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WATER SUPPLIES DEPARTMENT

STANDARD SPECIFICATION E-00-05

SITE INSTALLATION AND TESTING OF

BUILDING SERVICES EQUIPMENT

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SITE INSTALLATION AND TESTING OF BUILDING SERVICES EQUIPMENT

1. SCOPE

This standard specification stipulates the requirements for site installation and testing of the following building services equipment -

(1) Small power distribution installation including MCB distribution boards, fuse boards, isolating switches, socket outlets, connection units, etc., and the associated sub-main and final circuits in trunkings and conduits

(2) Lighting installations

(3) Lightning protection systems for buildings and structures

(4) Fire service installations

(5) Ventilation and air-conditioning equipment including roof extractors, exhaust fans, air-conditioners, etc.

It shall be read in conjunction with the following WSD Standard Specification -

E-61-02 Ventilation Fans for Plant Rooms

EM-00-02 Site Installation and Testing of Mechanical, Electrical and Instrumentation Plant and Equipment - General

2. GENERAL REQUIREMENTS

The Plant shall be installed in accordance with the recommendation or instruction of the manufacturer. Adequate space shall be allowed for the safe operation and maintenance of the equipment. Access platforms where required shall be supplied and installed by the Contractor / *Contractor* (hereinafter referred to as the Contractor) with the prior approval / *acceptance* (hereinafter referred to as approval) of the Engineer / *Project Manager* (hereinafter referred to as the Engineer).

All mounting brackets, supporting steelwork etc. shall be supplied and installed by the Contractor. Steelwork shall be of adequate strength with suitable surface treatment for the prevailing conditions on site. All mounting brackets and supporting facilities shall be hot-dip galvanised to BS EN ISO 1461 and be painted with approved colour.

Any temporary modification to the existing building finishes, fixtures and equipment during the course of the installation work shall be made good afterwards by the Contractor to the satisfaction of the Engineer.

Subject to particular requirements specified, parts of the pipeline which cross open ground above ground level shall be laid over concrete piers or supported by pipe hangers and the exposed pipes shall be painted or otherwise protected as directed by the Engineer.

Necessary supports, hangers, saddles, slings, structural steelwork, fixing and foundation bolts shall be supplied and fixed to support the pipework and its associated equipment in an approved manner.

No water pipes shall be installed in the electrical plant rooms.

Floor collars or wall boxes shall be supplied and fixed at all points where pipes pass through floors or walls, together with all fittings and, for external walls and floors, weatherproofing. The floors, walls and roof will be made good under another contract.

No drilling, welding or fixings of any kind may be made to any structural components or other contractor's work without the consent of the Engineer or his duly authorised representative.

3. ELECTRICAL SERVICES INSTALLATIONS

3.1 General

The electrical services shall be installed and tested by registered electrical workers of the appropriate grade in accordance with the Electricity Ordinance.

3.2 Standards and Specifications

The electrical services mentioned in paragraphs 1(1) to 1(3) above shall be installed and tested in compliance with the latest edition of the following standards and specifications -

(1) “Code of Practice for the Electricity (Wiring) Regulations” issued by the Electrical and Mechanical Services Department, HKSAR Government.

(2) “General Specification for Building Services Installation in Government Buildings of the Hong Kong Special Administrative Region” (GSBS) issued by the Architectural Services Department (ArchSD), HKSAR Government.

(3) “Testing and Commissioning Procedure for Electrical Installation in Government Buildings of the Hong Kong Special Administration Region” issued by the ArchSD, HKSAR Government.

3.3 Installation

3.3.1 General

During site installation, the Engineer's Representative / *Supervisor's Representative* (hereinafter referred to as the Engineer's Representative) will carry out installation inspection of the Works on the standard of workmanship. In the event of any part of the Works failing to meet the requirements of the Specification, the Contractor shall take immediate steps to remedy the deficiency to the satisfaction of the Engineer's Representative.

3.3.2 Lightning Protection System

The lightning protection system shall be installed in accordance with Clause 3.2 above and the following -

(1) The lightning protection system shall consist of a network of interconnected 25 x 3mm copper tapes as shown on the Drawings. All metal work on the rooftop of the building shall be bonded to the lightning protection system.

(2) Down conductor system shall consist of copper tapes connecting the air termination network to earth termination network. The system shall take the most direct route and shall be installed in surface mounted or concealed PVC ducts. A test joint shall be provided for each down conductor.

(3) Lightning protection earth termination shall comprise earth electrodes connected to the lightning protection down conductors. Additional earth electrodes shall be provided if the earthing resistance of the system exceeds 10Ω.

(4) The Contractor shall carry out all necessary work for earth electrode installation in accordance with the latest edition of the "General Specification for Civil Engineering Works" issued by the Civil Engineering and Development Department, HKSAR Government.

3.3.3 Installations in Power Company's Transformer/Switchgear Room

The Contractor shall make all necessary arrangements with the power company and obtain necessary approvals from the power company for carrying out the building services Works in power company's transformer and switchgear room.

Unless otherwise specified, the Contractor shall complete the installation of building services equipment at the power company's transformer and switchgear room within 21 calendar days after taking over the Site from civil contractor.

On completion of installation, the Contractor shall arrange a joint inspection with the power company, the civil contractor and the Engineer's Representative for the purpose of demonstrating the satisfactory performance of the installations to the power company and the Engineer.

The Contractor shall record and rectify the defects of building services equipment identified in the joint inspection and arrange re-inspection within 21 calendar days after the joint inspection.

3.4 Inspection and Completion Tests

Upon completion of installation and the remedy of any deficiencies noted during the installation inspection, the Contractor shall arrange a joint inspection with the Engineer's Representative to check for correct assembly and quality of workmanship on all the equipment installed.

The site tests shall be carried out by the Contractor after the remedy of any deficiencies noted during the installation inspection and under the supervision of the Engineer's Representative.

All measuring instruments, indicators and other apparatus necessary for carrying out the tests shall be provided by the Contractor and approved by the Engineer.

The Contractor shall notify the Engineer and other contractors on the Site prior to performing electrical testing at the Site, and shall ensure safety of personnel and complete isolation of electrical equipment and cables undergoing tests.

Reports for the site tests shall be submitted to the Engineer for approval prior to energisation of any electrical equipment.

4. FIRE SERVICE INSTALLATIONS

4.1 General

The fire service (FS) installations shall be installed and tested by the Specialist Contractor of the appropriate group in the "List of Approved Suppliers of Materials and Specialist Contractors for Public Works – Fire Service Installation".

4.2 Standards and Specifications

The FS installations shall be installed and tested in compliance with the latest edition of the following standards and specifications -

(1) Current requirements and FSD Circular Letters of the Fire Services Department (FSD), HKSAR Government (hereinafter referred collectively as FSD Requirements and Circular Letters);

(2) "Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment" (Codes of Practice) issued by the FSD, HKSAR Government;

(3) Part 7 and Part 8 of "General Specification for Building Services Installation in

Government Buildings of the Hong Kong Special Administrative Region" (GSBS) issued by the ArchSD, HKSAR Government.

(4) "Testing and Commissioning Procedure for Fire Service Installation in Government Buildings of the Hong Kong Special Administrative Region" (T&C Procedure for FSI) issued by the ArchSD, HKSAR Government.

4.3 Design

Unless otherwise specified, all fire service equipment and materials shall comply with the statutory requirements and specifications stipulated in the GSBS.

4.3.1 Electrical Wirings

The FS Contractor shall use fire resisting cables for fire service installation complying FSD latest requirement and GSBS for different parts of the installations, or cables having equivalent or better performance to the acceptance to the Engineer. The cable support shall be non-combustible and that the overall wiring and circuit integrity shall not be reduced below that afforded by any of the cables it supported. The fire resistant integrity of any cable support shall also be not less than that equivalent to the cables it supported.

4.3.2 Fire Service Installations in Hazardous Areas

Intrinsically safe heat detector shall be supplied and installed in appropriate classes of dangerous good stores, fuel oil tank rooms etc.

Manual call point, heat detector, smoke detector, multi-sensors detector and other detectors installed in hazardous areas including explosive gas and dust environment shall be intrinsically safe type as required by the FSD Requirements and Circular Letters.

Electrical equipment and wiring of electrical installations exposed to potentially explosive atmospheres should be constructed and protected to the requirements specified for hazardous areas to IEC 60079 or equivalent. Terminations of cables shall use sealing fittings, ground continuity connection or explosive proof seal whichever is appropriate.

4.3.3 Emergency Lighting and Exit Signs

Self-contained LED emergency luminaires for emergency lighting shall be used either in new installation or replacement works, unless otherwise specified.

Self-contained LED exit sign and directional sign shall be used in new installation or replacement works unless otherwise specified. The provision of exit signs shall include all related directional signs or series of signs for the exit routes.

The batteries shall use sealed, rechargeable, maintenance free nickel-metal hydride (NiMH) type unless otherwise specified.

The use of self-contained emergency lighting at Class 8 DG store shall obtain prior approval by the Engineer and the FSD.

4.3.4 Fire Detection System

Where the type of detector is not specified, heat detectors shall be used in electrical and mechanical plant room, switch room, utility room, pump hall, washroom, kitchen, non-air-conditioned space/area/void, basement, car parks, semi-open/open area, cold store, lift shaft, riser ducts etc.

For the sake of avoiding unwanted false alarms, point type smoke detectors shall not be placed in areas that would normally be humid, dusty, smoky, chemical or insect-laden.

Multi-sensors detectors shall be used to satisfy FSD Requirements and Circular Letters such as installation for sleeping risk, smoke management and ventilation/air-conditioning control system, etc.

Detectors shall not be mounted directly above transformers or switchgear and shall not be obstructed by ductworks or any other equipment.

For installation in areas with high ceiling, linear smoke detection system, ultraviolet/infrared flame detection system or other similar special detection system shall be applied. The detection system shall be of a type acceptable to the FSD. Selection of special detection system shall be to suit a particular application, environmental condition and fire hazard. The FS Contractor shall submit detailed performance data, equipment catalogue, description, technical information, maintenance access proposal, test report and certificate to the Engineer for justification on the suitability of the special detection system.

4.3.4.1 Linear Heat Detection System

Linear Heat Detection (LHD) System shall be applied in improvement works for a protection area above 200 m^2, unless otherwise specified. LHD System consists of LHD sensor cables, control modules, end of line units and/or a multifunctional control panel.

The LHD sensor cable shall be either a cable with electrical or optical conductor, which can be applied at continuous ambient temperature between 0^oC and 40^oC, complying with EN 54-22 or EN 54-28 or other standards acceptable to FSD. Each zone shall be up to 500m continuous length.

The LHD control modules shall interface to a conventional type / addressable type main fire alarm panel. The control circuits shall have minimum protection rating of IP 65 or equivalent standards.

The LHD end of line unit shall have minimum protection rating of IP 65 or equivalent standards. It can be applied at continuous ambient temperature between 0^oC and 40^oC, relative humidity up to 95%, dusty, smoky, insect-laden and corrosive environment.

4.3.4.2 Optical Light Beam Smoke Detection System

The detection system shall consist of transmitter, receiver and/or reflector units for measuring range 10 - 100m. Permanent or temporary access shall be provided with sufficient space for maintenance purposes.

Optical Light Beam Smoke Detection System to be supplied shall comply with EN 54-12 or other standards acceptable to FSD.

Optical Light Beam Smoke Detection System shall function correctly at continuous ambient temperature between 0ºC and 40ºC, relative humidity up to 90% continuous non-condensing environment in non-air-conditioned space unless otherwise specified. The detection units (transmitter and receiver) shall have minimum protection rating of IP 65 or equivalent standards.

4.3.4.3 Flame Detection System

Flame detection system shall be infrared type, detecting multiple infrared bands of active flame gases. Flame detection system shall be mounted on the perimeter of the area and pointed into the area for the best coverage. Permanent or temporary access shall be designed with sufficient space for maintenance purposes.

Flame detection system to be supplied shall comply with EN 54-10 or other standards acceptable to FSD.

Flame detection system shall function correctly at continuous ambient temperature between 0ºC and 40ºC, relative humidity up to 95% continuous non-condensing environment in non-air-conditioned space unless otherwise specified. Flame detection system shall have minimum protection rating of IP 65 or equivalent standards.

4.3.5 Gas Detection System in Battery Room

The Contractor shall supply and install a gas detection system in the battery room, where provided, which shall include detectors, indicators, alarm and interlock in accordance with the requirements of the FSD.

4.4 Installation

The Contractor shall make an application to the FSD to obtain the necessary approval of the detailed design of the installation prior to commencement of site work.

During site installation, the Engineer's Representative will carry out installation inspection of the Works on the standard of workmanship. In the event of any part of the Works failing to meet the requirements of the Specification, the Contractor shall take immediate steps to remedy the deficiency to the satisfaction of the Engineer's Representative.

4.5 Inspection and Completion Tests

Upon completion of installation and the remedy of any deficiencies noted during the

installation inspection, the Contractor shall arrange a joint inspection with the FSD and the Engineer's Representative to demonstrate the satisfactory performance of the installation and for the issue of any certificates that may be required.

The Contractor shall carry out all tests on the fire service installations in accordance with the requirements stipulated in the Codes of Practice and T&C Procedure for FSI.

The Contractor shall provide the FS equipment testing certificates under request by the Engineer or FSD.

All measuring instruments, indicators, consumable items and other apparatus necessary for carrying out the tests shall be provided by the Contractor at their own cost and approved by the Engineer and the FSD.

The test reports shall be submitted to the FSD for approval and to the Engineer for record. The Contractor shall be responsible for carrying out the tests again at his own cost if the test results fail to comply with the requirements of the FSD.

The Contractor shall obtain the relevant certificates for the fire service installations from the FSD.

4.6 Testing and Inspection after Substantial Completion

The Contractor shall carry out tests and inspections to the fire service installation for a period of 12 months from the date of acceptance of the completion tests by the FSD.

Details of works for testing shall be in accordance with the Codes of Practice. A log book of attendance by the Contractor shall be maintained at the installation. Test and inspection reports shall be submitted to the Engineer for record.

5. VENTILATION AND AIR-CONDITIONING INSTALLATIONS

5.1 General

The Contractor shall install and test the ventilation and air-conditioning equipment including roof extractors, propeller fans, exhaust fans, room coolers and all ancillary equipment installed in the plant rooms as shown on the Drawings.

5.2 Standards and Specifications

The ventilation and air-conditioning equipment shall be installed and tested in compliance with the latest edition of the following standards and specifications -

(1) Part 6 of “General Specification for Building Services Installation in Government Buildings of the Hong Kong Special Administrative Region” (GSBS) issued by the ArchSD, HKSAR Government.

(2) “Testing and Commissioning Procedure for Air-conditioning, Refrigeration, and

Mechanical Ventilation Installation in Government Buildings of the Hong Kong Special Administration Region" issued by the ArchSD, HKSAR Government.

5.3 Installation

5.3.1 General

During site installation, the Engineer's Representative will carry out installation inspection of the Works on the standard of workmanship. In the event of any part of the Works failing to meet the requirements of the Specification, the Contractor shall take immediate steps to remedy the deficiency to the satisfaction of the Engineer's Representative.

5.3.2 Roof Extractors

Roof extractors shall be mounted on concrete curb provided by others with dimensions according to the requirements of the manufacturer. All gaps between the mounting frame and structural base shall be sealed up properly.

The provision of all materials and equipment e.g. mounting plates, safety guards, wirings etc. and all necessary accessories e.g. cables and conduit system etc. shall be included for the installation of the roof extractors.

5.3.3 Exhaust Fans

Suitable galvanized steel mounting plates or bracket provided from the same manufacturer shall be used for fixing the fans.

The provision of all materials and equipment e.g. mounting plates, safety guards, wirings etc. and all necessary accessories e.g. cables and conduit system etc. shall be included for the installation of the exhaust fans.

5.3.4 Air-conditioning Installation

Supply to a room cooler shall be by means of a connection unit and a control switch, both of which shall have a current capacity of not less than the rated value of the room cooler. The control switch shall be D.P. with pilot light, installed at a height of 1350mm above the finished floor level.

The connection unit shall be installed adjacent to the room cooler and shall be on the same side of the room cooler as where the flexible cable enters the room cooler. In case it is not possible to ascertain where the flexible cable enters the room cooler, the connection unit shall be installed on the left side of the room cooler, as viewed from the front.

For split-type air-conditioners, the condenser shall be air-cooled and installed outside the building. The interconnecting refrigerant piping shall be field connected.

5.4 Inspection and Completion Tests

Upon completion of installation and the remedy of any deficiencies noted during the installation inspection, the Contractor shall arrange a joint inspection with the Engineer's Representative to demonstrate the satisfactory performance of the installation.

Noise level tests for roof extractors shall be carried out by the Contractor. In the event that the installation fails to pass the test, the Contractor shall take remedial measure at his own cost until such test has been passed. Test reports shall be submitted to the Engineer within one week after completion of the test.

- End of this Specification -