CHAPTER SEVEN

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TABLES

CHAPTER SEVEN - REPORTING

7.1 INTRODUCTION

There are no major revisions to this Chapter, the only additions being the expansion of the contents of the Preliminary Design Report Chapters by adding to that on design criteria and design components, the need for new sub-sections on climate change and life cycle analysis/costing and a word of caution on Bid Evaluation and Contract Document compilation.

Designers, be they in-house, with water authorities, or with consultants must now careful review and comment on the contents of this Manual, and where there is an intention to diverge from the requirements or recommendations herein, to carefully detail out the reasoning therefore. This is now mandatory as is the requirement that as a minimum, a copy of the designers Chapter on design criteria be forwarded to the Design Section of the Ministry of Water before proceeding to final design for the Ministry to consider and learn from and if considered appropriate either to issue an addendum to this Manual or to use the suggested modifications in periodic updates.

7.2 ENGINEERING DESIGN REPORTS IN GENERAL

Engineering design reports appear in two formats:

- Descriptive essay with mathematical analysis
- Drawings and symbols

1) Purpose

Such design reports have three main purposes:

- To present all particular data in a clear way together with the estimated costs, in order to enable the executing body to approve the design and to budget for implementation.
- To record all relevant data for future reference by other interested parties.
- To explain the reasons for the respective design decisions in order to enable proper supervision of the project, when executed.

2) Coverage of Design Report

The extent of detail in a design report required depends on the complexity of the project. However, the information supplied, always have to satisfy the three above purposes.

Generally, there should be two reports established

- A Preliminary Design Report (PDR) and
- A Final Design Report (FDR)

7.3 PRELIMINARY DESIGN REPORTS

A preliminary design report usually lays the basis for the detailed design report. It should contain the contents as listed below, but not necessarily be limited to this:

7.3.1 Summary

There should be a Project Summary sheet, giving information about:

- Geographic location
- Water source
- Water treatment
- Water demand
- Distribution system
- Implementation stages
- Annual costs.

Further, an O&M Expenditure Summary sheet should be attached, giving all the estimated costs for O & M for the initial year and for the following 20 years in stages of 5 years, plus the revenue expected, all the above being on a present cost basis.

A map to scale 1:20,000 or more detailed if possible, should show the scheme boundary.

The Summary should give in a concise way, information about the background of the project, with respect to:

> Demography, technical, economic and geographical data of the recommended scheme and of any existing supply. It should also describe the alternative solutions studied and the reasons for discarding the alternative schemes and selecting the one in question.

7.3.2 Introduction

This should include:

- Background;
- Previous schemes, reports or studies;
- Scope of the present report;
- Description of the scheme are: geographic location, climatic conditions, geological and topographical conditions; and
- Reasons for the study.

7.3.3 Existing Water Supply Schemes

The Chapter on existing water schemes should discuss:

- Ownership, Location, Source
- Purpose of the schemes
- Type and number of consumers
- Level of Service
- Existing constraints and reliability of the supply, both at present and in future
- Technical and economical assessment of the supply system.

7.3.4 Socio-economic

The socio-economic chapter should contain information on:

- Commerce and industry
- Transport
- Agriculture/forestry
- Health facilities
- Education
- Administration.

7.3.5 Water Demand

This is a very important chapter and must address the following:

- Design period and Design horizon
- Population
- Livestock
- Institutions
- Industry
- Commerce
- Houses and gardens
- Others
- Specific Water demands
- Total water demand.

7.3.6 Water Sources

As relevant, the alternative water sources available should be discussed under the following headings:

- Groundwater
- Surface water
- Springs
- Other sources
- Recommended source
- Estimate of the total capacity of all available sources within an economic framework
- Estimate of the total population, which can be served by the available water sources up to 2050.

7.3.7 Design Criteria

This is regarded as an important chapter and must contain the following:

- Review of Pertinent Design Criteria and Proposals contained in this Water Design Manual
- Identify and comment on those Criteria not being followed clearly indicating the reasons for this
- Summarise both the Design Criteria and the Proposals being adopted
- Indicate all parameters and assumptions that will be used in the design computation
- Discuss all data to be used, methods of analysis, etc.

As a minimum, a copy of the report cover page and of this Chapter should be forwarded to the Design Section of the Ministry of Water.

7.3.8 Water Withdrawal Structures

The structures proposed for water withdrawal should be described with respect to:

- Location
- Intake (river, pond, lake, etc)
- Dam
- Well
- Spring
- Raw water mains

The above information should be accompanied by

- General sketches or drawings and
- Preliminary Computations

7.3.9 Pump Stations

Where pumping is required, this must be clearly described depending upon type:

- Raw water pump station
- Clear water pump station
- Rising mains

The above are to be accompanied by general sketches or drawings and by respective preliminary computations.

7.3.10 Treatment Plant

Included here should be:

- Location of the treatment plant
- Water quality of the source
- Demanded water quality for supply
- Recommended treatment processes
- Reasons for deviation from WHO standards, (if any), and
- Flow plan for the proposed treatment processes.

7.3.11 Gravity Mains

These include:

- Raw water mains
- Clear water mains.

7.3.12 Distribution System

Distribution system proposals should include:

- Recommended distribution system including preliminary computations and system sketches
- Alternative systems considered and reasons for not applying them
- Choice of materials for pipes, fittings, etc., and reasons for excluding any of them
- Proposed implementation schedule
- Implementation time schedule
- Phasing of execution proposed.

7.3.13 Environmental Impact Assessment

The extent and detail required will depend on the nature and size of the project:

- It should meet the requirements of NEMC
- Discuss the possible impacts of climate change on the assumptions and proposals made.

7.3.14 Cost Estimates

These should be to the level of detail required and include:

- Costs for design, construction and supervision
- Costs for O & M
- Costs for management and administration
- Revenue expected,
- Financial Internal Rate of Return and Economical Rate of Return
- Conclusion regarding prices of the water and about the economy of the project, and
- Cash flow projections.

In addition, a statement is required on Life Cycle Analysis and Costing, indicating the current state of information available and to what extent this is being taken into consideration.

7.4 FINAL DESIGN REPORT

A final design report is a detailed study and analysis of the contents of the preliminary design report or feasibility study report. The contents list should be as given in Chapter One, section 1.4.3.

7.4.1 Appendices

All the preliminary design computations should be now provided in detail and these should be submitted in a separate volume.

All the earlier sketches and drawings should be updated to a standard suitable for issuance as tender drawings and submitted in a separate volume in format A4, A3, A2, A1 or A0 as may be determined. Usually however the format should be not less than A3.

7.4.2 Tender (Bid) Documents

Dependant upon the funding source, these should meet the requirements of the financing agency but are likely to include:

- Contract documents in the form of unfilled forms
- Form of Tender (Bid)
- Instructions to Tenderers (Bidders)
- Statement of Qualification
- Tender (Bid) Security
- Form of Letter of Acceptance
- Sample Forms of Securities
- Schedule of Prices
- Technical Schedules
- General Contract Conditions
- Contract Conditions of Particular Application
- The Method of Measurement used
- Bills of Quantities, inclusive of a Preamble
- Specifications for the works to be executed
- Book of Tender Drawings in format to be determined as per item 7.3.1

The Order of Precedence of the documents and drawings that will be incorporated into the final Contract Document shall be clearly enumerated, usually in the Conditions of Particular Application.

Also to be included but submitted separately is an

- Engineer's Cost Estimate (confidential)

7.4.3 Bid Evaluation and Contract Document Compilation

When evaluating bids and compiling Contract Documents, especially from electronic copies of the same in particular, a word of caution is required.

Regrettably, it has become necessary to include in the Conditions of Particular Application a clause to the effect that any tampering with any wording in any document that comprises the Bid will, if found during Bid Evaluation, lead to its rejection.

In addition and where any Contract document includes any difference whatsoever from the wording in the Bid Document, this shall both be ignored in any interpretation and the wording in the Bid Document shall prevail as well as it being grounds for both contract cancellation and black-listing of the contractor concerned.

Both during Bid Evaluation, and when assembling the final set of Contract Documents, this also requires that a further careful check is made, especially on such elements as the Specification, Method of Measurement, Preamble to and BOQ.

7.4.4 Formats to be used

The following formats should be used:

- All text documents - A4
- Book of Drawings - to be determined as indicated below.

7.5 DRAWING AND DRAUGHTING GUIDELINES

7.5.1 Format

Drawings shall be in a size: A4, A3, A2, A1, A0: to be determined.

Type or standard drawings are generally in A1 or A3 format.

7.5.2 Title Block

The preferred format is as depicted in Appendix A.

7.5.3 Folding for Filing

Unless presented in an A3 size volume, drawings should be folded to A4 size with space for punching. Method as depicted in Appendix B.

7.5.4 Line Work

Drawings of Buildings and Structures, inc. Details.

TABLE 7.1: LINE WORK TYPE AND THICKNESS

TYPE OF LINE	THICKNESS OF LINE (MM)
Site outline or new Building. Primary functional element in horizontal or vertical sections (e.g. load bearing walls)	1.0
Outlines requiring emphasis.	0.7
Existing Building General outlines of Details	0.6
Secondary elements and Details (e.g. non-load bearing partitions, windows, doors). Also Details etc. in elevation	0.4
Reference Grids	0.3 or 0.4
Dimension Lines Leader lines and Hatching	0.1 or 0.2

7.5.5 Symbols

The graphical symbols used should be as indicated below:

- Water supply in General, see Appendix and EN ISO 6412-2:1994
- Geotechnical Drawings, see Appendix
- Building and Civil Engineering Drawing, see Appendix
- Concrete Reinforcement and Bar Bending Schedules, see Appendix and ISO 3766:2003

7.5.6 Pipeline Drawings

These should be as follows:

1) General Plan and Profile Drawings

- A general Layout Plan to suitable scale, which covers the whole supply system. This plan shall show the information indicated below:
  - Reference to respective detail drawings enabling them to be easily located
  - Diameter
  - Material
  - Pipe fixtures
  - Manholes & BPTs
  - Crossings
  - Storage tank and service reservoir capacities.
- A general profile drawing to suitable scale which shall show the main pipelines and shall indicate:
  - Gradients
  - Static pressures
  - Diameters
  - Material and class

2) Plan and Profile Drawings in Detail.

- The scales to be used are 1:2000/200 or more detailed, in no case should they be less detailed, except for general plans and general profiles, depicting a whole pipeline-system.
- Chainages should run with the flow, be from left to right, and show the actual distance as measured, and not the reduced distance to a horizontal plane. Not to be included however are any equivalent lengths for friction losses in fittings.
- Plans and Profiles to be drawn on the same sheet, and the same horizontal scale, but the plan to be drawn to distances, reduced to horizontal lengths and the plan to be placed above the profile.

- The plan shall show the terrain in such detail, that the surveyed line can be easily found again. The distance of the centres line of the pipeline at the nodes to at least three other well defined objects nearby shall be shown in metres, exact to two decimal places. Lacking well defined objects, such have to be created by lasting paint marks on trees, bridges, walls, stones or by placing stones or steel bars into the ground. Special sketches showing the above points and the respective measurements have to be prepared.
- All plans to show the North direction
- The plans shall show the chainages in distances of 100 metres plus at the nodes, at installations and any change of direction
- If contours are shown these shall be enumerated such that the values are read when looking upslope, even if this means that the values appear upside down on the plan itself.

- Profiles should show the below details and information:
  - Ground levels , exact to two decimals in metres of all surveyed points which are spaced in distances of not more that 20 metres apart, plus where the gradient of the ground changes.
  - Invert levels of the pipeline at the same points plus where the gradient changes.
  - Chainage in km., exact to three decimal places, at the points, where ground levels are given, plus at the points where line manholes or other installations are to be placed.
  - Diameter, material and pressure class of pipeline.
  - Length of respective pipe with the same data:
  - Diameter
  - Material
  - Class
  - Design flow
  - Gradient
  - Design flow in 1/s
  - Friction loss in m/km
  - Hydraulic head above or below ground surface at no flow and at maximum flow
  - Symbols marking the points of installations:
    - Air valves
    - Washouts
    - Drains
    - Line valves
    - Break pressure tanks
    - Pipe crossings
    - Road crossings
    - River crossings

    - Railway crossing, etc.
  - Type of soil passed through

7.5.7 Building and Structural Drawings.

1) General

- All structures should be presented on separate drawings.
- There should be additional drawings for:
  - Shuttering
  - Reinforcement
  - Installations
  - Pipes
  - Pumps
  - Electric installations
  - Building installations for:
    - Water
    - Waste water
    - Electricity
    - Telephone, etc
  - Other installations & equipment.
  - Drawings for shuttering and for reinforcement shall be in scale 1:50 or 1:20
  - Details should be in suitable scales
  - Measurements should only be given once, in order to avoid contradictions.

2) Shuttering

- The drawings to show all measurements, but only .once and only with reference to shuttering.
- Details for thickness of reference to shown foundations, hardcore depth blinding respective levels in the ground level, etc. must be shown
- Construction joints and box-outs have be shown, if need be even in detail.

3) Reinforcement

- All measurements given should only refer to reinforcement and should only be given once.
- The drawings should show all data required in. order to identify
  - dimensions
  - shape
  - position of the steel reinforcement bars and steel meshes
- Separate bar bending schedules on separate sheets or on the same drawing should be given and respective references should appear in the drawings.

4) Installations

- Pipe Installations
  - All fittings or inbuilts should carry position numbers and be clearly marked with data about type, dimensions, materia1s and measurements.
  - For marking the type of fitting, etc., the symbols given in the Annexes should be used.
- Pump Installations
  - Section and discharge pipelines shown as described above, in layout and necessary sections.
  - Pump foundations or bases to be shown in size as exactly as possible.
  - Cable ducts or cable ways to be shown clearly, together with the location and approximate size of the switchboards. Cable ducts, exposed to water ingress, need to be drained.
  - Symbols to be used as given in the Appendices.

7.5.8 Standard Drawings

1) Definitions

- A Standard Drawing has to fulfil the following conditions:
  - Only designs, which can be used for a number of different projects qualifies
  - The drawing must be of a high professional standard and must present the most economical solution.
  - SI units shall be used exclusively
  - The design shall be the result of a co-operation between designers, constructors and operators, and shall reflect the respective discussions and comments.

2) Standard Drawings

- These will be released by the Ministry from time to time and will be presented in a booklet of size A3, which shall be updated occasionally. Copies of drawings in original size (mostly A1) can be procured from the Ministry of Water, Design Section, whenever the need arises.

3) Proposals for Standard Drawings

- Design–engineers at headquarters or in the regions or with water authorities can propose respective designs to be accepted as Standard Drawings by the Ministry of Water. These may have been developed in-house or prepared by consultants.