PD CEN/TR 15378-2:2017

BSI Standards Publication

Energy performance of buildings — Heating systems and DHW in buildings

Part 2: Explanation and justification of EN 15378-1, Module M3-11 and M8-11

National foreword

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This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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European foreword

This document (CEN/TR 15378-2:2017) has been prepared by Technical Committee CEN/TC 228 “Heating systems and water based cooling systems in buildings”, the secretariat of which is held by DIN.

This document has been prepared under a mandate [11] given to CEN by the European Commission and the European Free Trade Association.

This document is part of the set of standards and accompanying technical reports on the energy performance of buildings (the set of EPB standards).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

Introduction

General

Directive 2010/31/EU recasting the Directive 2002/91/EC on energy performance of buildings (EPBD, [11]) promotes the improvement of the energy performance of buildings within the European Union, taking into account all types of energy uses (heating, lighting, cooling, air conditioning, ventilation) and outdoor climatic and local conditions, as well as indoor climate requirements and cost effectiveness (Article 1).

The directive requires Member States to adopt measures and tools to achieve the prudent and rational use of energy resources. In order to achieve those goals, the EPBD requires increasing energy efficiency and the enhanced use of renewable energies in both new and existing buildings. One tool for this is the application by Member States of minimum requirements on the energy performance of new buildings and for existing buildings that are subject to major renovation, as well as for minimum performance requirements for the building envelope if energy-relevant parts are replaced or retrofitted. Other tools are energy certification of buildings, inspection of boilers and air-conditioning systems.

The use of European standards increases the accessibility, transparency and objectivity of the energy performance assessment in the Member States facilitating the comparison of best practices and supporting the internal market for construction products. The use of EPB-standards for calculating energy performance, as well as for energy performance certification and the inspection of heating systems and boilers, ventilation and air-conditioning systems will reduce costs compared to developing different standards at national level.

The first mandate to CEN to develop a set of CEN EPBD standards (M 343, [8]), to support the first edition of the EPBD ([9]) resulted in the successful publication of all EPBD related CEN standards in 2007-2008.

The mandate M 480 was issued to review the mandate M 343 as the recast of the EPBD raised the need to revisit the standards and reformulate and add standards so that they become on the one hand unambiguous and compatible, and on the other hand a clear and explicit overview of the choices, boundary conditions and input data that need to be defined at national or regional level. Such national or regional choices remain necessary, due to differences in climate, culture and building tradition, policy and legal frameworks. Consequently, the set of CEN-EPBD standards published in 2007-2008 had to be improved and expanded on the basis of the recast of the EPBD.

The EPB standards are flexible enough to allow for necessary national and regional differentiation and facilitate Member States implementation and the setting of requirements by the Member States.

In case the EPB standards are used in the context of national or regional legal requirements, mandatory choices may be given at national or regional level for such specific applications, in particular for the application within the context of EU Directives transposed into national legal requirements.

Further target groups are users of the voluntary common European Union certification scheme for the energy performance of non-residential buildings (EPBD art.11.9) and any other regional (e.g. Pan European) parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock.

The set of EPB standards, technical reports and supporting tools

In order to facilitate the necessary overall consistency and coherence, in terminology, approach, input/output relations and formats, for the whole set of EPB-standards, the following documents and tools are available:

a) a document with basic principles to be followed in drafting EPB-standards: CEN/TS 16628:2014, Energy Performance of Buildings - Basic Principles for the set of EPB standards [4];

b) a document with detailed technical rules to be followed in drafting EPB-standards; CEN/TS 16629:2014, Energy Performance of Buildings - Detailed Technical Rules for the set of EPB-standards [5];

c) the detailed technical rules are the basis for the following tools:

1) a common template for each EPB-standard, including specific drafting instructions for the relevant clauses;

2) a common template for each technical report that accompanies a EPB standard or a cluster of EPB standards, including specific drafting instructions for the relevant clauses;

3) a common template for the spreadsheet that accompanies each EPB standard, to demonstrate the correctness of the EPB calculation procedures.

Each EPB-standards follows the basic principles and the detailed technical rules and relates to the overarching EPB-standard, EN ISO 52000-1.

One of the main purposes of the revision of the EPB-standards is to enable that laws and regulations directly refer to the EPB-standards and make compliance with them compulsory. This requires that the set of EPB-standards consists of a systematic, clear, comprehensive and unambiguous set of energy performance procedures. The number of options provided is kept as low as possible, taking into account national and regional differences in climate, culture and building tradition, policy and legal frameworks (subsidiarity principle). For each option, an informative default option is provided (Annex B).

Rationale behind the EPB technical reports

There is a high risk that the purpose and limitations of the EPB standards will be misunderstood, unless the background and context to their contents – and the thinking behind them – is explained in some detail to readers of the standards. Consequently, various types of informative contents are recorded and made available for users to properly understand, apply and nationally implement the EPB standards.

If this explanation would have been attempted in the standards themselves, the result is likely to be confusing and cumbersome, especially if the standards are implemented or referenced in national or regional building codes.

Therefore each EPB standard is accompanied by an informative technical report, like this one, where all informative content is collected, to ensure a clear separation between normative and informative contents (see CEN/TS 16629 [5]):

— to avoid flooding and confusing the actual normative part with informative content;

— to reduce the page count of the actual standard; and

— to facilitate understanding of the set of EPB standards.

This was also one of the main recommendations from the European CENSE project [9] that laid the foundation for the preparation of the set of EPB standards.

This technical report

This technical report accompanies the standard on the inspection of heating and domestic hot water systems.

The first part of this technical report, up to Clause 7 and all annexes up to Annex E have the same numbering as EN 15378-1. Each clause in this FprCEN/TR 15378-2 is related to the same clause in EN 15378-1.

The role and the positioning of the accompanied standard(s) in the set of EPB standards is defined in the Introduction to the standard.

Accompanying spreadsheet(s)

Since no calculation method is defined in this inspection standard, no accompanying spreadsheet was provided.

This Technical Report, includes an examples of compiled inspection report.

History of this technical report and the accompanied standard

The first version of the standard on the inspection of boilers and heating system was issued in 2008 as part of the Mandate 343 of the EC to CEN to support the EPBD (2003).

The standard has been completely redrafted as part of Mandate 480 of the EC to CEN.

References in the text of the standard are given as module codes that are detailed in the annex. This enables flexible references (e.g. to national documents where necessary for local application) and use outside the CEN environment.

1 Scope

This technical report refers to EN 15378-1.

It contains information to support the correct understanding, use and national adaptation of EN 15378-1.

2 Normative references

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

EN ISO 52000-1:2017, *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures (ISO 52000-1:2017)*

EN 15378-1:2017, *Energy performance of buildings — Heating systems and DHW in buildings — Part 1: Inspection of boilers, heating systems and DHW, Module M3-11, M8-11*

EN ISO 7345:1995, *Thermal insulation — Physical quantities and definitions (ISO 7345:1987)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, EN ISO 52000-1:2017 and EN 15378-1:2017 apply.

NOTE There are no new terms in this Technical Report.

Most terms used in EN 15378-1, such as:

— space heating

— gross and net calorific value

— external temperature

— energy carrier

— delivered energy

and others are already given in EN ISO 52000-1:2017 and are not repeated.

The following definition is repeated for readability.

3.1
EPB standard
standard that complies with the requirements given in EN ISO 52000-1:2017, CEN/TS 16628 and CEN/TS 16629

4 Symbols and subscripts

4.1 Symbols

For the purposes of this document, the symbols given in EN ISO 52000-1:2017, in EN 15378-1:2017, *Heating systems and water based cooling systems in buildings — Heating systems and DHW in buildings — Part 1: Inspection of boilers, heating systems and DHW* (the accompanied EPB standard) apply.

NOTE There are no new symbols in this technical report.

Symbols that are already defined in EN ISO 52000-1:2017, Clause 4 and Annex C, are not be repeated in each EPB standard.

4.2 Subscripts

For the purposes of this document, the subscripts given in EN ISO 52000-1:2017, in EN 15378-1:2017, *Heating systems and water based cooling systems in buildings — Heating systems and DHW in buildings — Part 1: Inspection of boilers, heating systems and DHW* (the accompanied EPB standard) apply .

NOTE There are no new subscripts in this technical report.

Subscripts that are already defined in EN ISO 52000-1:2017, Clause 4 and Annex C, are not be repeated in each EPB standard.

4.3 Abbreviations

4.3.1
EPBD
EPBD, Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings and Recast of the Directive on the energy performance of buildings (2010/31/EU) of 14th December 2010

4.3.2
EPC
energy performance certificate

5 Description of the method

5.1 Heat generator inspection

The plain heat generator inspection, as described in Clause 6 and introduced in 5.1 of EN 15378-1:2017, is not enough to comply with requirements of Directive 2010-31-EU “EPBD recast”. In the previous version of EN 15378, it was intended to support “boiler inspection” that was a different item than “heating system” inspection.

These clauses have been kept indeed for the following reasons:

— consistency with the previous standard;

— many EU member states already adopted inspection schemes limited to the boiler.

These schemes are often used in conjunction with compulsory periodic maintenance of the heat generator which are not required by EPBD.

5.2 Heating system inspection

The inspection procedure described in Clause 7 and introduced in 5.2 is intended to support the heating system inspection required by EPBD recast.

The normative text highlights a defined inspection procedure, specifying which aspects could be inspected. However, many inspection items may be optionally included/excluded depending on the inspection level.

— Annex A gives a template to specify choices.

— Annex B gives a default set of choices.

— Annex C gives the practical translation of the defined procedure into a checklist that can be also used as a basis for the inspection report.

The definition of the procedure is organized in the following way to balance two opposite requirements:

— several Member States want to keep the possibility to modify the requirements for inspection;

— other Member States want to have a ready to use inspection procedure.

5.3 Inspection levels

Inspection levels have been introduced to guarantee adequate flexibility in the application of this standard.

The default inspection levels and the corresponding required sections specified in Annex B to EN 15378-1:2017, were determined taking into account the minimum requirements stated by article 14 of Directive 2010/31/EU of the European Parliament and of the council of 19 May 2010 on the energy performance of buildings (recast) that is “*a regular inspection of the accessible parts of systems used for heating buildings, such as the heat generator, control system and circulation pump(s), with boilers of an effective rated output for space heating purposes of more than 20 kW*”.

The default inspection levels are defined in EN 15378-1:2017, Table B.2.

The list of parameters given under 5.3 is not a list of parameters that shall be taken into account. It is a reminder of the possible criteria that can be used to specify custom inspection levels using EN 15378-1:2017, Tables A.1 and B.1.

5.4 Advice

A distinction has been made between three levels of advice:

— recommendations of cost effective immediate actions (e.g. actions that will pay-back in a reasonably short time which is significantly shorter that the expected lifetime of the installed appliances and products);

— recommendation of actions to be performed in case of major renovation or replacement of components due to aging or breakdown (e.g. action whose total cost would make them not cost effective but that are indeed cost effective in the context of unavoidable equipment replacements);

— notes, including any other advice.

This classification is required because cost-effective immediate actions are not so frequent and dependent on climatic conditions and building and/or system size.

EXAMPLE In the Mediterranean climate, it is not obvious to find cost-effective immediate actions on individual heating systems.

A larger category of cost effective recommendations relates on possible improvements in case of replacement of appliances, because of ageing or break-down. An example is a boiler in an individual house. The immediate replacement is seldom convenient in the milder climates. In case of replacement, the adoption of the best available technology (instead of installing again a simpler, less performant technology) is very likely to be cost effective because only the cost difference between poor performance and optimal performance appliances shall be recovered. It is very important that the information on the possibility to select high performance appliances when replacing old ones is given to the user otherwise, if a low performance appliance is installed again it will take many years before the next opportunity of improvement occurs.

The “notes” category shall be used for remarks about:

— low or no-cost measures;

— use and maintenance recommendations.

that may be noted during inspection.

5.5 Inspection report

The inspection report is the fundamental communication tool with the user.

The information in the report should trigger actions by the user. Therefore the important part of the message is presented on the first page.

The inspection report is intended also as a checklist to guide inspection and should be designed together with the list of inspection items to be recorded. This will facilitate creation of an electronic archive of reports.

See also the discussion on templates at Annex A.

The requirements to archive the inspection results and have them available for the next inspection is very important. The inspection process defined by EPBD is not a “one shot”, it is a repetitive task. It is therefore essential for the inspection process that the report and the information collected during the inspection is archived and made available for the next inspection. How this is done and who is responsible for it cannot be specified by this standard. However availability of previous reports allows:

— easier and faster inspection;

— to check if previous recommendations were followed and implemented;

— to compare readings of counters (if noted!) and get useful information about system operation.

Therefore this is considered an essential requirement for the inspection process. The decision on who has to archive and keep the information (e.g. end user, official inspection database, etc.) is left to the actual implementation process in each country.

5.6 Organization of EN 15378-1

The intended role of the parts of EN 15378-1 are the following:

— the normative text of Clause 7 defines the inspection procedure, specifying which aspects could be inspected for each subsystem. However, many inspection items may be optionally included/excluded depending on the desired inspection accuracy and effort.

— Annex A gives a template to specify choices about which inspection item shall be included or excluded according to the inspection level;

— Annex B gives a default set of choices in connection with two predefined inspection levels;

— Annex C gives the practical translation of the default inspection levels into a checklist that can be also used as a basis for the inspection report. There is one example for each defined inspection level given in Annex B.

6 Heat generator inspection procedure

6.1 Heat generator inspection level identification

The first step is determining the inspection level because actual requirements for the individual inspection are depending on it.

No detailed information is given for this level because heat generator inspection is not enough to comply with EPBD directive. See Clause 7.

6.2 Heat generator identification

This should include the necessary data that allows to identify the generator under inspection. In many countries there are systematic databases of existing installations with established unique coding.

6.3 Document collection

This section can be useful if there are regulations that ask for a documented maintenance of heating systems.

6.4 Heat generator visual inspection

It is normal practice that the inspection starts with a visual inspection looking for evidence of potential risk situations.

Visual inspection do not require mechanical actions on the system such as disassembling and reassembling components and installation parts.

6.5 Heat generator functionality check

This check points to the evidence that the generator is really used for heating and domestic hot water purpose and is supplying the intended services.

Evidence can be supplied by users, though this information may be inaccurate or biased. Operation and maintenance personnel is another possible source of information.

Another technique is comparing the set-point with the actual values. But this is possible and useful only if the system is in operation at a medium to high load.

6.6 Heat generator maintenance status

See information on 7.6.

6.7 Heat generator controls, sensors and indicators

See information on 7.7.

6.8 Meter readings

This is a potential source of simple and useful information.

EXAMPLE in case of periodic inspections, the difference in readings provide an indication about the system operation between inspections.

The usefulness of this requirement depends on archiving the results and making historical readings available. That's why it is asked that inspection results are archived. See also 5.5.

The list of possible meters from a) to h) is not a list of all meters that shall be read but a reminder of which type of meters may be included in the inspection level specification.

6.9 Heat generator performance evaluation

This clause specifies a number of properties that may be inspected to estimate the boiler performance.

Most of the data for the estimation of the boiler seasonal efficiency can be obtained from tables.

Some items are relevant only for some types of heat generators (like combustion efficiency for boilers).

6.10 Heat generator inspection report and advice

The rationale is to have on the first page the main message to the reader. If the useful information comes after several pages of non-interesting data, there is a high risk that the main message of the inspection report is not read. See also 5.4.

7 Heating system inspection procedure

7.1 Heating system inspection level identification

The first step is determining the inspection level because actual requirements for the individual inspection are depending on it.

The required inspection level shall depend on objective properties of the installation. A list of possible such properties is given in EN 15378-1:2017, 5.3.

7.2 Heating system inspection preparation

This procedure assumes that there is a communication between the inspector and the responsible person of the inspected system before the inspection. This has to happen at least to agree and organize access on site. At that time it can be asked to gather useful documents or documents that have to be available on site. Asking for documents when on site is too late and would cause unnecessary delays.

7.3 Heating system and inspection identification

This should include the data required to identify the heating systems under inspection.

In many countries there are databases of existing installations with established coding.

Which services are provided by the system, together with other information, is an essential information e.g. for generator sizing.

7.4 Document collection and system identification

This clause doesn't actually require that any document is available.

If such documents as a functional diagram are available on site this helps, provided they are checked against the real installation.

What is important is that the inspector understands the listed aspects (e.g. how is the system designed to operate and how it operates really).

7.5 Heating system functionality check

This point aims to identify if the heating system is really used for heating and/or domestic hot water purpose and is supplying the intended services.

Examples of malfunctioning and modified intended use:

— thermal solar system is not operating, only back-up heater is working

— system was designed for a block building but only few building units are still connected; individual systems have been installed in the other building units.

Evidence can be supplied by users, though this information may be inaccurate or biased, so it has to be checked. Operation and maintenance personnel is another possible source of information.

Some malfunctioning may be not possible to detect, just because the system is not operating. That's why it is asked to report only "what is detected".

7.6 Heating system maintenance status

Regulations may require that a periodic maintenance is performed and written records are kept on site ("*legal or statutory requirements*"). If so:

— inspection may include a check of compliance with regulations on maintenance;

— inspection may take into account maintenance record and data.

EXAMPLE Italy requires that each installation has a standardized log-book where installation data, maintenance results, efficiency assessments and results of inspection by public authorities are recorded.

7.7 Heating system central controls, sensors and indicators

Central control of the heating system means any control in the boiler room such as:

— flow temperature control;

— timing control;

— boiler sequence control.

Local indoor temperature controls are considered in 7.11.

Better controls setting may be an inexpensive energy efficiency measure. This includes both temperature levels and timing controls.

Wrong control and inefficient operation may be caused by defective or badly installed sensors.

7.8 Meter readings

This is a potential source of simple and useful information.

EXAMPLE in case of periodic inspections, the difference in readings provide an indication about the system operation and energy use between inspections.

The usefulness of this requirement depends on archiving the results and making historical readings available. That's why it is asked that inspection results are archived. See 5.5.

Fuel meter gives obviously the most relevant information about energy consumption.

The domestic hot water meter tells the domestic hot water load and may detect leaks.

The feed water meter may reveal leaks of technical water. A leak of technical water causes a higher energy use and also installation damage.

High count of on-off cycle counters reveal wrong setting or wrong design of generator control. Very frequent start/stop cycles may cause significant energy losses because of frequent purging.

7.9 Energyware consumption

7.9.1 General

This aspect of the inspection is not mentioned directly by EPBD, therefore it is optional.

It is considered to be very important indeed because it is an indicator:

— of the potential savings;

    — high energy use means that it is likely to find energy conservation measures;

    — low energy use means that the building and systems are performing well or that the building is partly used and/or occupied. There is little chance to find cost effective energy conservation measures.

— of the required sizing of the boiler: given the building category and insulation level there is a correlation between average power (heating needs) and required peak power (heat load and required sizing).

7.9.2 Energyware consumption estimation

There are several possible estimation methods. it is difficult to find a simple method can fit all cases that can be found in practice for a number of reasons:

— possibly even no metering and bill (wood);

— other services included in metering;

— no actual reading available.

Best compromise depends on the national context (example: type of fuel, from gas to wood). Some are mentioned.

The sum of the fuel bills may not cover an exact year and it often includes other uses like cooking for gas.

The energyware used since previous inspection is readily available for metered energyware but is seasonal.

Methods specified in M3-10 are better defined and include techniques to separate other uses but are time consuming.

Other relevant procedures may be the better choice to take into account national context and expected effort for inspection.

This can be improved by smart metering programs and other dedicated provisions to allow easy monitoring of energy use.

7.9.3 Reference values

No additional information.

See B.5 for information on suggested values

7.9.4 Advice criteria on energyware consumption

Advice should take into account that possible reasons for deviations in energy consumption might be:

— use of the building (occupancy);

— users behaviour;

— wrong room ventilation rates;

— high building envelope losses (missing or degraded insulation layer);

— actual climatic conditions, including degree days and solar radiation;

— heating system inefficiencies (e.g. poor balancing, poor insulation of distribution network, extension of distribution network outside the heated space);

— oversizing of heat generators;

— wrong settings of heating system controls;

— losses of heating medium from concealed piping;

— losses of fuel.

To ease tracking of energyware consumption, the following actions should be recommended:

— collecting data on fuel supply and periodic reading of available meters and fuel level in tanks;

— collecting, measuring or finding an appropriate source of actual climatic data;

EXAMPLE Data of public air quality monitoring systems are often accessible and include external temperature

— if missing, installing a counter for total domestic hot water supplied;

— if missing, installing an hour counter in parallel with burner fuel valve(s);

— if missing, installing independent electrical energy meters for high consuming appliances (example: heat pump, oil heaters, distribution pumps, boiler room, etc.).

7.10 Space heating emission subsystem

7.10.1 General criteria

The type of emitters has an impact on potential efficiency of the heat generator (example: heat pumps need emitters with a low flow temperature). The type of emitters and their possible control options (including the type of hydraulic connection) shall be known to give correct recommendations on heat generator replacement.

7.10.2 Stratification in high ceiling rooms

Stratification in high ceiling rooms (more than 4 m) can be estimated by measuring the following temperatures in the middle of the room:

— temperature near the floor θ_{floor} (within 0,1 m elevation);

— temperature at 1,5 m elevation θ_{mid}

— temperature at ceiling minus 0,1 m θ_{ceil}

— external temperature θ_e.

The relative temperature spread is given by:

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If the relative temperature spread k_{str} is higher than 0,2, destratification or a change of type of emitters and/or installation should be recommended.

This check can be done only during the heating season and should be done preferably in the coldest month.

7.11 Space heating emission control subsystem

7.11.1 General

This clause focuses on the control of indoor temperature.

7.11.2 Identification of the heat emission control level

Heat emission control subsystem may be classified according to its level of indoor temperature control:

a) no indoor temperature sensor (heating system is driven manually or only by external temperature);

b) one indoor temperature sensor (then check if it is installed in a representative location);

c) one sensor and actuator per zone (then check if zones are made of homogeneous heated spaces and if zone temperature sensors are installed in representative locations);

d) one sensor and actuator per emitter with local set point;

e) room specific, time depending temperature set point.

Level a) (only central control based on outdoor temperature, no room temperature control) is usually not efficient and the installation of indoor temperature controls is usually cost effective and should be recommended.

7.11.3 Indoor temperature check

Indoor temperature measurement can give evidence of poor control efficiency. Temperature should be measured in an adequate number of sample rooms like:

— corner rooms, lowest and highest floor;

— rooms in the centre of facades.

The relative temperature spread k_θ is given by:

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where

$\theta_{int,max}$ is the maximum measured internal temperature;

$\theta_{int,min}$ is the minimum measured internal temperature;

$\theta_{int,av}$ is the average of measured internal temperature;

θ_e is the outdoor temperature.

If the relative temperature spread k_θ is higher than 0,2, advice should be given to introduce zone or room by room control.

This check can be done only during the heating season and should be done preferably in the coldest month.

7.11.4 Possible advice on emission control

Where missing (only central control), add internal temperature controls.

If there are different uses or different temperature requirements in the building parts, the addition of separate temperature and timing control should be recommended.

Improve the setting of the outdoor reset function for supply water temperature.

Better location of sensors should be recommended, as appropriate and feasible.

If there is a high temperature spread with cold or overheated areas, balancing of the heating system or upgrading the level of indoor temperature control (to room by room) should be recommended.

7.12 Space heating distribution subsystem

7.12.1 General

No additional information on this item.

7.12.2 Possible advice on distribution systems

7.12.2.1 Insulation

Insulation of non-insulated pipes is usually an immediately cost-effective recommendation.

Insulation may be checked by visual inspection on accessible parts, thermography for concealed parts. However, even if a poor insulation of embedded pipes is shown by thermography, actions on embedded pipes are seldom cost-effective.

Effectiveness of accessible thermal insulation may be checked by comparing water (conveyed fluid), insulation surface and room temperatures.

7.12.2.2 Type and setting of circulation pumps

If variable flow rate circuits are used, consideration should be given to variable speed pumps.

Proper setting of variable speed pumps shall be checked (i.e. fixed speed step, constant head control, proportional head control, maximum head setting, etc.)

7.12.2.3 Distribution circuit typology

Recommendation should be given to replace by-pass type circuits with variable flow circuits, using variable speed pumps. By-pass type circuits cause unnecessary permanent circulation of water and higher temperature of the return pipe.

7.12.2.4 Compatibility of distribution circuits with heat generator typology

If the generation includes condensing boilers, the system should be designed and operated to minimize return temperature to the generator. Any emitter or zone by-pass should be avoided.

If the heat generation device is a heat pump, settings and controls shall minimize the flow temperature.

7.12.2.5 Flow rate

Measurement of actual flow and return temperatures, average power and outdoor temperature allows estimating the flow rate and $\Delta\theta_{fr}$ (flow-return) under design conditions.

Low $\Delta\theta_{fr}$ values (example: less than 10 °C for radiators) in design conditions shows that flow rate is excessive, causing high auxiliary energy consumption.

Higher $\Delta\theta_{fr}$ should be recommended, taking into account that reducing the flow rate may require balancing of the distribution system or installing automatic balancing devices (example: thermostatic valves),

7.13 Generation subsystem

7.13.1 General

EPBD recast refers to "heating systems with boilers of a rated power for heating of at least 20 kW". This suggests that heating systems based on other types of generators (e.g. heat pumps, district heating, etc.) may be inspected on a voluntary basis.

Some Member States already perform inspections on other types of generators whilst other want to stick to the minimum requirement level. Therefore the standard has optional sections on other types of generators than boilers.

This section has two separate lists of requirements:

— the "shalls" are the requirements of the EPBD directive;

— the "mays" are items beyond requirements of EPBD that are kept optional.

7.13.2 Heat generators identification

All generators should be at least identified, irrespective of the type (e.g. boiler, heat pump, etc).

7.13.3 Heat generators inspection

7.13.3.1 Boiler inspection

7.13.3.1.1 General

EPBD requires the assessment of "boiler efficiency". However, there are several possible definitions of "boiler efficiency" depending on what is taken into account.

— "Combustion efficiency" is based on a flue gas analysis and takes into account only losses through the chimney when the boiler is on. It is the less complete but it is easily measured. It is usually different at minimum and maximum power, especially for condensing boilers. For condensing boilers it is highly dependent on operating conditions (about ± 10 %) such as instantaneous power and water return temperature to the boiler.

— "Thermal efficiency" is the ratio of heat output to heat input. It takes into account all losses but also auxiliary energy recovery. It can be measured on a short or long time-span ("seasonal efficiency"). It can be measured accurately only in laboratory conditions. It can be checked directly when the installation includes heat meters. An estimate can be provided based on combustion efficiency and a simple calculation using tabulated losses factors to take into account additional losses through the envelope and through the chimney with burner off.

— "Primary energy efficiency". Efficiency may also include consideration of the effect of auxiliary energy, This parameter is often presented as the result of the energy performance calculation.

Additionally, the boiler efficiency may be evaluated for a specific (instantaneous) operating condition or as a seasonal average.

Unfortunately, the EPBD directive does not specify which "boiler efficiency" shall be assessed. Therefore it is left as an option to refer to "combustion efficiency" or "seasonal thermal efficiency".

7.13.3.1.2 Boiler combustion efficiency

This indicator takes into account only losses through the chimney with burner ON.

It is rather easily measured on-site. The procedure is given in EN 15378-3.

Since measurement takes time and requires specific measuring instruments, the option is kept to take into account available measurements.

7.13.3.1.3 Boiler seasonal efficiency

The method proposed is derived from the boiler cycling method. The method is described **in** EN 15378-3.

Combustion efficiency is an input data to boiler seasonal efficiency calculation..

The other required parameters can be estimated using tabulated values.

Other procedures can be also referenced via a custom version of default EN 15378-1:2017, Table B.3.

7.13.3.1.4 Losses through the chimney with burner off

This parameter is seldom measured on-site. Tabulated data are commonly used .

7.13.3.1.5 Losses through the generator envelope

This parameter is seldom measured on-site. Tabulated data are commonly used. An estimate is possible via a measurement of the external surface temperature of the boiler insulation.

7.13.3.1.6 Total stand-by losses

The stand-by operation test is time consuming.

Tabulated data are commonly used .

7.13.3.1.7 Load factor

The method in M3-10/9 estimates the load factor β_{cmb} with the following equation:

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where

E_{del}	is the delivered fuel during the heating season
$t_{gen;ON;seas}$	is the operating time of the boiler during the heating season
Φ_{cmb}	is the minimum set thermal power input, which is also the maximum (and only one set) for single stage burners

NOTE Auxiliary energy is not significant for this purpose.

Default values of the load factor are given in of EN 15378-1:2017, Table B.45 depending on the boiler oversizing.

7.13.3.1.8 Qualifying the boiler efficiency for the report

The idea is to transform the numerical result into a qualitative judgement that is easier to understand by the user. This is equivalent to setting a reference value and comparing the result for the inspected boiler with the reference.

7.13.3.1.9 Boiler basic setting

7.13.3.1.9.1 Reference values for boiler basic setting

If a flue gas analysis is performed to determine the combustion efficiency, the detailed data gives information about the boiler basic setting. Reference values for flue gas properties shall take into account

- instructions and specifications by appliance manufacturer or system designer;
- values given in national tables.

If no such reference is available, the following values may be considered good practice

Table 1 — Reference values for flue gas properties

Fuel	$X_{O2,fg,dry}$ %	θ_{fg} °C	$X_{CO,fg,dry}$ ppm	Bacharach -	η_{cmb} %
Natural gas non condensing	2…4 [a]	120…160	< 100		> 92
Natural gas condensing	2…4	$\theta_{gnr,w,r}$ + 5…20 [b]	< 100		[b]
Light oil non condensing	3…5	140…180	< 50	< 1	> 90
Fuel oil EL condensing	2…5	$\theta_{gnr,w,r}$ + 5…20 [b]	< 50	< 1	[b]

[a] Value referred to flue gases before any mixing with tertiary or dilution air

[b] Depending on return water temperature $\theta_{gnr,w,r}$ and thermal input (modulating step). The given range (5 to 20 °C) means from minimum to maximum set thermal input

7.13.3.1.9.2 Advice on boiler basic setting

Advice should include recommendation to set the burner within the limits defined in Table 1, taking into account the following criteria:

- minimum oxygen contents shall guarantee against drift towards defect air, which would result in high pollution, energy waste and explosion danger;

  NOTE approximately 1 % higher oxygen is required if setting in summer conventional burners (drift according to combustion air temperature)

- maximum oxygen contents shall guarantee against drift towards high excess air, which would result in pollution and energy waste. High excess air also inhibits condensation;
- minimum flue gas temperature is required to prevent condensation and corrosion of standard boilers and chimneys;
- CO contents shall be reduced to a minimum anyway.

Recommendation shall be given to check the stability of burner excess air setting (compare with previous setting before maintenance or test after power stepping).

7.13.3.1.10 Thermal input

7.13.3.1.10.1 Thermal input setting

Setting the thermal input is one low cost possibility to adapt the boiler to the required power and to improve the seasonal efficiency.

7.13.3.1.10.2 Advice criteria on thermal input

Advice on thermal input setting shall be based on the following criteria.

Actual set maximum thermal input and minimum thermal input (for multistage or modulating boilers) should be reduced to the lowest possible value sufficient for correct operation conditions because this:

— increases combustion efficiency;

— reduces stand-by losses relative to net energy supplied to the distribution sub-system (because of increase of burner-on efficiency and reduction of stand-by time);

taking into account the following limitations:

— any setting shall be within the range specified and allowed by the boiler and/or burner manufacturer;

— boilers without combustion air setting (only fuel setting) may not benefit from a reduced thermal input (i.e. fuel flow rate);

— actual (set) maximum thermal input shall not exceed nominal thermal input for safety reasons

— actual (set) maximum thermal input shall be sufficient to provide power required for designed operation (i.e. instantaneous domestic hot water, coldest days for space heating, any attached systems or requirements of the distribution sub-system);

— actual (set) minimum (maximum for single stage burners) thermal input shall be sufficient to avoid condensation in boiler or chimney if they are not designed and suitable for this operation condition. Flue gas temperature has to be checked therefore, taking into account possible boiler water temperature reductions;

— actual (set) minimum thermal input shall be sufficient to:

a) guarantee flame stability;

b) provide acceptable ignition conditions;

c) provide satisfactory emission levels;

d) avoid combustion efficiency decay because of high excess air.

7.13.3.1.11 Boiler controls settings

The setting of the following devices, if existing, may be inspected and verified against available design (system instructions) or previously recorded values:

— boiler thermostatic control, including effect of hysteresis on boiler on-off cycling frequency;

— outdoor temperature compensation setting;

— temperature setting of zone control;

— temperature control for domestic hot water production operation.

System design specification should be considered as a reference.

Advice to user shall include information on appropriate settings of available controls.

7.13.3.2 Thermal solar

Malfunctioning of thermal solar systems is often ignored or underestimated due to the presence of a back-up system.

Some frequent issues are:

— insufficient size of the hot water storage. Then the back-up heater is often used;

— broken collector temperature sensor;

— frequent vapour lock because of overheating;

— oversizing compared to building use;

— incorrect setting of priority for solar system.

7.13.3.3 Heat pump inspection

Direct measurement of the heat pump COP is not easy and there are few actions possible to improve it acting on the machine.

Since the COP is highly sensitive to operating conditions, a check of the control settings can be more productive.

A common mistake is using the heat pump like a boiler. Settings and control, strategy should aim at reducing as much as possible the flow temperature. Some examples are:

— no mixing of flow water with return water should be allowed:

— the flow rate in the heat pump primary circuit shall exceed the flow rate of the supplied circuits, otherwise the flow temperature will be higher than necessary;

— simultaneous operation for heating and domestic hot water should be avoided unless th heat pump is specifically designed for this operating mode.

7.13.3.4 Heat exchangers

No additional information on this item.

7.13.3.5 Other generation sub-systems

No additional information on this item.

7.13.4 Generation subsystem control inspection

For cascade control: if the offline generators are not excluded from the hydraulic circuit, a higher set-point is required for the online generator. This can lead to malfunctioning.

7.14 Storage subsystem

An attention point should be the insulation around departing pipes. Also, the configuration (geometry) of connected pipes may induce parasitic circulation and increase significantly the heat losses.

7.15 Generation subsystem sizing

7.15.1 General

According to EPBD, providing an estimate of the boiler sizing is a mandatory outcome of the inspection.

There are several methods to estimate the required heating power and check if the generator is correctly sized.

The following factors influence checking the sizing:

— type of generator

a) sizing a boiler does not require a very accurate estimation. Boilers are commercially available with a ratio between sizes which is typically from 1,3 to 1,5.

b) modulating condensing boiler show a higher efficiency at reduced load. One size more than required has no relevant effect and could even slightly improve seasonal efficiency;

c) sizing of a heat pump shall be much more accurate due to economic issues (cost per installed kW) and to the highly negative effect of oversizing during intermediate seasons, especially for air to water heat pumps);

— type of domestic hot water production

a) instantaneous domestic hot water production usually requires a much higher power than heating: sizing is dominated by domestic hot water requirements.

b) accumulation domestic hot water production usually requires a quite small average power: sizing is dominated by heating requirements.

— type of heating service; continuous or intermittent with fast reheat.

This has to be taken into account when selecting the sizing check methodology.

The required heating power is determined first. Then the actual installed heating power is compared with the required heating power.

Several methods are available to estimate the required heat power. They are briefly described and compared in the following clauses.

7.15.2 Heat power requirement

7.15.2.1 Heated surface

The method based on building type and heated surface (or volume) is suitable for boilers, provided that the boundary conditions for the tabulated values of the specific power are clearly established and identified.

7.15.2.2 Fuel use

The method based on seasonal fuel use is suitable for buildings with continuous occupation. It has to be checked that fuel use values are given for periods where the building was regularly occupied.

The method based on fuel use is a numerical representation of a simplified energy signature. Assuming that:

— the heating power requirement is linear with the external temperature;

— the contribution of heat gains to the internal temperature is usually in the range 2…4 °C;

then 2 points of the energy signature are readily identified:

— zero load point: the required power is zero at the balance temperature $\theta_{H;OFF}$, which is typically in the range 16…18°C (e.g. 20 °C minus 2…4 °C increase of indoor temperature given by heat gains).

— average load point: the average winter power input to the boiler $\Phi_{del,avg}$ is required at the average external winter temperature $\theta_{ext,avg}$.

The first point (zero load) is mostly a default point.

The second point (average load) is readily determined according to seasonal fuel use, length of the heating season and winter degree days.

The average seasonal external temperature $\theta_{ext,avg}$ is given by

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where

DD_{seas} are the seasonal degree days

t_{seas} is the duration of the heating season:

The average seasonal thermal input power $\Phi_{del,avg}$ is given by

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where

$E_{del;seas}$ is the delivered energy (fuel energy) during one season;

$t_{gen;ON;seas}$ is the operating time of the generator during the heating season.

The energy signature is then extrapolated to the design temperature as shown in Figure 1

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Figure 1 — relationship between design power and average power

This shows that

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and there is a constant proportionality between design power Φ_{des} and average power $\Phi_{del,avg}$.

The ratio $c_{H;\Phi;fuel}$ between seasonal energy use in kWh and the maximum thermal input in kW is the number of utilization hours of the maximum power. This parameter allows an immediate conversion of fuel use into a required design thermal power input,

Default values of this parameter are given in EN 15378-1:2017, Table B.44.

7.15.2.3 Heat load calculation

The required heating power is calculated according to EN 12831 and EN 12828. The heat load calculation according e.g. to EN 12831 is suitable in most cases but requires the identification of building structures, which is usually a long work and is not suitable for the time available during inspection. This method usually provides high values and is not suitable for heat pumps.

The original design heat supply capacity calculated according to EN 12831 and 12828 or previous national standards or codes of practice can also be used. If so, the inspector should verify the correspondence between original calculation assumptions and the actual building.

EXAMPLE Check whether the insulation of the building (floor, walls, roof, glazing) has been improved since the installation has been designed.

7.15.2.4 Emitters installed

If known, the total power of installed emitters is a limitation to the heating power that can be input to the building. The power of installed emitters should be known when heat cost allocation system is installed.

7.15.2.5 Other methods

Other methods can be specified in the definition of the inspection level.

7.15.3 Boiler oversizing factor

The boiler oversizing factor is the ratio between the actual thermal input power and the estimated required input power.

The numerical result is converted into a qualitative judgement that is easier to understand by the user. This is equivalent to setting a reference value and comparing the result for the inspected boiler with the reference.

7.15.4 Other generators sizing

No additional information on this item.

7.15.5 Advice

No additional information on this item.

7.16 Heating system global efficiency or rating

This is an optional feature that may be useful for communication to the user.

Two main possibilities have been identified:

— using a quantitative rating based on efficiency or loss factor for each subsystems and then providing an estimate of the global efficiency;

— using a qualitative scheme based on points or credits.

In the default template, provision has been included for this kind of information. The proposed default inspection procedure does not include a rating system since this is not required by EPBD.

See reference [1] in bibliography for an example of a rating system based on points.

7.17 Domestic hot water systems

7.17.1 General

This is an optional part according to EPBD. However:

— domestic hot water production mode (instantaneous or accumulation) strongly influences the sizing of the heat generator;

— domestic hot water energy use is more and more relevant in high performance building;

so a quick look at the domestic hot water system should be a must when the generator provides both services.

Item a) “structure” of domestic hot water includes basic information as

— instantaneous versus accumulation;

— with or without circulation loop.

7.17.2 Recirculation losses

Inspection should determine which parts of the system are kept continuously hot to provide ready domestic hot water and their insulation level.

Advice should include recommendation to reduce, as appropriate and possible:

— temperature of constantly hot parts (any storage vessel, recirculation circuits);

— losses of constantly hot parts (increase insulation efficiency and thickness, reduce or eliminate thermal bridges e.g. by using insulated pipe hangers);

— operation time and control of recirculation.

The insulation of the circulation loop should be gapless, valves and fixtures have to be insulated as well. Only the motor case of the pumps has to remain without insulation.

On the other hand, the draw-off lines have to cool down after the draw-offs and may be not insulated. A light insulation of draw-off lines is recommended anyway to avoid heating the domestic cold water.

Gravity recirculation systems should be transformed into forced recirculation systems with insulated pipes or a shut valve should be added to prevent unnecessary recirculation.

7.17.3 Other additional information

An additional issue of domestic hot water systems is legionella. The control of legionella has energy implications as well if the thermal disinfection method is used.

For legionella control purpose the following additional inspection items may be considered:

— A check of the water temperature at different heights of the storage vessel (if corresponding thermometers are provided). After storage vessel reload by the heat generator, the water temperature has to be at least 60 °C.

— A check of the settings of the heat generator that reloads the DHW storage vessel (reload shall start at latest at 55 °C)

— A check of the return temperature in the circulation line at the storage vessel input. if any (shall be at least 55 °C)

— A check whether heat traps are present in the DHW distribution network to separate the parts that are maintained at constant temperature (e.g. circulation line, storage vessel) from those that cool down after any DHW draw-off. Without such heat traps, DHW may remain at intermediate temperatures in the draw-off lines and this is favourable to the growth of legionella and other dangerous bacteria.

— A check of the date of the latest removal of limestone deposits from the storage vessel.

7.18 Heating system inspection report and advice

7.18.1 General

No additional information on this item.

7.18.2 Inspection report layout

See comments on 5.4

7.18.3 Heating system advice

See comments on 5.5.

8 Worked out examples

Two examples of compiled heating system inspection reports according to EN 15378-1:2017, Clause 7 are given in Annex C.

C.1 refers to a single family dwelling and is compiled according to default level 1 as defined in EN 15378-1:2017, Annex B.

C.2 refers to a block building with a centralized heating system and is compiled according to default level 2 as defined in EN 15378-1:2017, Annex B.

The main concern was time required for the inspection. This is discussed under 13.4 for the most critical situation, e.g. a single family house.

9 Application range

This standard is specifically meant to support inspection of heating systems as required by EPBD.

Collecting data for an EPC is an inspection process of the heating system as well. However, the amount of data to be collected is far higher than what is required for inspection purpose.

The simplification required for the practical application and the maximum time requirement for the inspection make the collected data not suitable to complement the data-input for an EPC.

10 Regulation use

This procedure defined in EN 15378-1:2017, Clause 7 is intended to support application of article 14 of EPBD Directive. EN 15378-1:2017, Annex B was drafted having in mind the minimum requirement of the directive.

EN 15378-1 can support more extensive and detailed inspection, e.g. covering other generators if custom inspection level is defined.

11 Information on the accompanying spreadsheet

There is no accompanying spreadsheet.

There is no specific calculation related to the inspection.

Estimation of seasonal efficiency is demonstrated in the accompanying spreadsheet to EN 15378-3.

12 Results of the validation tests

The examples provided in Annex C are the result of an inspection on real houses and systems.

13 Quality issues

13.1 Reproducibility

The inspection has been guided as far as possible to ensure reproducibility and comparability of results.

If each inspector is free to select any arbitrary descriptions, then reproducibility and comparability will be diminished. That's why an effort has been made to define selection lists to describe the status of the inspected installation.

13.2 Usability

The availability of required data has been verified.

All required data can be easily found or estimated during an inspection.

13.3 Software proof

The organization and definition of the data type of each answer required for each question is the basis to guarantee software proofness.

The crucial issue to guarantee that the inspection procedure is software proof, is being able to:

— store the result of each inspection in a database;

— facilitate production of software tools to guide and assist inspection.

The specification under EN 15378-1:2017, Annex B, Tables B.4 to B.16 and B.18 to B.38 is actually a definition of the data structure to be stored. It can be easily converted into an XSD file.

13.4 Time required

This standard was developed with a strong input to reduce, as far as possible, the time required for the inspection.

A value of 1 h was often mentioned, referred to single family dwellings.

The following time requirement is estimated to fill in the default level 1 inspection report as shown in the example. The reference case is a single family house.

The drafting time of the report depends on the availability of supporting software to record the inspection process. The template provided can be filled in manually or can be the basis for the input interface and printing layout of the inspection report.

Table 2 — Estimate of the time required for level 1 inspection

Inspection phase	Comments	Estimated time min… max (minutes)
Information to user and inspection presentation	Following access, some time will be spent to inform user about the reason, procedure and outcome of the inspection.	5…10
Inspection identification	This should be data already known following preparation. Otherwise it is just writing the name and address. Some time could be lost looking for the installation ID. However this data should be already known during inspection preparation if a database of installations exists	1…5
Identifying provided services	just putting a cross on heating, domestic hot water and mentioning possibly “cooking”	1…2
Available documentation	Asking for a previous inspection record record	1…2
Maintenance and conservation status	This evaluation implies a quick visual inspection on the boiler	1…2
Remarks on central control	This evaluation implies some understanding of the availability of central controls.	2…5
Meter readings	The counter reading is likely to be done and easy. It can take 5 min. Domestic hot water is not likely to be present in this context Previous record may not be available. A bill with an actual reading could be used as a reference	5…10
Emission subsystem	This requires only a quick visual inspection	1…2
Emission control	This requires only understanding which controls are installed. A look on the setting may be useful. This is done in combination with the previous item (emitters).	2…5
Distribution	This requires understanding the type of network and checking insulation level of accessible parts	1…2
Generators identification	This requires only a visual inspection	1…2
Boiler inspection	This implies a visual inspection and a some simple calculations. Time is short if no flue-gas measurement is made.	5…10
Thermal solar inspection	Visual inspection, understanding if it is correctly sized and if it works Only if a thermal solar system is installed	10…15
Storage	Visual inspection of insulation, connections, related controls and their setting	2…5

Inspection phase	Comments	Estimated time min… max (minutes)
Boiler sizing	Most data required for a simple calculation is already available after boiler inspection.	1…2
Domestic hot water	This requires only a visual inspection	5…10
Drafting recommendations	The drafting of recommendations requires experience and knowledge of repetitive situations. The database of proposed recommendation may help remembering recommendations. Recommendations should be drafted immediately. Specific situations will be forgotten if the report is read later and used as a basis for recommendations without knowing the context	5…10
Presenting results to the user	The report may be prepared and stored electronically during the inspection time and then sent to the user in a printed and/or electronic format. However, the used might be curious of the inspection result and may ask some explanations	5…10
	TOTAL ESTIMATED ON-SITE INSPECTION TIME	**44…94**
	Plus additional time for thermal solar inspection	**10…15**

The overall result of this quick analysis is between 45 min and one hour and a half which is consistent with the expectations.

It is not realistic that everything goes well or wrong. The most variable factors are the evaluation of energy use and any measurement on the boiler. It looks wise to invest some time in trying to understand actual energy use, since it is the basis for both probability to find cost effective recommendations and evaluating generator oversizing and it looks like being the most interesting data to be assessed.

Measurements can be avoided if maintenance records are available.

The conclusion is that one hour is a reasonable estimate of the time required for the level 1 inspection on a single family house.

Additional time shall be considered for the following organisational tasks.

— Preparing the inspection and agreeing the date with the end user.

— Time to go on site. This is strongly dependent on the organization of inspections (grouping inspections in the same area) and should include statistical misses (no one present despite an agreed date).

— Any follow up, sending the results, archiving, etc.

These contributions do not depend directly on the on-site inspection procedure.

It has to be noted that time has been evaluated and confirmed by a test based on the assumption that an expert is performing the inspection. Experience and expertise, e.g. knowledge of similar cases, is required for a quick identification and evaluation of the inspected system. This inspection standard is a reminder to the expert of the of aspects to be evaluated as well as a structure to record inspection results. Given the variety of the types of buildings and systems, it is not possible to replace expertise by a procedure.

Annex A
(informative)

Template for the definition of inspection levels, choices, input data and references

See EN 15378-1:2017, A.1 for general information on the use of Annex A.

EN 15378-1:2017, Tables A.3 and A.4 are a template to specify which parts of the procedures defined in Clause 6 and 7 are to be used. The referenced procedures can be part of an EN or a national application document. If a clause is not required, then the corresponding reference to the procedure is left empty. See EN 15378-1:2017, Table B.3 for an example.

EXAMPLE Heizungs-Check procedures (see [1]) can be referenced form these tables.

EN 15378-1:2017, Table A.5 is the format to define inspection items.

The column Efficiency/points is used only if a rating system is defined. In that case, the rule to rate the item shall be defined or referenced here.

The “type of information / values” is specified to facilitate preparation of supporting software. The basic types of information that have been considered are:

— string: any text in one line;

— note: any text, possibly on several lines;

— number: any numerical value, Further details could be:

  a) the type of number (integer, decimal);

  b) an acceptable range;

— date;

— YES/NO (Boolean);

— list: selection of one item among a predefined set (to be listed);

— multiple choice: selection of one or several items item among a predefined set (to be listed).

The difference between “list” and “multiple choice” is that you can select only one item in a “list” whilst you can select multiple items in a “multiple choice”.

If a “number” fields is specified, the units shall be specified as well.

For special string fields a format or a predefined length can be specified.

These are common basic rules to define elementary variable types in most programming languages. They are easily translated in an XSD format specification file.

Annex B
(informative)

Default inspection levels definition, choices, input data and references

B.1 Introduction

If compared to other calculation standards, there is no 1 to 1 correspondence between Annex A and Annex B tables because the format specified in Annex A is used repeatedly for several inspection items and for two default inspection levels .

B.2 References

No additional information on this item.

B.3 Heat generator inspection levels definition

No additional information on this item.

B.4 Heating system inspection levels definition

B.4.1 Inspection levels definition

One inspection level may be applied to several combinations of building categories an system types, as shown with level 1 (named "basic" level) repeated twice in default EN 15378-1:2017, Table B.2 Only two default inspection levels are defined:

— level 1 "basic" is intended for single family houses or residential building units with autonomous heating systems;

— level 2 "detailed" is intended for all other buildings.

B.4.2 Default level 1 inspection definition

The tables mentioned in the following are tables from EN 15378-1:2017, Annex B.

Table B.3: this table states which optional parts of the inspection are required and references the required procedure.

Table B.4: default building categories are taken from EPBD directive. Additional categories and custom coding may appear in a national application documents.

Table B.5: other documents that one may expect to find are log-book, system design report, an EPC or the instruction for use of the equipment and/or system.

Table B.6: In some countries compulsory maintenance scheme are applied.

Table B.7: Meter readings is an extremely valuable information especially if inspections are repeated periodically. It is both an indicator of actual energy use and a possible basis to check sizing. The "previous reading" may be a reading in a previous inspection or another documented reading (an invoice based on actual measured data).

Table B.8: A visual inspection is enough. The type of emitter conditions possible improvements (a heat pump may be installed only with low flow temperature emitters).

Table B.9: Upgrading emission control is often a cost-effective recommendation. Manual control only means no other control than the user turning heating on and off. Central control only means there is a heating curve and the whole system is driven by external temperature: no indoor temperature sensor. It is usually cost effective to install zone or room by room controls when there is only a central control.

Table B.10: No additional information.

Table B.11: No additional information.

Table B.12: No additional information.

Table B.13: It was decided to include at least a visual inspection of the thermal solar system. Thermal solar collectors are mostly used for domestic hot water. Frequent issues are insufficient storage volume, incorrect control schemes and collector temperature sensor malfunction.

Table B.14: No additional information.

Table B.15: Heat generator (boiler sizing) is an explicit requirement of the Directive. For the residential sector the sizing of boilers is strongly conditioned by domestic hot water (if instantaneous this sets the minimum boiler power) and availability of very small boilers (boilers below 15 kW is a recent development). The sizing is much more critical for heat pumps.

Table B.16: Domestic hot water system is not mentioned by EPBD directive. Nevertheless, a minimum effort to have a look at domestic hot water has been evaluated as worthwhile.

B.4.3 Default level 2 inspection definition

The tables mentioned in the following are tables from EN 15378-1:2017, Annex B.

Table B.17: this table states which optional parts of the inspection are required and references the required procedure.

Table B.18: default building categories are taken from EPBD directive. Additional categories and custom coding may appear in a national application documents.

Table B.19: this is an extensive list. In most cases only some of the listed documents will be found.

Table B.20: No additional information.

Table B.21: In some countries compulsory maintenance scheme are applied.

Table B.22: No additional information.

Table B.23: Meter readings is an extremely valuable information especially if inspections are repeated periodically. It is both an indicator of actual energy use and a useful basis to check sizing. The "previous reading" may be a reading in a previous inspection or another documented reading (an invoice based on actual measured data). This list doesn't require that all meters be present. If they are available they should be read. Notes on meter readings may include consideration on reliability of metering or suggestion to add meters to support energy use analysis.

Table B.24: No additional information.

Table B.25: A visual inspection is enough. The type of emitter conditions possible improvements (a heat pump may be installed only with low flow temperature emitters). Notes can be used e.g. to record which are the most common emitters if there are several types.

Table B.26: Upgrading emission control is often a cost-effective recommendation. Manual control only means no other control than the user turning heating on and off. Central control only means there is a heating curve and the whole system is driven by external temperature: no indoor temperature sensor. It is usually cost effective to install zone or room by room controls when there is only a central control.

Tables B.27 and B.28: No additional information.

Table B.29: Default losses factors can be found in Tables B.41 and B.42.

Tables B.30 through B.35: No additional information.

Table B.36: Heat generator (boiler sizing) is an explicit requirement of the Directive. See comments on 7.15.2.

Table B.37: Domestic hot water system is not mentioned by EPBD directive. Nevertheless, a minimum effort to have a look at domestic hot water has been evaluated as worthwhile. For centralized systems, distribution losses (recirculation loop) are often very high.

B.5 Default application data

Tables B.38 and B.39: This table are based on data for a mild climate. It should be replaced by an appropriate table based on national climate, typical insulation properties and building category. The insulation level could be linked to age, due to the history of legal requirements. However the propose default uses the average wall U value in (the default uses the average U value of 0,8 W/m^{2}K to distinguish between non-insulated and insulated buildings) since it is the most relevant fact.

Auxiliary energy is usually neglected for the purpose of inspection.

Tables B.40 Values are based on net calorific values.

Tables B.41 and B.42: No additional information.

Table B.43: the meaning of the value is a number of utilization hours of the maximum power.

Table B.44 through B.46: No additional information.

Annex C
(informative)

Sample filled inspection report

C.1 General

The examples of inspection report given in EN 15378-1:2017, Annex C, are coherent with the default tables in EN 15378-1:2017, Annex B.

In this technical report, two examples of completed reports are given.

The first example is for a single family house.

The second example is for a typical Italian block building with 16 apartments and centralized heating, built in the years 1960…1970.

C.2 Example of completed level 1 default heating system inspection report

C.2.1 First page

Date of inspection	***DD/MM/YYYY***	Inspector name	***My name***
Inspection level	***1***	Building category	***Residential, single house***
Heated net floor area	***90 m²***		
Address	***Street name***	Zip / City ***00000***	***City name***
Building unit identification	***n.a.***	Heating system ID code	***XXXXXXXXXXXXX***

ADVICE

Possible immediate improvements of the energy performance of your system

Insulating pipes in the boiler room.

____

____

Possible improvements in case of replacement of appliances and components or other events

Install a condensing boiler with a reduced rated thermal input (power) and integrated external temperature sensor

Install a dedicated storage for domestic hot water, separated from the boiler.

Install thermal solar collectors for domestic hot water

Replace distribution pump with a smaller electronic one. Current pump is oversized

NOTES

____

____

ESTIMATED SPACE HEATING SYSTEM PERFORMANCE			
Boiler efficiency	***77 %***	Boiler oversizing	***110 %***
Evaluation	***Very low***	Evaluation	Highly oversized

Report delivered on the	***DD/MM/YYYY***	Receipt signature	__________________

C.2.2 Next pages

Services provided by the heating system		☑ space heating ☑ domestic hot water ☐ other		____________________	
Available documentation on site		☐ Previous inspection report			
Regularly maintained		☑ YES		☐ NO	
Conservation status		☑ Good		☐ Bad	
Remarks on central controls		Constant flow temperature, no outdoor temperature reset ____			
METER READINGS					
Fuel ***Natural gas***	Date ***DD/MM/YYYY***	Reading/unit ***NNNNNNN m³***		Fuel used for:	
Previous reading:	Date ***n.a.***	Reading/unit_______________		☑ Space heating	
Difference	Months _____________	Value/unit_________________		☑ Domestic hot water	
				☑ Other ***cooking***	
DOMESTIC HOT WATER	Date _________________	Reading (m³) ______________			
NOTES ON METER READINGS ***No counter for domestic hot water available*** ____					
EMISSION SUBSYSTEM					
Emitter type	☑ radiators ☐ panels ☐ fan-coil ☐ all-air system ☐ other	Emitter positioning		☐ correct ☑ radiators on non insulated wall ☐ radiators on internal walls ☐ radiators along transparent surface ☐ air emitters: correct flow direction ☐ high ceiling rooms (H > 4m): stratification risk	
NOTES ON EMISSION ____ ____					
EMISSION CONTROL					
Control type	☐ Manual control only ☐ Central control ☑ Zone control only ☐ Zone control + central control ☐ Room by room control ☐ Room by room control + central control	Controller type		☐ none ☑ ON-OFF ☐ P ☐ PI, PID	
Zone with different usage individually controlled		☑ YES		☐ NO	
Correct location of sensors		☑ YES		☐ NO	
Time programs		☑ YES		☐ NO	

Services provided by the heating system			☑	space heating	
			☑	domestic hot water	
NOTES ON EMISSION CONTROL ____					
DISTRIBUTION					
All accessible network thermally insulated			☐	YES	☑ NO
Pump control type ______________________________			Pump rated power	***150*** W	
NOTES ON DISTRIBUTION ***Pump is oversized*** ***Missing insulation on some pipes in the boiler room***					
GENERATORS IDENTIFICATION					
☑	Boiler	Nominal power 20 kW	☐	Thermal solar	Collector area__________ m^2
☐	Heat pump	Nominal power________ kW	☐	Other	Nominal power_________ kW
NOTES ON GENERATORS ***Floor standing, single stage burner, integrated domestic hot water storage*** ____					

BOILER					
			ID in the system	***01***	
Boiler type	☑	standard	Fuel	☑	natural gas
	☐	low temperature		☐	LPG
	☐	condensing		☐	light oil
				☐	Wood, pellets
				☐	Other
Make, model	***Make***		Manufacturing year	***1990***	
Nominal power input	***20*** kW				
Combustion efficiency	**92 %**		Source	☐	Measured
				☑	Maintenance report
				☐	Default
Losses through the envelope	2_%		Losses through the chimney with burner off	1,2 %	
Load factor	20 %		Estimated seasonal efficiency	77 %	
NOTES ON BOILER EFFICIENCY ____					

THERMAL SOLAR					
			ID in the system	___________________	
Collector type	☐	Flat plate	Service	☐	Space heating
	☐	Evacuated tube		☐	Domestic hot water
	☐	Other		☐	Other __________
Orientation relative to south	______ °		TIlt	___________°	
Gross area	____________m^2		Storage volume	________l	
NOTES ON THERMAL SOLAR ____					

STORAGE				
Volume	80 (l)		Insulation thickness	________________mm
Use and sizing	☑	d.h.w. (boiler)	Specific volume	_____________ l/person
	☐	d.h.w. (thermal solar)	Specific volume	_____________ l/m^2
	☐	Heat pump buffer	Specific volume	_____________ l/kW

Services provided by the heating system		☑ space heating	
		☑ domestic hot water	
	☐ Biomass boiler buffer	Specific volume	_____________ l/kW
NOTES ON STORAGE Integrated within the boiler			
BOILER SIZING			
Sizing according to building type and size		☐ YES	☐ NO
Building type	______________________	Building area	________________m^2
Specific power	______________ W/m^2	Required power	________________kW
Sizing according to fuel use		☑ YES	☐ NO
Building type	Residential	Fuel use	18000 kWh/year
Utilization hours of max.	2000 kWh/kW	Required power	9 kW
instantaneous domestic hot water		☐ YES	☑ NO
Required power	9 kW	Installed power	20 kW
Oversizing	2,1	Very high	
NOTES ON BOILER SIZING ***Burner already set at reduced power, Operation is limited to 14 h per day***			
DOMESTIC HOT WATER			
Type of domestic hot water production		☑ Storage	
		☐ Instantaneous	
Storage volume	80 l	Storage insulation thickness	25 mm
After legionella cycle, temperature is reduced		☐ YES	☐ NO
Set temperature of distributed domestic hot water		50 °C	
NOTES ON DOMESTIC HOT WATER ***No legionella thermal cycle***			

Seasonal efficiency was estimated using the equation given in EN 15378-3:

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(C.2)

C.3 Example of level 2 default heating system inspection report

C.3.1 First page

Date of inspection	***DD/MM/YYYY***	Inspector name	***My name***
Inspection level	***1***	Building category	***Residential, single house***
Heated net floor area	***1300 m²***	Number of building units	***16***
Address	***Street name***	Zip / City ***00000***	***City name***
Building unit identification	***n.a.***	Heating system ID code	***XXXXXXXXXXXXX***

ADVICE

Possible immediate improvements of the energy performance of your system

Install thermostatic valves and replace the pump. Install heat cost allocators on radiators.

Replace the boiler with a condensing boiler

Insulate piping in the boiler room

Possible improvements in case of replacement of appliances and components or other events

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NOTES

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ESTIMATED SPACE HEATING SYSTEMS PERFORMANCE			
Boiler efficiency	78,5 %	Boiler oversizing	80 %
Evaluation	Very low	Evaluation	High

Report delivered on the	***DD/MM/YYYY***	Receipt signature	_________________

C.3.2 Next pages

SERVICES PROVIDED BY THE HEATING SYSTEM		☑ space heating ☐ domestic hot water ☐ other		____________________
AVAILABLE DOCUMENTATION ON SITE				
☐ Previous inspection report	☑ Maintenance reports	☑ Fuel bills		
☐ Functional diagrams	☐ Plans with location of components	☐ Operating schedules	☐ Operation log-book	
☐ Heating system instructions	☐ Components instructions			
Documents up to date	☑ YES ☐ NO			
NOTES ***Yearly fuel use communicated by the administration*** ________________				
REMARKS ON OPERATION		***Some complaints for low indoor temperature*** ________________		

SERVICES PROVIDED BY THE HEATING SYSTEM		☑	space heating		
		☐	domestic hot water		
Regularly maintained		☑	YES	☐	NO
Conservation status		☑	Good	☐	Bad
REMARKS ON CENTRAL CONTROLS		***3 ways mixing valve, boiler operated at constant temperature*** ____			
METER READINGS					
Fuel ***Natural gas***	Date ***DD/MM/YYYY***	Reading/unit ***NNNNNNN m³***		Fuel used for:	
Previous reading:	Date ***n.a.***	Reading/unit_______________		☑	Space heating
Difference	Months _____________	Value/unit_________________		☐	Domestic hot water
				☐	Other __________
Auxiliary energy	Date _________________	Reading (kWh) ____________			
Domestic hot water	Date _________________	Reading (m^3) ______________			
Feed water	Date _________________	Reading (m^3) _____________			
Heat meter for heating	Date _________________	Reading (kWh) ____________			
Heat meter for d.h.w.	Date _________________	Reading (kWh) ____________			
Cycle counter	Date	Reading (n) ____________			
NOTES ON METER READINGS		***No other meter available*** ______________________________			
ENERGY CONSUMPTION EVALUATION					
Source of reference value	☐ EPC	Reference yearly consumption		kWh/m² 180	
	☑ Building size and type			kWh 234 000	
		Actual yearly consumption		kWh 210 000	
				kWh/m² 161	
NOTES ____					
EMISSION SUBSYSTEM					
Emitter type	☑ radiators	Emitter positioning		☐	correct
	☐ panels			☑	radiators on non insulated wall
	☐ fan-coil			☐	radiators on internal walls
	☐ all-air system			☐	radiators along transparent surface
	☐ other			☐	air emitters: correct flow direction
				☐	high ceiling rooms (H > 4m): stratification risk

SERVICES PROVIDED BY THE HEATING SYSTEM		☑ space heating ☐ domestic hot water		
NOTES ON EMISSION ______________________________				
EMISSION CONTROL				
Control type	☐ Manual control only ☑ Central control ☐ Zone control only ☐ Zone control + central control ☐ Room by room control ☐ Room by room control + central control	Controller type		☐ none ☐ ON-OFF ☐ P ☐ PI, PID
Zone with different usage individually controlled		☐ YES		☑ NO
Correct location of sensors		☑ YES		☐ NO
NOTES ON EMISSION CONTROL ______________________________				
DISTRIBUTION				
Structure and zoning corresponding to building use		☑ YES		☐ NO
All accessible network thermally insulated		☐ YES		☑ NO
Long lines, high temperature for low loads		☐ YES		☑ NO
Variable flow rate control where possible		☐ YES		☑ NO
Pump control type ***fixed speed***		Pump rated power		***650*** W
NOTES ON DISTRIBUTION ______________________________				
GENERATORS IDENTIFICATION				
☑ Boiler	Nominal power 250 kW	☐ Thermal solar	Collector area__________ m^2	
☐ Heat pump	Nominal power________ kW	☐ Other	Nominal power_________ kW	
NOTES ON GENERATORS ***Floor standing boiler, with single stage gas burner***.				

SERVICES PROVIDED BY THE HEATING SYSTEM		☑ space heating		
		☐ domestic hot water		
BOILER				
		ID in the system	***01***	
Boiler type	☑ standard	Fuel	☑	natural gas
	☐ low temperature		☐	LPG
	☐ condensing		☐	light oil
			☐	Wood, pellets
			☐	Other
Make, model	***Make, model***	Manufacturing year	***1985***	
Nominal power input	***250*** kW			
Combustion efficiency	***88 %***	Source	☐	Measured
			☑	Maintenance report
			☐	Default
Losses through the envelope	3 %_	Losses through the chimney with burner off	1,2 %	
Load factor	0,3 %	Estimated seasonal efficiency	**78,5 %**	
NOTES ON THE BOILER ____				
THERMAL SOLAR				
		ID in the system	__________________	
Collector type	☐ Flat plate	Service	☐	Space heating
	☐ Evacuated tube		☐	Domestic hot water
	☐ Other		☐	Other
Orientation relative to south	_______ °	TIlt	__________°	
Gross area	____________m²	Storage volume	_______l	
Adequate storage volume		☐ YES	☐	NO
Piping adequately insulated and in good state		☐ YES	☐	NO
Expansion system adequately sized		☐ YES	☐	NO
NOTES ON THERMAL SOLAR ____				
HEAT PUMP				
		ID in the system	__________________	
Cold source	☐ External air	Hot source	☐	Air
	☐ Water		☐	Water
	☐ Ground			
Type of heat pump	☐ Vapour compressor	Back-up heating	☐	None
	☐ Absorption		☐	Electric
	☐ Other		☐	Boiler
			☐	Other
Make, model	__________________	Manufacturing year	__________	
Nominal power output	________________ kW	Conditions of output	__________	
NOTES ON THE HEAT PUMP ____				
DISTRICT HEATING				

SERVICES PROVIDED BY THE HEATING SYSTEM		☑	space heating	
		☐	domestic hot water	
		ID in the system		__________________
Heat supplier	___________________	Contractual power		_____________kW
NOTES ON DISTRICT HEATING ______________________________				
COGENERATION				
		ID in the system		__________________
Fuel	☐ natural gas	Power input		_____________kW
	☐ light oil			
	☐ Other			
Thermal output	_____________kW	Electric output		_____________kW
NOTES ON COGENERATION ______________________________				
GENERATION CONTROL				
Variable generation temperature according to requirements		☐	YES	☑ NO
Correct setting of control devices		☑	YES	☐ NO
Multi-generator: correct cascading strategy		☐	YES	☐ NO
Multi-generator: Isolation valves for off-line generators		☐	YES	☐ NO
NOTES ON GENERATION CONTROL ______________________________				
STORAGE				
Volume	______________(l)	Insulation thickness		_______________mm
Use and sizing	☐ d.h.w. (boiler)	Specific volume		____________ l/person
	☐ d.h.w. (thermal solar)	Specific volume		____________ l/m2
	☐ Heat pump buffer	Specific volume		____________ l/kW
	☐ Biomass boiler buffer	Specific volume		____________ l/kW
NOTES ON STORAGE_____ ______________________________				
BOILER SIZING				
Sizing according to building type and size		☐	YES	☑ NO
Building type	____________________	Building area		_______________m2
Specific power	______________ W/m2	Required power		_______________kW
Sizing according to fuel use		☑	YES	☐ NO
Building type	Residential	Fuel use		210 000 kWh/year
Utilization hours of max.	2000 kWh/kW	Required power		105 kW
Heat load calculation available		☐	YES	☑ NO
		Heat load		_______________kW
instantaneous domestic hot water		☐	YES	☐ NO
Required power	105 kW	Installed power		250 kW
Oversizing factor	2,45	Very high		
NOTES ON BOILER SIZING ***Operation is 16 h a day***				
DOMESTIC HOT WATER				

SERVICES PROVIDED BY THE HEATING SYSTEM	☑	space heating		
	☐	domestic hot water		
Type of domestic hot water production	☐	Storage		
	☐	Instantaneous		
Storage volume __________l	Storage insulation		_______________ mm	
Insulated recirculation loop	☐	YES	☐	NO
Timer on recirculation loop	☐	YES	☐	NO
After legionella cycle, temperature is reduced	☐	YES	☐	NO
Set temperature of distributed domestic hot water	___________ °C			
NOTES ON DOMESTIC HOT WATER ____				
____				

Seasonal efficiency was estimated using the equation given in EN 15378-3:

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Annex D
(informative)

Inspection flowchart

The calculation flow-chart is a required element of the TR associated to an EPB standard. The inspection flow-chart is the equivalent item for an inspection standard

The flowchart is kept within the main standard because it is considered as an essential and useful information in the specific case of the inspection procedure.

See EN 15378-1:2017, Annex D.

Annex E
(informative)

Heizungs-check

In Germany an inspection procedure has been developed by VdZ.

The inspection procedure is quite detailed and is associated with a series of calculation graphs to determine a global rating of the system. The procedure includes several measurements and accurate checks of systems (example: checking if thermostatic valves preset is correct).

The rating is expressed as a number of points. A high score indicates that some renovation is necessary. A low score indicates an energy-fit system.

For more details see reference [1] in bibliography.

Bibliography

[1] Leitfaden zum Heizungs-Check nach DIN EN 15378 — Vereinigung der deutschen Zentralheizungs-wirtschaft e. V

[2] OENORM M 7510-1 Ausgabe: 2013-11-15 Überprüfung von Heizungsanlagen Teil 1: Allgemeine Anforderungen und Inspektion

[3] Thermische Solaranlagen – Dokumentation von Übergabe und Inspektion - Bundesindustrieverband Deutschland Haus-, Energie- und Umwelttechnik e.V. - Informationsblatt Nr. 44

[4] CEN/TS 16628, *Energy Performance of Buildings — Basic Principles for the set of EPB standards*

[5] CEN/TS 16629, *Energy Performance of Buildings — Detailed Technical Rules for the set of EPB-standards*

[6] CEN ISO/TR 52000-2, *Energy performance of Buildings — Overarching EPB assessment — Part 2: Explanation and justification of ISO 52000-1*

[7] CENSE report WP6.1_N05rev02: Set of recommendations: Towards a second generation of CEN standards related to the Energy Performance of Buildings Directive (EPBD), May 27, 2010. and reports on specific clusters of standards, See http://www.iee-cense.eu

[8] EPBD, Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings

[9] EPBD Mandate M/343 Mandate to CEN, CENELEC and ETSI for the elaboration and adoption of standards for a methodology calculating the integrated energy performance of buildings and estimating the environmental impact, in accordance with the terms set forth in Directive 2002/91/EC; 30 January 2004

[10] Mandate M480, Mandate to CEN, CENELEC and ETSI for the elaboration and adoption of standards for a methodology calculating the integrated energy performance of buildings and promoting the energy efficiency of buildings, in accordance with the terms set in the recast of the Directive on the energy performance of buildings (2010/31/EU) of 14th December 2010

[11] EPBD, Recast of the Directive on the energy performance of buildings (2010/31/EU) of 14th December 2010

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