



DRAFT INTERNATIONAL STANDARD ISO/DIS 6781-3

ISO/TC 163/SC 1

Secretariat: DIN

Voting begins on
2013-02-14

Voting terminates on
2013-07-14

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Performance of buildings — Detection of heat, air and moisture irregularities in buildings by infrared methods —

Part 3: Qualifications of Equipment Operators, Data Analysts and Report Writers

Performance des bâtiments — Détection d'irrégularités de chaleur, air et humidité dans les bâtiments par des méthodes infrarouges —

Partie 3: Qualification des opérateurs de l'équipement, des analystes de données et des rédacteurs de rapports

ICS 91.120.10

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/ec0d0248-433b-4a23-930e-ff04872e9040/iso-6781-3-2015>

Copyright notice

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

Contents

	Page
Foreword	iv
Introduction.....	v
1 Scope	1
2 Normative references	1
3 Terms and Definitions	1
4 Classification of personnel	2
4.1 General	2
4.2 Class II	2
4.3 Class III	3
5 Eligibility	3
5.1 General	3
5.2 Qualifications	4
5.2.1 Education	4
5.2.2 Training.....	4
5.2.3 Experienced candidates	5
5.3 Work experience	5
6 Test instruments (Examinations).....	6
6.1 Content	6
6.1.1 Knowledge.....	6
6.1.2 Skills	6
6.1.3 Abilities.....	6
6.2 Administration of test instruments.....	7
Annex A (normative) Training course requirements for thermography personnel	8
A.1 Training syllabus	8
A.2 Detailed list of topics and hours of instruction.....	9
Annex B (Normative) Training course details.....	15

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 6781-3 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*, Working Group 15, *Thermography of Buildings by Infrared methods*.

ISO 6781 consists of the following parts, under the general title *Thermal performance of buildings — Detection of heat, air and moisture irregularities in buildings by infrared methods*:

- **Part 1:** *General Procedures (Under development)*;
- **Part 2:** *Equipment Requirements (Under development)*;
- **Part 3:** *Qualifications of Equipment Operators, Data Analysts and Report Writers*;
- **Part 4:** *Conducting Thermographic Inspections and Reporting of Results - Residential Buildings (Under development)*;
- **Part 5:** *Conducting Thermographic Inspections and Reporting of Results – Commercial Buildings (Under development)*;
- **Part 6:** *Conducting Thermographic Inspections and Reporting of Results – Institutional Buildings (Under development)*.

Annex A and Annex B form *normative* parts of this part of ISO 6781

Introduction

Reducing energy use in buildings is paramount to improving our environment. Infrared building thermography provides a tool to quantitatively and qualitatively identify the presence of energy-wasting defects and anomalies within building structures. These defects and anomalies can include, for example, thermal insulation defects, moisture content, and / or unwanted air movement or leakage within the building envelope.

Building Thermography is carried out by means of an infrared radiation sensing system, which produces an image based on the apparent radiance temperature of the target surface area. The thermal radiation (infrared radiation density) from the target area is converted by the infrared radiation sensing system to produce a thermal image (thermogram). This image (thermogram) represents the relative intensity of thermal radiation from different parts of the surface. The radiation intensity indicated by the image is directly related to (i) the surface temperature and distribution, (ii) the characteristics of the surface, (iii) the ambient conditions, and (iv) the sensor itself. Also included in the thermographic process is valid interpretation of the thermal images.

As a result, surface temperature distribution can be a key parameter for monitoring the performance of building components, building envelopes and the diagnostics of problems. In use, via analysis of surface temperature distributions, irregularities in the heat and moisture properties of building envelopes and components, and air movement within the building envelope, can be indicated. These irregularities can be due to, for example, thermal insulation defects, moisture content, air leakage within components, or incorrect installation of components which comprise the construction of the building.

To realize its full utility as an initial qualitative screening technique, or in-depth diagnostic technique, thermography must often be supported and / or validated by other methods to realize its full utility. Such methods include, but are not limited to, infra-red photosensitive tracer gas methods, fan pressurization of the building envelope, heat-flow meters, smoke diffusion, anemometry, etc.

The effectiveness of the investigations depends on the capabilities of individuals who perform the measurements and analyse the data. A person or entity wishing to use or implement infrared thermographic services for buildings can refer to this standard to understand and specify (i) the qualifications required of operators of the thermographic equipment, (ii) the qualifications required of interpreters of data gathered from the thermographic surveys.

This International Standards, ISO 6781 Part 3, sets out the requirements and defined levels of competence that Equipment Operators, Data Analysts and Report Writers must possess to in order to undertake thermographic investigations and the analysis and reporting of thermographic results stemming from investigations.

For validity of requirements to this Standard, assessment of competence will be undertaken by a body qualified to train and assess the competence of personnel whose duties require the appropriate theoretical and practical knowledge applicable to thermography of buildings.

DRAFT 2013

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Full standard:
<https://standards.iteh.ai/catalog/standards/sist/ec0d40248-433b-4a23-930e-fd4872e9040/iso-6781-3-2015>

Thermal performance of buildings — Detection of heat, air and moisture irregularities in buildings by infrared methods — Part 3: Qualifications of Equipment Operators, Data Analysts and Report Writers

1 Scope

This part of ISO 6781 specifies the qualifications and an assessment process for personnel who (i) perform thermographic investigations on buildings (ii) who interpret the data emanating from thermographic investigations, and (iii) who report the results of thermographic investigations.

This standard provides the basis for a declaration of conformity, in three classes, of the knowledge, skills and abilities of individuals to perform thermographic measurements, analysis and reporting of results for residential, commercial and institutional buildings.

Specialized equipment or other specific situations is not covered by this standard.

2 Normative references

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

ISO 9288:1996, *Thermal insulation — Heat transfer by radiation — Physical quantities and definitions*

ISO 17024:2003, *Conformity Assessment — General requirements for bodies operating certification of persons*

3 Terms and Definitions

3.1

trainee

person who is being trained to become qualified

3.2

significant interruption

absence or change of activity which prevents the assessed individual from practising the duties corresponding to the defined scope of their classification for (a) a continuous period in excess of 365 days or (b) two or more periods for a total time exceeding two-fifths of the total period of validity of the certificate or declaration of conformity.

3.3

test instrument

any means used (whether oral, written or demonstrative) to test that required knowledge, skills and abilities have been effectively assimilated, and can be effectively deployed in practice, by an individual.

3.4

authorized qualification body

body, independent of the employer, authorized by a nationally recognized certification body to prepare and administer qualification examinations

4 Classification of personnel

4.1 General

Individuals assessed as conforming to the requirements of this part of ISO 6781 shall be classified in one of three classes depending upon their qualifications. They shall have demonstrated the necessary knowledge, skills and abilities in thermography of buildings for their class as presented in Annex A.

Personnel classified as Class II need to have all the knowledge, skills and abilities expected of personnel classified as Class I, while personnel classified as Class III need to have all the knowledge, skills and abilities expected of personnel classified as Class II.

For the requirements of this Standard to be met, training specified in 5.5.2 of this International Standard shall be delivered by an authorized qualifying body (ii) training will be delivered by persons fully qualified as Class III for Thermography of buildings (iii) assessments of competence shall conform to the requirements of ISO 17024 in assessing the knowledge, skills and abilities of personnel who require the theoretical and practical knowledge applicable to thermography of buildings

Individuals classified as Class I are qualified to perform buildings infrared thermography of buildings according to established and recognised procedures. Personnel classified as Class I shall have the knowledge, skills and abilities to be able to:

- a) apply a specified thermographic measurement technique;
- b) have knowledge of, set up and operate the thermal imaging equipment for safe thermographic data collection;
- c) prevent, minimise or control poor data and error sources;
- d) perform basic fault detection, severity assessment, and diagnosis in accordance with established instructions;
- e) perform basic image post processing (measurement tools, emissivity adjustments, span and scale adjustments, etc);
- f) maintain a database of results and trends;
- g) verify the calibration of thermographic measurement systems;
- h) in accordance with established criteria, evaluate and report test results and highlight areas of concern; and
- i) be able to recognise and prevent or control factors that result in the acquisition of poor-quality data (sources of data error).

4.2 Class II

Individuals classified as Class II are qualified to perform infrared thermography of buildings according to established and recognised procedures. Personnel classified as Class II shall have the knowledge, skills and abilities to be able to:

- a) select the appropriate infrared thermography technique and understand its limitations;
- b) apply thermography theory and techniques, including measurement and interpretation of survey results;
- c) specify the appropriate hardware and software;
- d) perform advanced diagnoses of irregularities found during thermographic investigations;

- e) in accordance with industry-accepted practices, standards and regulations and statutes, recommend appropriate corrective actions;
- f) perform advanced image post processing (image, trending, montage, subtraction, super-imposition, statistical analysis, etc);
- g) use generally recognized advanced techniques for infrared thermography of buildings and diagnosis of irregularities in accordance with established procedures;
- h) prepare reports on as-found building condition, faults, irregularities and diagnoses, and recommend corrective actions for repair and remediation;
- i) be aware of the use of alternative or supplementary technologies that support or enhance the effectiveness of thermographic investigations of buildings;
- j) provide guidance to and supervise to Class I personnel.

NOTE Preparation of reports involving structural components and elements of buildings should be undertaken by registered professionals in accordance with local statutes and regulations.

4.3 Class III

Individuals classified as Class III are qualified to perform infrared thermography of buildings according to established and recognised procedures. Personnel classified as Class III shall have the knowledge, skills and abilities to be able to:

- a) develop and establish thermographic programmes, procedures, and instructions including determination of regimens for periodic / continuous monitoring, frequency of testing, the use of advanced techniques;
- b) determine severity assessment and acceptance criteria for new, existing and renovated buildings;
- c) interpret and evaluate codes, standards, specifications and procedures;
- d) designate the particular test methods, procedures, equipment and instructions to be used;
- e) perform prognostics for detected heat, air movement and moisture irregularities;
- f) recommend appropriate types of corrective actions based on sound building technology practices;
- g) provide guidance to and supervise Class I and II personnel; and
- h) be able to recommend the use of alternative or supplementary technologies for detection of heat, air and moisture irregularities in buildings by infrared methods.

5 Eligibility

5.1 General

Candidates shall have a combination of education, training and experience to ensure that they understand the principles and procedures applicable to thermographic measurement, analysis and report writing.

Candidates shall have colour perception assessed by the Ishihara 24 plate test. A record of test results should be retained and presented to the assessment body upon request. In the event that a colour perception deficiency, indicated by misreading four or more of the 24 plates, is detected during the Ishihara test, a further 'task specific' test is to be carried out by the employer to ascertain whether the detected colour perception deficiency affects the individual's ability to satisfactorily perform analysis of thermographic data using colour palettes. Failure to pass this test shall require the candidate to use a monochrome palette. This 'task specific'

test, and any requirement to use a monochrome palette, is to be documented and the record of the test made available to the assessment body upon request.

5.2 Qualifications

Candidates shall be qualified by confirming that the person has the knowledge, skills and abilities as outlined in the essential learning specified in 4.1, 4.2 and 4.3.. The pre-qualifications required are listed in 5.2.1, 5.2.2 and 5.2.2. The qualifications for a equipment operator, a data analyst, and a report writer shall be the same.

5.2.1 Education

Candidates seeking classification do not need to provide evidence of formal education to establish eligibility. Candidates for Class I and II shall have at least a secondary school graduate qualification or its equivalent. Class II and III shall be able to manipulate simple algebraic equations, use a scientific calculator, and be familiar with the operation of personal computers.

NOTE Successful completion of two or more years of mechanical technology, building technology or mechanical engineering at an accredited college, university, or technical school is recommended for candidates seeking classification to Class III.

5.2.2 Training

To be eligible to apply for assessment based on this part of ISO 6781, the candidates shall provide evidence of training based on the requirements of Annex A. The minimum hours of training is shown in Table 1. Training shall be in the form of lectures, demonstrations, practical exercises or formal training courses. Training time of each topic shall be in accordance with Annex A and Table 1.

Table 1 — Minimum Duration of Cumulative Training (hours)

Class I	Class II	Class III
50	53	35

Training shall be modularised into two or more subject areas covering general scientific principles and application specific knowledge in order to allow for mutual recognition between building thermography training and assessment bodies.

5.2.2.1 Training for supplementary classification

A modular training course designed to cover those topics particular to thermography-based investigation of buildings' performance shall be undertaken.

Such supplementary training courses shall cover the topics outlined in Annex A for Topics Five (5) through eleven (11) inclusive. The duration of such training shall comply with the durations stated in Annex A for the relevant subject areas.

5.2.2.2 Training on building technology

Candidates shall attend building technology training, or equivalent on-the-job training, of at least a similar duration as specified in Table 1.

Such training shall be in addition to the education requirement in Clause 5.2.1 inclusive of any college or university education.

Class I training shall consist of the design, construction, installation and maintenance of building materials and systems as it relates to the heat, air and moisture flow in buildings