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SINGAPORE STANDARD

Code of practice for long term measurement of central chilled water system energy efficiency

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Foreword

This Singapore Standard was prepared by a Working Group appointed by the Technical Committee on Building Maintenance and Management which is under the purview of the Building and Construction Standards Committee.

The purpose of this standard is to enable an organisation to design and implement a measurement and verification system for the long term, continuous and accurate tracking of central chilled water system energy efficiency.

Central chilled water system accounts for the lion's share of the energy consumption of most large buildings in the tropics. They are also the major energy consumers in industrial facilities.

When new system are considered or when system are retrofitted, the data from long term and continuous monitoring are vital for the correct sizing of plant components in order to optimise floor space, electrical and structural infrastructure as well as to reduce capital and operating costs. Measurement and verification (M&V) can also be used as an accountability tool to gauge the performance of the supplied equipment post installation. In addition, installation of a permanent M&V system can help to facilitate the reporting of the performance of the central chilled water system to relevant authorities.

The objectives of long term, continuous and accurate tracking of energy efficiency, important process parameters and relevant performance data of central chilled water system are to:

a) generate useful and accurate chiller performance data for the proper operation, maintenance, sizing, and control of the system to improve energy efficiency, and to reduce greenhouse gas emissions and water consumption;

b) allow buyers to specify energy efficiency requirements that shall be met and guaranteed by suppliers, Energy Services Companies (ESCOs), contractors, and designers of equipment and system;

c) improve system reliability by enabling more effective maintenance and operations;

d) reduce noise and vibrations from improper operation of chillers and other plant equipment;

e) reduce chemicals and other materials usage; and

f) extend the useful life of the plant and equipment.

The standard also subscribes to the general principles of international energy management system standards, such as ISO 50001 and its related guidance standards.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions.*

2. *An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR.*

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Code of practice for long term measurement of central chilled water system energy efficiency

Section One – General

1.1 Scope

This standard specifies the requirements for sensors and instruments in capturing relevant process parameters, their installation, commissioning, operational monitoring and maintenance in order to perform continuous, long term measurement of central chilled water system energy efficiency.

The standard also:

a) specifies the appropriate uncertainty levels for continuous measurements for the proper energy efficiency rating of the equipment and plant;

b) specifies the parameters and performance indicators for continuous measurements;

c) specifies installation details for easy comparison of sensor calibration and as-installed performance; and

d) recommends the development of useful presentation formats for the data collected, to be used widely and on various platforms, including web-based platforms.

1.2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASHRAE Guideline 14 : 2002	Measurement of energy and demand savings
IEEE 519 : 1992	IEEE Recommended practices and requirements for harmonic control in electrical power systems
IEC 61869-2 : 2012	Instrument transformers - Part 2: Additional requirements for current transformers
IEC 61869-3 : 2011	Instrument transformers - Part 3: Additional requirements for inductive voltage transformers
IEC 61869-5 : 2011	Instrument transformers - Part 5: Additional requirements for capacitor voltage transformers
IEC 62053-22 : 2003	Electricity metering equipment (a.c.) - Particular Requirements - Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)
ISO 4185:1980/Cor 1 : 1993	Measurement of liquid flow in closed conduits - Weighing method
ISO 8316 : 1987	Measurement of liquid flow in closed conduits - Method by collection of the liquid in a volumetric tank
ISO/IEC 17025 : 2005	General requirement for the competence of testing and calibration laboratories
SS ISO 50001 : 2011	Energy management systems – Requirements with guidance for use

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