IZIKO MUSEUMS | SCOPE FOR REPAIRS & MAINTENANCE TO BUILDINGS

BUILDING 4: IZIKO SLAVE LODGE (ISL)

TECHNICAL SPECIFICATIONS: FIRE SERVICES

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1. GENERAL NOTES TO TENDERERS

1.1 INTRODUCTION

The Client, Iziko Museums of South Africa, hereon referred to as the Employer, requires fire protection testing, maintenance and installations for the Roof Repair Project of the Iziko Slave Lodge.

1.2 TERMS AND DEFINITIONS

In interpreting this specification, the following words shall have the meaning herein assigned to them unless there is something in the subject matter or context inconsistent with such construction.

"**Shall**" is mandatory.

"**Should**" is strongly recommended.

"**TIP**" or "Tie-In Point" is a connection to an existing system that should not require a plant shutdown or significant isolation to make the connection.

1.3 GENERAL INFORMATION

The Contractor shall supply, install, test and commission the Fire Protection installation as discussed herein.

2. SCOPE OF WORK AND SUMMARY OF THE REQUIREMENTS OF THE CONTRACT

2.1 GENERAL

The Contract consists of the supply, the installation, testing, commissioning, maintenance and guarantee for the specified period, of the complete fire protection installation as shown on the drawings and as described in this specification.

2.2 SPECIFIC SCOPE OF WORK

The scope of work includes, but is not limited to, the following:

a) Testing of existing Fire Hose Reel System located on roof level. Testing to include a dynamical flow and pressure test shall be completed for each hose reel, to confirm of required flowrates and pressures are achieved;

b) New Fire Extinguishers as required by the Engineer;

c) New Fire Signage as required by the Engineer;

d) Maintenance of existing fire extinguishers and fire hose reels located on roof level.

Contractors are to include for a complete installation and all items necessary must be included whether specifically mentioned in the schedules and/or drawings or not.

2.3 SCOPE INCLUSIONS

Included in the above Scope of Work are the following:

a) Supply of "as-built" drawings;
b) Supply of all necessary certification;
c) Packing and shipping of all equipment to site;
d) Submission of procurement, manufacturing and delivery program;
e) All inspection and testing as required including all necessary testing equipment such as bolts, gaskets, hoses, flanges, plugs, test pumps and gauges etc.;
f) Painting of equipment in accordance with the Specifications;
g) All safety equipment (guards and locking facilities etc as applicable);
h) Supply of 3rd party inspection and non-destructive testing as required; and
i) Hot and Cold Commissioning.

2.4 SCOPE EXCLUSIONS

Excluded from this scope of work are the following:

a) All electrical works up to component isolators.

b) Builders work such as openings in brickwork, core drills through.

c) concrete, waterproofing, etc.

d) Fire detection.

e) Supply and installation of any fire ring main.

2.5 TERMINAL POINTS

a) Water tie-in to fire ring main

b) Outlets of all existing hydrants

c) Outlets of all existing hose reels

2.6 VISIT TO SITE

Tenderers must acquaint themselves with local site conditions such as access to the building, area available on site, type of ground, space available for on-site fabrication, storage, transport, loading and unloading facilities, scaffolding, tackles and tools needed, as no claims by The Contractor, which may arise from ignorance of the site conditions, will not be considered.

2.7 MATERIAL AND WORKMANSHIP

The Contract works shall be executed in accordance with the specified standards and level of workmanship, to the satisfaction of the Engineer.

All materials shall be of the quality specified and The Contractor shall, upon request of the Engineer, furnish him with proof to his satisfaction that the materials are of the specified quality.

All materials and equipment used for the Installations shall be new and undamaged.

The Contractor shall, if requested by the Engineer, provide samples of material and equipment for approval. If judged necessary by the Engineer, such samples, may only be returned after the completion of the Installation, in order to ensure that the quality of the installed product is the same as that of the approved sample.

2.8 REFERENCE SPECIFICATIONS AND STANDARDS

The latest revision of any Specification referred to in this Specification, will be applicable.

Where a Specification or standard is not specifically referred to, it will be assumed that the relevant SANS, ISO, BS, DIN or equivalent American standard, listed in order of preference will apply.

The SI ("Le Systeme International d' Unites") - Metric System of Units will apply. Refer to SABS - M33A: The International Metric System: Guide to the use of the SI in South Africa.

2.9 Applicable Standards

2.9.1 National Standards

a) South African Occupational Health and Safety Act, 85 of 1993.

b) The Machinery and Occupational Safety Act.

c) SANS 10400: The National Building Regulations (Code of Approval).

d) SANS 0142: Code of Practice for the Wiring of Premises.

e) SANS 10139.

f) Applicable Local municipal by-laws and Regulations.

g) Applicable Department of Health standards.

h) Local fire authority requirements.

2.9.2 International Standards

The following will generally apply where particularly pertinent:

a) British Standards (BS); in particular BS 5839 Part 1 or BS 6266.

b) International Electrotechnical Commission (IEC).

c) American Society of Mechanical Engineers (ASME).

d) National Electrical Manufacturers Association (NEMA).

e) National Fire Protection Association (NFPA).

f) Factory Mutual (FM) Global Fire Prevention Guidelines.

g) EN Standard Specification.

h) Instrument Society of America (ISA).

2.10 Equipment Standards

The equipment and components shall conform to and to have been tested and approved by a reputable and recognized international test laboratory to prove compliance with at least one or more of these Standards.

Material for which an SABS specification exists, shall be in accordance with such a specification, and shall bear the SABS mark.

All equipment used shall originate from suppliers which have been certified in accordance with SANS ISO 9001 (ISO 9001) or SANS ISO 9002 (ISO 9002) for quality assurance. The Tenderers shall provide copies of certificates of approval with their tenders.

2.11 VARIATION TO STANDARDISED SPECIFICATIONS

Should any requirements of the project specifications conflict with any requirements of the standardized specification, the requirements of the standardized specifications shall prevail.

2.12 SCHEDULE OF RATES

Rates indicated in the Schedule of Quantities shall, where applicable, include material, cutting and waste, patterns, models and templates, labour, supervision, duty and taxes, marking, transport, delivery, unloading, storing, unpacking, hoisting, labour, setting and fixing in position, temporary works, return of packings, tools, provision of contractor's equipment and consumables necessary for the complete installation.

2.13 DRAWINGS

2.13.1 Engineer's Drawings

Unless otherwise specified, the Engineer's Tender drawings are not manufacturing drawings and the dimensions given are only sufficient for tendering purposes or to enable The Contractor to complete manufacturing drawings. It is the responsibility of The Contractor to verify all dimensions.

2.13.2 Contractor's Drawings

The Contractor will be furnished, on request, with the following drawings, as applicable or pertinent to the project:

a) The Engineer's drawings.

b) The Architect's drawings.

c) The Structural Engineer's drawings.

d) The Engineer's drawings of other disciplines.

e) The drawings of other service installations that are relevant for co-ordination and installation purposes.

f) The installation drawings of other contractors.

Unless otherwise stated, three (3) sets of the Engineer's drawings, Specifications and Schedules (if any), and one set of (b) and (c) above, will be issued free of charge to The Contractor for installation purposes. (Refer to Part III, SAACE - 1978).

The Contractor shall supply to the Engineer four (4) copies of marked up structural or other drawings showing any changes and/or additional requirements to be made in the structure in order to meet the dimensional requirements of the equipment and materials to be installed by him. These builder's work drawings shall be supplied to the Engineer within four (4) weeks after notification by the Engineer that his tender was successful.

The Contractor shall supply four (4) copies of each detail design drawing for approval. The Contractor shall allow the Engineer three (3) weeks for drawing approval. After a marked up copy with all the Engineer 's comments has been returned, The Contractor shall update the original which shall then be submitted to the Engineer for signature. This will ensure that all prints used for construction will be certified as approved.

Four (4) copies of the certified drawing shall be issued to the Engineer for distribution.

The Contractor will be required to produce the following detail design drawings:

a) Builder's Work Drawings

b) Mechanical Drawings (wet services)
    i. These are all Workshop and Equipment Layout Drawings required for the manufacture and erection of the Installations.

Unless otherwise specified, pipe routes shall be superimposed on the Mechanical Layout Drawings, showing the runs and fixing details.

Any work done by The Contractor without an approved signed drawing, will be at the risk of The Contractor.

The Contractor shall update all drawings ("as built drawings") once the Installation has been completed. Four (4) sets of paper prints and one (1) set of sepia copies shall be supplied to the Engineer as part of the O & M Manual.

2.13.3 Progress Drawings

The Contractor shall arrange for a full set of white prints of installation drawings to be kept on the site showing the progress of all work in connection with this Contract. Such prints shall be kept up-to-date.

The progress drawings shall be available for inspection at any time by the Architect/Quantity Surveyor/ Engineer and Contractor or any other authorized person.

The Contractor shall include for his representative to keep a diary recording the progress of the works and details of all instructions received. The diary shall be at the disposal of the Engineer as and when required.

2.13.4 Equipment Drawings

The Contractor shall provide the Engineer with working drawings of all items of equipment, with a detail technical specification of the equipment, for approval, before placing an order for the equipment.

2.14 OPERATING AND MAINTENANCE MANUAL

The Contractor shall, at his cost, prepare and supply manuals for the successful operation and maintenance of the Installation.

Six weeks prior to the commencement of commissioning, The Contractor shall supply a draft of the manual to the Engineer for approval.

Two weeks after commissioning, The Contractor shall supply four (4) additional manuals which have been updated and include all commissioning data and "as built" drawings.

These manuals shall be bound in book form with hard plastic covers to withstand constant use, and shall have an index to facilitate quick reference.

In addition to the hard copies The Contractor shall submit an electronic copy of O&M Manuals which shall include as-builts, equipment, commissioning data, CoC's, compliance certification, etc.

The work shall not be considered to be completed for purposes of taking over until such manuals have been supplied to the Engineer and the subsequent equipment test results have been included in them.

The manuals shall include:

a) A list of recommended servicing tools and specialist plant.

b) A list of recommended spares necessary for a period of three (3) years.

c) Exploded drawings and spares list from which every item and every piece of plant can be positively identified for ordering replacement.

d) A list of names and addresses of the manufacturer for each item of plant.

e) A copy of all names and clearance certificates obtained with the plant.

f) One (1) paper copy of each drawing updated to “as built” status plus a drawing register updated to “as built” status.

g) A detailed preventative maintenance program for all plants.

h) Operating instructions for each item of plant.

i) Performance date, equipment test and characteristic curves.

j) Maintenance and system guarantee documents.

2.15 COMMISSIONING AND HANDING OVER

2.15.1 General

The Contractor shall generate health and safety risk assessments and method statements for commissioning procedures and performance tests. This includes, but is not limited to, the filling, pressure testing, cleaning flushing, and testing of the pipework and components.

The Contractor shall draw up a commissioning program at least 4 weeks prior to commissioning for submission and approval.
This program shall be included into the overall project program and incorporate time for witnessing of pre-commissioned and commissioned systems.

All testing equipment used in Pre-Commissioning and commissioning shall have a valid calibration certificate. The Contractor shall supply all instrumentation that is required for Pre-Commissioning and Commissioning.

2.15.2 Pre-Commissioning

a) Pre-commissioning is the specified systematic checks of a completed installation to confirm its readiness for commissioning. The purpose is to check that the system is in a safe and satisfactory condition before setting to work.

b) Preliminary tests shall be carried out first before requesting witnessing of tests. Repair defects disclosed by tests or, if required by the Engineer, replace defective work.

c) The entire pipework reticulation shall be properly cleaned out after erection by introducing flushing connections at the extremities of the distribution pipes.

d) Pre-commissioning is to be performed on the piping system, including valves, strainers, fittings, etc., pumps and motors, control panels and control system.

e) The procedure includes filling and venting and pressure testing (one and a half times the working pressure) for a minimum period of twenty four (24) hours or as otherwise agreed or specified.

f) Drain and flush the system.

g) Record all setting, set points, and offsets maintained through the pre-commissioning period and return to specified settings after pre-commissioning period. And all final adjustments to the field devices shall be marked indelibly.

h) All packaged systems should be fully commissioned by the manufacturer or installer and obtain written evidence of said commissioning.

i) One all faults are rectified The Contractor shall invite the relevant parties for witnessing.

j) In the event of the plant or installation not conforming to the requirements of the contract documents, the Owner is at liberty to either recover from The Contractor or to deduct from the Contract price all reasonable expenses incurred by himself or his agents attending the repeated test.

2.15.3 Commissioning and Testing

a) Commissioning is the process of ensuring that an installed system performs to specification. This includes the setting to work, regulation, and fine tuning of the system.

b) The Contractor shall create method statements (and health and safety risk assessments) for the commissioning and testing of the systems. The Contractor shall ensure that the system can be tested to any South African National Standard Specification.

c) The Contractor shall invite the relevant parties for witnessing of the commissioning and testing. All tests shall be carried out by The Contractor to the Engineer's satisfaction.

d) The Contractor shall commission including setting to work, running in, and performance testing the systems and components as per the method statements. This includes completion of the commissioning documentation.

e) At the completion of the system, the Contractor shall compile the data in a test pack that is included in the O&M manuals.

f) Testing, measurement and balancing of all plant parameters shall be carried out by the specialist contractor as part of the plant start-up and commissioning process. Having set up the plant to operate to the Specified requirements The Contractor shall measure and record all required operating parameters as per the schedule below. The Contractor shall make whatever adjustments are required to achieve the specified duties and plant operating parameters.

g) Once The Contractor is satisfied that he has achieved the requirements of the Specification he shall present the Engineer with the typed and printed operating data. The Engineer shall then "sample" the data and carry out random tests to verify the recorded plant performance parameters under different conditions. Should the Engineer find that any of the measured parameters are inaccurate or false he shall instruct The Contractor to re-commission/repair /replace the plant and take new measurements.

h) After the Engineer has concluded his tests he shall he present the commissioning data to the Owner who may then request further tests and measurements to ratify the presented data;

i) Only after the above process has been reasonably concluded and the Engineer is satisfied that the tests are accurate and representative and that they have been successfully demonstrated to the Owner shall the plant be deemed to be Practically Complete.

2.15.4 Hand Over

The work shall be deemed complete once a Fire Department certificate of approval is obtained and all defects listed thereon and those raised separately by the Engineer are remedied. The plant will then be handed over to the Owner via signed acceptance and the plant will be under the control and authority of the Owner.

2.16 STATUTORY AND REGULATORY REQUIREMENTS

The Installations shall be designed, erected, commissioned and maintained in compliance with the following appropriate regulations as specified in the Standard Technical Specification.

In addition, The Contractor shall exempt the Employer from all losses, costs or expenditures which may arise as a result of The Contractor's negligence to comply with the requirements of the regulations enumerated in this Clause.

It shall be assumed that The Contractor is conversant with the abovementioned requirements. Should any requirement, byelaw or regulation, which contradicts the requirements of this Document, apply or become applicable during erection of the Installation, such requirements, bye- 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 Installations in terms of such contradictions without obtaining the written permission to do so from the Engineer.

2.16.1 Arrangements with the Supply Authority

It shall be the responsibility of The Contractor to make the necessary arrangements at his own cost with any Statutory 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 or regulations and/or by these Documents.

2.17 ALTERNATIVE EQUIPMENT

The words "similar or equal to", are implied wherever specific descriptions of equipment is provided.

In the case of specific product names being provided in schedules, implies that such equipment was selected for design purposes only.

Tenderers may offer alternative equipment with the understanding that such alternative offers are "similar and equal to" the selected equipment (in quality and performance) on which the design was based.

The Engineer shall reserve the right, on behalf of the client, to decide whether such equipment is acceptable or not. Subject to a tender being accepted with such alternatives, approval must be obtained from the Engineer for such alternatives prior to The Contractor placing orders for the equipment.

2.18 REQUEST BY ENGINEER FOR CHANGES (Variations)

When a variation becomes necessary, the Engineer shall notify The Contractor in writing, setting out the scope and nature of the proposed variation.

The Contractor shall then determine what cost variation, if any, is involved, giving due consideration to any material already prepared or work already done which would require alterations.

Variation in cost shall be in accordance with rates set out in the Contract where these are applicable. A price breakdown is to accompany the variation quotation submitted.

Within seven (7) days of receipt of the Engineer 's request for variation, The Contractor shall inform him of the price adjustment attributable to the proposed variation. If it is decided that the work shall proceed, the Engineer will then issue a variation order to The Contractor, authorizing him to carry out the variation.
If The Contractor should fail to notify the Engineer within seven (7) days that there will be a cost increment associated with the proposed variation, it will be assumed in default that no cost variation is applicable.

If the carrying out of any variation instructed by the Engineer would, in the opinion of The Contractor, prevent him from fulfilling any of his obligations under the Contract, including the timely completion of the Contract, he shall notify the Engineer in writing without delay, and shall submit computations or other evidence in support of his opinion.

The Engineer should then decide whether or not the variation is be carried out. If the Engineer confirm his instructions to carry out the variation, The Contractor shall be held relieved of his obligation under the Contract insofar as they are affected by the required variation. The Engineer’s decision as to the validity of The Contractors claim is however final.

2.19 LABELLING AND NOTICES

The Contractor shall supply and install all coding, labeling and notices as required. The wording shall be in English.

To reduce the possibility of incorrect labels and/or notices, The Contractor shall submit a schedule of labels and notices to the Engineer for approval. Costs to rectify inscriptions, resulting from the failure by The Contractor to obtain approval, will be for his account.

2.20 LAYOUT OF EQUIPMENT

The various equipment shall comply in capacity and general layout with the details given in the specification and drawings. Should The Contractor offer equipment at variance with these requirements, full details and calculations and the supporting reasons therefore shall be given.

The general layout may be altered or modified to suit The Contractor's equipment, but a sketch showing the intended layout submitted to the Engineer before the tender is awarded.

Dimensions shown on the Drawings are sufficiently accurate for tendering purposes, but before construction of the plant is commenced, these dimensions together with all structural members etc., must be verified on site and the plant constructed accordingly.

If The Contractor requires alterations to the structure these must be described timeously so as not to effect the construction program. Minor structural alterations which might facilitate the work can be arranged with the Engineer and/or Architect as the work progresses, but no claims will be entertained for alterations to plant, etc. constructed before the necessary dimensions and details had been verified.

2.21 ACCESSIBILITY

All equipment shall be installed to be readily accessible for operation, maintenance and repair. Minor deviation from the drawings may be made to achieve this, however, change of magnitude or which involve extra costs shall not be made without the approval of the Engineer.

Platforms and ladders shall be provided where required for access to equipment in accordance with the requirements of the authorities having jurisdiction and the Engineer.

2.1 SPARES

The tender price shall include for a full complement of recommended spares for the total maintenance period as well as the following period of twelve months. Tenderers shall detail the allowance for recommended spares as a detailed breakdown of the total allowance.

2.2 TRAINING

The Contractor shall provide a suitably qualified and trained person to train the Owner's staff in the correct operation and maintenance of the Installation. The Contractor shall allow for this person to be full time on site for a period of three (1) days immediately after the handover date.

2.3 SAMPLE SUBMISSIONS

The following sample submissions shall be provided, including specification documentation and approvals:

a) Valve locking facility where applicable (chain & lock)

b) Hose reel

c) 9 Kg and 4.5 Kg DCP extinguisher & backing board

2.4 PROGRAM

The Contractor will be required to co-operate with other contractors so that all work may proceed with the minimum of delay and disruption. This, in particular, will apply to any planning that is required beforehand in order to make the site erection as simple as possible.

Within a period of ten working days of the contract being awarded, The Contractor will be required to submit an acceptable program for inclusion in the overall project program.

The installation shall be carried out strictly in accordance with the Main Contract's program.

3. DETAILED TECHNICAL SPECIFICATION

3.1.1 Water Supply

Existing hose reel feeds shall be rerouted to the new hose reels as positioned.

3.1.2 Hose Reel System

Internal hose reels shall be provided throughout the building as per the drawings. The fire hose reels complete with 30m. Rubber hose C.P. stopcock, shut-off nozzle and wall bracket all shall be supplied and installed in accordance with SANS 543, SANS 10105 -1.

3.1.3 Fire Extinguishers

Portable fire extinguishers shall be provided as per the drawings as per SANS 1910. The fire extinguishers shall be hung on purpose made hardwood backing boards. The supply and installation of the fire extinguishers shall be supplied and installed in accordance with SANS 1910, 1475-1 and SANS 10105-1.

3.1.4 Piping

<u>General</u>

All pipes and fittings shall be stamped with SANS or ISO standards and piping systems shall be pressure tested to 2000 kPa.

Welded pipe shall be hot dipped galvanized to SANS 121 after the fabrication of spools and sections. These fabrications shall be joined on site by threaded union or flange or coupling as applicable. No welding shall be permitted on site.

Grooved pipe joints shall be made using only pipe grooving tools supplied by the pipe fitting manufacturer. Where grooves are made on galvanised mild steel pipe the galvanising shall be made good with a suitable cold galvanising solution.

The entire piping system shall be electrically earthed. Any joints not providing electrical continuity shall be bonded across.

Unions, or flanged connections shall be provided as required and at connections to all equipment, shut off valves, apparatus and specialties requiring disconnection for repairs or replacement.

Shut-off valves shall be provided where indicated and for individual equipment units at inlet and outlet to permit unit removal for repairs without interfering with remainder of systems.

Piping shall be arranged such that valves are accessible for operation, maintenance and repair. Valves shall not be installed with handles pointing downward.

Mechanical pipe couplings may be used in lieu of unions or welded, flanged or screwed pipe connections provided they are used strictly in accordance with the approved equipment manufacturer's instructions and/or recommendations.

During construction, open ends of pipes shall be closed with sheet metal caps to prevent debris from entering into the piping.

Above Ground

a) Piping

    i. 15 NB to 40 NB Welded steel pipe manufactured to SANS 62-1 Medium grade/plain ended and galvanised to SANS 121.

    ii. 50 NB Welded steel pipe manufactured to SANS 62-1 Heavy grade/plain ended and galvanised to SANS 121.

    iii. 65 NB to 80 NB Welded steel pipe manufactured to SANS 62-1 Heavy grade/plain ended hot dipped galvanised to SANS 121.

    iv. 100 NB to 400 NB Welded steel pipe manufactured to SANS 719 Grade B 6 mm wall thickness/plain ended hot dipped galvanised to SANS 121

b) Fittings

    i. 15 NB to 50 NB SANS 14 Malleable cast galvanized screwed taper thread and beaded to SANS 1306-1 & 1109

    ii. 65 NB to 400 NB Butt weld seamless fittings to BS 1640 A234 Grade WPB. Wall thickness as per pipe line hot dipped galvanised to SANS 121 after fabrications.

c) Connections

    i. 50 NB and less – threaded connections.

    ii. 65 NB- 400 NB Flanged to SANS 1123 and SANS 135: all galvanised to SANS 121 after fabrication, or victaulic couplings manufactured from cast steel or cast iron.

    iii. Bolts nuts and washers – to SANS 1700 Grade 4,6 bolt and Grade 4 nut galvanised to SANS 121

    iv. Gaskets (full face) - 1.6 thick CF to BS 1832 or suitable neoprene type
    v. Thread Sealant - P.T.F.E. tape

    vi. Screwed piping shall be fitted with unions to enable ease of assembly or disassembly.

Below Ground

Piping shall be installed and laid to the manufacturer's recommendation.

The transition shall be at least 300 mm below grade.

a) HDPE CLASS (PN)16 to SANS 4427

b) Pipe Jointing –Butt Weld or electrofusion to SANS 0269 in accordance with manufacturer's specifications and method.

c) Fittings fabricated or butt weld fittings of the same pipe.

d) Connections - Stub with galavanised steel backing flange *or* Victaulic type coupling to suit the application and the pipe system pressure rating. Clamp to be cast ductile iron.

e) HDPE piping exiting the ground shall be fitted with HDPE to Steel pipe connection – galvanized or cast iron plain end flange adaptor/flange or Victaulic type to suit the application and the pipe system pressure rating. (FM Approved) The transition shall be at least 300 mm below grade.

f) Bolts nuts and washers – to SANS 1700 Grade 4,6 bolt and Grade 4 nut galvanised to SANS 121

Concrete thrust blocks (800 x 800 x 800) shall be provided at all bends and junctions.

<u>Welding</u>

Welding shall be in accordance with SANS 10044 for class B welds as amended and shall be performed by qualified welder holding a current welding certificate.

The Engineer may appoint an authorized third party inspectorate to carry put weld and fabrication tests.

Should any of these welds prove unsatisfactory, The Contractor will be called upon to have all welds examined by x-ray at his own expense and to have the x-ray examined by an authorized third party inspectorate.
All failed welds shall be redone by a new welder and retested and passed before re-installation on site will be allowed.

The Contractor shall provide all instruments required for testing. Pipes are to be re-painted where welded.

3.1.5 Pipe Supports and Brackets

a) All piping shall be adequately supported by means of galvanized support steel and hangers unless otherwise specified.
b) All supports shall make adequate provision for any thermal expansion and contraction of the pipework.
c) Pipe must be supported such that equipment is not stressed by the pipe weight or expansion.
d) Piping shall be supported and hanger rod sizes shall be at least as set out as follows:

NOMINAL PIPE SIZE	**MINIMUM SPACING**	**ROD DIAMETER**
Steel up to and including 50mm Ø	3.5 m	6 – 8 mm
Steel 65mm to 100mm Ø	4.0 m	12mm
Steel 100mm to 250mm Ø	4.5 m	16mm

In addition to the above, piping shall be supported at each change of direction, at ends of branches, at base and top of riser pipes and drops and wherever necessary to prevent sag, bending and vibration.

3.1.6 Flexible Connections

Flexible connections shall be installed in pipe lines to and from vibrating equipment or where shown on the tender drawings.

Inner flexible tubing shall be stainless steel 304 with outer braiding of stainless steel. Pipe connections shall be welded or flanged.

3.1.7 Valves

Isolating Valves

Isolating valves up to and including 80mm diameter shall be ball type. Sizes 100mm diameter and larger shall be gear operated butterfly type installed between suitable flanges which shall be independent of any other piece of equipment.

Gate Valves

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

Butterfly valves may be used in the place of gate valves. (Refer wafer butterfly valves).

Wafer Butterfly Valves

Wafer butterfly valves on nominal pipe diameters of 65 mm to 150 mm shall be provided as sprinkler zone control valves and shall be a component of the sprinkler zone control valve and flow switch arrangement. The wafer butterfly valves shall be rated for 15 bars working pressure and designed to fit between ANSI B16.5 Class 150 flanges.

The valves shall be right angle, gear driven from a hand wheel and have a high visibility position indicator and built-in Engineery switch and be listed by a recognized national agency

Check Valves

Check valves shall be provided on but not limited to the fire pump discharge and bypass line, standpipe risers and on the Fire Department connections. They shall be of the swing check design and manufactured with a cast iron Hanged body and suitable for a working pressure of 15 bars. The hinge pin mechanism shall be manufactured in brass and bronze to reduce corrosion. Seat rings shall be accurately machined bronze, and the swing clapper in ductile iron.

The seating disc shall be of rubber material. A tapping shall be provided on the underside of the body for attachment of a drain or ball drip valve, where required.

Ball valves

Ball valves of 50 mm and below used for system test and draining purposes shall be provided with screwed ends. They shall be of the serviceable 3 piece type with stainless steel bodies, grade 316/304 stainless steel balls and PTFE seats equipped with cast iron/steel handles, and be listed by a recognized national agency.

3.1.8 Pressure Gauges

Pressure gauges shall be 87 mm diameter, glycerin filled, dial spring type, manufactured in corrosion resistant material and controlled by bronze gauge valves with a draining arrangement. The gauge shall be marked in calibrated steps from 0 to 20 bars and be accurate to within 3%. They shall be listed by a recognized testing agency.

3.1.9 Signage

All fire escape routes, fire exit doors and firefighting equipment to be clearly indicated by means of photo luminescent symbolic signs as shown on the drawings. Signage shall be supplied and installed in accordance with SANS 1186/1 with stainless steel mounting hardware.