



MHSC

MINE HEALTH AND SAFETY COUNCIL

Alterations, Building Works and Internal Fit-Out for the MHSC Offices

BID No.: MHSC 013/2025-26

FIRE PROTECTION

SPECIFICATION

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Alterations, Building Works and Internal Fit-Out for the MHSC Offices

FIRE PROTECTION SPECIFICATION

1 GENERAL SPECIFICATION

1.1 GENERAL

The drawings form part of the project specification and shall be read in conjunction with the project specification.

Conflicts, errors, or discrepancies found in this specification or drawings shall be brought to the Engineer's attention for resolution.

Any deviations from the specifications, drawings and/or equipment specified shall be listed together with the alternatives offered and shall be submitted as part of the tender. If no deviations are listed, it will be assumed that the Tenderer comply with all the relevant technical parts of this specification.

All installations shall be complete in all respects, and the Contractor shall allow for the completion and successful operation of the complete installation, irrespective of whether every separate item is specified or not.

1.2 SITE AND SITE INSPECTION

The site is located at:

- Section 8, Tuscan Office Park
- 2 Coombe Place, Rivonia, Sandton, 2128, Gauteng

Tenderers are advised to visit the site and acquaint themselves with the nature and extent of the work involved before submitting their tenders.

1.3 NOTES ON THIS SPECIFICATION

This specification shall be read in conjunction with the Civil Engineer's specification for all underground piping installations. While this document outlines requirements specific to fire protection piping networks, it does not supersede or override the Civil Engineer's specification. All underground fire protection piping shall be installed in accordance with the Civil Engineer's guidelines, including trenching, bedding, protection, and routing, to ensure full compliance with applicable SANS standards and site-specific conditions.

The standard specifications included define the standard of equipment and materials as well as the quality of the services required for the various sections of the installation.

Not all clauses within this section of the standard specification may be applicable to this project. For specific requirements regarding materials and equipment, refer to the detailed or material specifications. Where relevant, installation and coordination must also comply with the Civil Engineer's specification.

The contractor shall at all times adhere to this specification unless otherwise specified on the drawings and/or in this detailed specification.

In instances where this specification differs on any way or form from the engineering drawings this must be brought to engineer's attention during tender stage and be clarified immediately.

Failing this. It shall be at the engineer's discretion which form of documentation to proceed with without any further consequence to the project or pricing.

The engineers' drawings show broad principles of design, general arrangements and when read together with the specifications and the drawings of other disciplines and other contractors, they carry sufficient information to enable the contractor to determine how the installation is to be installed, operated, services and maintained.

Pipe sizes and possible positions are shown on the engineers' drawings strainers etc must adapt to these pipe sizes.

The contractor shall submit workshop drawings, samples, catalogues, performance characteristics etc., on all equipment, except when specifically included by the engineer.

The contractor shall take in situ measurements for installation of the equipment of the system and produce complete workshop drawings for fabrication and installation. These drawings shall be co-ordinated by the contractor with all other relevant equipment and services. Dimensions given on the engineers' drawings shall be adapted to suit the relevant measurements of the specific fittings and/or equipment.

2 FIRE PROTECTION EQUIPMENT

2.1 FIRE HYDRANT

"Internal fire hydrants shall be provided in any building exceeding 12 meter in height. Fire hydrants will be provided at a rate of 1 fire hydrant for every 90 meter radius in the building (Rational fire design).

The norm is usually to provide 1 fire hydrant per 1000m² or part of total floor area and not less than one per storey of such building or occupancy.

Any fire hydrant required shall comply with the requirements contained in SANS 1128 Part 1.

The minimum diameter of the supply pipe to any fire hydrant not to be less than 65mm internal diameter, and should this supply pipe to the hydrant be further than 50 meters this supply pipe should be increased to at least 100mm internal diameter.

2.2 FIRE HOSE REEL

Fire hose reels for the purpose of fire-fighting shall be installed in any building of two or more storeys in height or in any single storey building of more than 250m² in floor area at a rate of one (1) hose reel for every 500m² or part thereof of the floor area of any storey.

Any fire hose reel installed in any building shall comply with the requirements contained in SANS543.

The minimum diameter of any pipe providing water to the fire hose reel will not be less than 25mm in diameter.

The fire hose reel will be robustly constructed and with brackets that will fix the hose reel against a wall.

This hose reel rotates on a centre pin that allows the user to unwind the fire hose reel unobstructed in case of a fire.

The standard dimensions and characteristics of a fire hose reel are as follows:

- The fire hose reel drum is 850mm in diameter
- A guide will prevent the fire hose reel from jamming
- The maximum length of a fire hose reel is 30m

- The diameter is 20mm

2.3 FIRE EXTINGUISHERS

Portable fire extinguishers for the purpose of fire-fighting shall be installed in the building at a rate of 1 fire extinguisher for every 200m² in floor area.

It is a standard practice to provide 2 x 4.5kg Dry Chemical Powder fire extinguishers with every 30m fire hose reel location and for storage areas the size will be increased to 9kg. Dry Chemical Powder is a highly versatile Class 'A' 'B' and 'C' fire-fighting medium for dealing with electrical hazard, flammable liquids and gas fires.

Features:

- Multipurpose extinguisher
- Simple method of operation
- Unique tamper – evident safety pin
- Corrosion – resistant high quality durable finish
- Rapid flame knock-down is achieved
- Controlled discharge ensures fire-fighting efficiency

Any approved portable fire-fighting extinguisher shall comply with the requirements contained in SABS 890, 889 or SABS 1151 and shall be installed, maintained and serviced in accordance with SANS 0105.

3 FIRE EVACUATION

3.1 FIRE DOORS

Wherever fire doors are indicated or suggested in any fire barrier wall, will have to be an approved door with an appropriate rating.

Standard fire doors can be supplied as either a single fire door or a double fire door.

Single doors:

The standard sizes of these doors are as follows:

Width:

- 813mm in width
- 900mm in width
- 1000mm in width

Height:

- 2032mm high
- 2400mm high

These doors can be obtained with a tested 100x300mm clear double glazed viewing panel with a stainless-steel beading surround.

Double doors:

The double fire doors can be obtained in the following sizes:

Width:

- 1511mm in width
- 1600mm in width
- 1800mm in width

Height:

- 2032mm in height
- 2400mm in height

These doors can also be obtained with a tested 100x300mm clear double glazed viewing panel with a stainless steel beading surround.

A fire door must be labelled with all required information indicating:

- Manufacturers name
- Fire rating
- Reference number
- Year of manufacture

Single or double doors with a viewing panel are to have a test report available on request.

Fire doors can be obtained in various finishes such as Masonite, Sapele, Red Oak, Veneered, Plywood, clad both sides, clad on one side with galvanized sheeting hung to companion 1.6mm mild steel, pre-galvanized mild steel or hot dipped galvanized frames with heavy duty brass hinges.

All fire doors shall be provided with automatic door closing devices.

Sliding fire doors:

Class 'B' sliding fire resistant doors finished in mild steel primed red oxide complete with track, brackets, guides, stops and fusible links or operated automatic closing arrangement.

Sliding fire doors can be supplied and installed to suit the required opening.

A sliding fire door must be labelled with all required information indicating:

- Manufacturers name
- Fire rating
- Reference number
- Year of manufacture

Sliding fire doors are to have a test report available on request.

3.2 EVACUATION PLANS AND PROCEDURES

A properly planned and regularly practiced evacuation procedure is necessary for all buildings, so that occupants will know how to make an efficient and orderly escape during an emergency. Any area affected by heat, flame or smoke should be evacuated and where there is any doubt, the entire building should be evacuated. Evacuation can only be successfully undertaken if there are well constructed marked exits in the buildings.

3.2.1 STANDARD OBJECTIVES

- ½minutes is the average time for everyone to reach a place of safety.
- No one should go towards a fire to escape. An alternative route should always be available.
- Everyone should be able to escape by their own unaided efforts. Special attention will have to be given to the aged, ill and non-ambulant occupants.
- Escape routes should lead directly to a place of safety.
- A place of safety is an area where people can disperse – it may be outside, in another compartment, a protected staircase or lobby.

3.2.2 PLANNING OBJECTIVES

In planning evacuation procedures, the following must be considered:

- The possible behaviour of a fire with special regard to the spread of smoke.
- The type of risk and number of occupants. People may either be sleeping, be unfamiliar with the building or be very young or aged. The building contents could facilitate rapid fire spread.
- The number of escape routes is determined by dividing the floor area by the recommended floor area required per person. The design density population for an office is, example, 1 person per 10m.
- The exit widths must accommodate the occupants to enable them to evacuate within 2½ minutes.

3.2.3 ADDITIONAL CONSIDERATIONS

An alarm system is essential to initiate evacuation procedures.

Mowing machinery, fuel and gas lines and certain electrical equipment should be shut down by a designated person prior to evacuation.

Partial or phased evacuation may be initiated in large buildings where total evacuation is impractical.

Partial evacuation refers to the relocation of people to a safe area and phased evacuation, the progressive relocation of people to safe areas – Suitable for hospitals.

3.2.4 PROCEDURE

The evacuation plan should be circulated to occupants and management, brief details being displayed on each floor or within each section. It will be necessary to appoint a chief fire marshal (CFM) to direct operations (usually from a control centre). Fire marshals on each floor can supervise evacuation, initially attack the fire and assist the CFM.

The following procedure is a general guide, which can be modified to suit the particular building and occupancy:

3.2.5 MARSHALS AND THEIR RESPONSIBILITIES

a. *CFM and Deputy Officer* – White hardhat

- Responsible for:
 - Staff training;
 - Fire prevention;
 - Notifying and meeting the Brigade;
 - Deciding to evacuate;
 - Organising personnel for evacuation duties.

b. *Floor or Section fire marshals* – Red hardhat

- Responsible for:
 - Notifying the CFM of the location and extent of the fire;
 - Fighting the fire;
 - Safe evacuation of all personnel from their own floor or section.

c. *Deputy floor or section fire marshals* – Yellow hardhat

- Responsible for:
 - Assisting the floor or section wardens in carrying out their tasks.

If a multi-storey building is to be completely evacuated, the following events should be followed as closely as possible.

When a fire breaks out, people in the emergency centre – in this case the reception area on the ground floor – are notified. They will then:

- Inform the fire brigade;
- Contact the CFM;
- Initiate the evacuation alarm;
- Recall lifts to ground floor.

The CFM will:

- Take charge of the emergency centre
- Co-ordinate the evacuation and activities of fire teams and control building services such as lifts, booster pumps, air conditioning, power supplies and fire suppression installations
- Liaise with the fire department

On the fire floor, fire marshals will:

- Begin evacuating employees
- Attack the fire if expedient to do so

The duties of fire marshals during and emergency are:

- Muster occupants and guide them to correct exits
- Prevent people from returning for personal possessions
- Prevent people using lifts
- Control congestion in stairways
- Assist the old, infirm, or injured
- Search floor area, toilets on landings between floors
- Close doors, particularly staircase doors
- Report to the CFM that floor is clear
- Guide occupants to assembly area
- Take roll call (this procedure is not always appropriate)

Once the emergency is over, staff will be dismissed to return to their workstations or to go home depending on circumstances. This will only happen when the fire department, chief fire marshal or management has given the "all clear", whichever is applicable

Finishing and tidying must be done daily and not simply be left to the end of the contract. All finishing and tidying shall be carried out to the best advantage of the project.

3.2.6 EVACUATION CHECKLIST

MEANS OF ESCAPE	Daily	Weekly	Monthly	3 Months	6 months	Annually
Escape routes free of obstruction	*					
Exit route signs clearly visible		*				
And legible	*					
Emergency lighting working	*					
All storey exit doors:						
- Opening outwards						*
- Working property	*					
- Closed but not locked	*					
- Free of all obstructions	*					

STAFF TRAINING	Daily	Weekly	Monthly	3 Months	6 months	Annually
Recognition of alarm sounds					*	
What to do on hearing the alarm					*	
Where to go (escape routes)					*	
Not using lifts.					*	
Induction training					*	
Refresher drills and evacuation Exercises						*

FIRE MARSHALS	Daily	Weekly	Monthly	3 Months	6 months	Annually
Appointed for each storey				*		
Deputies appointed				*		
Trained in: Directing evacuation					*	
Evacuating the disabled					*	
Floor search					*	
Roll-call					*	

EVACUATION OF THE DISABLED	Daily	Weekly	Monthly	3 Months	6 months	Annually
Up-to-date list of all disabled personnel on each storey	*					
Fire marshals aware of disabled personnel on their storeys	*					
Method for their evacuation worked out						*
People appointed (if other than fire marshals) to help them				*		

ROLL-CALL	Daily	Weekly	Monthly	3 Months	6 months	Annually
Up-to-date list of all disabled personnel on each storey	*					
Assembly point arranged for each storey						*
All occupants shown assembly points					*	

Importance of roll call Emphasised to staff					*	
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FIRE CONTROL CENTRE	Daily	Weekly	Monthly	3 Months	6 months	Annually
Indicator consoles for all alarm, Detection and extinguishing systems functioning		Consult manufacturer and Fire authority				
Controls for continuous and Intermittent alarms functioning		Consult manufacturer and Fire authority				
Emergency lighting controls functioning		Consult manufacturer and Fire authority				
Emergency smoke controls functioning		Consult manufacturer				
Lift grounding controls functioning		Consult manufacturer				
Up-to-date list of disabled people available	*					
Complete set of plans of buildings available				*		

4 FIRE VENTILATION

Notwithstanding the requirements of SANS 10400-O, any room of which the floor area is more than 500 m² shall be provided with a system of mechanical or natural smoke ventilation designed in accordance with the relevant part of EN 12101; or in the case of a single-storey building or room that has a floor area of up to 2 500 m² and that is not fitted with a sprinkler protection system, roof ventilators or openable windows or panels to permit smoke ventilation and such roof ventilators or openable windows or panels shall have an aggregate area of not less than 3 % of the floor area of such room or, in the case of any single-storey building where such room has an occupancy classified as D2 or D3, not less than 1,5 % of the floor of such room,

- a. Be located in the roof or in the upper third of the walls, as the case might be, and be distributed in such a way that smoke will be evenly extracted from all parts of the room,
- b. Be designed to open automatically when activated by heat or smoke detectors, and
- c. Be designed to maintain a clear layer of 2,5 m above the floor of the highest occupied level. This clear layer shall be maintained for the designed evacuation period or 600 s, whichever is the longer period;
 - Provided that where such room is so situated that neither the roof space nor an external wall of the building form part of such room, such room shall be equipped with a system of mechanical smoke ventilation. Such mechanical ventilation shall be designed to provide a clear layer of 2,5 m above the floor of the highest occupied level.
 - Where openable panels are provided on any building elevation for the purposes of smoke ventilation, the position of such panels shall be suitably marked on the outside of the building to permit easy identification by the fire services.
 - In any smoke ventilation or heat ventilation system, the applicable equipment shall comply with the requirements of the relevant part of EN 12101.

NOTE: Cognizance should be taken of the interaction between the sprinkler system and the detection system.

4.1 AIR-CONDITIONING SYSTEMS AND ARTIFICIAL VENTILATION SYSTEMS

An air-conditioning system or artificial ventilation system in a building shall be so designed as to prevent the distribution of products of combustion in the event of a fire in such building.

An air shaft or duct used for air conditioning or artificial ventilation, including any internal or external insulation thereto and any flexible joint, shall be constructed of non-combustible material in accordance with SANS 10177-5, provided that

- a. Combustible flexible connections may be used where the length of such connection does not exceed 1,5 m and such connection does not pass through any wall or floor which is required to have a specified fire resistance, and
- b. Combustible flexible joints not more than 200 mm in length can be used in any plant room where such plant room is equipped with a smoke detection system, designed, installed and maintained by competent persons in accordance with SANS 10139.

A fire damper, which shall comply with the requirements of SANS 193, shall be provided in an air duct in any position where such duct passes through a required division or occupancy-separating element or any element required for the enclosure of an emergency route, or passes into any duct.

Any such fire damper shall:

- a. Close automatically upon the operation of a sensing device activated by the presence of smoke or heat in the air duct,
- b. Be provided with access, the position of which shall be clearly marked, for inspection, maintenance and resetting of the mechanism,
- c. Be so installed as to remain in position at the protected opening even if the air duct distorts during a fire,
- d. Be provided with an overriding fusible or resettable link, and
- e. Have the same fire resistance rating as the elements of construction through which it passes.

A plenum, the supports of which shall be non-combustible (excluding return-air intakes), that forms part of an air-conditioning system or artificial ventilation system, shall be constructed of non-combustible material or material which has been evaluated in accordance with SANS 10177-5. Where the sum of the areas of all air supply and return-air intake grilles in such plenum is not more than 5 % of the area of surface of such plenum exposed to the room below and no individual grille has an overall area of more than 0,09 m², such grilles may be of combustible material.

In any plenum system, the fire stops, as described in 4.12.1.6 and 4.13.2, shall be non-combustible and shall seal or close automatically upon the operation of sensing devices, or be activated when the temperature of the air in such space reaches 15 °C above its design temperature or 45 °C, whichever is the lesser.

No plenum system shall be used for storage or for the accommodation of persons.

Where the air-conditioning system or ventilation system constitutes the whole, or part of a smoke control system, the installation shall comply with the requirements for smoke control as given in above.

5 FIRE WATER

5.1 FIRE FIGHTING EQUIPMENT

The minimum water pressure for firefighting will be designed and calculated on 300 kPa. The reason for this figure of 300kPa is that this is the only maximum pressure the Greater Johannesburg can guarantee.

The isolating valve will be 1,5 meters into the site boundary.

A non-return valve will be installed in each exclusive hose reel supply pipe to prevent hose reel water from returning to the domestic supply.

Although it is known that the municipal water pressure in the Greater Metropolitan area is adequate for fire installations, we are required to base our calculations on an available pressure of 300 kPa.

5.1.1 CONCISE EXPLANATION OF SANS 10400 OF 2011 - PART A

A19 – The new regulation under this section is clear and well defined. The emphasis of the responsibilities on the professional engineers or competent persons are now more intense and require us to be more involved with the design of a project relating to any fire aspects. This is not a guide line, it is the law and it must be adhered to as we will be held responsible for any shortfalls in a design.

The new SANS 10400 of 2011 states that when a rational assessment (rational fire design) is done and submitted to the local authority, the person must either be registered or be a competent person.

a. Competent Person

A competent person is qualified by virtue of his education, training, experience and contextual knowledge. Such person is therefore competent to make a determination regarding the performance of a building or part thereof in relation to a functional regulation or to undertake such duties as may be assigned to him in terms of the National Building Regulations.

b. Rational Assessment

The definition used in the new SANS 10400 of 2011 refers:

Assessment by a competent person of the adequacy of the performance of a solution in relation to requirements including as necessary, a process of reasoning, calculation and consideration of accepted analytical principles, based on a combination of deductions from available information, research and data, appropriate testing and service experience.

c. Rational Design

The definition used in the new SANS 10400 of 2011 refers:

Design by a competent person involving a process of reasoning and calculation and which may include a design based on the use of a standard or other suitable document.

The appointment of a competent person to do a rational assessment or rational design in accordance to the prescribed framework must be done by the client.

d. Category 1 Building

Plans prepared in respect of category 1 buildings will ensure that all of Part T – Fire Protection must be adhered to, and to be done and prepared by a competent person.

Appointment of a Competent Person [A19]

- In terms of these Regulations and in respect of the erection of any building –

- A rational design or rational assessment is required in terms of:
- Regulation AZ4(1)(b)(ii)

AZ4

- The requirements of the National Building Regulations shall be complied with by –
 - Satisfying all functional regulation by –

Reliably demonstrating, or predicting with certainty, to the satisfaction of the appropriate Local Authority, that an adopted building solution has an equivalent or superior performance to a solution that complies with the requirements of the relevant part of SANS 10400.

The owner of any building who is required by these regulations to appoint an approved competent person, shall state in terms of the appointment of the competent person that such person undertakes all duties and responsibilities required by these regulations. The competent person shall declare his or hers acceptance of such responsibilities as contained in Form 2 of A19.

Where in a building any element of structural, fire protection, ventilation or any aspect relating to a fire installation, is required to be subjected to a rational assessment or rational design. The person appointed to be an approved competent person shall assume the responsibilities of satisfying the functional Regulation to that particular system in its entirety.

Where an approved competent person is required in terms of sub-regulation (7) to assume responsibilities for the system in its entirety and where parts of the system are to be undertaken by another competent person, then the approved competent person shall assume overall responsibilities of the entire design, and shall ensure that:

- The rational assessment or rational design is to be done in accordance with the new SANS 10400 of 2011 – Fire Protection/Installation Part T.

It is the responsibility of the Local Authority (Fire Department) to ensure that the person submitting the rational assessment or rational design is deemed to be a competent person as stipulated in SANS 10400 of 2011-part A19.

On completion of the structural fire protection or fire installation system for which an approved competent person appointed in terms of sub-regulation (1) & (2) such competent person shall complete and submit to the local authority a fully completed Form 4 as contained in SANS 10400-A in respect of each system for which such person has accepted responsibilities in terms of 14(2A) of Act 103.

6 CONCLUSION

The SANS 10400 Part A clearly states that the owner of a building is to appoint a competent person who shall undertake the responsibilities to implement all fire related matters as stated in the SANS 10400 Part T of 2011. Such a competent person shall undertake all responsibilities of the fire installation in its entirety. This section also implies that there can no longer be split responsibilities between the various disciplines regarding fire related matters.

The work shall be done by, or always be under the personal supervision of a qualified artisan (or qualified technician) in the respective trade. Details of this operation and prospective work shall be given at the time of tendering in a covering letter.

6.1 QUALITY OF MATERIALS AND WORKMANSHIP

All materials shall be new, undamaged and free from rust or other defects. Only material of the best quality, which has been approved by the Engineer, shall be used.

The Contractor shall, upon the request of the Engineer, furnish him with documentary proof to his satisfaction that the material is of the quality specified. Samples of materials for testing, if required, shall be supplied by the Contractor, free of charge.

Where applicable, all material shall be in accordance with the relevant standard specifications of the South African Bureau of Standards and the British Standard Specifications.

The installation shall be carried out according to the latest modern engineering practices.

The Engineer reserves the right to reject any work or part thereof that, according to his judgement, does not meet the highest standards of material and workmanship and to enforce replacement of the work at the expense of the Contractor.

6.2 RATING OF EQUIPMENT

The Contractor shall supply the sizes and rating of all the equipment offered to the Engineer for approval prior to purchasing or ordering such equipment.

All equipment offered shall operate well within the manufacturer's ratings, and equipment to be operated beyond these limits will not be considered.

6.3 SPACE REQUIREMENTS AND ACCESS

Tenderers shall ensure that the equipment offered by them can be installed in the available space as shown on the drawings. Should it be found at a later stage that the equipment offered does not fit, all costs arising from the rectification of this problem shall be for the Contractor's account.

The equipment shall be installed in such a manner that complete access is provided for operating and maintenance purposes.

Tenderers shall also ensure that the equipment offered by them will pass through available building openings. Large equipment shall be made up in sections and each section shall be small enough for access through doors and other building openings. All additional costs involved for the modification of equipment or to change the maker of equipment in order to allow access shall be for the account of the Contractor.

6.4 REGULATIONS AND STANDARDS

The equipment, installation, commissioning and maintenance shall in all respects comply with the following authorities and regulations:

- The Occupational Health and Safety Act, Act No. 85 of 1993.
- Local Municipal Regulations, by-laws and Ordinances.
- Local Fire Department Regulations.
- SANS 10400: 1990: The application of the National Building Regulations.
- Local Electrical Supply Authority Regulations.
- The wiring of premises Part1: Low-voltage installations, SANS 10142-1 as amended.

All losses, costs or expenditures, which may arise as a result of negligence to comply with any regulation applicable to this service as specified above, shall be for the account of the Contractor.

Where trade names and references to catalogues are found in the specification, the intention is to set a particular standard of equipment. Where “other approved” equipment is specified, the Tenderer shall obtain written approval from the Engineer before he may deviate from the specified equipment. This approval must be obtained at tender stage.

The Contractor shall work strictly according to this specification and shall ensure that only the best quality material is used, and that the installation is handed over as a complete working system.

6.5 DRAWINGS

The dimensions and positions of equipment shown on the Engineer’s drawings are schematic and for tender purposes only. The drawings are not suitable for manufacturing purposes. The responsibility for dimensional and layout accuracy remains with the Contractor. The exact positions will be pointed out on site where necessary.

The following drawings shall be submitted by the Contractor to the Engineer for approval, within four (4) weeks of acceptance of the tender:

6.5.1 BUILDER’S WORK DRAWINGS

All building requirements are to be indicated on these drawings to meet the dimensional requirements of the equipment and materials to be installed by the Contractor.

6.5.2 MECHANICAL DRAWINGS

These are workshop and equipment layout drawings required for the manufacture and installation of equipment, showing detailed dimensions. **No work may be conducted on site without approved workshop drawings approved only by the mechanical engineer!!**

6.5.3 ELECTRICAL DRAWINGS

These include switchboard layouts, circuit diagrams, interconnection diagrams, and cable and equipment schedules.

Any work done by the Contractor without an approved drawing shall be at the Contractor’s own risk, and any changes required to conform with the contract documents or co-ordinate his work with other trades, shall be for the account of the Contractor.

The approval of drawings by the Engineer shall not relieve the Contractor of his responsibilities to carry out the work in terms of the contract documents.

The mechanical and electrical drawings shall be updated during the contract period and shall be included in the operation manual at the end of the contract period as “as built” drawings.

6.6 OPERATION MANUALS AND MAINTENANCE INSTRUCTIONS

The Contractor shall submit three (3) copies of operation and maintenance manuals to the Engineer.

Manuals shall consist of:

- I. Comprehensive literature of the different components of the installation.
- II. Paper prints of all approved drawings and diagrams where applicable.
- III. Start-up and shutdown procedures.
- IV. Commissioning data of all equipment in tabulated form.

- V. Prescriptions for routine tests, which shall be performed by the user together with the time when such tests shall be, performed (e.g., pressure tests).
- VI. Schedule of apparatus and equipment complete with model numbers, optional extras, modifications, electrical requirements, etc.
- VII. Detailed daily, weekly, monthly, quarterly, bi-annual, or annual preventative maintenance procedures where applicable.
- VIII. Manufacturer's catalogues.
- IX. List of spares for all equipment.
- X. Suppliers telephone numbers and addresses.
- XI. Wiring diagrams.
- XII. Test certificates.

The operation manuals shall be sturdily bound in a strong hard cover. Material in the manual shall be clear, legible and well-arranged and provided with an index.

In addition to the manuals the sub-contractors shall also provide a very simple operational instruction with areas/zones affected, on A4 or A5 paper sheet size, framed and mounted in sprinkler cabinets and adjacent to control console to which it pertains. This is to enable a non-technical person to operate the system. It shall give clear instructions of how to stop and start the plant/system, the use of the auxiliary/standby equipment, etc.

The above manuals shall be available three weeks before first handover / practical completion of the installation and no handover shall be considered without these manuals.

6.7 MAINTENANCE AND GUARANTEE

All equipment supplied and work done as part of this contract shall be maintained and guaranteed for a period of one year from the date of practical completion.

The Contractor is responsible for all material and labour during this period.

The Contractor shall visit the installation uninterrupted and do the scheduled maintenance as prescribed in the operating instructions. On completion of the monthly visit a full report shall be prepared and submitted to the Engineer within seven (7) days from the visit.

In case of a breakdown, the Contractor shall react within reasonable time and repair the installation to the satisfaction of the Engineer. Should the Contractor, in the discretion of the Engineer, not react within reasonable time, the Engineer shall commission another Contractor and the cost thereof shall be recovered from the defaulting Contractor.

6.8 PAINTING

Where applicable the following painting specifications shall apply:

Iron and steel surfaces shall be properly cleaned by removing all dirt, oil, scale and rust by brushing and sanding until a clean shiny surface is obtained. Hereafter a metal primer shall be applied.

Galvanized surfaces shall be cleaned with a galvanizing cleaning agent and then washed with clean water to remove the factory applied protection against white rust. Hereafter a calcium plumbate primer shall be applied, followed by an undercoat between 24 and 72 hours after application of the primer.

Other surfaces shall be cleaned by removing all dirt and a primer as specified by the paint supplier for the particular surface shall be applied.

The primer coat shall be followed by a matt undercoat and a final topcoat of high gloss enamel of an approved colour. Each layer of paint shall be clearly distinguishable from each other by means of different colours and each layer shall be properly sanded before the following coat is applied.

All paint shall at least be of SABS quality for industrial use and shall be approved by the Engineer. Equipment shall be painted according to the National Colour Standards, SANS 1091.

6.9 DAMAGE AND PROTECTION OF WORKS

The Contractor shall take all precautions necessary for the protection of life, equipment and property in connection with the works during installation.

The Contractor shall be held completely responsible for any damage of equipment during transport and installation, as well as any damage to the building and shall repair any such damage at his own expense. Where equipment cannot be repaired to an "as new" condition, it will be completely replaced at the expense of the Contractor.

Equipment delivered to site shall be stored in a well-protected area where it cannot be damaged by either the weather or other trades.

6.10 WELDING

Welding shall be carried out in accordance with the current edition of SANS 10044 Parts 1 to 2 where applicable. All welding shall be performed according to the latest technology and where exposed, it shall be smoothly finished off.

6.11 BUILDING WORK AND REMOVAL OF EQUIPMENT

The following work shall be carried out by the builder/main Contractor.

- Drilling and cutting of necessary holes in the concrete, brickwork, ceilings and wooden doors, including making good to match finish.
- Concrete plinths for installation of equipment.
- Waterproofing of roof penetrations and plinths.
- Provide drain points where required.

6.12 TESTING

The piping system shall be tested and operated to meet the performance figures and duties specified. All safety features and interlocks shall be tested.

Pressure tests for water and piping shall be done at a test pressure of 1.5 times the maximum working pressure at the lowest point in the system, but not less than 700 kPa. All instrumentation, which could be damaged during the test, shall be removed from the pipe system.

The relevant system shall be filled with water, and all high points shall be vented at least 24 hours before the test. The duration of the pressure test shall be 2 hours, after which no water leaks shall be visible, and no pressure drop shall occur after corrections have been made for changes in ambient temperature during the test period.

Pressure tests shall be completed prior to insulating or covering piping. If leaks are found, welded connections shall be cut out and re-welded. Rectified piping shall be retested.

6.13 COMMISSIONING

The installation shall be commissioned in accordance with the relevant codes and recognised commissioning procedure or code approved by the consulting engineer:

The Contractor shall submit a commissioning program to the Consulting engineer at least two weeks prior to the commencement of commissioning and at the same time shall notify the consulting engineer of the code or procedure to which the plant/equipment will be commissioned.

The results of all checks and measurements shall be recorded in writing during the commissioning period. Commissioning records shall be handed over to the Consulting engineer prior to the first acceptance of the plant. The commissioning records shall also be included in the operation manuals.

6.14 STAFF TRAINING

The Contractor shall be responsible for the training of the Client's site staff after the commissioning has been completed. The site staff shall receive enough instructions to ensure that they are fully conversant with the equipment concerned. The operating manuals shall be used during training. Upon completion of the training exercise the contractor is to obtain the client's representative's written acceptance of this handover tuition, thus acknowledging his complete understanding of the operational procedures for this installation. Site staff shall be instructed on:

- the general operating method of the building;
- starting and stopping instructions;
- stopping the plant in an emergency and warning against restarting after an emergency;
- positions and normal settings of control equipment;
- safety measures;
- operational checks on gauges, flow switches, indicator lights, etc.;
- name, address and telephone number of competent person responsible for the maintenance of the plant.

6.15 DIAMETERS OF PIPES

All diameters of pipes given are the nominal bore or external diameters in accordance with the normal conventions of the materials being used.

6.16 CODES OF PRACTICE, LAWS AND STANDARDS

All workmanship and materials used in the execution of the works shall be of the highest class and, where not fully covered by the Specification, shall be carried out in conformity with best modern practice, as determined by the Engineer.

It shall be the contractor's responsibility to ensure that the with all relevant requirements of governmental and Local Authorities whose jurisdiction embraces the location of the Site of the Works and the equipment provided for those installations which shall comply in every respect with the National Building Regulations and Building Standards Act, Act 103 of 1975 and the Occupational Safety Act, Act N°6 of 1983, both as amended to date,

excepting only where exemption from any such regulations has first been obtained in writing from the said authorities, provided that the approval of the Engineer has been given prior to application for any exemption.

All materials and equipment supplied and installed shall carry the SABS or BS mark of approval unless otherwise specified or agreed to in writing by the engineer. Where alternatives are offered, the submission is to include full details of the item together with tests and compliances with any other standards.

All electrical wiring shall comply fully with the latest edition of the Standard Regulations for the wiring of Premises, SABS 0142 and the additional requirements of any local authority who has jurisdiction over the Site of Works, as well as being in accordance with best modern practice.

Wherever relevant, this Specification shall be understood to be amplified to embrace Codes of Practice and Standards promulgated by recognised authorities in the field of Plumbing and Drainage Technology and all other branches of engineering science applicable to this project.

It shall be assumed that the contractor is conversant with the abovementioned requirements. Should any requirement, by-law, or regulation, which contradicts the requirements of this document, apply or become applicable during the erection of the installation, such requirement, by-law, or regulation shall overrule this document and the contractor shall immediately inform the Engineer of such a contradiction. Under no circumstances shall the contractor carry out any variations to the installation in terms of such contradictions without obtaining written permission to do so from the Engineer.

It shall be the responsibility of the contractor to make the necessary arrangements at this own expense with the local supply authority and to supply the labour, equipment and means to inspect, test, commission and to hand over the installation.

The Contractor shall supply and install all Notices and Warning signs that are required by the appropriate laws, regulations and/or by this document.

6.17 ORGANISATION AND STAFF CONTRACT

In addition to the site supervisor and/or foreman, the contractor shall employ as many competent and experienced persons as may be necessary for the purpose of the contract and shall be bound to remove from the contract works any person to whom the employer or his agent or the principal contractor may reasonably object by reason of any failure, neglect, incompetence or substandard work execution by or under the supervision of such person.

The duties and responsibilities of the contractor's management is but not limited to the following:

- I. Selection of equipment and components into working assemblies in conformance with the design concept in the subcontract specification.
- II. Submission of equipment and installation drawings for approval in accordance with the required procedure.
- III. Programming and planning of the work to fit in with the office programme.
- IV. Attendance at routine site progress meetings and programme monitoring meetings organised by the principal contractor.
- V. Conducting of all tests required.
- VI. Expediting of the work.
- VII. Directing his employees to ensure efficient, timely and safe execution of the work, and co-operation with the principal contractor and other trades to ensure such execution.

- VIII. Attendance at meetings from time to time with the engineer in order to discuss any technical matters that need clarification.

6.18 CO-ORDINATION WITH OTHER TRADES

The contractor shall acquaint himself with the general arrangement of all other services and ensure that in fixing the work it will not obstruct the fixing or future maintenance of the contract works or other services.

The contractor shall also fully co-operate with other trades and take all reasonable precautions to ensure that they do not cause damage and/or impede the progress of their work.

6.19 TEST AND INSPECTION PRIOR TO COMPLETION

Except where otherwise provided in the contract, the contractor shall provide all labour, materials, power, fuel, accessories and properly calibrated and certified instruments necessary to carry out such tests. Arrangements for such tests shall be made by the contractor, and he shall give at least 72 hours' notice to the engineer, in writing, of the test prior to commencement.

In the event of the plant or installation not passing the test, the employer shall be at liberty to deduct from the contract price all reasonable expenses incurred by himself or his agents attending the repeated tests.

Whenever any installation or equipment is operated for testing or adjusting as provided, the contractor shall operate the entire system for as long a period as may be required to always prove satisfactory performance in the occupied space served by that system for up to twenty-four hours a day continuously until the system is handed over.

The contractor shall provide all labour and supervision required for such operation and the employer may assign operating personnel as observers, but such observation time shall not be counted as instruction time.

After complete installation of the system all equipment shall be tested, adjusted and readjusted until it operates to the satisfaction and approval of the engineer and the client.

The contractor shall submit certificates of tests carried out to prove all equipment and also certificates to be obtained from all relevant authorities and statutory bodies etc.

6.20 WORKSHOP DRAWINGS

The contractor shall prepare at his own expense and shall submit copies of shop drawings for all fabricated work, working or setting out drawings, shop details and schedules to the Owner's representative for approval and no installation shall not be performed by the contractor until such approval has been given.

As soon as approval has been given the contractor shall forward representative two prints of the approved shop drawings, setting out drawings and schedules. The contractor shall also furnish to the Works as many prints of the approved shop drawings and schedules as are required. No work shall be performed from shop drawings and/or catalogues not stamped with the original approval stamp of the engineer. All approvals, and such stamped drawings and/or catalogues shall be kept available at the job site as evidence of such approval.

The contractor shall be responsible for dimensions, design of adequate connections, details for the satisfactory construction of all work and the furnishing of materials for work required by the subcontract even if not indicated on the submissions that have been approved by the Owner's representative.

The Owner's representative will check drawings for design on drawings, schedules and catalogues by the Owner's representative as a complete check but shall not relieve the contractor of his responsibility as above stated. If the submissions differ from the requirements of the subcontract, the contractor shall make specific mention of each difference in his letter of transmission, with a request for substitution, together with his reasons

for same, in order that, if acceptable, suitable action may be taken by Otherwise, the contractor will not be relieved of the responsibility for executing the work in accordance with the requirements of this subcontract.

Corrections of shop drawings by the Owner's representative are scope of work. Should any such corrections constitute a change of scope of work, the contractor shall notify the Owner's representative in writing within 7 calendar days of such change and shall not proceed with the fabrication until so authorised by the Owner's representative. Claims for change of scope, work constituting the claimed change of scope, will not be considered.

6.21 "AS-BUILT" DRAWINGS AND MANUFACTURERS INFORMATION

The Contractor shall provide the Engineer with a complete signed transparent set of "as-built" drawings together with stored drawings in DXF electronic format as a pre-requisite to final payment; and the Engineer shall hand the set over to the Owner after having established their correctness. The "as-built" set shall include all mechanical and electrical work.

Where possible, a transparent copy of Architects or Engineers drawings shall be used and the contractor may purchase copies of the necessary transparencies from the relevant party. If "as-built" variations cannot be clearly shown thereon, then the Contractor shall prepare supplementary transparent drawings that will properly impart the necessary information. Manufacturer's and Contractor's shop drawings shall be corrected to correspond with the "as-built" drawings and copies of each shall also be furnished to the Engineer.

"As-built" drawings shall be maintained on a current basis as work progresses, and all deviations in work as actually installed accurately entered, at least once a week, on paper prints of design drawings affected, with such prints kept available at the site for the inspection of the Engineer. At the end of each month, the record for the month, properly identified by notes, shall be transferred to the original drawings by competent draughtsmen. Within seven days after the end of each monthly period, submit to the Engineer one paper print of each drawing affected showing the latest corrections.

6.22 QUALITY ASSURANCE SYSTEM

The contractor shall institute an approved Quality Assurance system (QA) which shall be submitted to the engineer for his approval. The records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the engineer at regular intervals as required by the engineer.

6.23 OPERATING AND COMMISSIONING OF INSTALLATION

The completed system shall be put into operation after all tests and adjustments have been carried out to the satisfaction of the engineer. The contractor shall run and operate the system for a period of time as specified by the engineer and train the staff of the client to operate and maintain the system for a period as required by the engineer, which will not exceed one month.

Logging of the operation of the installations shall commence immediately upon start-up. The contractor shall submit a full commissioning report.

6.24 MAINTENANCE OF THE INSTALLATION DURING THE PERFORMANCE GUARANTEE PERIOD

The contractor shall furnish, free of charge, all maintenance on the entire equipment supplied by him for the guarantee period. Maintenance shall include systematic examination and adjustment of all this equipment at least every 3 months. The contractor shall, in the course of such maintenance or on call during the maintenance period, repair or replace defective parts as required and shall use only genuine standard parts produced by the manufacturer of the original part, Renewals or repairs resulting from misuse of air wear and tear, however, shall not be made at the expense of the contractor where certified as such by the engineer. Specified spares shall not be used during this period. If any spares are used due to operational necessity and with the engineer's permission, such spares shall be replaced in full by the contractor. The maintenance period shall only begin

with completion of the Main Contract and when the engineer has certified the contract works as completed, unless otherwise specified.

6.25 COMPLETION OF CONTRACT WORKS

Completion of the contract works will only occur after the following procedure has been certified by the engineer as having been carried out in accordance with the specification.

Physical completion of all systems has been reported to the principal contractor by the contractor, and all defects made good. The principal contractor to satisfy himself that all work has been completed satisfactorily before reporting to the engineer.

Acceptance tests have successfully taken place as specified and test results have been witnessed (where required), recorded and approved by the engineer.

“As-built” drawings, commissioning reports and maintenance manuals have been submitted to and approved by the engineer.

The employer’s nominated operator(s) has received instruction of the contract works by the contractor.

The installation or part of the installation shall only be deemed handed over when completed, tested and fully commissioned and then signed off by the Engineer.