

4	ENERGY USE	4.4 PROVISIONS FOR ENERGY MANAGEMENT	
		EU 11 OPERATION AND MAINTENANCE	
	EXCLUSIONS	None.	
	OBJECTIVE	Enable building operators to implement the design intent, be able to monitor the performance of the building, and maintain the performance.	
	CREDITS ATTAINABLE	3	
	PREREQUISITES	None.	
	CREDIT REQUIREMENT	<p>a) Operations and maintenance manual 1 credit for providing a fully documented operations and maintenance manual to the minimum specified.</p> <p>b) Energy management manual 1 credit for providing fully documented instructions that enable systems to operate at a high level of energy efficiency.</p> <p>c) Operator training and operation and maintenance facilities 1 credit for providing training for operations and maintenance staff to the minimum specified; and demonstrating that adequate maintenance facilities are provided for operations and maintenance work.</p>	
	ASSESSMENT	<p>The Client shall submit details of the provisions for operation and maintenance as outlined below.</p> <p>a) Operations and maintenance manual</p> <p>The design intent and basis of design shall be included as a defining part of the operations and maintenance manual and the energy management manual. The manual shall include the details given in Section 8.5.6 as a minimum. A1</p> <p>Where an adequate contract sum was provided for the preparation of comprehensive operations and maintenance manual, and the manual covers adequately the major energy consuming building services systems and equipment the credit shall be awarded. A2</p> <p>b) Energy management</p> <p>Where the operations and maintenance manual, or a dedicated energy management manual is provided, and meets the requirements of Section 8.5.7 as a minimum, the credit shall be awarded. B1</p> <p>c) Operator training and operation and maintenance facilities</p> <p>The training program shall cover as a minimum the items listed in Section 8.5.8. Details of the facilities for operation and maintenance, such as the workshop(s), office accommodation, computing facilities etc., shall be provided, and the case made to demonstrate the adequacy of the facilities in relation to the size and complexity of the building served. C1 C2 C3</p> <p>Where the Client can verify that training of the building's operations and maintenance staff was undertaken for all commissioned systems and major equipment, using the operations and maintenance manual, and the energy management manual as the basis for the training, and demonstrate that the provided operation and maintenance facilities are adequate, the credit shall be awarded. C4</p>	
	BACKGROUND	Facilities to carry out basic maintenance and equipment for monitoring consumption can help improve operating efficiency and environmental	

**8.5.5 INDEPENDENT
COMMISSIONING
AUTHORITY**

The Commissioning Authority shall be an entity that is independent of the design team appointed by the Client to carry out the role of commissioning authority.

**8.5.6 OPERATIONS AND
MAINTENANCE
MANUAL**

The parties responsible for the design each system to be commissioned shall provide in writing:

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- the design intent;
- the basis of design; and
- full sequences of operation for all equipment and systems, all of which must meet the legal requirements and industry wide standards.

The description of the design intent shall include as a minimum:

- space temperature and humidity criteria (refer also to the section on IEQ);
- levels operator and/or occupant control over HVAC systems;
- ventilation requirements and related indoor air quality criteria (refer also to the section on IAQ);
- performance criteria related to energy efficiency;
- environmental responsiveness of the facility; and
- commissioning criteria.

The basis of design shall include at a minimum:

- details of occupancy;
- space activity and any process requirements;
- applicable regulations, codes, and standards;
- design assumptions;
- performance standards and benchmarks; and
- control system appropriate for the skill of the operations and maintenance staff.

The operations and maintenance manual must include for each piece of equipment and each system:

- the name and contact information of the manufacturer or vendor and installing contractor;
- submittal data; and
- operations and maintenance instructions with the models and features for the subject site clearly marked.

The manual shall include only data for equipment that is actually installed, and include the following:

- instructions for installation, maintenance, replacement, start-up;
- special maintenance requirements and sources for replacement parts/equipment;
- parts list and details of and special tooling requirements;
- performance data; and
- warranty information.

The manual shall include an as-built documentation package for controls covering the following:

- control drawings and schematics;
- normal operation;
- shutdown;
- unoccupied operation;
- seasonal changeover;
- manual operation;
- controls set-up and programming;
- troubleshooting;
- alarms; and
- final sequences of operation.

8.5.7

ENERGY MANAGEMENT MANUAL

The details shall include:

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- descriptions of the final design intent and basis of design, including brief descriptions of each system;
- final sequences of operations for all equipment;
- procedures for seasonal start-up and shutdown, manual and restart operation;
- as-built control drawings;
- for all energy-saving features and strategies, rationale description, operating instructions, and caveats about their function and maintenance relative to energy use;
- recommendations and brief method for appropriate accounting of energy use of the whole building;
- specifications for re-calibration frequency of sensors and actuators by type and use;
- recommendations for continuous commissioning or recommended frequency for re-commissioning by equipment type, with reference to tests conducted during initial commissioning;
- recommendations regarding seasonal operational issues affecting energy use;
- list of all user-adjustable set points and reset schedules, with a discussion of the purpose of each and the range of reasonable adjustments with energy implications;
- schedules of frequency for reviewing the various set points and reset schedules to ensure they still are near optimum;
- list of time-of-day schedules and a frequency to review them for relevance and efficiency;
- guidelines for establishing and tracking benchmarks for building energy use and primary plant equipment efficiencies;
- guidelines for ensuring that future renovations and equipment upgrades will not result in decreased energy efficiency and will maintain the design intent;
- list of diagnostic tools, with a description of their use, that will assist facility staff for the building in operating equipment more efficiently;
- a copy of the commissioning report; and
- index of all commissioning documents with notation as to their location.

8.5.8

**OPERATOR TRAINING
AND FACILITIES**

C5

The training program shall cover the following:

- general purpose of each building system including basic theory of operation, capabilities and limitations, and modes of control and sequences of operation;
- review of control drawings and schematics;
- procedures for start-up, shutdown, seasonal changeover, normal operation, unoccupied operation, and manual operation;
- controls set-up and programming;
- troubleshooting;
- alarms;
- interactions with other systems;
- operational monitoring and record keeping requirements, and the use of data for analyzing system performance;
- adjustments and optimizing methods for energy conservation;
- any relevant health and safety issues;
- inspection, service, and maintenance requirements for each system, including any need for specialised services;
- sources for replacement parts/equipment; and
- any tenant interaction issues.

The demonstration portion of the training program shall include at least the following:

- operation typical examples of each system;
- start-up and shutdown procedures;
- operation under all specified modes of control and sequences of operation;
- procedures under emergency or abnormal conditions; and
- procedures for effective operational monitoring.

The Client shall submit details in the form of drawings and a report demonstrating:

- that proper maintenance facilities are provided for operations and maintenance work in the form of workshop(s), office accommodation and control room;
- adequate provision of chemical storage and mixing areas for housekeeping products (central storage facilities and janitors closets, where appropriate) to allow for adequate and secure product storage with water in the space for mixing concentrated chemicals; and
- adequate provision of drains plumbed for the appropriate disposal of liquid waste products, equipped with separate outside venting, and operated under negative pressure.



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EU 11c Operator Training and Operation and Maintenance Facilities
Appendix 8.5.8 Operator Training and Facilities

1. Technical Circular Letter No. 2015.126 dated 19 March 2015 will be **withdrawn** on the effective date.
2. The following table sets out the buildings required to provide chemical storage area and/or chemical mixing area.

C6

Parts of The Building	Type of A/C System	Requires Chemical Storage Area	Requires Chemical Mixing Area
Domestic ^{1, 2}	Window-type units	✗	✗
	Split-Type/VRF system without fresh air provisions	✗	✗
	Split-Type/VRF system with fresh air provisions (including DX-PAU and fresh air processing units)	✗	✗
Non-Domestic ³	Chiller plant installed within the assessment boundary	✓	✓ ⁴
	District cooling system or chiller plant installed outside of the assessment boundary	✓	✗
	Split-Type/VRF system without fresh air provisions	✓	✗
	Split-Type/VRF System with fresh air provisions (including DX-PAU and fresh air processing units)	✓	✗

3. Projects that are required to provide chemical storage area and/or chemical mixing area shall observe the following functional requirement:

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¹ Domestic refers to the part of a composite building that is constructed or intended for habitation. This may include residential flats and dormitories.

² The requirement on chemical storage area and chemical mixing area is exempted for the domestic parts of the building given that the habitant will be responsible for the operation and maintenance of their personal domestic space.

³ Non-domestic refers to the part of a composite building that is constructed or intended for use otherwise than for habitation. This may include clubhouses, offices, hotel rooms, shopping arcade, cinema, common entrance.

⁴ A separate chemical mixing area is required for the non-domestic parts of the building with the provision of chiller system because the chiller system requires chemical mixing and dosing as part of the chiller water treatment.

- i. Chemical storage area – a lockable enclosure within an operation and maintenance facility⁵.
 - ii. Chemical mixing area – an area within an operation and maintenance facility equipped with the following building services installation:
 - (a) Separate outside venting and operated under negative pressure;
 - (b) Water point for mixing and diluting concentrated products; and
 - (c) Provision of drainage for the appropriate disposal of liquid waste products.
4. Co-location of chemical storage area and chemical mixing area in a single operation and maintenance facility is acceptable so long if all functional requirement has been fulfilled.
 5. The Applicant is encouraged to file a Credit Interpretation Request for clarifications if he/she is in doubt on whether certain parts of the building is can serve as chemical storage area and/or chemical mixing area.
 6. Approved PA projects: For projects that have already completed PA, the Applicant may opt to include the same chemical storage area, same chemical mixing area and same supporting amenities to the chemical storage/mixing area for the subsequent assessments (FA or Re-assessment in the PA stage). For the avoidance of doubt, the Applicant shall provide the relevant documentations (e.g. extract of the PA report, relevant layout drawings, etc). in subsequent assessments to support the intention of including same chemical storage area, same chemical mixing area and same supporting amenities to the chemical storage/mixing area as in PA.



Mr KM So
Chairperson of Standards Sub-committee

⁵ Operation and maintenance facility refer to an indoor area having the function compatible to workshop, janitor room, central storage, chiller plant room or A/C plant room.