

ADDITIONAL SPECIFICATION**SB OPERATING AND MAINTENANCE MANUALS****CONTENTS**

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SB 01 SCOPE

The Contractor shall be responsible for the compilation of complete sets of Operating and Maintenance Manuals. A separate Operating and Maintenance Manual shall be supplied for each Sub-Installation where required and as defined in the Additional Specification SA: General Maintenance.

SB 02 PROCEDURE FOR SUBMISSION OF MANUALS**SB 02.01 SUBMISSION OF DRAFT MANUALS**

A draft copy of each Operating and Maintenance Manual shall be submitted to the Engineer prior to safety inspection of the installation. Approval of the draft Operating and Maintenance Manuals shall be a prerequisite for commencement of the safety inspection in terms of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)

Where and installation/ sub-installation has an existing Operating and Maintenance Manual, the Contractor shall check whether its contents are still applicable and accurate. When drawing up his own Operating and Maintenance Manual for the installation/ sub-installation, the Contractor shall incorporate there in all such existing applicable data. The existing Operating and Maintenance Manual shall then be disposed of provided written permission to do so has been obtained from the Engineer.

The manuals will be reviewed and checked by the Engineer and returned to the Contractor with comments, where necessary. The Contractor shall make the necessary changes and amendments to the manuals to incorporate the Engineer's comments.

SB 02.02 DEVELOPMENT OF FINAL MANUALS

A final draft copy of each Operating and Maintenance Manual shall be submitted to the Engineer at least one week prior to commencement of Day 1 tests on commissioning. This set of manuals will not be accepted without the Contractor's

verification of the information contained in the manuals and the professional language editing thereof. The Engineer shall return the manuals to the Contractor, who shall make the final corrections. The Engineer will, however, not be responsible for the quality control on manuals. Approval of final Operating and Maintenance Manuals shall be a prerequisite for issuing of a Certificate of Practical Completion for Repair, Upgrade and/or New Work of the Installation/ Sub-Installation.

After the Engineer has approved the final Operating and Maintenance Manuals, the Contractor shall provide the Engineer with seven (7) sets of the manuals. Approval of the final Operating and Maintenance Manuals shall be a prerequisite for issuing of a Certificate of Completion.

SB 03 **FORMAT OF OPERATING AND MAINTENANCE MANUALS**

- (a) Manuals shall be bound in hardcover lever-arch files with plastic coatings. The files shall be clearly labelled on the front cover, as well as on the back band, with the following information:
 - (i) The title "Operating and Maintenance Manuals"
 - (ii) Name of the installation/ sub-installation (as defined in Additional Specification SA: General Maintenance)
 - (iii) Name of the contract and contract number
 - (iv) The Contractor's name, address and contact telephone number and fax (logo optional)
 - (v) Month and year in which the manuals are finally handed over to the Employer
 - (vi) Name of the User Client
- (b) Pamphlets and bound leaflets/booklets from suppliers or manufacturers shall be placed in plastic pockets.
- (c) Drawings and diagrams larger than A3 shall be folded and placed in plastic pockets to be easily removed or stored.
- (d) The sections of the manuals specified below shall be clearly partitioned.
- (e) Cross-referencing between drawings/diagrams and text shall be in a clear and consequent format.
- (f) The Operating and Maintenance Manuals shall be supplied in English.
- (g) An electronic copy of the final manual shall be handed to the engineer upon approval of the operation and maintenance manual.

SB 04 **CONTENTS****SB 04.01** **TABLE OF CONTENTS**

The table of contents shall appear on the second page and shall consist of the headings of the various sections in the manual and the relevant page numbers.

The table of contents shall essentially contain at least the following:

1. Introduction
 - 1.1 Scope of the manual
 - 1.2 General arrangement of the manual
 - 1.3 Description of installation
 - 1.4 Specifications
2. List of drawings and diagrams
3. Parts and components
4. Operating procedures
5. Maintenance
 - 5.1 Purpose of maintenance
 - 5.2 Preventative maintenance
 - 5.3 Trouble-shooting
6. Breakdown maintenance and repair
7. List of Appendices.

SB 04.02 **INTRODUCTION**

The introduction shall contain at least the following:

SB 04.02.01 **Scope of the manual**

A summary shall explain the scope of the contents.

SB 04.02.02 **General arrangement of the manual**

A brief description shall explain the way in which the manual is arranged.

SB 04.02.03 **Description of Installation/ Sub-Installation**

This section shall give a functional description of the complete installation/ sub-installation covered by the manual, including all systems and/or functional units deemed to form part thereof, as defined in Additional Specification SA: General Maintenance.

SB 04.02.04 Specifications

A summary shall be given of the specifications applicable to the particular part of the Contract.

SB 04.03 DRAWINGS AND DIAGRAMS

SB 04.03.01 Mechanical flow diagrams (MFDs) and single line diagrams

Mechanical flow diagrams (for mechanical systems) or single line diagrams (for electrical systems) of the system and/or functional unit shall be included in the Operating and Maintenance Manuals for easy reference by the operators of the installation. Diagrams shall be drawn not only for parts of an installation that have been repaired, but also for the complete installation, including all the components.

SB 04.04 PARTS AND COMPONENTS

SB 04.04.01 Equipment data sheets

A data sheet shall be drawn up for each piece of equipment and/or machine forming part of the installation and shall contain the following information:

- (a) Equipment tag number
- (b) Equipment description
- (c) Model/make/manufacture
- (d) Supplier/Reconditioning details
- (e) Ordering details
- (f) Details of fixed components
- (g) Details of lubrication
- (h) Maintenance references (refer to supplier/reconditioning technical manual).

SB 04.04.02 Technical equipment manuals

For each piece of equipment and/or machine forming part of the installation/ sub-installation the following information shall be included in this section of the Operating and Maintenance Manuals:

- (a) the supplier or reconditioning manual and/or standards of operating and maintenance instructions;
- (b) illustrated parts breakdown and/or group assembly drawings as agreed with the Engineer;
- (c) parts lists and data sheets, including all characteristic curves for machines indicating operation point, efficiency, power consumption, etc;
- (d) calibration charts, and
- (e) test certificates for hydraulic pressure tests, flame-proof grading, materials, non-destructive examinations, coating and lining details, etc.

Each detailed description shall be accompanied by a set of engineering drawings. From the drawings the functionality of each part or component used, as well as the special characteristics associated with the part or component shall be very clear.

SB 04.04.03 Parts and components list

A detailed description shall specify all the parts and components used for the duration of the Contract. This description shall include new parts and components, as well as existing parts and components that have either been reconditioned or used as specified in the Contract.

The description shall state at least the part or component number, part or component name, the size of the part or component, an explanatory description, the quantity used, the material of which the part or component is made, the coating (if any), date of purchase, as well as any relevant remarks as to the application thereof.

Details of the manufacturer of the part or component shall also be listed. This shall at least state the name, address, telephone number, fax number and name of a contact person.

The supplier of the part or component shall also be stated and shall include at least the name, address, telephone number, fax number, name of a contact person and an alternative supplier (if available).

SB 04.04.04 Drawings

Drawings shall contain a descriptive heading, an explanatory key and relevant comments. Drawings shall be done on a computer-aided design package approved by the Engineer.

A compound drawing for all subassemblies shall clearly indicate how and where the various parts fit in the subassembly. The compound drawing shall be linked to the equipment data sheets and parts and components list and shall clearly specify the parts or components used, their model numbers, their sizes and the quantities used. The compound drawings shall also be accompanied by a short description explaining the workings of the subassembly, as well as the assembly of the parts or components to complete the subassembly.

SB 04.05 OPERATING PROCEDURES

The operating instructions shall be a step-by-step description of the manual start-up and shut-down procedure for every piece of equipment and/or process reconditioned, repaired or supplied with references to the MFDs. For automatic operation the operators shall be referred to the automatic control manual (if applicable).

The functioning of the installation shall be clearly described, using a flow diagram depicting the interrelationships among the various subassemblies. The subassemblies shall be described by descriptive drawings.

Each mechanical or process flow diagram shall contain at least a heading, relevant comments and a key.

Every subassembly shall also have its own flow diagram explaining the operation of the subassembly, as well as the application of each part and component. The application of the subassembly shall also be very clear. The flow diagram shall consist of at least a heading, relevant comments and an explanatory key.

A detailed description shall be given of all operational systems forming part of the installation, explaining the operation and functioning of the system and the number of operations personnel required for performing the operation successfully.

The preparations, which are required before the system can be operational, shall be clearly stated and explained.

The operation tasks shall be clearly explained with reference to dangerous situations that might occur. Hazardous operations shall be explained in great detail and cover all the applicable safety precautions.

SB 04.06 **MAINTENANCE**

SB 04.06.01 **Purpose of maintenance**

The maintenance process shall be explained and the main responsibilities described.

SB 04.06.02 **Preventative maintenance**

A preventative maintenance and lubrication schedule shall be included in this section. This schedule shall be in table format and shall include a summary of all the maintenance actions required for each different system and/or functional unit covered by this manual, in order to give a single summary of all routine preventative maintenance actions required for the complete installation.

The schedule shall indicate daily, weekly, fortnightly, monthly and yearly maintenance actions. A lubrication schedule summary shall also be included under this section.

The frequency of routine preventative maintenance actions shall be indicated very clearly.

The Contractor shall provide the maintenance requirements as prescribed by the manufacturer. The type of maintenance shall be clearly indicated. The description of the maintenance to be performed shall include at least the part name, location of the part in either the assembly or subassembly, the model number, the quantity of the particular part or component to be maintained, the type of maintenance, and notes on the maintenance procedure.

A brief description shall accompany the maintenance schedule, indicating special tools to be used, maintenance and test equipment required for the test procedures. Any special tools necessary for maintenance shall be specified in terms of name, model, size, manufacturer, supplier (name, telephone number, fax number, contact person), coating (if any) and notes on the use of the equipment.

Remarks on the system readiness checks of each subassembly shall be explained in detail. Routine inspection and maintenance processes shall be described. It shall be

very clear what needs to be done, how to perform the necessary task and any dangers that are present.

SB 04.06.03 Trouble-shooting

An explanation shall be given to assist the maintenance personnel in analysing and resolving malfunctions that might occur. Various scenarios with possible causes and rectification procedures shall be explained.

The scenarios shall be accompanied by drawings indicating the position of the part that is faulty. Each of these drawings shall have a heading, comments and an explanatory key.

SB 04.07 BREAKDOWN MAINTENANCE AND REPAIR

The Contractor shall describe the complete procedure to be followed in the event of a breakdown. It shall be very clear what the operating personnel should look for, how to eliminate any dangers due to the breakdown (eg electricity must be shut off in the event of problems with the wiring) and who should be contacted. The Contractor shall supply the names and telephone numbers of at least two contact persons who may be contacted in the event of a breakdown.

The Contractor shall refer to Additional Specification SA: General Maintenance, to determine the reaction time for the repair to the breakdown.

Repair instructions shall provide the maintenance personnel with detailed instructions for the removal and/or replacement of any item requiring replacement due to malfunctioning. Contact numbers shall also be given to assist maintenance personnel, should a breakdown occur.

The Contractor shall specify the actions expected of maintenance personnel in the event of a breakdown.

The Contractor shall also specify the testing procedures to be followed before the system can be put into operation again. Every procedure shall be described clearly and all the potential dangers pointed out, as well as the precautions that have to be taken.

The testing procedures shall be accompanied by drawings illustrating the process to be performed. Every drawing shall have a heading, comments and an explanatory key.

SB 05 MEASUREMENT AND PAYMENT

SB.01 COMPILE AND SUPPLY A COMPLETE SET OF OPERATING AND MAINTENANCE MANUALSUnit : sum

The unit of measurement shall be a sum for each complete set (seven copies) of Operating and Maintenance Manuals. Operating and Maintenance Manuals for different installations/ sub-installations shall be measured separately in the Schedule of Quantities.

The tendered sum shall include full compensation for all technical research, gathering of information, compilation of manufacturer's instructions, compilation of drawings and diagrams, and for writing of all the descriptions, instructions and functional procedures, as well as language editing, in order to provide a clear and correct set of Operating and Maintenance Manuals.

The tendered sum shall also include full compensation for all expenses such as paper, copy work, binding and printing necessary for the completion of the manuals.

The tendered sum shall also include full compensation for the compilation of draft sets of operating and maintenance manuals in accordance with the specification, and for incorporation of all comments and corrective requirements.

SB.02 **COMPILE AND SUPPLY A COMPLETE KEY PLAN**Unit : sum

The unit of measurement shall be a sum for each complete set (three A0-size copies) of the key plan(s).

The tendered sum shall include full compensation for all expenses such as paper, copy work and printing required for the completion of the key plan.

The key plan shall include and comply with the following:

(a) Detail ground survey

All services must be shown on a complete key plan as required by the Engineer, including roads, fences, paving, transmission and telephone lines, etc. For sewerage reticulation and stormwater drainage systems the pipe sizes, as well as invert heights must be provided. An effort must be made to trace the routes of these services.

(b) Survey of buildings

The "footprint" of all the buildings and structures must be surveyed.

(c) General

All survey data shall be captured in electronic format (DXF).

SB.03 **UPDATE AND REVISE THE EXISTING SET OF OPERATING AND MAINTENANCE MANUALS**Unit : sum

The unit of measurement shall be a sum for each complete set (seven copies) of Operating and Maintenance Manuals updated, revised and compiled. Operating and Maintenance Manuals for different installations shall be measured separately in the Schedule of Quantities.

The Contractor shall note that existing manuals may not be to an acceptable standard or may not be available. All manuals that exist will be available to view at the compulsory site inspection.

SB.9

The Contractor shall also note that manuals may not necessarily be available in an electronic format.

The tendered sum shall include full compensation for all technical research, gathering of information, compilation of manufacturer's instructions, compilation of drawings and diagrams, and for writing of all the descriptions, instructions and functional procedures, as well as language editing, in order to provide a clear and correct set of Operating and Maintenance Manuals.

The manuals shall also include all new equipment installed under this contract.

The tendered sum shall also include full compensation for all expenses such as paper, copy work, binding and printing necessary for the completion of the manuals.

The tendered sum shall also include full compensation for the compilation of draft sets of operating and maintenance manuals in accordance with the specification, and for incorporation of all comments and corrective requirements.