CIBSE Guide M

Guide M Update 2014

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Manager in BSRIA’s Sustainable Construction Group

Chair – CIBSE Maintenance Task Group
Guide M - Maintenance Engineering and Management

• How to operate and maintain….

• A guide for designers, maintainers, building owners, operators, facilities managers

• Update of 2008 version
  • Previously ‘Guide to ownership, operation and maintenance of building service’
Guide M - Maintenance Engineering and Management

• Updated by volunteers

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• In collaboration with:
  • RICS
  • BSRIA
  • B&ES
  • CIOB
Guide M - Maintenance Engineering and Management

- How to operate and maintain....

- Designers/Contractors role

- Maintainers/Operators role
Guide M - Maintenance Engineering and Management

Designers/Contractors
- Provide installations that are safe
- Economic to maintain
- Delivers good performance
- Whole life not just capital cost
Maintenance strategy and techniques

Table 3.3 Standard planned maintenance ‘float’ allowances

<table>
<thead>
<tr>
<th>Period</th>
<th>Suppressed task</th>
<th>Non-suppressed task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>(Not recommended: do not use)</td>
<td>Complete on the exact day</td>
</tr>
<tr>
<td>Weekly</td>
<td>(Not recommended: do not use)</td>
<td>Complete within the calendar week</td>
</tr>
<tr>
<td>Monthly</td>
<td>Complete within the calendar month: one week’s float</td>
<td>Complete within the calendar month: one week’s float</td>
</tr>
<tr>
<td>Quarterly</td>
<td>Complete within the calendar month: two weeks’ float</td>
<td>Complete within the calendar month: two weeks’ float</td>
</tr>
<tr>
<td>Half yearly</td>
<td>Complete within the calendar month: three weeks’ float</td>
<td>Complete within the calendar month: three weeks’ float</td>
</tr>
<tr>
<td>Yearly</td>
<td>Complete within the calendar month: four weeks’ float</td>
<td>Complete within the calendar month: four weeks’ float</td>
</tr>
<tr>
<td>Two yearly</td>
<td>Complete within the calendar month: four weeks’ float</td>
<td>Complete within the calendar year: eight weeks’ float</td>
</tr>
<tr>
<td>Three yearly</td>
<td>Complete within the calendar month: four weeks’ float</td>
<td>Complete within the calendar year: eight weeks’ float</td>
</tr>
<tr>
<td>Four yearly</td>
<td>Complete within the calendar month: four weeks’ float</td>
<td>Complete within the calendar year: eight weeks’ float</td>
</tr>
<tr>
<td>Five yearly</td>
<td>Complete within the calendar month: four weeks’ float</td>
<td>Complete within the calendar year: eight weeks’ float</td>
</tr>
<tr>
<td>Ten yearly</td>
<td>Complete within the calendar month: four weeks’ float</td>
<td>Complete within the calendar year: eight weeks’ float</td>
</tr>
</tbody>
</table>

• Service delivery options
  – (O&M Benchmarking Network Workshop – 23rd April 2015)
Guide M - Maintenance Engineering and Management

Maintainers/Operators

- Safe and healthy environment
- Support core business
- Economic operation
- Minimise environmental impact
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be used for any type of FM/maintenance service?</td>
<td>Yes</td>
<td>Yes</td>
<td>No—limited to maintenance and new works</td>
<td>Yes—depending on contract selected</td>
<td>Yes</td>
</tr>
<tr>
<td>Provides for service provider design?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Different methods of pricing and payment?</td>
<td>Yes—but not defined in the contract</td>
<td>Yes—lump sum or cost reimbursable</td>
<td>No—schedule of rates</td>
<td>Yes—depending on contract selected</td>
<td>Yes—lump sum, target cost or cost reimbursable</td>
</tr>
<tr>
<td>Choice of risk allocation?</td>
<td>No</td>
<td>Yes—limited to inflationary increases</td>
<td>No</td>
<td>No</td>
<td>Yes—multiple options</td>
</tr>
<tr>
<td>Designed for and used internationally?</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Demands collaboration/partnering?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Early warning of anything affecting the cost or performance</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Contract plan/programme allows monitoring of performance?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Stated reasons for decisions?</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Provides for multiparty partnering?</td>
<td>Yes—integral</td>
<td>No</td>
<td>No</td>
<td>Yes—optional</td>
<td>Yes—optional</td>
</tr>
<tr>
<td>Service provided continuously over the period of the contract?</td>
<td>No—orders issued to instruct works</td>
<td>Yes</td>
<td>No—orders issued to instruct works</td>
<td>Yes—under GC/Works/9 and 10</td>
<td>Yes</td>
</tr>
<tr>
<td>KPIs for continuous improvement?</td>
<td>Yes—integral</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes—optional</td>
</tr>
<tr>
<td>Provides for instructing one-off projects?</td>
<td>Yes—integral</td>
<td>No</td>
<td>Yes—integral</td>
<td>Yes—integral</td>
<td>Yes—optional</td>
</tr>
</tbody>
</table>
Chapter 5 and 6

Chapter 5 Energy

Summary
This chapter outlines techniques by which a maintenance team might improve energy efficiency. It includes information on improving the effectiveness of artificial lighting, routine boiler efficiency checks for heating and hot water services systems are recommended and it suggests that the merits of variable volume pumping be considered for some water distribution systems.

Renewable sources of energy are introduced, along with the legislation, taxation and subsidies promoting energy efficiency in the UK.

Chapter 6 Controls

6.1 Purpose of controls
6.2 Maintenance requirements
6.3 Building management systems
6.4 Upgrading control systems
6.5 Need for training
Chapter 7, 8 and 9

7 - Commissioning and testing
- Management, seasonal, recommissioning, continuous, mothballing and decommissioning

8 - Handover procedures
- Checklist, snagging and information

9 - O&M documentation
- Content, roles and responsibilities
Chapters 10, 11, 13, 14, 16, 17

- 10 - Operational Risk
- 11 – O&M costs
- 13 – Audits
- 14 – Condition surveys
- 16 – Health and comfort
- 17 - Training
Chapters 10, 11, 13, 14, 16, 17

- 10 - Operational Risk

**Table 10.1 Example risk assessment (source: cStephen Hunter at Kaizenge)**

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Person(s) or areas affected</th>
<th>Likelihood</th>
<th>Severity</th>
<th>Initial risk rating</th>
<th>Business impact (£k)</th>
<th>Controlling factors</th>
<th>Monitored risk rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of electrical supply</td>
<td>Production</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>1000</td>
<td>UPS and emergency generator installed and tested weekly</td>
<td>10</td>
</tr>
<tr>
<td>Environmental spillage</td>
<td>Discharge of oil to surface; lake nearby</td>
<td>2</td>
<td>5</td>
<td>10</td>
<td>2000</td>
<td>Bund installed to tank, new delivery procedure implemented; reduced quantity stored to three-day holding</td>
<td>5</td>
</tr>
<tr>
<td>Electrical shock</td>
<td>Maintenance team member</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>1000</td>
<td>New training and interview selection procedures to determine competency; new local working procedures</td>
<td>6</td>
</tr>
<tr>
<td>Explosion in pressure vessels</td>
<td>Production team operators and production assembly</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>20000</td>
<td>Old pressure system renewed; new safety devices fitted, training and familiarisation provided; routine control of major accident hazards (COMAH) testing arranged</td>
<td>5</td>
</tr>
<tr>
<td>Falling from heights</td>
<td>Maintenance and public when changing atrium lights</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>1000</td>
<td>Training, mobile access platforms and out of normal hours working; supervision</td>
<td>8</td>
</tr>
<tr>
<td>Failure of production plant</td>
<td>Production team</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>1000</td>
<td>Fault analysis identified critical components; suppliers have 24-hour availability, board agreed £10 000 critical spares stock holding</td>
<td>3</td>
</tr>
</tbody>
</table>
Chapters 10, 11, 13, 14, 16, 17

- 11 – O&M costs
- Capturing costs
- Benchmarking
- Information for planning & control
  - Building / function
  - Systems / components
  - Maintenance tasks
- Budget checklist
Chapters 10, 11, 13, 14, 16, 17

- 13 – Audits
- Management
- Maintenance service
- Communication
- Health and Safety
- Technical Proficiency
- Energy use and management
- Environment and sustainability
- Financial management
### Table 14.1 Example NRM3 classification of engineering services elements

<table>
<thead>
<tr>
<th>Group element</th>
<th>Element</th>
<th>Sub-element</th>
<th>Component</th>
<th>Sub-component</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Services</td>
<td>5.4 Water installations</td>
<td>5.4.1 Mains water supply</td>
<td>5.4.1.1 Mains water supply above ground</td>
<td>5.4.1.1. Pipelines and pipeline fittings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>— Copper</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>— Steel: galvanised</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>— Plastic or non metallic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.4.1.1.2 Valves</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.4.1.1.3 Water meters: internal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.4.1.1.4 Rising main to storage tanks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.4.1.1.5 Water meters: not provided by statutory bodies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.4.1.1.6 Trace heating</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.4.1.1.7 Thermal insulation</td>
</tr>
<tr>
<td>5.5 Heat source</td>
<td>5.5.1 Heat source</td>
<td>5.5.1.1 Heat Source</td>
<td></td>
<td>5.5.1.1.1 Boilers—biomass</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.5.1.1.2 Boilers—gas/oil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.5.1.1.4 Water tanks</td>
</tr>
<tr>
<td>5.6 Space heating and air conditioning</td>
<td>5.6.1 Central heating</td>
<td>5.6.1.1 Central heating</td>
<td>5.6.1.1.1 Central heating system</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.6.1.1.2 Pipework system</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.6.1.1.3 Heat emission units</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.6.1.1.4 Under floor heating</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.6.3 Central cooling</td>
<td>5.6.3.1.1 Chilled beams</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.6.3.1.2 Fan coil systems, for cooling only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.6.3.1.3 Air-based systems: variable air volume (VAV) for cooling only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.6.3.1.4 Variable Refrigerant Volume (VRV) systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.6.3.1.5 Chillers and packaged chillers</td>
</tr>
</tbody>
</table>
Chapters 10, 11, 13, 14, 16, 17

• 16 – Health and comfort

16.1 Indoor air quality
16.2 Thermal comfort influences
16.3 Air distribution systems
16.4 Comfort during modifications to existing buildings
16.5 Recommended assessment schedules
Chapters 10, 11, 13, 14, 16, 17

• 17 - Training

• Competency
  • Fgas – Handling Refrigerants
  • Gas Safety – City & Guilds
  • EPC /DEC

• Policy, needs and plan

• Evaluation and Records
Chapter 12

• 12 – Life cycle
  • Element
  • Component
  • Specification
  • Maintenance task
  • Indicative economic life expectancy
Table 12.A1 Indicative economic life expectancy

<table>
<thead>
<tr>
<th>RICS NRM 3 code</th>
<th>Equipment: Maintainable components</th>
<th>Economic life/years</th>
<th>Remarks</th>
<th>SFG20 Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.6</td>
<td>Space heating and air conditioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.6.1</td>
<td>Central heating (CH)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.6.1.1</td>
<td>Central heating systems:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.6.1.1.1</td>
<td>Central heating system (covered by items 2–14):</td>
<td>Including everything within the plant room specifically relating to the heating system</td>
<td></td>
<td>40-01</td>
</tr>
<tr>
<td>5.6.1.1.2</td>
<td>Heat distribution pipelines from heat source to heat emitter or other equipment:</td>
<td>Depends on the material type.</td>
<td>Consider tube thickness and quality of copper</td>
<td></td>
</tr>
<tr>
<td></td>
<td>— Pipework systems: general</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>— Copper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>— Steel galvanised: closed</td>
<td>35</td>
<td></td>
<td>Including mountings and supports</td>
</tr>
<tr>
<td></td>
<td>— Steel galvanised: open</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>— Plastic</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Economic life

Factors to be consider when using reference service life expectancy data:

• External environment / Internal environment
• Technology changes - obsolescence
• Design and specifications
• Installation
• Maintenance
• Adequate space
• Unoccupied buildings
• Hours of operation
Chapter 15 Legislation and Compliance

- Tasks undertaken at specific intervals
  - Statutory
  - Operational
  - Risk Assessment

- Records
## Compliance spreadsheet

<table>
<thead>
<tr>
<th>Types of System/Plant</th>
<th>Action required</th>
<th>Frequency</th>
<th>Inspection by</th>
<th>Type of Inspection</th>
<th>Relevant Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire and Smoke</td>
<td>Inspection Discharge (not CO₂)</td>
<td>12 monthly 60 monthly</td>
<td>Competent person (Accredited Company)</td>
<td>Statutory Statutory</td>
<td>BS 9999:2008 Code of design, management</td>
</tr>
<tr>
<td>Fire extinguishers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BS EN 3:2000 Portable extinguishers BAFE, LPC or similar</td>
</tr>
<tr>
<td>Fire detection &amp; alarm systems</td>
<td>Functional check</td>
<td>Daily Weekly 3 monthly 12 monthly</td>
<td>User Competent person (Accredited Company)</td>
<td>Operational Statutory</td>
<td>BS 5839-1:2013 Fire detection &amp; alarm systems FIA, LPC, or similar</td>
</tr>
<tr>
<td>Fire hose reels</td>
<td>Visual Inspection</td>
<td>1 monthly 12 monthly</td>
<td>User Trained person</td>
<td>Risk Assessment</td>
<td>BS EN 694:2001 Fire hose reels BS EN 671-3:2009 Fixed fire hydrant system</td>
</tr>
</tbody>
</table>
Further reading

• ISO 55000 Asset Management: Overview, Principles and Terminology

• PAS 1192-3 Specification for Information Management for the Operational Phase of Assets Using Building Information Modelling

• BS 8544 Guide for Life Cycle Costing of Maintenance during the In Use Phases of Buildings

• BS EN 15221-7 Facility Management. Guidelines for Performance Benchmarking

• BSRIA BG (54/2014) Business Focused Maintenance
  – will be 52/ 2015
Thank you

• Please get in touch if you have any questions
  jo.harris@bsria.co.uk or 01344 465 586
CIBSE Guide M

Chapter 3 Maintenance Strategy
Geoff Prudence
Chairman CIBSE Facilities Management
Added Value
-Effective Maintenance Strategies and Delivery

CIBSE Guide M
Maintenance engineering & management

- Design Standards
- Plan of Design Standards
- Plan of Work
- BIM/1192.3/4
- SFG 20
- BS 8544
- NRM 3
- “Plan, Do, Check, Act - Build, Maintain, Renew”

Building Operational Risk Management and Compliance

Source: Geoff Prudence 2014
CIBSE Guide M - Maintenance Strategy

A significant Opportunity

- Without a Strategy- *Cannot have Robust Plans.*
- Previously- *Various Views and Formats.*
- *No Defined links to Design*- Experiential Planning.
- Now a Defined, Overarching Approach.
- Design, Through Operational Life & Retrofitting.
- Consistency of Approach-Linking Industry Best Practice
- Real Data, to Make Informed Decisions against Risk and Cost.
Appendix 2.A1: Design guide to maintainable buildings

1. Feasibility
- Location of building
- Weather/climate
- Air/noise quality required
- Microclimate for broad assessment of A/C requirements and possible options
- Effect of weather on services equipment located outdoors
- Electrical/heat/cooling load (estimates)

2. Outline proposals
- Minimise services requirement
- Simplify those deemed necessary
- Highlight essential services
- Incorporate changes to feasibility brief
- Future use of building, change of use, service capacity
- Plantroom locations
- Focus on daylight, max/min temperatures

3. System design
- Verify outline proposal report and integrate with all design team members
- Ensure facilities representative included (if not previously appointed on design team)—challenge design concepts
- Firm up envisaged maintenance regime, initiate selection of staff/service provider if possible (i.e. management organisation)

* RIBA Plan of Work 2013 for project

Stage 0: Strategic definition
Stage 1: Preparation and brief
Stage 2: Concept design
Stage 3: Developed design

Development expertise → Building requirement/inception → Formation of project team including:
- project manager
- client representative
- architect
- design engineers
- quantity surveyors and consultants

Outline design brief formulated → Development budget → Traditional architect-led construction team?

Consider options → Speculative building or user driven or user requirement

Drive early in design process → Engineering services design
CIBSE Guide M - Maintenance Strategy

- Link to Core Business
- Client, Policy & Strategy
- Priorities-Business Operations Compliance
- Design Stage, Operations Stage.
- Assets, Buildings, Portfolio Level.
- Types of Maintenance & Techniques.
- Delivery Models.

Provides
- Defined Basis for Tendering-Linked to Best Practice
- Flexibility, Prioritised-Budget & Risk Discussions.
- Drive Future Designs (See also Chapter 2).
- Standardisation for BIM considerations.

Estate Importance
Building Rating - ABC
Function Priority - 1234

Asset Performance
Function ABCDEFX
• Condition/remaining life
• Energy efficiency
• Space utilisation
• Resilience/capacity
• Other form of assessments
In reality?......

“B I M”

- Asset Survey?
- Maintenance Strategy?
- Develop Information/Documentation

End to End Efficient Effective Designs and Buildings that Work, over their Lifetime

Handover Period/ Soft Landings
Pragmatic, focussed Approach

Asset/Structure

Baseline Maintenance Standards

Cost/Performance Measurement

Drive Consistency of Approach