in brass and bronze to reduce corrosion. Seat rings shall be accurately machined bronze, and the swing dapper in ductile iron. The seating disc shall be of rubber material. A cast boss tapped 12.7mm shall be provided on the underside of the body for attachment of a drain or ball drip valve, where required. They shall be listed by a recognized national agency (UL, FM, etc.).

9.1.6 System Check Valves:

System check valves required at the base of standpipe, and combined standpipe sprinkler risers shall be wet-pipe sprinkler valves, which will provide the facility from standard tapped bosses for connection of the system drain valve and pressure gauges. The wet-pipe sprinkler valve (check valve), shall have a cast iron, flanged body, and rated for a working pressure of 15 bars. Wet-pipe sprinkler valves shall be divided ring, rubber faced clapper, check type, water-flow alarm valves, which are intended for use in wet-pipe automatic sprinkler systems. They shall be listed by a recognised national agency (UL, FM, etc.).

9.1.7 Wet-Pipe Sprinkler Valves:

Wet-pipe sprinkler valves shall be installed at the base of each sprinkler system riser. The wet-pipe sprinkler valve (check valve), shall have a cast iron, flanged body, and rated for a working pressure of 15 bars. Wet-pipe sprinkler valves shall be divided ring, rubber faced clapper, check type, water-flow alarm valves, which are intended for use in wet-pipe automatic sprinkler systems.

<u>The valve shall be installed with the following trim:</u>

- Pressure gauges with 6mm gauge test valves, installed either side of the dapper assembly, therefore recording water supply pressure and sprinkler system pressure.
- A 50 mm drain valve installed at a location above the dapper assembly.
- An alarm and test arrangement, complete with automatic drain.
- The valve with associated trim, shall be listed by a recognized national agency (UL, FM, etc.).

9.2 Pressure sensing devices.

9.2.1 Pressure Gauges:

Pressure gauges shall be 87mm diameter, dial spring type, manufactured in corrosion resistant material, and controlled by bronze gauge valves with a draining arrangement. The gauge shall be marked in calibrated steps from 0 to 20 bars and be accurate to within 3 %. They shall be listed by a recognized testing agency (ASIB, UL, FM, BSI, LPC, AFNOR, VdS, etc.). Gauges installed indoors shall be glycerine filled to even-out pulsations.

9.2.2 Pressure switches:

Pressure switches shall be used to provide fire suppression system fault indications for high and, low water pressure, fire pump start initiation on a fall in pressure, and pressure maintenance pump (jockey pump) control, with low pressure initiating a pump start, and high pressure initiating a pump stop. Pressure switches are also used on dry system valves to actuate alarms.

Low pressure switches - refer to Fire Pump Controllers, Water Pressure Control, in this specification.

High/Low pressure alarm switch: Shall be field adjustable for the low setting to operate between 1.38 to 15.5 bars and the high setting within 3.45 bars, of the low setting. The switch shall unit shall be provided with two single pole double throw (Form C contacts) snap action switches enclosed in an oil resistant NEMA Type 2 drip proof, indoor rated housing. The housing cover shall be finished in red and secured with tamper resistant screws, which require a special key wrench for their removal.

The electrical switch contacts shall be rated as follows:

- 125/250v AC 10.00 amps
- 6/12/24v DC 2.50 amps
- 125v DC 0.50 amps
- 250v DC 0.25 amps

The pressure switch unit shall have a 12mm male NPT thread, for connection into the system piping. The pressure switches shall be connected by the Fire Detection and Alarm System Contractor to the central fire alarm panel, to provide a fire suppression system initiated fault condition. Field wiring shall be through a 12mm conduit opening in the base. They shall be listed by a recognized testing agency (UL, FM, BSI, LPC, AFNOR, VdS, etc.).

9.3 Water flow and measuring devices.

9.3.1 Water Flow Detectors:

Water flow detectors (flow switches), installed in the standpipe and sprinkler systems, shall have a vane-type sensor to actuate two single pole double throw snap-action switches, when water flows through the system at a sustained rate of 19 l/min or more. The switches shall be enclosed in an oil resistant NEMA Type 2 drip proof, indoor rated housing. The housing cover shall be finished in red and secured with tamper resistant screws, which require a special key wrench for their removal.

The electrical switch contacts shall be rated as follows:

- 125/250v AC..... 10.00 amps
- 6/12/24v DC..... 2.50 amps

The switches shall be capable of being wired for either normally open or normally closed circuits. The unit shall have a built-in pneumatic retard assembly (with automatic reset), which delays the actuation of the electrical switches to reduce the possibility of false alarms caused by transient pressure surges. The time delay shall be field adjustable from 0 to 60 seconds, and factory set at 30 seconds. The unit shall be fixed to the system piping with a "U" bolt and saddle "O" ring. A hole shall be drilled/cut in to the pipe, to the device manufacturers recommended size, for insertion of the poly-propylene vane.

The flow switch shall be connected by the Fire Detection and Alarm System Contractor to the central fire alarm panel, to provide a fire suppression system initiated alarm condition. Field wiring shall be through a 12 mm conduit opening in the base. The devices shall be listed by a recognized testing agency (UL, FM, BSI, LPC, AFNOR, VdS, etc.). Marking shall be in metric-format on the direct reading flow meter.

9.3.2 Flow Measuring Device:

A flow measuring device shall be installed for commissioning and periodic measurement of the fire pumps performance. The direct reading flow meter shall be installed in a straight horizontal length of pipe, with minimum distances upstream and downstream of the device as stipulated by the device manufacturer. Two isolating valves shall be provided either side of the straight pipe length to which the device is installed. The valve up stream of the device shall be for pump test line isolation purposes, and the valve downstream shall be used as a throttling valve to provide a back pressure when testing, to ensure that a steady flow indication is achieved.

The flow meter shall be a venturi device with a capability of measuring from 0 flow to 175 Percent of the fire pumps nominal rated duty. The meter gauge shall be marked to provide flow readings from 0 to the maximum required. The test pipe diameter shall be confirmed by the device manufacturer. The device shall be listed by a recognized testing agency (UL, FM, BSI, LPC, AFNOR, VdS, etc., and shall be similar or equal to Gerand direct reading flow meters. Meter shall be wall mounted and not mounted on the pipe. At least 10 diameters of straight pipe before and 5 after the meter shall be incorporated in the installation design.

10 AUTOMATIC SPRINKLERS

Automatic sprinklers shall be of the size, type, temperature rating, style and finish as those indicated on the drawings. The automatic sprinklers shall be listed by a recognized testing agency (UL, FM, BSI, LPC, AFNOR, VdS, etc.). All sprinklers in ceiling voids shall be upright and standard brass finish. All sprinklers under ceiling level or exposed in occupancies shall be epoxy coated white finish with matching rosette. All sprinklers shall be installed in accordance with its listings.

10.1 Sprinkler Temperature Ratings:

Sprinklers shall be supplied and installed with the temperature ratings as indicated on the drawings. The temperature rating of Contractor supplied sprinklers, shall be within a tolerance of plus or minus five (5) percent of the temperature ratings indicated on the drawings.

10.2 Sprinkler escutcheon plates:

Metal escutcheon plates shall be provided for all sprinklers connected to concealed piping, i.e., sidewall sprinklers connected to piping penetrating a wall, and pendent sprinklers connected to piping above suspended ceilings. Adjustable escutcheon plates shall be provided for recessed sprinklers. The finish of escutcheon plates shall match the sprinkler finishes.

10.3 Office area Sprinklers:

Sprinklers for protection of office areas are fast response, Pendant spray, with a temperature rating of 68°C, white epoxy coated, 13.5mm orifice, and 19mm male NPT thread. Quick response pendent and sidewall sprinklers may be used in locations where the suitability is proven by hydraulic calculations and where shown on the drawings

Pump room sprinklers shall be replaced with sprinkler heads with a temperature rating of 141°C, white epoxy coated, 13.5mm orifice, and 19mm male NPT thread.

10.4 Sprinkler Guards:

Sprinkler guards shall be installed on sprinklers which are located in positions where they may be exposed to possible physical damage. The guards shall be manufactured by the sprinkler manufacturer and listed by a recognized testing agency (UL, FM, BSI, LPC, AFNOR, VdS, etc.).

10.5 Zone control valve assembly.

Each sprinkler system zone shall be controlled and monitored with a zone control valve assembly.

<u>This assembly shall comprise of the following:</u>

- A wafer butterfly valve, as specified under "valves" in this specification.
- A water flow detector (flow switch), as specified under "water flow indicating and measuring devices" of this specification.
- A Pressure gauge, as specified under "pressure sensing devices" of this specification.
- A test facility comprising of a valve, sight glass, and restriction orifice equivalent to the smallest orifice sprinkler installed in each zone.
- A 50.8mm zone drain valve.
- Pipe and fittings as specified under "pipe, fittings and hangers" in this specification.

10.6 Water motor alarm.

Water motor alarms shall be provided for each sprinkler system wet-pipe alarm valve

installation. The water motor alarm shall be a hydraulically operated outdoor device suitable for mounting on a rigid wall. The gong, gong mounting and water motor housing shall be manufactured in corrosion resistant aluminium. The device shall be capable of producing a very high sound pressure level and be listed by a recognized testing agency (UL, FM, BSI, LPC, AFNOR, VdS, etc.).

10.7 Inspectors test connection

Each sprinkler system and/or combined standpipe and sprinkler system shall be provided with an inspectors test connection. This connection shall be installed at the highest and where possible, the end of the most remote branch pipe of each system, and piped to terminate with possible the end of the most remote branch pipe of each system and piped to terminate with an open sprinkler, of the smallest diameter orifice, installed in the system. A test valve shall be located within the building at a height not exceeding 2.13 metres above floor level, and the open sprinkler shall be located outside the building, or in an approved position inside the building.

10.8 Flushing caps

Sprinkler system cross mains shall terminate with a minimum 32mm diameter pipe, to which, a flushing cap shall be fitted. These flushing caps shall be removed and hoses connected, when system piping flushing is required. Access shall be provided to all flushing cap locations. All piping shall be properly flushed prior to pressure testing.

11 FIRE SUPPRESSION SYSTEMS WATER SUPPLY

The primary water supply to serve the sprinkler system in this development will be a diesel driven fire pump set, including a jockey pump and emergency water supply tank.

11.1 Water storage tanks and appurtenances. (Sprinklers and firewater for hose reels)

11.1.1 Construction type

The tank shall be made up of pre-manufactured galvanized pressed steel sections and is described as follows

11.1.2 Materials

The material, as specified, shall be without defects that affect its strength or service. The workmanship shall be of such quality that defects or injuries are not produced during manufacture or erection. Specified unit stresses shall not be exceeded. The structure and its details shall possess the requisite strength and rigidity.

11.1.3 Construction

A suction tank shall be fitted with a roof, a contents gauge, overflow pipe(s) and drainage facilities. The tank shall be mounted on a stand, 1.0 meter high and constructed of concrete up-stands cast in position by the builder. Foot plates shall be of sufficient size to distribute the tank weight evenly without damage to the footings.

Automatic float valves shall be readily accessible for testing and maintenance.

Provision shall be made for the tank to be isolated for cleaning and maintenance purposes.

11.1.4 Joints

All joints and plates or sheets shall be field bolted. Boltholes shall be shop-punched or drilled for field assembly. Joints that are in contact with water and weather-tight joints shall be sealed. Bolts, anchor bolts, and nuts shall conform to AWWA D103, Factory-Coated Bolted Steel Tanks for Water Storage.

11.1.5 Gaskets

Gasket material shall be of adequate tensile strength and resilience to obtain a leak proof seal at all seams and joints. Gasket material shall be resistant to weather and ozone exposure. In addition, gasket material shall be capable of resisting chlorination exposure.

11.1.6 Sealant

The tank manufacturer shall supply sealants. Sealants shall remain flexible over a temperature range of -40ºC to 75ºC. Resistance to hardening and cracking shall be required.

The sealant shall be solid with no plasticisers or extenders to cause shrinkage. The sealant shall resist ozone and ultraviolet light and shall not swell or degrade under normal water storage conditions. In addition, the sealant shall be capable of resisting chlorination.

11.1.7 Welding

Welding shall be limited to the shop installation of nozzles, vents, manway connections, and subassemblies. Field welding shall not be permitted.

All coated parts shall be protected from damage during shipment.

11.1.8 Baffles, screens and strainers.

Baffles shall be provided at the point of entry of supply-water to suction tanks or pits to prevent the pump from entraining air.

11.1.9 Roof hatch

A safe means of access shall be provided to equipment such as float-valve assemblies and feed pipes.

An easily accessible roof hatch or roof door having a minimum opening dimension of 650 mm shall be provided in the roof. The hatch cover shall be built of steel plate with a minimum thickness of 4.8 mm. The opening shall have a curb that is a minimum of 100 mm high, and the cover shall have a minimum downward overlap of 50 mm. A substantial catch shall be provided to keep the cover closed.

11.1.10 Ladders

Outside and inside steel ladders that are arranged for convenient passage from one to the other and through the roof hatch shall be provided. Ladders shall not interfere with the opening of the hatch cover and shall not incline outward from the vertical at any point.

11.1.10.1 Outside fixed shell and roof ladder

The outside tank ladder shall be fixed a minimum of 175 mm between the tank side and the centreline of rungs and shall be rigidly bolted or welded to brackets that are spaced a maximum of 3.7 m apart and that are welded to the tank plates. The bottom bracket shall be located a maximum of 1.8 m above the base of the tank cylinder, and the ladder shall extend up the tank shell and radially along the roof, with the top bracket located within approximately 0.61 m of the roof hatch. There shall be a minimum 300 mm clearance at the sides and front of the ladder at the balcony.

11.1.10.2 Inside ladder

The inside fixed ladder provided for passage between the roof hatch and tank bottom shall not be rigidly connected to the bottom plates.

A ladder shall extend from the top to the bottom of the inside of the large steel riser pipes and shall be secured to the shell plates by brackets that are spaced a maximum of 3.7 m apart. The upper bracket shall be located at the top of the riser.

11.1.10.3 Ladder bars and rungs

Ladder side bars shall be not less than 50 mm x 15 mm or 65 mm x 10 mm. Side bars shall be spaced at least 400 mm apart. Rungs shall be of at least 20 mm round or square steel and shall be spaced 300 mm on their centres. The rungs shall be firmly welded to the side bars. Ladders and connections shall be designed to support a concentrated load of 159 kg.

11.1.11 Erection

Experienced contractors shall handle any necessary work. Careful workmanship and expert supervision shall be employed.

Bolted tanks shall be erected in accordance with the manufacturers' drawings and instructions.

The erector shall exercise care to properly install all parts of the tank including, but not limited to, gaskets and sealants.

Care in handling coated parts shall be exercised. Any sections that experience damage to the factory-applied coatings shall be repaired or replaced in accordance with the manufacturer's instructions. Excessively damaged parts shall be replaced.

11.1.12 Workmanship

In addition to complying with the requirements of this specification, it is expected that the

contractor will also follow the spirit of the standard, by using their experience and ability to create structures that shall prove reliable under all specified conditions.

The contractor's representatives shall provide careful inspection during shop fabrication and field erection.

The inspection shall include, but shall not be limited to, a check of the following:

(a) The thickness of butt-welded plates in tanks and tubular columns
(b) The appearance of welding in tank plates where a balcony is omitted and in tubular columns and at struts, except near the ladder and base of the structure
(c) The extent of inaccessible dents and out-of-roundness of tubular columns and struts

11.1.13 Corrosion protection

Parts that are inaccessible after fabrication, but that are subject to corrosion, shall be protected by paint before assembly. Surfaces in watertight joints shall be coated with clear oil or lacquer.

The tank stand shall be galvanized and bolted together on site. No site welding is permitted.

11.1.14 Suction pipes

The nominal diameter of the suction pipe shall suit the pump NPSH requirements, but shall not be less than 150 mm

Suction pipes shall be protected from the passage of materials that might impair the operation of the pump or other fire protection equipment, and screens, or strainers (or both) shall be so arranged that they can be cleaned or repaired without disruption of the suction pipework.

11.1.15 Tank connections

The suction connection from the tank shall be higher than the centre-line of the pumps, provision made in the storage tank for the installation of a sampling tap situated at a point not less than 50mm and not more than 150mm above the floor of the tank.

The tank shall be fitted with a 50 mm ball float valve, a 50 mm drain valve piped to the floor drain outlet as well as a visual tank water level indicating device. An 80 mm overflow pipe shall also be drained to waste.

11.1.16 Low and High Water Level Alarm Switches:

Float operated water level supervisory switches shall be provided for high and low water level alarms. The unit shall be single pole double throw snap-action, and enclosed in an oil resistant NEMA Type 2 drip proof, indoor rated housing. The housing cover shall be finished in red and secured with tamper resistant screws, which require a special key wrench for their removal.

The electrical switch contacts shall be rated as follows:

a) 125/250v AC.... 10.00 amps

b) 6/12/24v DC..... 2.50 amps

The switches shall be capable of being wired for either normally open or normally closed circuits. The switch shall be connected by the Fire Detection and Alarm System Contractor to the central fire alarm panel, to provide a fire suppression system initiated fault condition.

Field wiring shall be through a 12mm conduit opening in the base. The devices shall be listed by a recognised testing agency (UL, FM, BSI, LPC, AFNOR, VdS, etc.). In addition a sight glass or visual water level indicator shall be provided for each section of the tank.

Each tank shall also be fitted with a visual level indicator mounted in the fire pump room.

11.1.17 Tank configuration

Use	Volume
Sprinkler water	121 m^3
Stand height	0.5 m

12 DIESEL ENGINE DRIVEN FIRE PUMP

12.1 Description

The nominal rating of the fire pump unit is equal to that specified for the electric pump. The duty point shall be selected in accordance with the hydraulic calculations:

a) Flow: 1 800 l/min
b) Pressure: 675 kPa.

The final selection shall be based on final hydraulic calculations

The fire pump and diesel engine driver shall be supplied to site, assembled on a fabricated steel, or cast iron bedplate, suitable for installation on a prepared cast concrete foundation. The pump and driver shall be connected with a flexible coupling, which shall be provided with a guard, to prevent rotating parts from causing injury to personnel. The complete unit with associated equipment shall be listed by ASIB

12.2 Fire pump

<u>The fire pump shall be of the of the end suction design and be delivered to site equipped with the following:</u>

a) Pressure gauges on the suction and delivery sides of the pump. (see pressure gauges, in this specification.)

b) Check valves and all other valving

12.3 Diesel engine

The engine shall be a compression ignition diesel engine, specifically listed for fire pump service. The engine shall be either heat-exchanger-cooled, or, radiator cooled, and be provided with a governor, capable of regulating engine speed within a range of 4.5% between shut off and maximum load condition of the pump. The governor shall be field adjustable.

A tachometer shall be provided to indicate revolutions per minute of the engine. The tachometer shall be the totalising type, or an hour meter shall be provided to record the total time of engine operation. The engine shall be provided with an oil pressure gauge to indicate lubricating oil pressure and a temperature gauge to indicate cooling water temperature.

An instrument panel shall be provided to house the tachometer, temperature and oil pressure gauges.

All connections for the diesel engine controller shall be harnessed, or flexibly enclosed, mounted on the engine, and connected in an engine junction box with numbered terminals which will correspond with numbered terminals in the controller. The main battery contactors supplying current to the starting motor, shall be capable of manual mechanical operation to energize the starting motor in the event of control circuit failure. The engine shall be provided with a speed-sensitive switch to signal engine running and crank termination. The power for this signal shall be taken from a source other that the engine generator of alternator.

The engine shall be equipped with an electric-starting device taking current from storage batteries. Engine cooling system shall be the closed-circuit type, including a circulating pump driven by the engine, a heat exchanger, and a reliable engine jacket temperature-regulating device. An opening shall be provided in the circuit for filling the system, checking coolant level, and adding make-up coolant when required. The engine exhaust manifold shall incorporate provisions to avoid hazard to the operator or to flammable material adjacent to the engine.

12.4 Exchanger water supply

The cooling water supply for the heat exchanger shall be from the pump discharge pipe, taken from a point, prior to the pump discharge valve. The pipe connection shall include an indicating manual shut off valve, a flushing type strainer, a pressure regulator, an automatic solenoid valve, a pressure gauge and a second indicating manual shut off valve. The pressure regulator shall be of a size that is capable of, and adjusted for, passing 120 percent of the cooling water required when the engine is operating at maximum brake horsepower, and when the regulator is supplied with water at the pressure of the pump, when it is pumping at 135 percent of its rated capacity.

12.5 Engine exhaust

Each pump engine shall have a separate exhaust system. A seamless or welded corrugated (not interlocked) flexible connection shall be made between the engine exhaust outlet and exhaust pipe. The exhaust pipe shall not be any smaller than the engine exhaust outlet, and shall be as short as possible, and covered with high temperature insulation, or otherwise guarded to protect personnel from injury. The exhaust pipe and silencer shall be suitable for the intended use, and the exhaust back-pressure shall not exceed the engine manufacturers recommendations. It shall be fully insulated at all sections where below 3 meter from floor level

12.6 Batteries

The system comprises two separate sets of engine batteries, each with its own automatic battery charger, housed in the fire control panel. In the event that the diesel engine driven pump does not start first time, an automatic cranking action is operated. This action cranks the engine on one battery set for approximately 10 to 15 seconds, rests for 10 seconds, then cranks on the other battery set for 10 to 15 seconds. This cycle is repeated three times on each battery set, (i.e. six start attempts) and if the engine has still not started the "Pump Fail" alarm shall come up, along with the siren inside the fire pump room and the alarm and flashing, strobe light above the ICV chamber room.

The batteries shall be of the lead-calcium type. Lead-calcium batteries shall be delivered to site in a dry charge condition, with the electrolyte liquid in a separate container. The electrolyte shall not be added to the batteries until the engine is put into service, at which time, it shall be added, and the batteries given a conditioning charge.

Batteries shall be readily accessible for servicing, and located on racks above the floor, secured against displacement, and in a position where they will not be exposed to excessive temperature, vibration, mechanical damage or flooding water. Current carrying parts shall not be less than 305mm above the floor level.

12.7 Battery recharging and battery chargers.

One means for recharging batteries shall be provided. It shall be an automatically controlled charger taking power from an alternating (AC) power source. (Alternators shall not be permitted)

Battery chargers shall comply with the following:

- The rectifier shall be a semiconductor type.
- The charger for a lead-acid type battery shall automatically reduce the charging rate to less than 500 milliamperes when the battery reaches a fully charged condition.
- When operating, at its rated voltage, the battery charger shall recharge a fully discharged battery within 24 hours, in a manner which will not damage the battery.
- An ammeter with an accuracy of five (5) percent of the normal charging rate shall be provided to indicate the operation of the charger.
- The design of the charger will be such, that it will not be damaged or blow fuses during the cranking cycle of the engine when operated by automatic or manual controller.
- The charger shall automatically charge at the maximum rate whenever required by the state of charge of the battery.
- When not connected through a control panel, the battery charger shall be arranged to indicate loss of current output on the load side of the DC over current protection device.

12.8 Fuel tank

The diesel engine fuel tank shall, be located adjacent to the diesel engine. The tank shall be of fabricated steel construction with the external surfaces finished with a corrosion retardant treatment. The tank shall be mounted on a purpose built steel frame which shall be securely anchored to the floor.

The capacity of the tank shall be a minimum size equal 6 hours at full pump duty, plus five (5) percent volume for expansion. and five (5) percent volume for the sump. The vertical location of the diesel fuel tank shall be arranged so that the top level of the five (5) percent volume for the sump shall be level with the fuel pump centre line transmitting fuel to the engine fuel supply pump. The tank shall be equipped with suitable fill, drain and vent facilities and have a means, other than a sight tube, to determine the amount of fuel in the tank. The fill and vent pipes shall be extended to outside of the building. A reserve fuel supply shall be provided along with facilities to transfer the fuel in to the diesel engine fuel tank.

The capacity of the diesel fuel tank shall be at least 25% larger than the minimum required. This increase in capacity will provide fuel for the thirty (30) minute weekly pump test operation and extend the periods of time for tank refill.

A bunded wall shall be built below the tank with a capacity of the tank volume plus 10%.

12.9 Fuel piping

All exposed fuel lines shall be protected with guards. Flexible hoses from the engine to the fuel line shall be flame resistant. There shall be no shut off valve in the fuel return line to the tank.

12.10 Diesel engine drive controller and Annunciator Panel

The diesel engine controller shall be completely assembled, wired, and tested by the manufacturer before shipment to the site. The controller shall be listed by ASIB. The controller shall be sited as close as possible to the engine which it controls, and shall be within sight of the engine, and located, or protected such that water escaping from pumps or connections, will not cause damage. Current carrying parts of the controller shall be not less than 300mm above the floor. If the controller requires rear access for servicing, a clearance of 750mm shall be provided at the rear of the controller and 600mm on one side.

The equipment shall be suitable for use in an environment with a moderate degree of moisture. The control equipment shall be securely mounted within an enclosure which will protect the equipment against mechanical damage and water dripping from above. All switches required to keep the controller in the "automatic" position shall be located within locked cabinets with break glass panels.

The enclosure shall be grounded, and voltage surge protective devices shall be connected to the cabinet grounding lug by a copper wire of suitable size. Wiring elements of the controller, with the exception of conductors which are in a circuit only during the engine starting sequence, shall be designed on a continuous duty basis. Wiring between the controller and diesel engine shall be sized by the controller manufacturer, and installed with protection

against mechanical damage. Voltage surge protective devices shall be installed from each incoming ungrounded AC terminal of the controller to ground.

These devices shall be rated to suppress voltage surges above rated line voltage. Wiring diagrams and operating instructions shall be provided, the former within the controller, and the latter, conspicuously mounted on the controller.

12.11 Pump house Annunciator Panel (Diesel similar to Electric)

An A.S.I.B. approved annunciator panel shall be installed in a prominent position in the pump house, to monitor and display Fire pump status. Circuitry shall be self monitoring arranged for “normally closed” conditions. Open circuit shall indicate a “fault” condition with an “alarm” or “warning” condition indicated by a short circuit.

The Annunciator Panel shall monitor the following conditions (As a minimum and not limited to):

a. Fire Alarm
b. Electric Pump Running
c. Fault
d. Electric Pump Failure
e. Diesel Low Oil Pressure
f. Diesel Power Failure (battery charger electrical supply)
g. Diesel Pump Running
h. Fault
i. Diesel Pump Failure
j. Mains Failure
k. Water tank low level
l. Water tank high level

Each pump shall have a separate annunciator section in the pump controller panel

The Annunciator shall be battery powered, with batteries of sufficient capacity to monitor all circuits for 48 hours, following 1 hour in alarm condition.

A trickle charger shall be incorporated to ensure that the lead calcium batteries are maintained at full charge.

Facilities shall be included for remote monitoring of alarm conditions at the security control room as well as the necessary audible and visual alarms at the pump house.

An audible alarm capable of being heard while the engine is running, and operable in all positions of the main switch, except "off", shall be provided for the visual indications of items (b) to (f) above.

The fire detection and alarm system contractor shall wire from the contacts of the controller to the building’s central alarm control panel, and arrange with the detection alarm system designer that the input signals are identified and displayed as fire suppression system fault signals.

12.12 Starting and control

The controller shall also operate as a non-automatic controller.

The controller's primary source of power shall not be AC electric power.

12.13 Water pressure control

The controller circuit shall be provided with a pressure actuated switch having independent high and low calibrated adjustments. There shall be no pressure snubber or restrictive orifice employed within the pressure switch. The switch shall be responsive to water pressure in the fire suppression system. The sensing elements of the switch shall be capable of momentary surge pressure of (27.6 bars) minimum, without losing its accuracy.

Suitable provision shall be made for relieving pressure to the switch, to allow for testing the operation of the controller and pumping unit.

A connection for the sensing line, shall be taken from the pump discharge line between the check valve and discharge control valve, to the controller pressure switch. This line shall be 13mm nominal diameter, corrosion-resistant metallic pipe.

12.14 Non automatic operation of controller

A manually operated switch shall be provided on the controller, which shall be arranged so that when the engine is manually started, the pressure switch cannot affect the operation until manual shut down.

12.15 Non-automatic operation of controller.

A manually operated switch shall be provided on the controller, which shall be arranged so that when the engine is manually started, the pressure switch cannot affect the operation until manual shut down.

12.16 Starting equipment arrangement.

The two (2) battery storage units described above, shall be arranged so that manual and automatic starting of the diesel engine can be accomplished with either battery unit. The starting current shall be furnished by first one battery and then the other, on successive operations of the starter. The changeover shall be made automatically, except for manual start.

In the event that the engine does not start after completion of its "attempt to start" cycle, the controller shall be arranged to stop all further cranking and operate a visible and audible alarm on the controller.

The controller shall have the facility, during a cranking sequence, to lock-in on one battery, should the other be inoperative or missing.

12.17 Methods of stopping

Manual electric shutdown shall be accomplished by either of the following methods:

a) Operation of the main switch within the controller.

b) Operation of a stop button located on the outside of the controller enclosure. This shall cause engine shutdown through the automatic circuits, only if all starting causes have been returned to normal. The controller shall then return to full automatic status.

12.18 Emergency control

The controller shall be provided with a facility to bypass all automatic circuits, failure of which, could prevent the engine starting, during manual starting and run.

13 PRESSURE MAINTENANCE JOCKEY PUMP

Nominal pump rating:

Flow: 50l/min
Pressure: $P_{main\ pumps}$ + 100kPa = 650 kPa

A centrifugal, electric motor driven pump shall be provided for pressure maintenance of the fire suppression system.

The jockey pump shall be controlled with a controller, which incorporates a pressure switch as described under the heading of "pressure switch" in this specification. The jockey pump shall be connected from the pump suction line at a point upstream of the pump suction control valve to the fire suppression pump discharge header, downstream of the pump discharge control valves.

Both the jockey pump suction and delivery lines shall be equipped with indicating butterfly or gate valves. Tamper switch devices are not required on these valves. A check valve shall be installed between the jockey pump discharge connection and the discharge control valve. A pressure sensing line to the controller pressure switch shall be connected to the main fire pump discharge header at a location downstream of the main fire pump control valves. The AC electric power supply to the jockey pump shall be arranged from the emergency power supply source.

14 SPARE AND REPLACEMENT PARTS

Spare and replacement parts shall consist of a quantity of two (2) percent of each type of device used in the system with a minimum quantity of the following as listed.:

a. Set of manufacturers recommended spare parts for each fire pump - 1

b. Set of manufacturers recommended spare parts for each fire pump engine - 1

c. Valve gaskets and seals - 3 for each type and size

d. Supervisory switches - 2

e. Hose valves - 2

f. Pressure gauges - 4

g. Pressure switches - I of each type

h. Flow switches - I of each size

i. Sprinklers - 6 of each size and type

j. Sprinkler wrench - 2 of each type

Spare and replacement parts shall be in original packaging and submitted to the building maintenance Chief Engineer.

Furnish and install a wall mounted storage cabinet with lock suitable for storing the spare sprinklers and spanners, located below the diesel fire pump panel.

The cabinet shall be manufacturer's standard finish with 6.35mm white lettering, **"SPARE SPRINKLERS".**

The lock shall be mastered keyed the same as fire pump control panels.

15 PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers shall be provided to the types specified, and at locations as shown on the drawings. Standard portable fire extinguishers are 4.5 kg ABC dry chemical units Carbon dioxide extinguishers shall be provided for all electrical equipment areas.

Portable extinguishers shall be located within combined hose reel cabinets where shown, or attached to walls with purpose made brackets. Extinguishers with a gross weight of 18 kilograms or less, may be installed in a position where the top of the extinguisher is no more than 1.5 metres above the floor. Extinguishers with a gross weight in excess of 18 kilograms shall be installed such that the top of the extinguisher is no more than 1000mm above the floor.

16 FIRE HOSE REELS

Hand held hoses shall be 25.4mm diameter, 30 metre length hoses mounted on hose reels, which shall be connected to the standpipe systems in locations shown on the drawings. The hose shall be two braid red rubber non collapsible hose, coiled onto a steel drum, attached to a sidewall mounting bracket, with supply and hose connections. The hose nozzle shall be a three (3) way nozzle, providing shut off, full jet, and variable spray settings and shall be

manufactured from either aluminium or brass. The hose reel assembly shall be provided with a 25mm isolating valve.

17 FIRE DEPARTMENT CONNECTIONS

Fire department connections shall be provided at locations indicated on the drawings. The connections shall be comprised of an assembly with two (2) siamese arranged, clappered hose valves on a casting with a 100mm flanged outlet. The hose valves shall be provided with hose connections, caps, and chains. **The inlet threads or couplings must be compatible with the local fire department equipment.**