

GUIDELINES FOR REVIEW OF OPERATION AND MAINTENANCE MANUALS

The following provides a recommended outline for the preparation of O&M Manuals. The general content is listed followed by suggested details for each section.

- Include a Table of Contents
- Tab Sections as Appropriate
- Identify the author of the manual. Preferably, the author should be the Professional Engineer who designed the facility.
- This O&M manual should be provided to the owner and reviewing agencies in both paper and electronic format.

I. Introduction

- a) Manual should briefly describe the historical background of the facility.
- b) Plant treatment requirements:
 - 1) Type of treatment: Briefly describe the type of treatment process employed.
 - 2) Description of plant: Briefly describe the various units or processes incorporated in the facility.
 - 3) Flow diagram: Include a simple schematic showing the individual units and flow sequence.
 - 4) Design efficiency: State and briefly discuss the design efficiency in terms of percent removal of biochemical oxygen demand, suspended solids, etc.
 - 5) State, specifically, the certification required by the operators for the respective facility.
 - 6) Provide a table of general design criteria, such as: capacity of individual units, size of pumps and motors, pumping rates, clarifier overflow rate, aerator size and capacity, design efficiency, loading rates, etc.

II. Operation and Control of Unit Processes

- a) Description of Unit Processes
 - 1) Describe each unit mechanically, including each unit component and its function.
 - 2) Describe the flow sequence through each unit, identifying all valves, pumps or gates involved. Prescribe normal operating positions of all gates and valves (whether opened or closed). Provide a flow schematic showing valve, gate and pump locations, and employ an index system for identification.
 - 3) Describe thoroughly the treatment process employed in each unit; chemical, biological, physical or combination.
 - 4) Describe the relationship of each unit to adjacent units in the facility.
 - 5) Describe where and/or how additions or expansions to the plant are intended by designer.
- b) Control of Unit Processes

Describe thoroughly and in detail how each unit is to be operated and how to control the unit process. Thoroughly discuss all applicable laboratory or other process control parameters. For example, a conventional activated sludge facility may employ any or all of

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the following parameters for controlling the process: dissolved oxygen, settleable solids, suspended solids, volatile suspended solids, total solids, total volatile solids, pH, sludge volume index, sludge age, food to microorganism ratio, return sludge rate, and waste sludge as dictated by unit process employed. These parameters should be defined and their significance to plant operation or process control thoroughly discussed. This discussion should include normal operational levels or ranges and how these levels are maintained. Include discussion of problems anticipated when operational ranges are not maintained. For parameters such as food to microorganism ratio, sludge volume index, sludge age, return sludge rates, give formulas and examples for calculating respective values.

c) Common Operating and Control Problems

Discuss common operating problems such as: foaming, frothing, sludge bulking, rising sludge, ashing, shock loads, hydraulic washouts, short circuiting, insufficient oxygen, or, include in this discussion the probable causes and possible remedies. Where appropriate, describe means by which the operator may visually identify certain problems.

d) Alternate Operational Modes

Describe, if applicable, alternative operational modes. Include flow diagrams and valve indices. Discuss any changes in unit process control that may be necessitated by the alternate mode. Describe advantages or disadvantages. Indicate situations that may dictate a change to an alternate mode. Discuss any change in treatment efficiency.

e) Emergency Operations and Failsafe Features

Discuss all applicable failsafe features or features incorporated into design, such as: warning devices, standby power, high water, and overload alarms, etc.

f) Provide a discussion of plant start-up procedures

- 1) Discuss preparation for start-up. Include a discussion of pre start-up inspection, checklist, staffing duties and responsibilities, dry run, wet run, etc.
- 2) Devise and discuss a start-up procedure for each individual unit in regard to mechanical operation and unit process. Discussion should maintain relationship to overall plant operation. Discuss process monitoring and objectives desired during various stages of start-up phase. Describe any special technique that may be applicable, such as sludge seeding.

g) Equipment Maintenance Summary

- 1) Summarize lubrication schedules, including frequency and specific lubricant to be used for each type of equipment. It is suggested the schedule be tabular.
- 2) Recommended preventative maintenance schedules. It is suggested the schedule be tabular.

h) Safety

- 1) Keep Material Data Safety Sheets, (MSDS) available and up to date. Reference location.
- 2) Discuss safety precautions: Prescribe means of preventing and/or procedures for testing for hazardous conditions, specifically toxic or explosive gases. Discuss and define Confined Space entry requirements.
- 3) Prescribe first aid procedures for dealing with accidents involving personal injury or provide a first aid handbook and training.

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III. Appendix - General Information

- a) Provide record drawings of facilities. (Reference, but do not submit to the State)
- b) List equipment and materials provided. Equipment O&M manuals should be brief, concise, relevant and to the point. General brochures and literature, if provided, should have irrelevant information marked out and/or relevant information highlighted. Information on equipment not provided or not applicable should not be included. (Reference, but do not submit to the State)
- c) A Copy of The NPDES Permit and applicable State Administrative Code.
- d) Recommend references for approved laboratory procedures. Must be in accordance with 40 CFR 136. A copy of STANDARD METHODS For the Examination of Water and Wastewater should be available at the facility.
- e) Provide list of WWTP operating references.
- f) Provide a copy of municipality's sewer use ordinance and pretreatment ordinance.
- g) Phone Numbers: List emergency phone numbers and contacts for all the utilities serving the facility, including electrical, telephone, gas, water, fire, hazmat, and emergency rescue.
- h) Post startup addendum. This section should be provided to the operator to address any issues or alterations to the manual as a result of changes in intended operations during startup.

NOTE: At the writer's discretion, any applicable charts, graphs, guidelines, or documents that may be significant and useful to plant operation and maintenance should be included in the appendix. It is not necessary to submit these items for review. It is suggest that these materials be bound into a single volume and presented to plant personnel.

* Information is available on line at the following sites :

State Regulations	http://www.enr.state.nc.us/html/rules.html
North Carolina government	http://www.ncgov.com
NC Water Quality	http://www.ncwaterquality.com
Construction Grants and Loans	http://www.nccgl.net

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SRF O&M Manual Policy

WWTP Projects:

Required? Yes

Submittal: Must be submitted and approved by 90% milestone. CG&L checklist applies.

Sewer Rehabilitation, New Sewer Construction, and Pump Station/Force Main projects:

Required? No, unless a very large and complex pump station is being constructed or the engineering contract contains an item for one and the loan recipient will request reimbursement for it.

Submittal: If reimbursement is requested for one, it must be included in the engineering contract then it must be submitted and approved.

- If CG&L requires one (large PS) then our checklist applies.
- If CG&L does not require but it is still in the A/E contract then equipment manuals will be sufficient.