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Building environment design — List of test procedures for heating, ventilating, air-conditioning and domestic hot water equipment related to energy efficiency

Conception de l'environnement des bâtiments - Liste des procédures d'essai liés à l'efficacité thermique pour les installations de chauffage, ventilation, air conditionné et eau chaude à usage domestique — Équipement de chauffage, de ventilation et de refroidissement — Exigences relatives au rendement d'énergie

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 205, *Building environment design*.

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Introduction

The world's energy resources are being consumed at a significant rate that will result in the depletion of known fossil fuel resources within the next century. Combustion of fossil fuels has contributed to the build-up of greenhouse gases in the atmosphere resulting in discernible climate change. The ill effects of climate change have been documented. It is imperative that energy be conserved. The building industry, through its use of energy, accounts for 30 % to 35 % of all fossil fuel usage. Conservation of energy in buildings can result in a slowing down of fossil fuel usage and consequently the build-up of greenhouse gases.

The energy efficiencies of components in HVAC systems are critical factors when determining building overall energy performance. Therefore, it is necessary to define common test methods that are to be used to determine efficiency for space heating, space cooling, and water heating equipment, in order to improve energy conservation. Space heating, space cooling, and water heating equipment are typically regulated by specifying both a measure of efficiency that the equipment must meet and a test method that must be used to determine that measure of efficiency. A technical report containing test procedures and globally relevant standards for the energy-efficiency of products is needed for the proper assessment of building energy performance. This Technical Report will be a useful reference for standards developed by ISO/TC 205 and ISO/TC 163-ISO/TC 205. The ultimate goal of this effort is to develop a set of globally adopted HVAC equipment testing and rating standards under the auspices of ISO.

This Technical Report lists existing HVAC equipment testing and rating procedures from around the world. Standards are listed in two ways, by the standards writing organization and by the type of equipment addressed in the standard. In Clause 2, procedures are listed by the organization that developed the procedure. In Clause 4, procedures are listed by the types of equipment that are covered by the procedure. Procedures are listed to aid in the development of new ISO procedures that may be globally adopted.

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Building environment design — List of test procedures for heating, ventilating, air-conditioning and domestic hot water equipment related to energy efficiency

1 Scope

This Technical Report lists testing and rating procedures for determining energy efficiency of heating, ventilating, and air conditioning equipment. This Technical Report is applicable to space conditioning and water heating equipment. Testing and rating procedures are listed in two ways.

2 List of procedures by organization

The following documents contain provisions which, through reference in this text, constitute provisions of this Technical Report. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. For undated references, the latest edition of the document referred to and any updates applies. Members of ISO and IEC maintain registers of currently valid International Standards.

AHRI

AHRI 400 with Addendum 2 Liquid-to-Liquid Heat Exchangers

AHRI 1230, *Performance Rating of Variable Refrigerant Flow (VRF) Multi-split Air-Conditioning and Heat Pump Equipment*

AHRI 1160, *Performance Rating of Heat Pump Pool Heaters*

AMCA

AMCA 500-D-07, *Laboratory Methods of Testing Dampers for Rating*

ANSI

ANSI Z21.47, *Gas-Fired Central Furnaces*

ANSI Z83.8, *Gas Unit Heaters and Duct Furnaces*

AHAM

ANSI AHAM RAC-1, *Room Air-Conditioners*

ASHRAE

ANSI ASHRAE 118.1, *Method of Testing Commercial Gas, Electric and Oil Water Heaters*

ANSI ASHRAE 118.2, *Method of Testing Residential Gas, Electric, and Oil Water Heaters*

ANSI ASHRAE 146, *Method of Testing for Rating Pool Heaters*

ASHRAE Standard 103, M*ethod of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers*

AHRI

AHRI 210/240, *Unitary Air-conditioning and Air Source Heat Pump Equipment*

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AHRI 310/380, *Packaged Terminal Air-conditioners and Heat Pumps*

AHRI 340/360, *Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment*

AHRI 365, *Commercial and Industrial Unitary Air-conditioning Condensing Equipment*

AHRI 390, Performance Rating of *Single Packaged Vertical Air Conditioners and Heat Pumps*

AHRI 460, *Remote Mechanical-Draft Air-Cooled Refrigerant Condensers*

AHRI 550/590 with Addenda through July 2002, *Water Chilling Packages Using the Vapor Compression Cycle*

AHRI 560, *Absorption Water Chilling and Water Heating Packages*

CTI

CTI ATC-105, *Acceptance Test Code for Water Cooling Towers*

CTI STD-201*, Standard for Certification of Water Cooling Tower Thermal Performance*

DOE

DOE 10 CFR Part 430, Appendix N, *Uniform Test Method for Measuring the Energy Consumption of Furnaces*

EN

EN 297, *Atmospheric gas boiler without fan, < 70 kW*

EN 303-1, *Boilers with forced draught burners — General requirements*

EN 303-2, *Boilers with forced draught burners — Atomizing oil burners*

EN 303-3, *Gas boilers with forced draught burners — Assemblies*

EN 303-4, *Boilers with forced draught burners — Oil burners < 70 kW*

EN 303-6, *Boilers with forced draught burners — Oil fired combi-boilers*

EN 416, *Single-burner gas-fired overhead radiant tube heaters for non-domestic use — Part 2: Rational use of energy*

EN 419, *Non-domestic gas-fired overhead luminous radiant heaters — Part 2: Rational use of energy*

EN 625, *Gas-fired combi-boilers*

EN 15035, *Room-sealed (type C) oil-fired boilers*

EN 15456, *Electrical power consumption for heat generators*

EN 267, *Forced draught oil burners — Definitions, requirements, testing, marking*

EN 304, *Atomizing oil burners — Test code*

EN 303-7, *Boilers with forced draught burners — Gas fired boilers < 1000 kW*

EN 656, *Gas boilers, type B, 70 - 300 kW*

EN 13836, *Gas boilers, type B, 300 - 1000 kW*

EN 483, *Gas boilers, type C < 70 kW*

EN 677, *Gas condensing boilers < 70 kW*

EN 15034, *Condensing oil boilers < 1000 kW*

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EN 13203-1, *Gas-fired water heaters, performance assessment*

EN 13203-2, *Gas fired water heaters, energy use assessment*

EN 12897, *Water supply — Specification for indirectly heated unvented (closed) storage water heaters*

EN 15332, *Heating boilers — Energetic assessment of hot water storage tanks*

EN 89, *Gas-fired storage water heaters for the production of domestic hot water*

EN 26, *Gas-fired instantaneous water heaters for sanitary uses production, fitted with atmospheric burners*

EN 12976-1, *Thermal solar systems and components — Factory made systems — Part 1: General requirements*

EN 12976-2, *Thermal solar systems and components — Factory made systems — Part 2: test methods*

EN 14511-1:2011, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 1: Terms and definitions*

EN 14511-2:2011, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 2: Test conditions*

EN 14511-3:2011, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 3: Test methods*

EN 14511-4:2011, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 4: Requirements*

EN 12102:2008, *Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling — Measurement of airborne noise — Determination of the sound power level*

EN 15218:2006, *Air conditioners and liquid chilling packages with evaporatively cooled condenser and with electrically driven compressors for space cooling — Terms, definitions, test conditions, test methods and requirements*

EN 14825:2012, *Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling — Testing and rating at part load conditions and calculation of seasonal performance*

EN 15240:2007, *Ventilation for buildings — Energy performance of buildings — Guidelines for inspection of air-conditioning systems*

EN 12599:2012, *Ventilation for buildings — Test procedures and measurement methods to hand over air conditioning and ventilation systems*

EN 15726:2011, *Ventilation for buildings — Air diffusion — Measurements in the occupied zone of air-conditioned/ventilated rooms to evaluate thermal and acoustic conditions*

HI

HI, Division of GAMA, BTS 2000, *Testing Standard Method to Determine Efficiency of Commercial Space Heating Boilers*

ISO

ISO 13256-1, *Water Source Heat Pumps — Testing and Rating for Performance — Part 1: Water-to-Air and Brine-to-Air Heat Pumps*

ISO 13256-2, (1998), *Water-Source Heat Pumps — Testing and Rating for Performance — Part 2: Water-to-Water and Brine-to-Water Heat Pumps*

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ISO 9459-3, *Solar heating — Domestic water heating systems — Part 3: Performance test for solar plus supplementary systems*

ISO 5151:2010, *Non-ducted air conditioners and heat pumps — Testing and rating for performance*

ISO 13253:2011, *Ducted air-conditioners and air-to-air heat pumps — Testing and rating for performance*

ISO 15042:2011, *Multiple split-system air-conditioners and air-to-air heat pumps — Testing and rating for performance*

JIS

JIS A 1400, *Radiators, convectors and similar appliances — Methods of performance test*

JIS A 4003, *Warm air furnaces*

JIS A 4004, *Radiators, convectors, and similar appliances — Classification and requirements*

JIS A 4007, *Fan convector*

JIS A 4008, *Fancoil units*

JIS A 4111, *Solar water heater*

JIS A 4112, *Solar collectors*

JIS A 4113, *Solar storage tanks*

JIS A 4412, *Air-conditioning unit for dwellings*

JIS B 8122, *Test methods for measuring performance of cogeneration unit*

JIS B 8606, *Testing of refrigerant compressors*

JIS B 8608, *Refrigerating systems–Test methods — General requirements*

JIS B 8609, *Performance tests of mechanical draft cooling tower*

JIS B 8613, *Water chilling unit*

JIS B 8615-1, *Non-ducted air conditioners and heat pumps — Testing and rating for performance*

JIS B 8615-2, *Ducted air-conditioners and air-to-air heat pumps — Testing and rating for performance*

JIS B 8616, *Package air conditioners*

JIS B 8621, *Centrifugal water chillers*

JIS B 8622, *Absorption refrigerating machines*

JIS B 8623, *Testing methods of refrigerant condensing units*

JIS B 8625, *Ice thermal storage units for air conditioning purpose — Test methods*

JIS B 8627-1, *Gas engine driven heat pump air conditioners — Part 1: General requirements*

JIS B 8627-2, *Gas engine driven heat pump air conditioners — Part 2: Non-ducted gas engine driven heat pump air conditioners — Testing and rating for performance*

JIS B 8627-3, *Gas engine driven heat pump air conditioners — Part 3: Ducted gas engine driven heat pump air conditioners — Testing and rating for performance*

JIS C 9612, *Room air conditioners*

JIS C 9803, *Household electric direct-acting room heaters-methods for measuring performance*

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JIS C 9807, *Methods for measuring the performance of electric storage water-heaters for household purposes*

JIS S 3031, *General rules for test methods of oil burning appliances*

JRA

JRA 4002, *Package air conditioners*

JRA 4033, *Multi type room-air conditioners*

JRA 4043, *Testing Method-Gas engine driven heat pump air conditioners for cooling and heating*

JRA 4046, *Calculation Criterion for Annual Power Consumption of Room Air Conditioner*

JRA 4048, *Annual Performance Function for Package air conditioners*

JRA 4049, *Multi type room-air conditioners*

JRA 4050, *Heat pump for domestic hot water*

JRA 4053, *Package air conditioners with ice thermal storage*

JRA 4058, *Gas heat pump for cooling & heating with generator*

JRA 4060, *Heat pump for commercial use hot water*

UL

UL 727, *U.L. Standard for Safety — Oil-Fired Central Furnaces*

UL 731, *U.L. Standard for Safety — Oil-Fired Unit Heaters*

3 Terms and definitions

NA

4 Mechanical equipment test procedures by equipment type

4.1 General

Equipment efficiency is either supported by data furnished by the manufacturer or certified under a nationally-recognized certification program or rating procedure. For products covered by the test procedures listed below, a test report from an independent laboratory verifies equipment efficiency ratings.

4.2 Air conditioner and condensing unit test procedures

Air Conditioners less than 19 kW

ANSI AHRI 210/240, *Unitary Air-conditioning and Air Source Heat Pump Equipment*

Air Conditioners greater than or equal to 19 kW

AHRI 340/360, *Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment*

Condensing Units (any size)

AHRI 365, *Commercial and Industrial Unitary Air-conditioning Condensing Equipment*

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