Engineering Site Standard

GPC-GSS-006

Preparation of Operation & Maintenance Manuals

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Brief description

This standard outlines the requirements for the preparation of Operation & Maintenance manuals at GPC.

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Role	Position
Owner	Technical Services Manager
Custodian	Systems & Planning Specialist

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Document Version Control

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1	30/10/2017	M Porter	Issued for use
2	13/03/2020	D Barnham	Reviewed and issued for use

1. Scope

This Standard outlines the requirements for the preparation and supply of Operation & Maintenance Manuals at or to GPC.

1.1. GPC Engineering Site Standards

Refer to the GPC Engineering Site Standards Register for the link to each standard.

In the event of conflicting requirements between Australian Standards and GPC standards or specifications (including drawings or datasheets) the more rigorous requirements will prevail.

Standard No.	Standard Name
GPC-CSS-101	Supply, Fabrication & Erection of Structural Steel
GPC-CSS-102	Cladding and Insulation
GPC-CSS-103	Plumbing
GPC-CSS-104	Installation of Gantry Rails
GPC-CSS-105	General Earthworks
GPC-CSS-106	Concrete
GPC-CSS-107	Protective Coatings
GPC-CSS-108	Piling
GPC-CSS-109	Pavements
GPC-CSS-110	Masonry
GPC-CSS-111	Welding of Structural Steel
GPC-CSS-112	Manufacture of Pre-Cast Concrete
GPC-ESS-200	Electrical Design Criteria
GPC-ESS-201	Electrical Design
GPC-ESS-202	Electrical and Instrument Installation
GPC-ESS-203	Electrical, Instrumentation and Control Preferred Equipment
GPC-ESS-204	Electrical Drafting, Drawing and Naming Requirements
GPC-ESS-205	Identification Labels and Signs
GPC-ESS-301	High Voltage Switch Gear
GPC-ESS-302	Power Transformers Including Pad Mount Transformers
GPC-ESS-304	High Voltage Variable Voltage Variable Frequency Drives
GPC-ESS-305	Earthing Resistors and Reactors
GPC-ESS-400	Electrical Cable installation

GPC-ESS-401	Electrical Cables
GPC-ESS-402	LV Squirrel Cage Induction Motors
GPC-ESS-403	Generators
GPC-ESS-404	Low Voltage Motor Control Centres
GPC-ESS-405	Electrical Distribution Boards
GPC-ESS-406	Enclosures for Electrical Equipment
GPC-ESS-407	Battery Backed and Uninterruptable Power Supplies
GPC-ESS-408	Portable Electrical Equipment
GPC-ESS-409	Lighting
GPC-ESS-410	Electrical Earthing and Lightning Protection
GPC-ESS-411	Temporary Electrical Installations
GPC-ESS-412	Testing and Commissioning of Electrical Equipment
GPC-ESS-413	Hazardous Area Installations
GPC-ESS-414	Fire Detection and Alarm Systems
GPC-ESS-415	Low Voltage Variable Speed Drives
GPC-ESS-416	Electrical Switch Rooms including Prefabricated Type
GPC-ESS-417	Electrical Requirements for Demountable Transportable & Prefabricated Buildings
GPC-ESS-502	PLC Programming
GPC-ESS-503	SCADA Programming
GPC-ESS-504	Communications
GPC-ESS-508	Control Systems Tag Naming
GPC-ESS-510	Functional Safety Standard - Functional Safety Management Plan
GPC-GSS-001	Site Information
GPC-GSS-002	Lifting Equipment
GPC-GSS-003	Drafting
GPC-GSS-004	Manufacturer's Data Report (MDR)
GPC-GSS-005	Contractor Pre-Shutdown Planning
GPC-GSS-006	Preparation of Operation & Maintenance Manuals
GPC-GSS-007	Packaging, Transport and Delivery of Goods
GPC-GSS-008	Contractor Site Mobilisation & De-Mobilisation
GPC-MSS-101	General Mechanical

GPC-MSS-102	Belt Conveyors
GPC-MSS-103	Conveyor Drives
GPC-MSS-104	Piping Systems
GPC-MSS-105	Pumps & Valves
GPC-MSS-106	SPD's
GPC-MSS-107	Vibratory Feeders
GPC-MSS-108	Tunnel Ventilation Systems
GPC-MSS-109	Hydraulic Equipment
GPC-MSS-110	Pneumatic Equipment
GPC-MSS-111	Hoses
GPC-MSS-112	Equipment Guarding

1.2. GPC Procedures and Standards

Document No.	Document Name
100248	Labelling/ Colour Coding of Plant, Storage Tanks, and Pipelines
111030	Pressure vessel Register - Procedure
111517	Safe use of Compressed Air - Procedure
115171	Permit to Dig/ Excavate
119038	Air Compressors – Safe Work Procedures
124710	Risk Analysis and Risk Assessment
154111	Hot Work Procedure
159385	GPC Policy – Corporate Risk Management
177022	Protective Coating Painting Specification
494645	Permit to backfill and complete

2. Presentation Standards & Supply Requirements

2.1. Layout

Manuals shall be divided into eight (8) major sections with a tab indexing system. If warranted, because of the volume of material, each section can be contained in a separate cover, suitably tab indexed.

Sections

1) Description of Equipment

2) Operational Philosophy
3) Functional Description
4) Safety and Operating Instructions
5) Maintenance Procedures and Settings
6) Servicing Instructions
7) Parts List – Manufacturer's part number inclusive
8) Equipment Installation and Commissioning Instructions

The detailed requirements of each section are discussed in Section 3 of this specification. Each section shall start on a new page to facilitate updating.

2.2. Binding/Covers

All manuals shall be bound in standard minimum 3 ring General Binding Corporation binders. Each manual is to be supplied with a CD, DVD or USB storage device in either Microsoft Word, Excel or PDF format, whichever format is the most suitable for the information to be compiled.

2.3. Manual Identification

The front cover and spine of each manual shall identify the equipment and supplier in accordance with the following minimum requirements:

All text to be Size 14 for column heading and size 12 for all other text.

All text to be printed on labels permanently fixed to the cover.

All printing and bonding must be waterproof and able to withstand constant "heavy" use.

The publication date shall be clearly printed on the lower left hand corner of the front page.

2.4. Paper Size

Standard A4 paper shall be used throughout.

Where illustrations cannot be effectively reduced to standard A4 size, "throw clear" sheets shall be used. "Throw clear" sheets may be A3 size and folded, do not use clear plastic sleeves. Drawings shall be arranged so that it is not necessary to rotate the manual to read them.

2.5. Indexing System

An indexing system shall be provided referring to section, subsection and page number. The index shall be placed at the start of the manual. Cross referencing must be used where similar information is spread between sections.

2.6. Printing/Publishing

Manuals shall be produced using a process that will give original style documents.

Photocopying will only be acceptable if it gives this quality. If photographs are included they can be either black and white or colour. Clear line drawings are preferred because they copy better.

2.7. Publication Language

Manuals shall be written in the English Language.

2.8. Page Markings

Each page shall be clearly numbered with the page number, sub section or section number and revision number.

2.9. Revision and Updating

Manuals shall be produced and compiled to facilitate updating without destroying the continuity of the text. The equipment supplier shall maintain a register of manuals produced and provide revised material if and when they become available. A record chart shall be included which will specify the revision number, the pages affected and the date of the revision.

2.10. Irrelevant Material

Manuals shall be compiled to represent the "as built" equipment. Therefore material that is not relevant to the "as built" equipment shall not be included in any part of the manual. Data sheets that refer to many model numbers shall be blanked out so that only the relevant items are shown.

2.11. Copies

Three (3) hard copies of each manual shall be supplied. Each of the hard copies shall be supplied with a CD, DVD or USB storage device that is stored in a secure pocket of the manual folder, and contain a narrative in Microsoft Word or Excel format. PDF format requires the RGTES approval and should be avoided if possible.

2.12. Drawings

Vendor drawings shall comply with GPC Engineering Site Standard GPC-GSS-003 Drafting.

They shall be provided in hardcopy and electronic formats. Electronic copies are to include native format (i.e. AutoCad DWG) and interactive PDF.

Electronic copies of all Models (including 3D) are to be provided where applicable.

2.13. Manual Delivery

All manuals shall be received on site no less than one calendar month before the delivery to site of the equipment. The manuals supplied will not be considered complete until the equipment is commissioned. Should commissioning lead to modifications to the equipment, the manuals previously supplied shall be updated to "as built" within four weeks of the completion of commissioning.

2.14. Division of Material

Unless otherwise specified, separate electrical, instrumentation and mechanical maintenance manuals are required for each item of equipment.

3. Contents of Manual

3.1. Description of Equipment

This section shall provide all technical and purchasing details applicable to the equipment supplied so that it can serve as a general specification and introduction to the equipment. It shall include:

- Short description of the equipment.
- Supplier's and/or manufacturer's full name, address and telephone number and email address.
- The order number and contract number where applicable.
- Date of purchase order.
- Date equipment was manufactured.
- Date of commissioning.
- The supplier's equipment model and serial number.
- Other relevant supplier's identification.
- Supplier's actual warranty policy for the equipment against faulty parts, design and workmanship. Any such statement of warranty shall comply with the conditions included in the purchase order or contract document. The purchase order/contract shall always take precedence over the manual, in this respect.
- Design specifications of the equipment and performance charts where applicable.
- Documentation of any tests carried out during commissioning or as proving tests or which were performed to satisfy any statutory requirements. (Refer Clause 3.7)
- A copy of all drawings which are referred to by the text of the manual shall be included in the manual.

An electronic copy of all drawings related to the "as built" equipment shall be supplied separate to the manual with a full listing of these drawings being included in the introduction section of the manual. Drawing masters shall be supplied on CAD and shall comply with GPC Engineering Site Standard GPC-GSS-003 Drafting.

3.2. Operational Philosophy

This section of the manual shall describe the operational parameters of the equipment and its relationship to the plant in which it is located.

- The projected life of the equipment shall be estimated stating the conditions used to determine the estimate.
- The operational parameters shall be stated giving the overall equipment effectiveness. Also included will be the requirements that are assumed to achieve the level of stated equipment effectiveness. The overall equipment effectiveness is the product of the equipment availability, the performance efficiency, and the quality rate.
- The manual shall state the estimated maintenance window which will be needed to allow the operational parameters to be achieved.

3.3. Functional Description

This section of the manual shall provide an overview of functional names and general features of the equipment with its expected outcomes.

- Purpose of the equipment with possible categories and who will use it.
- Operating environment, where does it run and what services or other applications does it depend on.
- Functional requirement; state in general terms the functions the application performs.
- Performance requirement specify system requirements and timing constraints.

3.4. Safety & Operating Instructions

This section shall provide a complete overview of the equipment and its operational characteristics, and shall specify what is required to achieve the best performance for the equipment. It shall include:

- Any cautions or warnings concerning the installation, commissioning, operation or maintenance of the equipment by reason of the hazard analysis that has been performed (see Division of Workplace Health and Safety Code of Practice for managing risk of plant in the workplace – Appendix B – Hazard Checklist). Potentially dangerous or hazardous peculiarities of the equipment must be illustrated to provide complete safety awareness. This section shall include the correct means of isolation and any other steps required to de-energise and make the equipment safe for personnel to work on during maintenance.
- A thorough and complete description of the method of operation of the equipment with reference to the relevant electrical, pneumatic or hydraulic schematics as appropriate. These schematics shall be part of the manual.
- Hydraulic schematics shall clearly indicate the direction of flow of fluid.
- Pre start up procedure - illustrations of the items to be inspected prior to routine start up with concise narrative description detailing acceptable and unacceptable conditions.
- Routine start up procedure - an illustrated step by step flow chart with a concise narrative description providing details of the methods used to energise the equipment.
- Corrective action in case of failure - an illustrated overview and narrative description of the correct sequence and method to be employed for emergency situations or stoppages.
- Routine operational inspections - illustrated overview and narrative descriptions detailing potential trouble points, and what to look for.
- Trouble shooting flow charts or “If /Then” tables for all foreseeable failures shall be supplied.

3.5. Maintenance Procedures

The maintenance procedures section is the technical reference section of the manual. It shall describe the methods and procedures used to maintain the equipment. It shall provide:

- Step by step instructions for the disassembly and reassembly of all major components, sub-assemblies or assemblies in a descriptive and illustrated manner, including weight of the components, correct lifting methods and tooling required for the job, etc.

- A comprehensive listing of specialised tooling, jigs, lifting frames, etc. required to perform maintenance on the equipment, including dimensioned drawings of all such tooling, etc. Section 3.1 shall apply to the supply of all drawings.
- A list of all adjustments and settings and clearances used to set up the equipment or re-commission after an overhaul e.g. hydraulic pressure setting.
- A list of tolerances of interconnecting or fitted parts.
- Detailed calibration and set up procedures for instrumentation and other electronic equipment. Software packages and drivers required for these procedures shall be supplied complete with instruction manuals. Parameter setting lists and as-commissioned backup files shall also be provided. P&IDs shall be supplied where applicable.

3.6. Servicing Instructions

This section shall include the regular and routine maintenance activities, inspections and lubrication required to keep the machine operating efficiently.

- Each servicing point shall be defined on a schematic, detailing the type of service required and the recommended frequency.
- Servicing procedures shall be illustrated and have a covering narrative description. Where a servicing procedure requires the use of a standard set of spare parts then this listing shall be included in the description of the procedure.
- All servicing and lubrication compartment capacities and allowable levels shall be defined.
- Lubrication specifications for oils and greases. The equipment supplier shall conform to GPC site Condition Monitoring recommendations for all lubrication requirements.
- A suggested list of the inspection instructions to determine the equipment condition and the recommended schedule for the inspections.
- Recommended alarm points in equipment inspections which will require follow up corrective work on the equipment.
- Recommended maintenance strategy for electrical, electronic and instrumentation equipment, detailing specific tasks to be completed, special procedures and scheduled intervals.

3.7. Parts List

The parts segment of the manual shall document all parts belonging to the equipment and shall conform to the following specifications and standards:

- It shall provide a complete parts list of all components used in equipment supplied, detailing part numbers, serial numbers, model numbers, quantities used, etc. This list shall be organised in a logical manner so that the build-up of sub-assemblies is clear. The list will refer to those pages where further information about any part, sub assembly or assembly is contained.
- If the item of equipment includes parts that were manufactured by another company and procured by the supplier/contractor to make part of the equipment, all such parts shall carry the original manufacturer's and supplier's/contractor's part, serial and/or model numbers.
- Original manufacturer's part number shall take precedence over any subsequent part number allocations.
- It shall contain only those parts and components used in the final 'as built' equipment.

- Exploded view showing how all assemblies fit into the equipment, sub-assemblies fit into assemblies etc. shall be included. Each item on each view shall be numbered with reference to the parts list and manufacturer's or supplier's part numbers.
- An electronic version of the parts listing shall also be furnished in Microsoft Excel format and comprise the estimated pricing and availability at the time of the offer.
- A listing of the manufacturer's recommendations regarding spare parts holding including insurance and consumable items shall be included.

3.8. Installation & Commissioning Instructions

This section shall include the manufacturer's detailed instructions for unloading, uncrating the equipment, order of initial installation and setting up, including tolerances and clearances of components and fits, torque settings for fasteners and level and squareness tolerances.

First time start up procedure (where different from Clause 3.3) illustrated as a step by step flow chart with concise narrative.

List of commissioning tests with details of any numerical data that should be checked and recorded e.g. hydraulic pressure setting (this should match Clause 3.1.).