NORTH LONDON WASTE AUTHORITY

ICHEME

SCHEDULE 14: CRITERIA FOR COMPLETION OF CONSTRUCTION

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1. INTRODUCTION

This Schedule covers the criteria to confirm completion of construction for the Plant. Completion of construction will only occur when everything described in this Schedule of the Contract is physically complete, subject to the Snagging List. Once a turn over package (TOP, as more specifically described in section 1.1 below) has achieved construction completion, the TOP shall undergo the prescribed tests and inspections as outlined in this Schedule.

The ~~Purchaser,~~ Project Manager and any person authorised by them (including the Operator) shall have the right to inspect the completion of construction and relevant tests. The Contractor shall demonstrate that every individual ~~Section~~section of the Plant (TOP, as more specifically described in section 1.1 below) has been manufactured, constructed and installed in accordance with the Specifications.

The Contractor shall not start cold testing of a TOP until the ~~Project Manager has issued a Construction Completion Certificate~~construction completion has been certified by the Contractor's commissioning manager for that TOP and for all other TOPs that are required to enable the commissioning ~~operations~~operation to be carried out without compromise to the health and safety of personnel on Site and the integrated safety systems.

The Project Manager shall, in accordance with Sub-clause 32.6 of the Conditions of Contract, issue the Construction Completion Certificate for the Plant within 10 Business Days of the last TOP Construction Completion Certificate.

1.1 Completion of construction plan

1.1.1 Turn Over Packages (TOPs) Definition:

The concept of turn over packages (or TOPs) is based on the systematic division of the Works into separate packages consisting of groups of elements or items of the Works that can be grouped together as individual works packages which (as separate turnover packages) perform their own function, process or service (such as, for example, civil works) and so can be treated independently of other elements or items of the Works.

These TOPs may be further divided into smaller, more manageable packages called Sub-TOPs.

TOPs and Sub-TOPs shall be proposed by the Contractor's commissioning team and will be the foundation on which the acceptance and the turnover of parts of the Plant are made from construction to commissioning. The Contractor shall ensure the contents of each TOP are defined as soon as practicable and issued to the Project Manager for ~~approval in accordance with the requirements of section 2.5 of Schedule 15 *Take Over procedures*~~review and comment.

Similarly, the TOPs will form the basis on which the Contractor performs the Works as well as the pre-commissioning and the commissioning programme. The TOPs will be divided according to the priorities provided by the Contractor's ~~home office~~ commissioning manager and be based on the Plant logic start-up and commissioning need.

The Contractor shall clearly define the commissioning TOPs in the Contractor's plans (PID, single line diagram, etc.) so that its contents are clear to all.

1.1.2 Completion of Construction Plan

The Contractor shall submit to the Project Manager for review and ~~approval~~comment its plan, completed with construction completion report index~~,~~ for the completion of construction no later than ~~six~~twelve months before the due date for construction completion of the first TOP.

The Contractor may organise completion of the Works in TOPs to enable first fire on waste at the earliest available instance provided it is safe to do so. In this instance, the Contractor shall include in the completion of construction plan a full breakdown of its plan for completion of Plant TOPs.

For the avoidance of doubt, the Contractor may propose an alternative arrangement for construction and commissioning activities to the order indicated in the Specification. The Contractor must clearly detail all changes to the order of completion of activities as part of its preparation of the completion of construction plan and the commissioning plan (see also Schedule 15 *Take Over Procedures*).

The plan shall include a template for the TOP Construction Completion Certificate (TOP CCC) for the ~~Plant and/or~~ each section / individual subsystem(s) ~~and the civil works~~. The Contractor shall list all supporting Documentation that will be available for inspection by the ~~Purchaser~~Project Manager at the point of submission of the TOP CCC. ~~The Contractor shall ensure all listed Documentation is aligned with the Master Information Delivery Plan (refer to Schedule 2 *Documentation*). The Project Manager shall, in accordance with Sub-clause 32.8 of the Conditions of Contract, issue the Construction Completion Certificate for the Plant within 10 Business Days of signing the last TOP Construction Completion Certificate.~~

~~In each case the Contractor shall not proceed without the Project Manager's prior written approval, such approval not to be unreasonably withheld.~~

1.2 Minor items requiring completion

The Contractor shall conduct its own inspections and testing of the Works as part of preparation of the draft TOP CCC to check fulfilment of the requirements in the Contract and prepare a list of any minor non-material Defects requiring completion before the issue of a Take Over Certificate (further detail in Schedule 15 *Take Over procedures)* which do not affect the performance of the Plant or pose any risk to health and safety (the "**Snagging List**").

The Snagging List shall contain ~~all~~the Defects to be rectified and ~~the corrections~~all remaining works required to complete the Plant in accordance with the Contract. The Snagging List shall capture all the ~~Defects~~items from the issue of the Construction Completion Certificate until the Take Over Certificate is submitted. The Snagging List shall be updated continuously by the Contractor until such time as all items are properly complete.

Any additional findings from the ~~Purchaser's and~~ Project Manager's witnessing of testing, inspections, and its review of the draft TOP CCC shall be added to the Snagging List.

The Snagging List items shall be categorised as follows~~; all categorisation shall be approved by the Project Manager~~:

Category	**Definition**	**Consequence**	**Resolution Requirement**
Category A -	Item identified as presenting a safety risk. This may include TOP work items that have not been completed, missing equipment/items or the completed TOP presenting a safety risk.	The TOP cannot be accepted by the Commissioning Team for commissioning activities. The Construction Team will need to remedy the defect for the TOP to progress to cold testing.	Remedy before the start of cold testing.

Category	Definition	Consequence	Resolution Requirement
Category B	Item identified as presenting a risk or issue for operations but not presenting a safety risk.	Allows cold testing to be undertaken, but hot testing cannot be undertaken before resolution of the item.	Requires resolution before hot testing, with a target closing date set for each item.
Category C	Outstanding item, deficiency, or incomplete work which may affect a functional, quality, documentation, or completion requirement of the TOP, but does not compromise the safety of personnel, equipment, or the safe and normal operation of the plant.	Given the nature of these items, there is a need to distinguish these items from routine maintenance activities. For example, the replacement of lamps, oil, grease, fuses, or other consumables due to normal wear, deterioration, or the end of their service life shall not be considered punch items, but maintenance activities.	Remedy before Take Over of the Plant, unless otherwise agreed by the relevant parties.

~~A. Remedy before the start of cold testing~~
~~B. Remedy before the start of hot testing~~
~~C. Remedy before Take Over of the Plant~~

~~The Project Manager shall not approve completion of construction for the Plant until such time as the Contractor has submitted all final draft CCC(s) and has rectified all Snagging List items in category A. The Contractor shall note that the Project Manager reserves its right to withhold approval if a significant number of lower level (B or C) Snagging List items are present.~~

1.3 TOP construction completion report

The Contractor shall submit a TOP construction completion report for the Plant in support of any draft TOP CCC submitted for Project Manager ~~approval~~review and comment.

The construction completion report will include documentary evidence which, in conjunction with any visual inspection that the ~~Purchaser and~~ Project Manager may wish to make, is sufficient to determine that the Plant (or the component functional system) is ready for cold testing and subsequently the Trial Operation Period tests (as defined in Schedule 15 *Take Over procedures)*.

The Contractor shall present Documentation in a logical order, grouped (where applicable) into identifiable process systems or TOPs. Documentation shall include, but not be limited to:

- Completed installation checklists for:
  - Mechanical equipment: alignment, lubricants charged, packing removed, manufacturer's test certificates,
  - Vessels: internal checks, safety valve settings and certificates, pressure test certificates,
  - Piping systems: ~~construction cleaning and flushing records,~~ pressure test certificates, onsite NDT results, adjustment of pipe hangers,
  - Electrical equipment and cabling, including insulation (mega-ohm) checks
  - construction checks required by the Distribution Network Operator (DNO),

    - Manufacturers' tests,
- Piping and vessel pressure test record complying with Pressure Equipment Safety Regulations 2016 (Including UK Approved body sign off when applicable).
- Where applicable
    - Painting records
    - Fire test certificates
    - Safety certificates.
    - Draft O&M Manuals
    - Draft H&S File
    - Records showing that the risk close-out workshop(s) has been completed (see section 2.5 of this Schedule)
- Record showing that the cleaning activities have been completed (see section 3 of this Schedule)

2. CONTRACTOR'S COMPLETION OF CONSTRUCTION INSPECTIONS AND TESTS

The Contractor shall conduct completion of construction quality assurance testing at Site. This shall comprise pre-commissioning checks and tests in addition to inspections that the Contractor shall carry out throughout the construction period. The Contractor shall include in its plan for completion of construction full details of all testing to be carried out and shall address all areas of the Works ~~and:~~in compliance with the Conditions of Contract.

- ~~Provide full procedures including safety aspects of tests (exclusion zones, emergency preparedness etc.)~~
- ~~Meet the requirements of the Contract and the safety conditions~~
- ~~Ensure the Works have been executed with good workmanship~~
- ~~Conform with the prevailing standards and codes and Good Industry Practice.~~

2.1 Process M&E works equipment

Pre-commissioning activities shall ensure that all individual mechanical and electrical plant items, and control and instrumentation systems, are checked, witnessed and documented to function as expected, safely and in isolation.

The Contractor shall prepare a list of all components (including drive systems and instrumentation equipment), subdivided into TOPs. When all of the component checks have been completed, all of these components are to be listed and each item on the list initialled by the Contractor.

The Contractor shall prepare detailed procedures and checklists for each type of equipment (e.g. pumps, conveyors) and submit to the Project Manager for ~~approval~~review and comment.

A thorough programme of testing and inspection of the Plant shall be conducted and documented by the Contractor. The Contractor shall carry out the following activities / checks as a minimum:

- Checks of pre-installation tests undertaken by manufacturers including welding and pressure tests, as required.
- Plant is as detailed in all Documentation, including Piping & Instrumentation Drawings (P&ID), and layout drawings
- Plant meets all relevant Specification(s) including mechanical and electrical properties.
- Plant safety systems installation including signage, lighting installation, insulation, galleries, steps and platforms
- Control and verification of location
- Condition of insulation and protection
- Control and check of all welding and joints in piping systems and components
- Hydraulic and / or pneumatic pressure testing of equipment and pipework
- Certification of the designs (including drawings) and installation of pressure containing and vacuum containing items in accordance with the Pressure Equipment Safety Regulations 2016
- Certification of lifting equipment in accordance with the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)
- Other statutory tests, for example electrical installation checks
- Mechanical and electrical safety systems checks and adjustments; confirming safety equipment is installed, according to relevant standards

- Check ~~and demonstrate to the Project Manager~~ the arrangements to carry out operation and maintenance safely and effectively and in accordance with Schedule 4 *Health & Safety*
- Handing over of test certificates, in particular those required by statute or insurers, relating to any item of ERF Equipment or Material
- Calibration of instrumentation.
- Checking alignment of major machinery and drivers; particularly rotating equipment which was coupled on the Site with other rotating parts (for example motors, pumps, gearboxes, generators, and so on)
- Installation of gland packing and lubrication of valves and minor machinery
- Isolating equipment, removing expansion joints, rupture discs and relief valves from pipework and equipment before line flushing, cleaning and testing and reinstalling thereafter. Final TOP cleaning shall be performed by Contractor's commissioning team during either cold-commissioning or hot-commissioning, depending on the nature of the cleaning.
- Setting and testing non-return valves, relief valves and other relief systems e.g. bursting discs
- Installing orifice plates after line cleaning, installation of temporary and commissioning strainers, removal of slip plates
- Checking of clearance gaps and flanges on flameproof equipment to ensure that they are in a clean condition.
  The Contractor's commissioning team has verified that all construction activities have been completed and the TOP is ready for handover.
  All painted work is to the standard required under the Contract and touched-up, carefully matching colour and brushing out edges where necessary (further details in Schedule 22.1.7 *General Technical Requirements).*

For pressure tests requiring the presence and acceptance from Notified Bodies~~, the Purchaser~~ and the Project Manager shall be invited to ~~inspect~~attend such tests with the Notified Bodies.

2.2 Building services M&E equipment

The Contractor shall carry out the following activities as a minimum in relation to the building services works elements either during completion of construction or the commissioning period:

- Testing of the fire protection systems, including checking all firefighting equipment meets the requirements of BS 5306 ’Fire Extinguisher installations and equipment on premises’ (or equivalent) and BS 5839 ‘Fire detection and alarm systems for buildings’ (or equivalent).
- All life safety systems (in addition to the above) have appropriate certification records in place and have been signed off by the relevant accredited party/engineer.
- Testing of the goods and passenger lifts
- All ventilation, heating, emission, odour and noise abatement equipment is fit for purpose and in working order, tested and commissioned, witnessed and signed off and performing to the standard required by the Contract and in line with the Chartered Institution of Building Services Engineers (CIBSE) commissioning code using plant specific commissioning procedures
- Satisfactory completion, test and commissioning certificates shall have been submitted to the Project Manager in relation to all relevant elements of the building services M&E. The originals of these documents shall be placed in the operating manuals.
- All service and utility connections are made (external and internal to the Site), inspected and tested and necessary permits, consents, and certificates are in place.

- The Contractor has developed and lodged an energy performance certificate(s) for the Works in compliance with building regulations.
- Unless otherwise agreed with the Project Manager, all external building services M&E elements of the Works are complete including but not limited to: security, CCTV, electrical and lighting.

~~• Verifying that all other checks (functional or otherwise) have been carried out.~~

The Contractor shall refer to Schedule 15 *Take Over procedures* for additional commissioning of building services M&E equipment to be carried out during the Trial Operation Period.

Building services and M&E Equipment TOPs, as with all other TOPs, will undergo construction completion, cold testing and hot testing in accordance to the commissioning and execution plan.

2.3 Civil and building works

The Contractor shall carry out the following activities as a minimum in relation to the civil & building works elements to achieve completion of construction. These activities may be carried out either within the construction phase or the commissioning phase, but in any case they must have been performed before the Trial Operation Period commences:

- The Plant is complete to enable its occupancy and the safe movement and processing of ERF Contract Waste, in compliance with environmental and health and safety standards.
- Satisfactory test results / certificates in an agreed format have been submitted to the Project Manager, including but not limited to;
    - Piling – including dynamic load testing
    - Concrete cubes
    - Civil drainage pressure testing
    - Drainage CCTV survey
    - Lifting beams
    - Workshop cranes
    - Concrete mix design
    - Structural steelwork sections
    - Concrete reinforcement
    - Structural fill
    - Structural integrity of roof, walls etc.
    - Gas protection installation
    - Water leak test for the waste bunker
    - Testing and inspection of all civil drainage systems, and
    - Cathodic protection

- Issuance of final certification from building control
- Draft operating manuals in relation to all relevant aspects of the building & civil works elements have been provided for review and ~~approved~~comment by the Project Manager
- Inspection and approval of all access platforms and walkways – including ensuring escape routes are cleared and clearly identified

~~• Regulatory approval for processing of ERF Contract Waste and occupation of the Plant has been obtained from relevant authorities and the fire officer and relevant insurance approvals have been obtained~~

- Appropriate air-tightness between bunker / tipping hall and all surrounding buildings

~~• Office accommodation is complete, fitted out and finished in accordance with the Contract; including acoustic and vibration separation from the waste bunker~~

- ~~Completion of all external works including but not limited to: roadways, hard-standings, bays, drainage, fencing, gates, landscaping~~
- ~~Temporary markings, coverings and protective wrappings are removed unless agreed otherwise with the Project Manager.~~

2.4 Architectural completion and reporting

The Contractor shall reference Schedule 22.4 *Architectural Specifications* for details on the specific requirements in reporting, testing and approval of construction of architectural elements of the Plant.

2.5 Risk close-out workshops

The Contractor shall conduct the risk close-out workshop / meetings to ensure that all risks have been handled and properly mitigated and all actions and recommendations from the HAZOP are closed (further detail on HAZOP requirements is in Schedule 22.3.5 *Safety in design*),

The workshop shall involve the necessary competent parties including, but not limited to, Contractor's experts, Subcontractors, Project Manager, Purchaser and Operator.

In accordance with the reviewable Design Data detailed in Schedule 2 *Documentation,* the Contractor shall present to the Project Manager risk assessment methodology and Documentation templates containing a complete and detailed description of areas to be covered by the risk close-out workshop / meetings at least two weeks before the agreed workshop date. The workshop shall not take place until such time as the Project Manager has reviewed and approved the risk assessment methodology and Documentation template. Where the Project Manager does not approve the risk assessment methodology and Documentation templates, the Contractor shall submit updated risk assessment methodology and Documentation templates to the Project Manager for approval.

In addition, the Contractor shall present to the Project Manager updated Documentation and background material including but not limited to Piping & Instrumentation Diagrams (P&IDs), Process flow diagrams (PFDs), functional descriptions, material lists and isometrics at least two weeks before the assessment schedule date.

The Contractor shall issue to the Project Manager for approval a record of each risk close-out workshop and its results, no later than one week after each workshop has been held.

3. PROVISIONS FOR SYSTEM CLEANING

The Contractor shall ensure the following system cleaning provisions are completed as part of the pre-commissioning activities and throughout the Take Over procedures (as detailed in Schedule 15 *Take Over procedures*):

- Internal cleaning of the water/steam side of the boiler and associated tubes and pipes shall be conducted in accordance with the latest version of VGB-S-513 (formerly VGB-R 513E) unless otherwise instructed in the Specification.
- The Contractor shall take measures during construction to verify that blowing-out of the entire live-steam system, including the turbine bypass pipe system, can be carried out safely and efficiently~~ and without causing excess noise during hot testing~~.
- The Contractor shall verify that the steam and condensate system piping and fittings are free from any mechanical or other obstruction to keep the period of steam blowing of the steam system as short as possible.
- The Contractor shall provide sufficiently dimensioned auxiliary equipment and silencers for steam blowing. This shall be mounted by the Contractor and subsequently dismantled on completion of the steam blowing.
- During cold testing and prior to steam blowing, the Contractor shall conduct chemical cleaning by flushing, degreasing, acid cleaning and passivation. The Contractor shall verify during construction that chemical cleaning can be carried out safely and efficiently. The Contractor is responsible for handling of all aspects of chemical cleaning including handling of related environmental issues such as disposal of chemicals. ~~Chemicals used for the cleaning shall be approved in advance by the Project Manager.~~
- All fluid systems shall be flushed; systems shall be kept clean prior to and during construction to minimise flushing times, and consequently loss of fluid. All equipment and piping of the entire steam and condensate system shall be provided with a sufficient number of nozzles for draining and flushing.
- The Contractor shall ensure that all safety devices such as valves, which are shut off during pressure tests, are put back into operation after the test. The Contractor shall document such measures as part of the construction completion report. Removing loose material and dirt, installation of internals, inspections and closing up of vessels.
- Applying special treatment or other preparation of internal surfaces.
- Verifying that all drying out operations have been carried out successfully.
- The Contractor shall ensure the Plant is thoroughly cleaned inside and out, including all ductwork and voids. All surfaces shall be maintained free of dirt and dust until Take Over.
- Unless otherwise agreed with the Project Manager in relation to any Snagging List items, all splashes, deposits, efflorescence, rubbish and surplus materials are removed from Site or that part of the Site being evaluated for acceptance.
- The Plant is secure with all accesses closed and locked where appropriate. The Contractor shall ensure all keys are accounted for and adequately labelled and provided to the ~~Purchaser~~Project Manager with an itemised schedule.

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