

WATER SUPPLIES DEPARTMENT

STANDARD SPECIFICATION EM-00-01

INSPECTION, TESTING AND REPORTING

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WATER SUPPLIES DEPARTMENT**STANDARD SPECIFICATION EM-00-01****INSPECTION, TESTING AND REPORTING**1. **GENERAL**1.1 **Scope**

This specification covers the requirements for the inspection and testing of plant and equipment and the reporting thereon.

The plant and equipment required to be inspected and witness tested shall include materials, parts, sub-assemblies, assemblies, sub-systems or systems, etc. designed and provided for that plant and equipment under the Contract.

1.2 **Independent Inspection Body (IIB)**

An Independent Inspection Body (IIB) shall be a company or a firm nominated by the Contractor and approved by the Purchaser, or appointed by the Purchaser for carrying out the inspection work and witnessing the tests for the plant and equipment supplied under the Contract.

1.3 **Appointment of IIB**

The Purchaser, at his own discretion, may appoint either the Contractor's nominee or a different IIB to act on his behalf for inspection and witnessed testing of the plant and equipment as required for the Contract.

1.4 **Declaration of Conflict of Interest**

The IIB and their representatives shall not be any associated body of the Contractor, and shall declare that there is no perceived conflict of interest for them to carry out inspection and witnessed testing duties of the plant and equipment as required for the Contract.

The representative of the IIB who carries out the inspection and witnessed testing shall also be required to declare in the inspection report that he has no conflict of interest with the manufacturer of the equipment being inspected or tested.

1.5 Acceptance Tests

Acceptance tests shall be carried out to verify that the electrical, mechanical and instrumentation equipment, software and hardware are free from failures. The operation is validated and the performance of the plant is assessed. The acceptance tests shall achieve the followings:-

	Type Test	Factory Acceptance Test (FAT)	Site Acceptance Test (SAT)
Technological Conformity	✓		
Performance	✓	✓	✓
Functional Conformity		✓	✓
Commissioning			✓

For any requested inspection, the Contractor shall complete prior inspections and testing to ensure that equipment is ready for inspection and acceptance by the IIB, the Purchaser and / or governing authorities. The Contractor shall draw up a plan, document detailed procedures, record test results and make conclusions in the test report.

The Contractor shall take responsibility for quality control services of the plant and equipment including calibration of testing instruments, supply of all necessary material, replacement of non compliance equipment and workmanship, etc.

If the results of required inspections, tests or similar services are unsatisfactory or do not meet the requirements, the reinspection and / or retesting shall be the sole responsibility of the Contractor.

1.6 Validation Final Report

Testing shall be run to ensure quality of plant and equipment. Validation of the equipment shall be implemented through the qualification steps including Design Qualification (DQ), Installation Qualification (IQ), Operational Qualification (OQ) and Performance Qualification (PQ).

The process of equipment qualification shall commence in a DQ stage. This qualification is an examination of the design against specified requirements. Documents published by manufacturers including data sheets, drawings, etc. shall be provided.

Installation and operating instructions in compliance with the manufacturers' specifications, codes, safety and design parameters, detailed instructions for setting up the equipment, interface descriptions, installation diagrams, etc. shall be provided to perform IQ on site and at the time of the installation.

OQ is gone through subsequent to the installation to verify functional Specification. Measurements shall be documented in test reports. Standard operating procedure shall be provided.

PQ shall test the plant for specific application performance to confirm the correct operation of all equipment, hardware, software and accessories and procedures that combine to run the design and approval process.

Inspection and documented approval of individual equipment shall be accomplished prior to requesting substantive completion inspection and testing of the plant.

On successful completion of qualification testing and approved test reports, the Contractor shall forward the purchaser a validation report to certify that the equipment is ready for use in the plant for which it is designed.

2. CONTRACTOR'S RESPONSIBILITY

The Contractor shall be responsible for the quality control activities of the plant and equipment.

2.1 Nomination of IIB

If required under the Contract, the Contractor shall nominate a suitably qualified IIB for the inspection. The Contractor shall forward his nominee's curriculum vitae and a statement of his previous experience in a similar capacity to substantiate his suitability. The Purchaser reserves the right to appoint either the Contractor's nominee or a different IIB.

2.2 Place of Inspection

The Contractor shall state the place of inspection for each item of equipment. The preferred location is the manufacturer's works for the FAT.

2.3 Notice to IIB

The Contractor shall give the IIB a minimum of 15 working days' notice in writing when the equipment is ready for inspection.

2.4 Facilities for Inspection

The Contractor shall provide access to the IIB for inspecting and testing of the equipment, during its production or when production is completed. He shall provide facilities for such inspection including all materials, testing instruments, appliances and labour required for such purpose.

2.5 Testing

The Contractor shall carry out all tests specified. Any item or components found to be defective, inferior in quality, or fails to achieve the specified performance criteria shall be rejected. The Contractor shall replace or make good any rejected items at his own expense. The Contractor shall record all test readings during the witnessed tests and obtain the IIB's signature on the result sheets. A copy of the result sheets shall be handed over to the IIB at the end of the test. Results of tests which are required to be carried out but not witnessed shall be made available to the IIB for reference.

2.6 Calibration of Testing Instruments

The accuracy of the testing instruments shall be higher than that required for the equipment being measured and / or calibrated. Only instruments, which have been calibrated and certified for such accuracy traceable to International Standards by a recognised testing authority within 12 months preceding the tests, shall be used. The calibration certificates for all instruments shall be made available to the IIB at the time of the inspection.

2.7 Approved Documents

The Contractor shall supply a copy of the Contract Conditions and Specification for the equipment and one complete set of documents approved by the Purchaser including drawings, technical schedules, components lists, and test data sheets to the IIB at least 2 weeks prior to the inspection.

2.8 Re-inspection

If the equipment fails the inspection, the Contractor shall make arrangement with the IIB for a re-inspection after making good or replacing any defective/sub-standard items. No extension of time for the delivery of the equipment shall be given due to such re-inspection.

2.9 Safety

The Contractor shall take all necessary precautions and make available all necessary protective gears and facilities to ensure the safety of the personnel of the IIB during the inspection. The IIB shall not be required to sign any form of waiver or indemnity concerning his presence or actions at the place of inspection.

2.10 Reporting

The Contractor shall forward to the Purchaser and the IIB a complete set of test result sheets immediately after the tests and a complete test report within 1 week of the inspection. The written test report shall include, but not be limited to, the following details:-

- (a) Test data and results for each test bearing the IIB's signature and the date of test.
- (b) Sample calculation for each derived (not directly read) quantity.
- (c) Test results verifying all declared functions and performance characteristics.
- (d) Results and calculations for other tests called for in the Specification, but not required to be witnessed by the IIB.
- (e) Type test results and certificates called for in the Specification.
- (f) Calibration certificates issued by accredited institutes for all instruments used for the testing.

The Contractor shall not despatch the equipment for shipment until the IIB and the Purchaser have given their consent in writing. Such consent shall not relieve the Contractor from any of his liabilities under the Contract.

2.11 Equipment Acceptance

The Contractor shall coordinate and schedule the work in advance. All major quality control activities shall be shown in the programme of work for the approval of Purchaser.

The Contractor and / or the manufacturer's representatives shall carry out inspection, testing and commissioning on equipment and process validation on site to confirm acceptable operation and compliance. The Contractor shall submit written Request for Inspection Forms to the Purchaser at least 5 working days for the SAT.

The SAT shall be more extensive than the FAT to assure that the equipment, software and / or hardware perform the same as in the manufacturer's works with additional requirements at site conditions.

The application software programmes and the compatibility with the hardware shall be validated in IQ. Commissioning demonstrates that plant and equipment documentation, construction and installation comply with the Specification.

3. IIB's RESPONSIBILITY

The IIB shall be responsible for the following aspects of the inspection, testing and reporting on the equipment.

3.1 Physical Inspection

The IIB shall carry out physical inspection of the equipment to check for compliance with the Specification including but not limited to the following aspects:-

- (a) Dimensions - agreement with approved drawings and Specification.
- (b) Construction - materials, quality of materials, finish, workmanship and agreement with approved drawings and Specification.
- (c) Rating plates - agreement with technical schedules.
- (d) Components - agreement with the approved component list regarding manufacture, country of origin, rating and enclosure protection.

The IIB shall ensure that a complete set of approved drawings, technical schedules and approved component lists is available prior to the inspection. A copy of the Contract Conditions and Specification for the equipment shall be supplied to the IIB by the Contractor.

3.2 Witnessing Tests

The IIB shall check that the tests are carried out in accordance with the specified requirements and conditions, where applicable the IIB shall refer to relevant International Standards / national standards or statutory requirements of the Hong Kong Special Administrative Region (HKSAR). The IIB shall check the calibration certificates for the testing instruments and ensure that instruments with the appropriate accuracy traceable to International Standards are used. At the end of each test he should certify the test results and obtain a copy of the result sheets.

3.3 Inspection Report by IIB

Within one week of the completion of the inspection the IIB shall forward a copy of his report, duly signed and endorsed, to the Purchaser. The IIB shall forward the **original** copy of the report to the Purchaser within 1 month of the completion of the inspection and witness tests. The written report of each inspection, test or similar service shall include, but not be limited to:-

- (a) Observations during the inspection and testing.
- (b) List of approved drawings (with revision reference and approval date) and technical schedules against which the equipment was checked.
- (c) Copy of approved equipment and component list.
- (d) Description of each witnessed test with reference to relevant clauses in the Specification, International Standards or other national standards, where applicable.
- (e) Test data and performance curves, compiled for each test and include any multiplication factors, where applicable.
- (f) List of measuring instruments with serial numbers and a copy of their calibration certificates.
- (g) List of items which fail the inspection and reasons for failure.
- (h) Declaration of no conflict of interest with the manufacturer of the equipment.
- (i) Other recommendations.
- (j) Acceptance of the equipment for shipment or requirement of a re-inspection and / or retesting.
- (k) Interpretations of test results.
- (l) Comments or professional opinion as to whether inspected or tested work complies with requirements of the Contract.
- (m) Manufacturer's registered name.
- (n) Manufacturer's work location.
- (o) Project title and number.
- (p) Name, address and telephone number of IIB.
- (q) Dates and locations of inspections and / or tests.
- (r) Name of IIB representative making the inspections and / or tests.
- (s) Date of issue.

The IIB's inspection report shall be independent of the Contractor's test report. The IIB shall forward his report to the Purchaser instead of waiting for the availability of the Contractor's report.

3.4 Checking of Contractor's Report

The IIB shall scrutinise the Contractor's report to ensure that the results are in accordance with the actual tests and the equipment complies with the Specification. Special attention shall be paid to the following:-

- (a) Completeness.
- (b) Accuracy of test results.
- (c) Accuracy of calculations.
- (d) Verification that all declared performance & withstand characteristics are achieved.

If the IIB is not fully satisfied with the report or in his opinion the equipment does not fully comply with the Specification, he shall inform the Purchaser immediately. Equipment shall not be released for shipment until the Contractor remedies all defects and deficiencies. Any non-conforming equipment and items shall be clearly identified and segregated to prevent unauthorized use.

3.5 Re-inspection

The IIB shall carry out re-inspection after the Contractor has made good or replaced the faulty equipment.

3.6 Release of Equipment for Shipment

When the IIB is satisfied that the inspected equipment complies fully with the Specification (except for any deviation accepted by the Purchaser in writing) he shall seek consent from the Purchaser prior to releasing the equipment for shipment. He shall examine and certify the method of packing and protection for compliance with the Specification. The IIB shall forward the Contractor's test report immediately to the Purchaser with the following:-

- (a) Declare that the equipment complies with the Specification (except for any deviation accepted by the Purchaser in writing) and that the test report is complete and correct; and
- (b) Declare that the method of packing complies with the Specification.

QUALIFICATIONS AND EXPERIENCE OF IIB

The respective representatives of the IIB for carrying out inspection or witnessing tests and for endorsing the report for inspection and witnessed tests shall possess the following qualifications and experience. Unless otherwise specified in this specification, the person who carries out inspection/witnessing test shall not be the same person who endorses the report for inspection/witnessing test.

Equipment to be inspected / tested	Qualifications of IIB's representative for carrying out inspection / witnessing test	Qualifications of IIB's representative for endorsing the report for inspection / witnessing test
H.V. equipment (Including switchboard, motor, capacitor, transformer)	The person shall at least be a holder of higher certificate in electrical engineering and have at least 5 years of experience in the inspection of the equipment, software and hardware being inspected and tested.	The person shall be a corporate member of the electrical discipline of a professional institution; and have at least 5 years of experience in the inspection of the equipment, software and hardware being inspected and tested.
L.V. equipment (Including switchboard, control panel, capacitor, battery, standby generator, motor, wind turbine, variable speed drive, photovoltaic panel, electrochlorinator)	The person shall at least be holder of higher certificate in electrical engineering and have at least 5 years of experience in the inspection of the equipment, software and hardware being inspected and tested.	The person shall be a corporate member of the electrical discipline of a professional institution; and have at least 5 years of experience in the inspection of the equipment, software and hardware being inspected and tested.
Instrumentation equipment (Including flowmeter, SCADA, telemetry equipment, uninterruptible power supplies, communication equipment, control system)	The person shall at least be holder of higher certificate in electrical, electronic, communications, telecommunications, computer and / or information engineering, where applicable and have at least 5 years of experience in the inspection of the equipment, software and hardware being inspected and tested.	The person shall be a corporate member of the control, automation & instrumentation, electrical, electronics or information technology discipline of a professional institution, where applicable; and have at least 5 years of experience in the inspection of the equipment, software and hardware being inspected and tested.

Equipment to be inspected / tested	Qualifications of IIB's representative for carrying out inspection / witnessing test	Qualifications of IIB's representative for endorsing the report for inspection / witnessing test
*Pressure / Surge Vessel (Hydraulic test and examination)	The person shall at least be a holder of diploma or certificate in mechanical or marine engineering or a relevant engineering discipline. He shall be an appointed examiner defined under the Boilers and Pressure Vessels Ordinance of the HKSAR or shall hold the equivalent qualification satisfying local statutory requirements. He shall have at least 5 years of inspection experience in the relevant field.	The person shall at least be a holder of diploma or certificate in mechanical or marine engineering or a relevant engineering discipline. He shall be an appointed examiner defined under the Boilers and Pressure Vessels Ordinance of the HKSAR or shall hold the equivalent qualification satisfying local statutory requirements. He shall have at least 5 years of inspection experience in the relevant field.
Pressure / Surge Vessel and Pipe Fitting (Non-destructive testing of welded joints)	The person shall hold an appropriate certificate of competence (i.e. certified to be competent to carry out non-destructive tests stipulated in the design standard of the equipment) which is recognised by the local Authority. He shall have at least 5 years of inspection experience in the relevant field.	The person shall hold an appropriate certificate of competence (i.e. certified to be competent to carry out non-destructive tests stipulated in the design standard of the equipment) which is recognised by the local Authority. He shall have at least 5 years of inspection experience in the relevant field.
Valve and Pipe Fitting (Hydraulic test and examination)	The person shall at least be a holder of diploma or certificate in mechanical or marine engineering or a relevant engineering discipline. He shall have at least 5 years of inspection experience in the relevant field.	The person shall at least be a degree holder in mechanical or marine engineering or a relevant engineering discipline. He shall have at least 5 years of inspection experience in the relevant field.

Equipment to be inspected / tested	Qualifications of IIB's representative for carrying out inspection / witnessing test	Qualifications of IIB's representative for endorsing the report for inspection / witnessing test
Pumpset (Performance test)	The person shall be qualified with a degree in mechanical or marine engineering or relevant discipline, and have at least 5 years of experience in the relevant field.	The person shall be qualified with a degree in mechanical or marine engineering or relevant discipline, and be a corporate member of a mechanical, or marine or relevant discipline of a professional institution; and have at least 5 years of experience in inspection of similar equipment.
*Chlorine Pipework	The person shall at least be a holder of diploma or certificate in mechanical or marine engineering or a relevant engineering discipline. He shall be a FSD authorised surveyor. He shall have at least 5 years of inspection experience in the relevant field.	The person shall at least be a holder of diploma or certificate in mechanical or marine engineering or a relevant engineering discipline. He shall be a FSD authorised surveyor. He shall have at least 5 years of inspection experience in the relevant field.
Overhead Crane (Inspection)	The person shall at least be a holder of diploma or certificate in mechanical or marine engineering or a relevant engineering discipline. He shall have at least 5 years of inspection experience in the relevant field.	The person shall be a registered professional engineer in mechanical or marine engineering discipline; and be a competent examiner defined under the F&IU (Lifting Appliances and Lifting Gear) Regulations of the HKSAR or holding equivalent qualification satisfying local statutory requirements.

Equipment to be inspected / tested	Qualifications of IIB's representative for carrying out inspection / witnessing test	Qualifications of IIB's representative for endorsing the report for inspection / witnessing test
*Overhead Crane (Load Test)	The person shall be a registered professional engineer within a relevant discipline satisfying the local statutory requirements; and be a competent examiner defined under the F&IU (Lifting Appliances and Lifting Gear) Regulations of the HKSAR.	The person shall be a registered professional engineer with a relevant discipline satisfying the local statutory requirements; and be a competent examiner defined under the F&IU (Lifting Appliances and Lifting Gear) Regulations of the HKSAR.

Note : * For this particular item, it is acceptable that the person who carries out inspection/witnessing test is the same person who endorses the report for inspection/witnessing test.

- End of this specification -