

## **APPENDIX C STANDARD SPECIFICATION FOR SPRINKLER INSTALLATIONS**

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THE CONTRACTOR/TENDERER MUST CHECK THE SPECIFICATION FOR ANY MISSING, DUPLICATED OR INDISTINCT PAGES AS NO CLAIMS WILL BE ENTERTAINED AFTERWARDS DUE TO WANT OF KNOWLEDGE OF THE CONTENTS OF THIS SPECIFICATION

**FOR**  
**SPRINKLER INSTALLATIONS**

**1.0 GENERAL**

- 1.1 This standard specification applies to, and is to be read in conjunction with the particular technical specifications for sprinkler installations (Part 3)
- 1.2 In so far as the conditions contained herein are at variance with anything contained in the particular specification, the contract shall be interpreted in terms of the particular specification for each particular service.
- 1.3 Equipment, materials and operational methods, shall comply with the relevant South African Bureau of Standards Specification and ASIB 11<sup>th</sup> Edition Rules, where both such specifications exist, unless otherwise prescribed in this or the particular specification.

**2.0 OCCUPATIONAL HEALTH AND SAFETY ACT**

- 2.1 All equipment supplied and installed under the contract shall meet the requirements of the Occupational Health and Safety Act (Act No 85 of 1994, (as amended) and all other relevant statutory requirements and the Contractor shall comply with the requirements laid down by the Inspector of Machinery under this Act.

**3.0 DRAWINGS**

- 3.1 The drawings issued with this specification do not purport to show the exact position, size or details of construction of equipment.
- 3.2 Tenderers must satisfy themselves that the equipment offered by them can be accommodated in the available space and positioned in such a way that access for maintenance, repairs or removal is not obstructed.
- 3.3 Drawings showing any alternative suggestions differing from the Engineer's design must be submitted with tenders.
- 3.4 Within four weeks of signing of the contract (or date of order) the successful tenderer shall submit to the Engineer or his duly appointed representative the following working drawings:
  - 3.4.1 Plant room lay-out showing total operating mass of equipment and the positions and sizes of the water and drain connections required.
  - 3.4.2 Construction details of all items manufactured by the air conditioning and/or ventilation Contractor, such as air plenums, duct work, bases etc.
  - 3.4.3 Dimensions and positions of all holes through walls, slabs, etc., and any amendments to the sizes or positions of return grilles, louvred openings, etc., indicated on the Engineer's drawings.
- 3.5 Approval by the Engineer of drawings submitted by the Contractor shall not relieve him of his liability to carry out the work in accordance with the requirements of the contract documents.

- 3.6 Positions and sizes of return air grilles, louvred openings, openings through reinforced concrete beams and slabs, etc., as indicated on the drawings shall be adhered to as far as possible. Amendments will only be considered if absolutely unavoidable.
- 4.0 MANUFACTURER'S RATINGS
- 4.1 All equipment such as fans, compressors, cooling towers, pumps, etc., shall be operated well within the manufacturer's ratings. Equipment offered for use beyond these limits will not be considered.
- 4.2 Tenderers must submit manufacturer's ratings of all equipment offered. Ratings shall be given in the SI system.
- 5.0 POWER, WATER AND DRAIN CONNECTIONS
- 5.1 Power, water and drain points in the plant rooms will be provided to a point by others.
- 5.2 All plumbing between equipment and water and drain points shall form part of the contract.
- 6.0 NOTICES
- 6.1 The Contractor shall supply and install all notices and warning signs that are required in terms of the Occupational Health and Safety Act, by local by-laws or regulations and by these documents. This includes notices prohibiting entry to un-authorized persons, etc.
- 6.2 A log-book and log-book stand must be provided for each plant room. This must take the form of an A5 size hard cover note book fixed by a light chain through the top left hand corner to a writing surface.
- 7.0 WELDING
- 7.1 Welding shall be carried out in accordance with the current edition of SANS 044 Parts 1 to VII where applicable.
- 7.2 All welded fillet or butt joints shall be free from porosity, cavities and entrapped slag. Joints shall be ground smooth if required for aesthetic reasons only. If strength is required they shall not be ground.
- 7.3 The joints in the weld run, where welding has been recommenced, shall be as smooth as possible and shall show no pronounced hump or crater in the weld surface.
- 7.4 The profile of the weld shall be uniform, of approximately equal leg length and free from overlap at the toe of the weld. Unless otherwise specified the surface shall be either flat or slightly convex in the case of fillet welds and with a reinforcement of not more than 3 mm in the case of butt welds.
- 7.5 The weld face shall be uniform in appearance throughout its length.
- 7.6 Filler metal electrodes shall be of an approved type for the material being used and shall be kept in a dry condition. All electrodes shall conform to SANS 455.
- 7.7 Only welders in possession of a valid approved competence certificate shall be employed.
- 7.8 When pipes are welded, tenderers must allow for pipe joints (where chosen by the

Engineer's Representative) to be X-ray tested by the SANS or other approved body for sound welding at the Contractor's expense or for joints to be cut for examination purposes. After the removal of these joints, the piping must be made good by the Contractor. Should any of the welds prove unsatisfactory, the Contractor may be called upon, at his own expense, to have all welds examined by X-ray. The X-ray examination shall be carried out by the South African Bureau of Standards or other approved body.

- 7.9 All welds must show proper fusion.
- 8.0 GALVANISING
- 8.1 All hot dip galvanising shall be carried out in accordance with SANS 934 and SANS 763 where applicable.
- 8.2 Mild steel plate and sections shall be of good commercial quality, or higher grades, best suited for galvanising. The materials shall be free from slag or coarse laminations, fine fissures and rolled-in impurities.
- 8.3 Castings shall be sound, dense and clean, and free from distortion, porosity, carbon and slag enclosures, blow-holes, and other injurious conditions.
- 8.4 Welding flux shall be chipped away and all welds wire brushed before galvanising.
- 8.5 The surfaces to be galvanised shall be free from paint, oil, grease, and similar impurities.
- 8.6 All exposed surfaces including welds shall be thoroughly sand blasted prior to galvanising.
- 8.7 The Engineer shall have the right to inspect all steel components before galvanising, and shall have the right to reject or ask for remedial treatment of any material which is considered to be unsuitable. This applies particularly to welds.
- 8.8 The galvanised coating shall be smooth, adherent, continuous and free from black spots or flux stains.
- 8.9 Globular extra-heavy deposits of zinc which interfere with the intended use of the material will not be acceptable. Excessively protuberant lumps and nodules shall be removed by hot wiping or by the skilful application of mechanical means, however, there shall remain a sufficient minimum thickness of unbroken zinc coating. Flaws on small parts and working surfaces shall be repaired only by stripping and re-dipping. The zinc bath shall contain not less than 98.5% pure zinc.
- 8.10 The deposits expected from galvanised coatings shall be as follows:-

MATERIAL THICKNESS	COATING GRAMS PER m2	APPROXIMATE THICKNESS
Bolts and Nuts	275 - 300	0,033 - 0,036 mm
1,25 mm to 2 mm	400	0,056 mm
2 mm to 5 mm	535	0,07 mm

5 mm and over

760

0,108 mm

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## 9.0 MECHANICAL DRIVES

### 9.1 CHAIN DRIVES

- 9.1.1 To facilitate maintenance, spares inter-changeability and standardisation, the chains selected shall be standard stock roller type precision drive chains of reputable manufacture.
- 9.1.2 The axial and angular alignments of wheels and chains shall be carefully checked to very close limits to ensure maximum life and trouble free operation.
- 9.1.3 The amount of adjustment possible to take up chain wear shall be not less than 2 pitches or 2 per cent elongation above nominal chain length, whichever is the greater. Chains shall be lubricated in accordance with the manufacturer's recommendations.

### 9.2 VEE-BELT DRIVES

- 9.2.1 All vee-belts shall conform to the latest issue of CKS 322 - 1972 Specification for Industrial V-belts.
- 9.2.2 Vee-belt drives shall only be used on applications of constant and slightly varying load conditions.
- 9.2.3 Belt speeds shall not exceed 15 m/s.
- 9.2.4 For reasons of spares inter-changeability and maintenance standard stock vee-belts shall be used.
- 9.2.5 The belt pulleys shall be manufactured from close grained cast iron, accurately balanced. The belt grooves shall be properly machined to the correct groove angle and depth.
- 9.2.6 All sharp corners at the top of the groove shall be removed and the groove sides shall be polished smooth to avoid excessive rope wear.
- 9.2.7 The grooves of mating pulleys shall accurately match each other, particularly regarding width, angle and alignment.
- 9.2.8 Adjustment inward, i.e. towards the driven pulley, shall be provided to ensure sufficient movement of the driving pulley to enable the vee-belts to be fitted by hand without the use of a lever of any kind to force the belts over the pulleys.
- 9.2.9 The outward adjustment shall provide for correct rope tensioning to ensure that slipping does not occur.
- 9.2.10 All belt tensions shall be re-checked within 24 hours and again within a week of start-up to ensure that the initial stretch, if any, is taken up.
- 9.2.11 Speed ratios greater than 7:1 are not acceptable.
- 9.2.12 Pulley sizes and centre distances shall be designed to give a belt contact arc with the smaller pulley of not less than 120°.

### 9.3 COUPLINGS

Couplings shall be aligned by means of a clock gauge and the results entered in the commissioning data included in the Operating and Maintenance manuals.

### 10.0 BEARINGS

#### 10.1 ANTI-FRICTION

10.1.1 Anti-friction bearings shall include all bearings which provide rolling contact between one or more sets of hardened steel balls or rollers and the hardened steel rings or raceways.

10.1.2 Anti-friction bearings shall be of approved manufacture.

10.1.3 To facilitate maintenance, spares inter-changeability and standardisation, anti-friction bearings of standard design and manufacture shall be employed. All anti-friction bearings shall be provided with greasing facilities in accordance with the manufacturer's requirements.

#### 10.2 BUSHED BEARINGS

10.2.1 Only where specifically stated and in cases of low velocities and light loads in moisture free conditions will bushed bearings be accepted. All bushed bearings shall be made of an approved bearing metal composition which has good anti-friction qualities and is capable of withstanding severe usage.

10.2.2 All bushed bearings shall be provided with lubrication facilities to ensure adequate lubrication and shall be properly grooved to distribute the lubricant uniformly over the bearing surfaces. Grooves shall not be cut into the journal, but always into the surrounding bush. The edges of all chambers and grooves shall be rounded to avoid sharp corners and to facilitate the introduction of the oil or grease between the journal and the bearing metal.

#### 10.3 SELF-LUBRICATING OR OIL-LESS BEARINGS

10.3.1 Self-lubricating or oil-less bearings shall only be used on application of light loads and low velocities in moisture free and low humidity and conditions and where access to bearings is difficult and likely to be neglected during servicing.

10.3.2 The type of bearing metal composition used shall have friction and wear resistant properties akin to those of grease lubricated bushed bearings.

### 11.0 GENERAL MACHINERY PROTECTION

#### 11.1 COUPLING AND SHAFT GUARDS

11.1.1 All high speed couplings, projecting shaft ends and every dangerous moving part of machinery within normal reach of a person shall be protected by a guard manufactured from not less than 1,5 mm mild steel plate.

11.1.2 The guards shall be neatly formed and securely fixed in position.

#### 11.2 BELT GUARDS

11.2.1 All belt or rope drives shall be adequately protected by a belt guard.

- 11.2.2 The guard shall be manufactured from 25 mm wire mesh or open type expanded metal, securely braced and stiffened with light rolled steel sections and bolted in position. They shall be in accordance with the Occupational Health and Safety Act of 1994 (as amended).

### 11.3 CHAIN DRIVES

- 11.3.1 All chain drives shall be fitted with sheet chain cases and lubrication facilities to the chain manufacturer's recommendations. All joints shall be dust tight and arranged for convenient installation and dismantling.
- 11.3.2 Each chain case shall be fitted with a hinged inspection door, drain hole and plug.

### 12.0 QUALITY OF MATERIALS

- 12.1 Only materials of high quality shall be used throughout and shall be subject to the approval of the Engineer.
- 12.2 All materials, where applicable, shall conform in respect of quality, manufacture, tests and performance, with the requirements of ASIB standards, or, where no such standards exist, they shall conform with the appropriate current specification of the British Standards Institution. Materials manufactured in South Africa shall be used wherever possible.
- 12.3 Imported materials shall comply with the requirements of the relevant SANS or ASIB Specifications, although these materials need not necessarily bear the SABS mark.
- 12.4 All materials shall be suitable for the site conditions. These conditions shall include weather conditions as well as prevailing conditions during installation and subsequent use.
- 12.5 Should the materials or components not be suitable for use under temporary site conditions the Contractor shall provide at his own cost, suitable protection until these unfavourable site conditions cease to exist.

### 13.0 MAINTENANCE INSTRUCTIONS

- 13.1 As requested in the particular specification the Contractor shall provide operating and maintenance manuals/instructions at the time of hand-over of the installation.
- 13.2 The manuals shall include the following:
  - 13.2.1 Maintenance instructions for all components of the plant which shall include maintenance items required over and above those included in the maintenance schedules attached to this specification, troubleshooting guide, part numbers of all replacement items, capacity curves of pumps, fans and compressors, belt sizes, types and lengths, serial numbers of all principal pieces of equipment, etc.
  - 13.2.2 The names, addresses and telephone numbers of manufacturers or their agents.
  - 13.2.3 Receiver test certificates.
  - 13.2.4 A complete set of the "as built" drawings reduced in size to fit the manuals.
- 13.3 The operating and maintenance instructions specified above shall be obtained from the equipment manufacturer and where no such manuals exist they shall be compiled by the

Contractor to the best of his ability.

- 13.4 The contract shall be considered incomplete until all tests have been conducted to the satisfaction of the Engineer and all drawings and manuals have been handed over.

#### 14.0 MAINTENANCE, SERVICING AND GUARANTEE

##### 14.1 MAINTENANCE AND SERVICING

- 14.1.1 The Contractor shall be responsible for all maintenance and servicing of the installation during the 12 month guarantee period in accordance with the service schedules attached to this specification. Such additional items as required by the manufacturer of the equipment shall be included. (See also clause 13.2)

Four (4) services are required during this period on dates to be agreed at the first delivery inspection. The final service shall be carried out approximately 14 days before final delivery and expiry of the guarantee.

The contractor shall complete the service schedules and submit copies thereof together with his invoice for the servicing to the engineer after each service.

- 14.1.2 During the 12 month guarantee period the Contractor shall make good any defects due to inferior materials and workmanship and maintain all plant and equipment in perfect operating condition.

- 14.1.3 The Contractor shall maintain the plant log book on site in which he shall record, sign and date all work carried out at each inspection as well as log all temperature and pressure readings.

- 14.1.4 The Contractor shall allow for all expendable materials necessary for servicing such as lubricating oils, grease, refrigerant, cleaning materials etc.

##### 14.2 GUARANTEE PERIOD

- 14.2.1 The CONTRACTOR shall unconditionally guarantee all new plant and equipment (machinery) for a minimum period of twelve (12) months from the date of hand over to the Engineer.

If the CONTRACTOR or his supplier has a standard guarantee which exceeds the minimum warranty called for, the remaining portion of such extended warranty must be ceded to the client.

- 14.2.2 The guarantee shall cover the performance of the WORKS and any defects due to inferior materials and/or workmanship, fair wear and tear excepted, and the CONTRACTOR shall repair any such defects without delay.

This guarantee shall include malfunction, and water, refrigerant gas, oil, or air leaks, and all adjustments.

- 14.2.3 Should the performance of any part of the complete WORKS become unsatisfactory so as to become detrimental to its functional use, the CONTRACTOR shall replace any such part or the complete WORKS with equipment as prescribed by the Engineer.

- 14.2.4 If any such defects are not remedied without delay, the Engineer reserves the right to have such defect repaired at the risk and cost of the CONTRACTOR by another CONTRACTOR whom the Engineer deems to be proficient in the WORK. this to be



without prejudice to any rights the Engineer has against the installation CONTRACTOR. The Engineer will give written notice to the installation CONTRACTOR of such instances where he appoints another CONTRACTOR to remedy defects in the WORKS.

#### 14.3 PREVENTIVE MAINTENANCE SERVICES.

Preventive maintenance servicing of plant and equipment shall be carried out in accordance with the maintenance schedules and programs to be supplied by the Engineer. Copies must be made as required of these schedules.

#### 15.0 ELECTRICAL EQUIPMENT AND INSTALLATION

15.1 Unless otherwise stated in the particular specification tenderers must allow in their price for the complete electrical installation and wiring.

15.2 All electrical equipment and wiring shall be in accordance with the current issue of the Standard Wiring Regulations (SANS1 0142) (as amended).

15.3 Three phase power will be provided by others in the plant room.

15.4 Ammeters and pilot lights shall be provided for electric heaters.

14.5 All motors over 5 kW shall be provided with an approved electronic type motor protection unit.

15.6 In conventional field assembled plants lighting shall be provided for filter, coil and fan chambers, etc and shall comprise of bulk-head fittings permanently fixed to the walls or ceiling and earthed directly to the main earthing bar of the switchboard by means of a 4 mm<sup>2</sup> bare copper earth continuity conductor, in addition to being earthed by means of the continuity of the conduit as specified.

15.7 A single phase power point will be provided in the plant room by others for this lighting.

#### 16.0 AUTOMATIC CONTROL SYSTEMS

16.1 Unless otherwise specified either electric or electronic controls may be offered. All control devices shall perform the functions indicated and operate in the required sequence.

16.2 The performance of controllers shall be stable under all conditions and shall be such that an aperiodic recovery of the controlled variable is obtained following a disturbance. Means of adjusting the control loop stability, such as adjustable proportional bands, adjustable reset rates etc., shall be provided on controllers when applicable.

#### 17. DRIVES

17.1 Compressors and pumps shall be direct coupled to their driving motors.

17.2 The drives between centrifugal fans and motors shall be by means of grooved pulleys and V- belts.

17.3 V-belt drives shall be designed in accordance with CKS 332. Motors shall be mounted on slide rails for adequate belt tensioning and replacement.

17.4 All drives shall be protected by stout 25 mm wire mesh guards and shall be in accordance with the Occupational Health and Safety Act of 1994 (as amended).

## 18.0 EQUIPMENT BASES

- 18.1 Bases for centrifugal fans, compressors, air cooled condensers, air compressors, pumps and motors etc., shall consist of reinforced concrete cast into sheet metal formers at least 150 mm deep.
- 18.2 Bases shall be reinforced with at least 13 mm reinforcing bars located at 150 mm centres each way.
- 18.3 The mass ratio between bases and equipment shall be at least 1:1 for fans and 1,5:1 for pumps.
- 18.4 Concrete bases for the pumps shall be large enough to support pipes and fittings between the pumps and flexible connections.
- 18.5 Bases generally shall be large enough to accommodate the motors and driven equipment. Equipment shall be bolted onto the concrete inertia base.
- 18.6 Spring isolators shall be installed between concrete inertia bases and floor plinths and between the cooling towers or evaporative condensers and floor plinths.
- 18.7 Structural steel bases shall be provided for the cooling towers and evaporative condensers if their framework does not permit point support.
- 18.8 Either free standing stable spring or caged spring with snubber may be used. Spring isolators shall be installed with leveling bolts and shall incorporate 6 mm thick ribbed neoprene acoustical pads bonded to the base.
- 18.9 Spring diameters shall be large enough to prevent excessive rocking of equipment during start-up and normal operation.
- 18.10 Isolators shall be chosen to give a static deflection corresponding to a ratio of 3:1 of the lowest disturbing frequency to the natural frequency of the mounting.
- 18.11 Bases and spring isolators shall be arranged to give a clearance of approximately 25 mm between the underside of the bases and floor plinths.
- 18.12 Floor plinths of sufficient height shall be installed under all equipment by the air conditioning contractor. The plinths shall be large enough to accommodate the concrete inertia bases and spring isolators. Floor plinths shall also be provided under items of equipment which do not require concrete inertia bases such as cooling towers, air plenums, etc. The plinths under the air plenum shall be at least 100 mm higher than the finished floor level in the plant room.

## 19.0 RUNNING OF PIPES

- 19.1 Pipes and ducts shall be installed in accordance with the drawings issued with the supplementary specification.
- 19.2 The drawings are schematic and do not purport to show the exact positions of pipes nor the details of construction and installation. All final dimensions must be checked on site before the fabrication of piping sections.
- 19.3 Pipe sleeves with at least 6 mm clearance filled with a resilient material shall be provided where refrigerant tubing or water piping passes through walls or slabs.

- 19.4 Where beams, stanchions or other obstructions interfere with the straight running of pipes or ducts, suitable offsets shall be provided or changes in the section of the duct made, without altering the cross sectional area.
- 19.5 Tenderers should make themselves conversant with complete drawings of the building in order to determine the number of such offsets or changes in section and the positions in which they will be required. Due allowance for these shall be made in the tendered price.
- 19.6 A complete set of drawings of the building may be inspected at the office of the Architect.
- 20.0 PAINTING
- 20.1 All exposed galvanised sheet metal work in plant rooms, air conditioned and ventilated spaces, basements, corridors etc., shall be painted.
- 20.2 Ducts shall be identified by coloured symbols as specified in clause 6 of SANS 0173-1980.
- 20.3 The temporary white rust preventative compound on new galvanised sheet metal shall be removed by means of washing, brushing and if necessary abrasion with a special solvent or compound used for this purpose. The surface shall be well rinsed and dried. It shall then be painted with one coat of zinc dust/zinc oxide paint to SANS 910 or one coat of calcium plumbate primer to SANS 912 followed by one under coat to SANS 681 type II and one coat high gloss enamel paint to SANS 630, Grade I, as top coat, the colour of which will be determined by the Engineer.
- 20.4 The entire air-conditioning unit casing, including galvanised iron eliminators, sumps, drip pans, fans etc., shall be painted internally with two coats of epoxy-tar paint to SANS 801, type II. The white rust preventative compound on galvanised iron shall be removed as specified above before the paint is applied. Angle iron framework shall be similarly painted with epoxy paint before side covers are fitted.
- 20.5 Ferrous cooling tower and evaporative condenser casings, including galvanised iron eliminators sumps and fans and internal areas of connecting ductwork shall be internally painted as specified above. Externally the casings shall be painted as specified in clause 48.3. Factory painted equipment will also be acceptable.
- 20.6 Exposed hot water piping with canvas covered insulation shall be painted two coats of bitumen aluminium paint to SANS 802.
- 20.7 Exposed uninsulated galvanised piping shall be thoroughly degreased. In case a detergent is used, the surfaces shall be well rinsed and dried. It shall then be painted with one coat of zinc dust/zinc oxide paint to SANS 910, or one coat of calcium plumbate primer to SANS 912, followed by either one undercoat to SANS 681, type II, and one coat high gloss enamel paint to SANS 630, Grade I, as topcoat or two coats of PVA to SANS 634, Grade I.
- 20.8 Uninsulated black piping, flat-iron, angle-iron and rods for supports, brackets, duct stiffeners, etc., shall be painted on all sides with a zinc chromate primer to SANS 679, Type I followed by two coats of enamel paint to SANS 630, Grade I.
- 20.9 Where specified in the supplementary specification aluminium shall be painted with a wash primer to SANS 723, followed by a zinc chromate primer to SANS 679, Type I, and two coats of enamel paint to SANS 630, Grade I.

- 20.10 Motors, compressors, pumps etc., shall be painted light grey. Belt guards shall be painted bright red.
- 20.11 Before any painting is applied the steel surfaces shall be prepared according to SANS 064, (Code for preparation of steel surfaces for painting.)
- 20.12 Where specified in the particular specification steel surfaces shall be cleaned and then treated by the hot phosphate process to a minimum weight of 1,6 gr/m<sup>2</sup> coating followed by two coats of baking enamel to SANS 783, Type I.
- 21.0 GENERAL REQUIREMENTS FOR SPRINKLER INSTALLATIONS
- All automatic sprinkler pipe installations shall adhere to the technical and particular specifications of the Employer, and shall include the following general requirements:
- 21.1 Piping shall conform to the requirements of SANS 10287.
- 21.2 Pipes shall be cut accurately to measurements established on site and installed without springing or forcing and properly clear of windows, doors and other openings. All piping shall be reamed after cutting and shall be clean, straight and free of defects.
- 21.3 Drawings are generally diagrammatic and indicative of work to be installed. Routing and arrangement of piping shall be as indicated, subject to site conditions and the appropriate requirements of SANS 10287 and current ASIB rules.
- Clashes with other trades shall be avoided and fittings, valves, drain points, etc shall be located so as to ease access, maintenance and operation of the system. Note that required offsets, fittings, valves, drains, etc are not necessarily indicated.
- 21.4 Pipe runs shall be straight and direct as possible, in general forming right angles with or parallel to walls or other piping, and neatly spaced. Piping shall be installed so that there is sufficient clearance between finished coverings of piping, fittings and adjoining work. Sleeves shall be provided where piping passes through partitions, beams, slabs, etc.
- 21.5 Valved and capped drain points shall be provided at all low points in the piping network. Unions or flanged connections shall be provided to aid dismantling of the piping should it be required.
- 21.6 No cold springing shall be allowed. Pipe sections shall be fabricated/cut to length accurately in order to avoid cold springing.
- 21.7 Where necessary, adequate temporary supports shall be installed during erection so as not to overstress piping or equipment to which piping is connected.
- 21.8 All supports shall conform to the requirements of SANS 10287, and no perforated straps or strip steel shall be used.
- 21.9 Piping which is subject to vertical movements shall be provided with springs or other suitable supports.
- 21.10 Hangers shall be installed in such a manner that they cannot be disengaged by any pipe or support steel movement.
- 21.11 No pipe shall be suspended from another pipe except if specifically called for on the drawings or in the particular specification (Part 3).
- 21.12 The Contractor shall be responsible for selecting the sizes and types of pipe hangers,

supports and support devices not shown on the drawings, but which are necessary for the completion of the installation. Support spacing shall be as specified in paragraph 23.0 The Contractor shall supply details of all calculations to the Engineer for scrutiny together with two marked up prints showing the location and types of all supports/pipe hangers to be installed prior to ordering and commencing installation.

- 21.13 During construction all pipe ends shall be kept plugged to prevent any ingress of dirt, rubble etc.

## 22.0 PIPING

- 22.1 Steel piping shall be solid drawn, heavy grade steam quality piping conforming to ASTM/A106 Schedule 40 or to B.S. 1387/1967 (heavy quality) or SANS 62/1971. In all instances the latest editions and amendments to these specifications shall apply.

In plant rooms piping may be welded, prefabricated off-site to aid in installation and connection to pumps, storage tanks, etc. Welding shall be carried out as specified in paragraph 7.0 of this specification.

Generally pipe sections shall be screwed together using malleable iron threaded fittings, class 150 and 300 in accordance with ASME B 16.3. Only eccentric fittings shall be used at changes in pipe size.

Pipes joined with grooved fittings (eg Klambon or Victaulic) shall be joined by a listed combination of fittings, gaskets, and grooves. Grooves cut or rolled on pipe shall be dimensionally compatible with the fittings and pressure at which the system is to operate.

Where flanges are used they shall be in accordance with ASME B16.5. Steel slip-on boss flanges for welding shall have a nominal pressure at least 10% in excess of the maximum fluid pressure. Where equipment is supplied complete with flanges not in accordance with the above specification, a matching weld-on flange is to be used for connecting up such equipment. Bolts in flanges are to be high tensile steel and of the correct length such that no more than 1,5 clear threads protrude beyond the nuts after tightening to the correct torque. In flanged joints new gaskets shall be used for every assembly operation unless such an assembly is intended solely for initial fitting. Gasket material shall be fibre composition or similar material suitable for the system operating pressure and temperature.

- 22.2 Underground piping shall be class 16 uPVC piping as per ASIB specification.

Pipes shall be laid on a 100 mm sand-bedding cradle and covered with 300 mm sand before backfilling. The total cover over the piping shall be a minimum of 900mm generally and 1100mm under roadways. All backfilling shall be to the Engineers approval.

Where required thrust blocks shall be cast between the pipe and the undisturbed trench material. At thrust blocks the pipe bend shall be wrapped with a "Densopol 80 HT Tape" (or equal and approved) so that no concrete comes into direct contact with the HDPE piping.

All underground piping shall be pressure tested prior to it being covered.

## 23.0 PIPE SUPPORTS AND HANGERS

All necessary pipe hangers, brackets, supports, stanchions and anchors shall be designed, supplied and installed by the Contractor, in accordance with SANS 10287.

23.1 Maximum pipe support spacing shall be as follows:

Pipe Diameter	Max support Spacing
20 mm	3 m
25 mm	3.6 m
32 mm	3.6 m
40 mm	4.5 m
50 mm	4.5 m
65 mm	4.5 m
80 mm	4.5 m
100 mm	4.5 m
150 mm	6 m
200 mm	6 m

The contractor will be required to ensure that the hangers/supports selected are conservatively rated for the carrying capacity required. (Refer to paragraph 21.12).

23.2 The following requirements shall also apply:

23.2.1 At least one hanger supporting range pipes is required between adjacent sprinklers.

23.2.2 At least one hanger supporting range pipes is required between a sprinkler and a distribution pipe.

23.2.3 The minimum distance between any sprinkler and hanger shall be 150 mm.

23.2.4 There shall be at least one pipe support for each mechanical pipe joint .

23.2.5 Components of any pipe support shall be securely attached to each other by means of bolts or threaded rod with nuts and washers.

23.2.6 All components of all pipe supports shall be galvanized.

#### 24.0 VALVES AND FITTINGS

All valves, check valves, shut-off valves, etc. shall be of a pressure class greater than or equal to pressure class of the piping.

All valves controlling water supplies for sprinkler systems or portions thereof, including floor control valves, should be accessible to authorized persons during emergencies. Permanent ladders, chain-operated hand wheels, or other acceptable means should be provided where necessary.

Outside control valves shall be located within a fenced enclosure under the control of the owner, sealed in the open position, and inspected weekly as part of an approved maintenance and safety procedure.

24.1 Valves greater than 50mm diameter shall be of the butterfly type with resilient rubber seats. 100 mm and 150 mm diameter valves shall be equipped with gear operated closing mechanism. Valves shall conform to BS 5155 and shall be KERR fig. no 104A or similar or equal and approved.

- 24.2 Valves up to and including 50mm diameter shall be of the screwed and socketed type with bronze body and gated with non-rising spindle.
- 24.3 Valves shall be labelled as follows:
- (a) Main stop valves, control valves, etc shall be labeled by means of rust free metal tags indicating their purpose and the section they isolate, if isolating valves.
  - (b) The tags shall be securely fixed to the valve and shall be clearly legible.
  - (c) All letters on labels shall be engraved or punched. No painted or plastic embossed labels will be accepted.
- 24.4 Strainers shall be of the Y-type with cast iron body, stainless steel or bronze strainer element and shall be equipped with flanged ends. The hole sizes of the strainer element shall be maximum 1 mm Ø and be removable without dismantling of pipe-work. Strainers shall be suitable for a temperature of up to 90°C at a 1 600 kpa pressure rating and installed with the element facing downwards or a maximum of 45° sideways.
- 24.4 Non-return valves shall be of the spring loaded wafer dual flap plate type fitted between two flanges. They shall be equipped with a cast iron body, aluminium bronze plates, stainless steel springs and neoprene seals on the plates. The valves shall be suitable for working pressures of up to 1 600 kPa.
- 24.5 Sprinkler alarm valve sets shall be installed where required by the regulations, particular specification and drawings in appropriate, accessible, maintainable and clearly identifiable positions as approved by the local authorities. The valves shall be of the approved UL listed type equipped with all required accessories for the particular application. The valves shall be suitable for variable and constant pressure and shall be designed to prevent false alarms due to pressure surges. The valve sets shall be equipped with alarm gongs, flow switch, drain connection, testing arrangement and fire booster connection consisting out of a fourway breeching inlet suitable for the local authorities boosting equipment. Valves shall be sized to accommodate the required flow and pressure for the specific installation shall be capable of handling operating pressures of up to 12.5 Bar with a test pressure of 18 Bar for 24 hours.

## 25.0 SPRINKLERS

Sprinkler heads shall conform to the regulations set out in SANS 10287 and all local authority requirements. They shall be installed in positions as indicated on the drawings.

Unless otherwise specified or indicated, sprinkler heads shall be cast brass with quartzoid bulb and be of the conventional pattern.

Heads subject to abnormal heating conditions are to be of sufficiently high temperature rating to prevent accidental discharge.

Sprinkler temperature ratings are to be specified as per intended use.

Heavy wire sprinkler guards are to be provided for heads which are liable to be accidentally damaged in the normal course of events.

- 25.1 Sprinklers shall be located such that there will be minimum interference to the discharge pattern by structural members such as beams, columns, girders, trusses or other obstructing features. Unless otherwise specified sprinklers shall be located at the appropriate distance below ceilings and beams, columns, girders and roof trusses as set out in SANS 10287.

- 25.2 Sprinklers shall be located in positions indicated on the drawings, below air conditioning and ventilation ducting within ceiling spaces. The sprinklers shall be provided where rectangular ducts exceed 800 mm in width and under circular ducts exceeding 1 000 mm in diameter unless there is at least 150 mm clearance from adjacent walls when the width without protection may be 1 000 mm and 1 200 mm respectively.
- 25.3 Where sprinklers are located less than 2-meter apart baffle plates shall be provided. They shall be 200 mm wide and 150 mm high and constructed of galvanized sheet metal, located midway between sprinklers. The tops of the baffles shall extend above the sprinkler head deflectors by a minimum of 150 mm.

A manual ball type shut off valve between the service tank and the lift pump shall be incorporated in the steel or copper fuel feed pipeline.