Germany

Building Code Implementation - Country Summary


Section I: Code Development

History
Germany has had building energy efficiency requirements since 1977. The first performance-based code, the Energy Saving Ordinance (EnEV; Energieeinsparverordnung), was introduced following the Energy Performance of Buildings Directive (EPBD) in 2002. The 2009 revision of EnEV reduced maximum U-values based on different climate zones and introduced requirements for testing air-tightness, and boiler and HVAC performance. Technical installations that aren’t covered by the ordinance can show the required compliance by computer simulation. In 2013, the federal government passed another amendment to EnEV, further raising energy efficiency standards in new buildings from 2016 onward. Insulation requirements for summer conditions and limiting solar heat gain exist since 1995 and were adjusted continuously.

Existing codes

Structural coverage

<table>
<thead>
<tr>
<th>Scale</th>
<th>Building size threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>National, regional,</td>
<td>All residential buildings which are heated or cooled using energy, except those meant</td>
</tr>
<tr>
<td>local, etc.</td>
<td>for use less than four months a year or temporary buildings meant for a period of use</td>
</tr>
<tr>
<td></td>
<td>no longer than two years</td>
</tr>
<tr>
<td>New buildings</td>
<td>All residential buildings, except for those meant for use less than four months a year.</td>
</tr>
<tr>
<td>National</td>
<td>Building modifications in existing buildings are categorized (within set thresholds) as</td>
</tr>
<tr>
<td></td>
<td>either fundamental changes, in which case they have to meet 140% of new building</td>
</tr>
<tr>
<td></td>
<td>energy consumption requirement; changes to building elements, if at least 10% of the</td>
</tr>
<tr>
<td></td>
<td>component surface is affected, in which case these components have to meet building</td>
</tr>
<tr>
<td></td>
<td>element requirements; and modernization of heating installations, in which case the</td>
</tr>
<tr>
<td></td>
<td>building has to comply with the minimum heating or hot water supply or cooling</td>
</tr>
<tr>
<td></td>
<td>requirements. If the area that is</td>
</tr>
</tbody>
</table>

| Existing buildings for|
|                        |                                                                                       |
|                        |                                                                                       |
| retrofits              |                                                                                       |
heated or cooled is expanded, such area has to meet requirement for new buildings, above a certain expansion threshold, or, if below an expansion threshold, such area must meet minimum requirements for building elements and requirements for heating/hot water supply/cooling.\(^1\) Extensions and expansion of more than 50 m\(^2\) have to fulfil the requirements for summer conditions.

<table>
<thead>
<tr>
<th>Commercial buildings</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>New buildings</td>
<td>National</td>
<td>All heated and/or cooled non-residential buildings, except those used for livestock, greenhouses, religious buildings, tents, temporary buildings with a scheduled service life of up to two years or underground constructions; used less than four months a year or heated to less than 12°C.</td>
<td></td>
</tr>
<tr>
<td>Existing buildings for retrofits</td>
<td>National</td>
<td>Same non-residential buildings as covered for new buildings. The ordinance covers the modification of components, the retrofitting of buildings, the extension and expansion of a building by heated or cooled spaces. The requirements are the same as for residential buildings.</td>
<td></td>
</tr>
</tbody>
</table>

Germany’s national building code, EnEV, is mandatory and was legislated at the federal level because of its importance to Germany’s sustainable development. Compliance is performance-based. Regional governments must implement EnEV but have the freedom to establish their own enforcement processes and structures as well as to adopt stricter requirements.

**Measures covered**
- Envelope
- HVAC
- Service water heating
- Lighting
- Electric power
- Renewable energy
- Maintenance

The energy performance requirement is based on an equivalent reference building specified in annexes 1 and 2 of the EnEV and measured as kWh/m\(^2\)/year of primary energy.

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\(^1\) From [http://www.mgipu.hr/doc/06_tproplan.pdf](http://www.mgipu.hr/doc/06_tproplan.pdf).
Correction/new codes

Motivation/policies for improving existing building energy codes
Both European legislation and national climate goals (as articulated in the federal Energy Concept of 2010) motivate German building energy regulations. The German federal government is also keenly interested in enhancing Germany’s energy independence.

Revision schedule
The German government has committed to reducing the primary energy demand of buildings by 80% by 2050. Achieving this reduction will require deep efficiency improvements. The first milestone toward this goal is a 20% reduction in heat demand levels by 2020. End of 2014, the German government has endorsed a set of instruments within the National Action Plan on Energy Efficiency (NAPE) and is currently working on a comprehensive Energy Efficiency Strategy for the buildings sector to show ways for achieving the 2050 target.

Section II: Code Implementation

Administration

Administrative/enforcement structures

Mix of models Individual German states enforce the building energy codes. Enforcers could be only government offices, government and planner, government and a third party.

The roles of stakeholders (what do they do at each stage)

<table>
<thead>
<tr>
<th>Role of stakeholders</th>
<th>Design</th>
<th>Construction</th>
<th>Pre-occupancy check</th>
</tr>
</thead>
<tbody>
<tr>
<td>The role of federal/central government</td>
<td>Varies between states: in some states, municipal building code officials carry out spot checks. Checking the accuracy and completeness of calculations.</td>
<td>Checks based upon evidence that something might be wrong</td>
<td>Checks based upon evidence that something might be wrong</td>
</tr>
<tr>
<td>The role of state/provincial and local government</td>
<td>Varies between states: in some states, municipal building code officials carry out spot checks. Checking the accuracy and completeness of calculations.</td>
<td>In some states, on-site-inspections are a prerequisite for</td>
<td>In some states*, a report must be handed over to the</td>
</tr>
<tr>
<td>Involvement of third parties and their role</td>
<td>Varies between states: usually, code enforcement is based</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
on self-certification of the builder/architect to the owner. Construction cannot commence until the municipal government grants a permit based on the self-certification. This is not the case in all states. Owner confirming that the energy performance of the building as constructed corresponds to the energy performance set out in the plans.

* In all states an Energy Performance Certificate, proving the compliance to the minimum requirements of the EnEV, has to be handed over to the owner.

Requirements for energy audits after occupancy
EnEV requires energy audits for the installation of HVAC and hot water and for major retrofits.

Tools used for compliance checking

Software used for compliance checking
Germany does not have governmental code compliance software. On the private sector several software packages for simulating energy performance to demonstrate compliance exist. Some examples can be found at: http://www.enob.info/de/software-und-tools/.

Capacity building and education

Education and capacity building programs that support code implementation
The German Energy Agency (Deutsche Energie-Agentur GmbH (dena)) disseminates information and supports the stimulation of demand for energy efficiency in buildings by:

- Training experts (engineers, architects, craftsmen) in new energy saving skills by documenting evidence and techniques, organizing events and maintaining online databanks on:
  - measures to achieve target efficiency levels in different buildings
  - refurbishment of rented homes
  - best practices for residential and non-residential buildings (new and existing)
- Increasing transparency in all energy standards and certification (e.g., validated Energy Performance Certificates (EPC), the voluntary Quality Mark building labelling program, Energy Efficient Building Displays)
- Developing and promoting model projects to demonstrate quality standards, implement best practice and develop regional know-how
- Simplifying methods and increasing the reliability of renovation.

The Chambers of Architects and Engineers offer vocational training programmes for their members, including voluntary training on energy performance issues.
The Chambers of Crafts also offer training on energy performance issues. For persons with a higher level of qualification (e.g. “Meister”) it is possible to obtain an extra qualification as energy consultants.
In Germany, there is no official accreditation procedure for experts of energy efficiency; nevertheless, qualified experts can voluntarily get an accreditation via professional associations and third-party bodies. Those organisations (e.g. dena) have internal rules and requirements for accreditation (e.g., KfW certifiers). The qualified experts take personal responsibility for the quality of the certification results (under risk of penalties).

Target groups for programs
Capacity building programs target engineers, architects, craftsmen and building owners.

Best-practice example of capacity building
The EU project “Build up-skills” aims to align building retrofit workers with the highest EU standards. The program is helping European countries harmonize their national qualification frameworks, develop a reference model for training paths, provide incentives for hiring qualified workers, and set up training workshops at the appropriate scale.

Section III: Compliance & Enforcement
Penalties, incentives and other mechanisms for improving compliance

Penalties for non-compliance with energy provisions in codes
- Fines Depending on the severity of the infringement a fine of between EUR 5,000 and EUR 50,000 must be paid. The latter applies for example to existing residential buildings where there is continued use of prohibited old heating systems, non-insulation of uninsulated conducts or accessible upper-storey ceilings non-compliant with the construction standard.
- Rejection of construction permit

Incentives/rewards to go beyond minimum required performance level
The German government provides subsidized loans and interest rates via the German government-owned development banks KfW’s CO2-building renovation programmes (see Annex for details) and the market incentive programme (“MAP”) for renewable energy in the heat market.

Compliance assessment
Assessments on rate and effectiveness of compliance
On the national level there are regular evaluations mainly on KfW’s financing programs, but not on the building energy code implementation. In Germany, the political field of building is the competence of
the federal states. Therefore the compliance is in their responsibility only. For the European level, the status of EPBD implementation has to be proven to the EU Commission with periodical reports.

Publicly available information on compliance assessment
Not available on building energy code programs. The German status of implementation of EPBD is published as Country Report (http://www.epbd-ca.eu/). The publication of the Reports stating the status of implementation at the end of 2014 is due to be published.

Lessons learned from compliance studies
Because Germany does not evaluate its building energy code implementation programs, there are no explicit lessons learned. Questions of compliance for the Energy Saving Ordinance EnEV are at the level of the federal states. However, Germany does have a robust evaluation system for its financing programs, which the government regularly uses to improve these programs.

Assessment methodologies, protocols and statistics.
Central assessment methodologies/protocols are available only for the evaluations of financing programs. Statistics on permitting and energy use are publicly available.

Airtightness testing required prior to occupancy
Yes (not mandatory). If airtightness is tested, the results can have a positive effect on the calculations required (proof can be required for financial support).

Section IV: Building Materials & Energy Performance Certificates

Building materials (e.g., windows, insulation, HVAC, lighting)

Building materials rating & labeling
Germany adopted CE marking under the Construction Products Regulation (305/2011/EU-CPR), which covers energy economy and heat retention.

Energy Performance Certificates

Building codes and energy performance certificate
In Germany, an energy performance certificate is required in course of implementing EU’s Energy Performance of Buildings Directive (EPBD), via amendment of the Energy Saving Ordinance (EnEV). EnEV regulates the issuing and the display of energy performance certificates as well as their content.

EPCs in Germany can be grouped into two categories according to the type of assessment method: certificates based on calculated demand assuming a standard use and certificates based on metered...
consumption. In doing so, all new buildings and cases of major renovation must have an EPC based on a calculated demand. With the EnEV 2013 getting into force by 1st May 2014, the energy certificates are changed significantly, including the establishment of an independent control system and the introduction of energy classes for residential buildings.

For more details see EnEV 2002 and in the Annex.

**Enforcement of energy performance certificates**

Germany introduced an independent control system in 2014. A statistically significant sample of certificates will be randomly selected from the EPC registry, which consists inter alia of the EPCs’ identification number and contact details of the EPC assessors. Additionally the plausibility of EPCs is checked by the German Institute for Building Technology (DIBt). After the responsible assessor of the selected EPC or the EPC which attracted attention has provided additional input, an independent inspector conducts checks at paper and on-site level. Therefore, experts are required to store all relevant data for at least two years after the EPC has been issued. In Germany, states are responsible for checking the quality of EPCs, but it is not clear to what extent these checks effectively take place.

**Existence of national registry database for energy performance certificates**

The federal government introduced a registry of all EPCs in May 2014. Due to data protection regulations in Germany, only the identification number of the EPC, the building type, the type of rating (asset or operational), the region where the building is located and the responsible assessor (who needs to provide detailed information when requested) can be kept for statistical evaluation.

**Number of certified buildings and the percentage**

The number of EPCs issued before May 2014 is not available. More than 500,000 EPCs were issued in the first year after introducing the registration.
Appendix 1. Additional Information on Germany Building Codes

**New Requirements under the EnEV 2013**

The EnEV primarily poses requirements for the primary energy demand of new buildings. It takes into account the structural heat insulation of the building envelope as well as the energy efficiency of the systems engineering used (heating system, ventilation, cooling, light). By means of a multiplier, the primary energy factor, the upstream processes of the utilised energy carrier (until the removal from the building) is assessed, so that the differing usage of resources and indirectly also the differing CO₂-emissions are taken into account.²

Based on the latest revision compared to its predecessor “EnEV 2009”, the “EnEV 2013” includes the following³:

**New buildings (residential)**

EnEV 2013 tightens the level of performance required by 2016. It still obliges house-builders to have their new constructions erected in an energy-efficient way, which limits to annual primary energy demand and building envelope’s heat loss as required in the ordinance.

**Residential building stock (existing)**

EnEV 2013 clarifies that owners renovating or extending part of their building's (e.g. facade, roof or windows) have to respect the maximum U-values.

The requirement regarding thermal insulation of the upper story’s ceiling (mandatory for many buildings since January 2012) has been tightened and clarified. The new text refers to construction standard DIN 4108 (Thermal protection and energy saving in buildings). If it is not fulfilled, owners must insulate accessible ceilings over the upper storey’s heated rooms until the end of 2015 not exceeding a U-value of 0,24 Watt/(m²xK). Alternatively, they can insulate the roof accordingly.

EnEV 2013 (Retrofitting of installations and buildings) mandated retrofits for central-heating boilers:

- Boilers put into service before October 1978 are still excluded from service (as under EnEV 2009)
- Boilers put into service until 1984 must not be used beyond 2015.
- Boilers put into service after 1984 must not be used for more than 30 years.

However, there are many exceptions to this retrofit obligation. **Applicable to both residential and non-residential buildings**

Non-compliance can lead to the maximum fine of up to € 50,000. The latter applies to the following offences regarding the residential stock: Further use of prohibited old heating systems, non-insulation of uninsulated conduits or accessible upper-storey ceilings non-compliant with the construction standard.

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² From: [http://www.bbsr-energieeinsparung.de/EnEVPortal/EN/EnEV/enev_node.html](http://www.bbsr-energieeinsparung.de/EnEVPortal/EN/EnEV/enev_node.html)
The primary energy factor of the German grid mix for electricity has been lowered from 2.6 to 2.4 and will go down to 1.8 on 01.01.2016. This is due to the increasing share of renewables and the decrease of nuclear power at the same time. This is relevant since electricity or heat consumption in buildings are multiplied by a factor according to the energy sources used for supplying the building.

**Requirements for thermal insulation in summer**

For both building types the new annex 1 no. 3 and annex 2 no. 4 EnEV prescribe thermal insulation in summer to comply with the requirements of DIN 4108-2 2013-02, paragraph 8, by limiting either the factors for sun exposure or the hours of over-temperatures\(^4\).

**Enforcement and compliance**

The EnEG, EnEV and EEWärmeG are federal laws, but the states ("Länder") have the competency to oversee them. There are substantial differences between the Länder.

To give just one example for rules in one Land: In Berlin\(^5\), all EnEV-related certificates, calculations and checks are not checked by the regulatory construction authorities mentioned below, but delegated to the “Inspection experts for energy planning of buildings” ("Prüfsachverständige für energetische Gebäudeplanung”). Although these experts are hired by the constructor, they must not receive instructions from him in the execution of their tasks since they act as experts on behalf of the authorities ("Bethehende"), an institute of law special to German public law. Such experts shall provide guarantee for independence and reliability and have to fulfil special requirements in terms of qualification. In Berlin, they have to ensure compliance of building execution (new built and extensions according to art. 9 V EnEV) with all EnEV-related certificates, calculations and EPCs.\(^6\) In all cases where these experts are operating (mandatory for all constructions beyond two housing units), calculations and certificates are deemed correct. Thus, no checks will be done by the authorities unless there is evidence for errors or misbehaviour.

Therefore, just a couple of remarks on execution in general:

- The competent authorities in this matter are the Authorities for the supervision of construction ("Bauaufsichtsbehörden"), usually in a two-tiered organisation, the “Obersten Bauaufsichtsbehörden” (Superior authorities for...) at the level of the Ministry of a Land and the “unteren Bauaufsichtsbehörden” (Lower authorities...) at municipal or county ("Kreis") level. The intermediate tier which used to exist in many Länder, at least the bigger ones, has been partly or fully suppressed in administrative reforms during the last two decades in some of them.
- Due to the varying administrative organisation of the Länder-governments the ministry in charge can be the one for environment and urban development, for energy and construction, the ministry of the interior or a completely different one.
- Construction issues are being taken very seriously by the German authorities as they entail potential danger for citizens' safety. Therefore, execution of all construction issues pertaining to

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\(^4\) Simplified description. This is a requirement that a professional planner has to calculate based on the DIN-standard mentioned above.


safety are executed and supervised quite thoroughly.

- On the other hand enforcement of rules which are not relevant to safety is generally handled much less thoroughly. E.g. market surveillance of rules for energy consumption of products (energy labels) is hardly being done in Germany (as in many other MS, unfortunately). The reason given is always a lack of finance, staff capacity and of testing installations.
- There is some evidence that enforcement of building energy efficiency rules is and will not be much higher on the agenda.

**Compliance with EnEV rules**

The latest EnEG and EnEV revisions have extended and increased fines for certain offences. For instance, failure to comply with the following duties can lead to a fine of up to € 50,000 (increase):

- use of old boilers despite the interdiction,
- non-insulation of non-insulated conducts,
- non-insulation of upper-storey ceiling.

Up to € 15,000 (new):

- Non-presentation of EPC at the occasion of sale or rent,
- non-publication of mandatory specifications in real-estate advertisements.

Up to € 5,000:

- non-transcription of allocated registration number into EPC
- non-transmission of documents or data for EPC-sample control.

**Compliance with new EPC rules according to EnEV 2013**

The rules for compliance-checks and enforcement in Germany have been delayed which has already been criticised by the European Commission. By law, a competent authority has to check a statistically relevant percentage of EPCs registered and thoughts with attracted attention within a given year. Included in the system of registration, such authority has to control the plausibility of the input-data and the values shown in an EPC.

But enforcement is also scarce in other fields of EPC implementation. Two testing campaigns have shown that EPCs were provided without request from a potential renter or owner in 30% and 10% of cases, whereas such disclosure is mandatory.

**Supporting Program: KfW - CO2-Building renovation programme**

Although not a building code program, the Federal Government qualifies the “CO2-Building renovation programme” (“CO2-Gebäudesanierungsprogramm”) as its most important tool for building efficiency together with the EnEV. The funds from this programme endow the “Programmes for energy efficient

construction and renovation”, through which the KfW-group of banks\(^8\), the public German development, export finance and promotional banks, have been supporting building efficiency since 1990. Currently, every third renovation is being supported by them and every other newly constructed building in Germany. The requirements of this support go beyond the EnEV-standards. In 2014, about € 1,8 billion are being used for this purpose (current programme year and payment authorisations from previous years).

These programmes take various shapes, for renovation (deep or individual measures), including for protected buildings and new built, by providing cheap loans (e.g. of 1% effective annual interest rate) or subsidies for investments, including into deployment of RES (via the MAP - see above), RES-storage, change of the heating system, (mini-)CHP and for the services of planners supervising the projects.\(^9\) Also municipalities can benefit from these funds.

**Urban development promotion programme (“Städtebauförderung”)**

To complete the picture, this programme run by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) via its responsibility for housing and construction has another addressee, the municipalities. Via several programmes urban development, urban infrastructure, preservation of monuments and social aspects are being supported by the Federal Government and handed out through the Länder.\(^10\) The programme’s endowment has been increased to € 700 million for the year 2014 only, but just a fraction of it will benefit energy renovation and energy infrastructure, since this is not its main goal.\(^11\)

**Fiscal incentives**

Fiscal incentives have many benefits, e.g., to secure or create economic welfare and jobs and to be more popular among owners than subsidies or cheaper loans. However, it is a sensitive issue, since the respective legislative proposal of the previous government was rejected by the Federal Council (”Bundesrat”) in July 2011 and could not be agreed upon by the mediation committee\(^12\) of Federal Parliament (”Bundestag”) and Bundesrat until the dossier was formally buried in December 2012. The stumbling block was the allocation of losses from tax income between Federation and Länder, but also political strategy between government and the then-opposition played a role and contributed to final rejection in late 2012, less than a year before the last elections to the Bundestag.

The law was originally supposed to come into force on 01.01.2012 and would have cost from € 150 mill. in 2013 to € 600 mill. in 2016, € 1,5 billion altogether split between federation (less than half), Länder (more than a third) and municipalities (some 20%) - without taking into account potential additional income from increased economic activity and tax income at all levels. Expenditure made for energy renovation measures by house-owners leading to the “efficiency house 85”-standard (see above) would have been tax-deductible over 10 years.\(^13\)

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8 [https://www.kfw.de/KFW-Group/About-KFW/](https://www.kfw.de/KFW-Group/About-KFW/) , “KfW-Bankengruppe” - “Kreditanstalt für Wiederaufbau”
9 [http://www.bmwi.de/DE/Themen/Energie/Gebaeude/co2-gebaeudesanierungsprogramm,did=649966.html](http://www.bmwi.de/DE/Themen/Energie/Gebaeude/co2-gebaeudesanierungsprogramm,did=649966.html)
10 [http://www bmub bund de/themen/stadt-wohnen/staedtebaufoerderung/kurzinfo/](http://www bmub bund de/themen/stadt-wohnen/staedtebaufoerderung/kurzinfo/)
12 “Vermittlungsausschuss”
13 „Entwurf eines Gesetzes zur steuerlichen Förderung von energetischen Sanierungsmaßnahmen an Wohngebäuden“, Bundestags-Drucksache 17/6074, 06.06.2011
EPCs

Energy performance certificates for new buildings were introduced in Germany through earlier ordinances since 1995\textsuperscript{14}. They have been mandatory for new buildings and, in certain cases, for major refurbishments since 2002\textsuperscript{15}.

With the EnEV 2013 coming into force, the EPC and the requirements derived from it, have undergone significant change:

\begin{center}
\begin{tabular}{|l|c|}
\hline
Energieeffizienzklasse & Endenergie [kWh/(m\textsuperscript{2}⋅a)] \\
\hline
A+ & $< 30$ \\
A & $< 50$ \\
B & $< 75$ \\
C & $< 100$ \\
D & $< 130$ \\
E & $< 160$ \\
F & $< 200$ \\
G & $< 250$ \\
H & $> 250$ \\
\hline
\end{tabular}
\end{center}

- Real estate advertisements have to provide information on the EPC type (asset or operational rating), energy demand (or consumption, respectively) of the building, energy carrier, date of construction and energy efficiency class. This is also based on a request by the Bundesrat (mainly based on Article 12(4) in EPBD).

- Submission: Sellers or lessors now have to show the EPC to their clients during the visit of the object. If no visit takes place, it has to be shown once it is requested (this was the general rule before), or at the latest once a contract is due to be signed. In that case, the EPC has to be handed over (copy or original).

- Display: Buildings in which over 500m\textsuperscript{2} are occupied by public authorities and which are frequently visited by the public have to display their EPCs in a well visible place. On 09.07.2015 the threshold went down to 250m\textsuperscript{2}.

- Registration: As requested by the EPBD, all EPCs now have to be registered. This is done via an online data exchange\textsuperscript{16} with the website of the DIBt. Experts issuing EPCs can be asked to transmit additional documents to the DIBt, which is based in Berlin and has been assigned the task by the federal states to play the role of central authority for control for a maximum of 7 years.

\textsuperscript{14}Modified from: http://www.bbsr-energieeinsparung.de/EnEVPortal/EN/EnergyCertificates/certificates_node.html
\textsuperscript{15}Energy Performance Certificates across Europe - From design to implementation, BPIE, 2010, p.49, see: http://bpie.eu/energy_performance_certificates.html#VXhoxYqTII
\textsuperscript{16}https://www.dibt.de/en/Fields_of_activity/GF-EnEV-Registrierstelle.html