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EPBD and Building Energy Codes - Compliance, Quality Assurance & Enforcement Strategies

EU EXPERIENCE ON EPBD - POSITION PAPER No 8

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FOREWORD

This position paper has been developed by the project "Clean Energy Cooperation with India (CECI): Legal and policy support to the development and implementation of energy efficiency legislation for the building sector in India ("ACE:E²"[1])".

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[1] ACE: E² – Adoption, Compliance, Enforcement – Energy Efficiency

ABBREVIATIONS

ACE: E2	Acronym of the project (Adoption, Compliance, Enforcement – Energy Efficiency)
CECI	Clean Energy Cooperation with India
CPD	Continuing Professional Development
ECBC	Energy Conservation Building Code
EP	Energy Performance
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Certificate
EU	European Union
EUD	European Union to India
HVAC	Heating Ventilation and Air-Conditioning
M&R	Monitoring & Reporting
NZEB	Nearly Zero Energy Buildings

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SUMMARY

The focus of this paper has been on compliance and enforcement practices in EU Member States in relation to the energy performance (EP) requirements arising from the EPBD in relation to new buildings and major renovations and on the associated requirements in relation to energy performance certification (EPC) or labels being mandatory at the point of offer for sale or rental. It has outlined good practice processes applied among the leading EU Member States and has provided information in relation to compliance levels with new buildings, major renovations and with retrofitting of energy efficiency measures.

As prescribed in their transposing national legislation enacting the EPBD and as applied in practice, Member State systems for ensuring practical operational implementation of the building energy code on the ground have involved enforcement by local/ municipal enforcement authorities including receipt, assessment and recording of evidence of compliance by building owners/ developers, through documentation and declaration by registered professional certifiers.

A key ingredient in good practice compliance systems is the setting of clear lines of professional accountability through each step of the building process.

In this regard, the extensive range of preparatory 'upstream' capacity building measures, covering development of Tools, People and Systems as outlined in Position Paper 5, are a vital precondition to establishing a credible compliance, quality assurance and enforcement regime.

An important need is for Government to authorise the financial and human resourcing of the assigned authorities to enable the development and operation of the necessary administrative and enforcement processes and associated IT systems (capacity building), and to enable ongoing promotion and systems development.

A fundamental resource in enabling credible and effective compliance, quality assurance and enforcement practices has been the establishment of databases of EP certification records. Good practice systems with powerful functionalities including facility for analysis and informing of inspection and quality assurance strategies have been established in many EU countries.

While the investment cost of specifying, procuring and delivering such a system is substantial, Member States that made this investment to help carry out the administrative burden of managing millions of documents have been able to achieve a robust system with a relatively small administrative staffing backup requirement. It has also brought substantial co-benefits in terms of systematic insights into the building stock to inform ongoing and future planning.

Unlike the case of India's ECBC system, there is no fully consistent and comparable central EU database. The nearest example to such a pan European resource is the BPIE EU Building Stock Observatory.

Effective and cost efficient quality assurance strategies involve a combination of preventative measures upstream and in the course of building design and certification and

of sampled auditing applied as part of a post works monitoring regime, using a combination of a risk based prioritisation and random audits to keep the industry alert to compliance.

Independent analysis indicates average rates of compliance of 85% with Member State EP requirements. The most common form of penalty applied in practice has involved denial of an occupancy permit for the building pending correction of non-compliance items.

There is an acknowledged limitation to current building energy codes which are based on calculated performance at the design stage (which is rational and necessary, and is an objective 'asset rating'), whereas measured energy performance ('operational rating') in practice may deviate considerably from the design prediction.

India's framework for enabling compliance and enforcement in relation to the ECBC has the potential to be at least as effective as has been the case with the EPBD in several EU countries, for two strategic reasons: Firstly because of its development of relatively uniform systems and procedures for implementation across all States, including: (a) the common EP calculation methodology; (b) similar EP compliance criteria (allowing for inter-regional climatic variations); (c) a consistent legal framework and administrative infrastructure across its States; (d) a consistent/ centralised database for lodgement, review and retention of evidential EP code compliance records; and (e) hence a facility for training and other capacity building initiatives to be organised centrally to a common template and delivered consistently across all States. Secondly, the fact that energy in ECBC buildings is 100% supplied from electricity and the fact that the policy authorities have secured the co-operation of the electricity utilities and regulators regarding access to real performance data will enable ongoing monitoring and reporting of progress and inform their energy management and improvement practices.

Success factors in implementation can be summarised as follows:

- Adopt a legal framework which defines clear responsibilities, functions and powers
- Design and build an independent control system, including smart databases
- Apply an effective system of compliance checking at appropriate points for declaring performance/ inspecting/ checking compliance
- Monitor the compliance rate and take appropriate corrective educational action
- Sanctions need to be effective, proportionate and adapted to local context
- Establishing and operating an effective system needs policy commitment and investment of money and people in the necessary tools, people and systems.

While the quality of implementation varied across Member States, ultimately the majority succeeded in putting the necessary human capacity, organisational, enforcement and communication systems in place to ensure the preparedness of the construction and property sectors to achieve compliance with the new energy performance requirements, and for the authorities to oversee, monitor, enforce and report on compliance. This is also relevant to ensuring readiness to meet the EPBD requirement for 'nearly zero energy buildings' (NZEB) by year 2020. **It is anticipated that elements of the compliance and enforcement frameworks applied in EU Member States could also be beneficially applied in the circumstances of India. Indeed, particular elements of EPBD implementation in the EU show good resonance with elements of the ECBC implementation process to date in India.**

1 INTRODUCTION

The two primary requirements of the EU Energy Performance of Buildings Directive (EPBD) in terms of their relevance to the circumstances of the ECBC in India are:

- The mandatory setting and implementation of energy performance (EP) standards for new buildings and major renovations (with such standards being informed by a cost optimal or life cycle costing analysis); and
- The mandatory obligation on building developers and owners to make an energy performance certificate (EPC) available to all prospective purchasers or tenants when a building is being placed on the market, including explicitly quoting the energy rating of the building in all public advertising.

Associated reporting obligations in relation to these requirements are two-fold:

- High level legal, practical and reporting requirements on EU Member States, enforced by central EU authorities. This pertains to the faithfulness of legal transposition of the requirements in the Directive (analogous to 'notification' of the ECBC in the India context) and the routine annual reporting of progress in the practical implementation of those requirements.
- Operational level requirements within EU Member States, enforced within their own jurisdictions by the EU Member State authorities or by authorities delegated on their behalf.

Both of these levels of monitoring and reporting (M&R) have been discussed in a separate paper on M&R and also outlined in Position Paper 2. These papers have already covered the high level reporting requirements upon EU Member States (annual progress updates and reviews, cost optimal methodology, NZEB roadmap etc.) in sufficient detail.

The focus of this Position Paper is therefore on enforcement of the EPBD requirements at an operational level within their own jurisdictions by EU Member State authorities or their delegated authorities, including strategies and resources for maximising compliance and quality assurance. The paper selects and highlights learnings from good practice approaches, systems and operational experiences from EU Member States in relation to building the necessary technical capacity, human skills and organisational systems to administer compliance and enforcement in relation to the EP and EPC requirements.

2 BACKGROUND LEGAL & TECHNICAL CONTEXT

The background and traditions prevailing in EU Member States are relevant as these had a significant influence on the approaches taken by national authorities in relation to compliance and enforcement systems design and operation.

2.1 EU Member States

The EU has a population of approximately 500 million across its 28 Member States. It is not a federal Union but on a number of areas of recognised common policy interests it shared common mandatory policies. Its Member States are highly diverse in respect of:

Figure 2-1 The European Union

- Size – from 0.4 M to 80 M people
- Levels of economic development
- Climates and architectural idioms
- Political/ administrative/ regulatory traditions
- Educational systems
- Approaches to setting building codes
- Traditions and cultures of compliance enforcement

2.2 Common features with EU building energy codes

The following are a number of common features of building energy codes and their regulatory systems in EU Member States:

- In each EU country, there is a regulatory system comprising building regulations (covering various common subject areas – safety, health, comfort, accessibility, as well as energy efficiency) and a 'building control' system for administration and enforcement of the regulations. Building regulations set minimum requirements (as performance or prescriptive criteria) for each functional subject area, including energy efficiency. Building control aims to ensure that these minimum requirements are applied and enforced.

- In most EU countries, central government authorities are responsible for setting technical building regulations or codes. However, the involvement and discretion of regional and local authorities varies, with an expected stronger involvement in countries with federal and regional government structures, such as Austria, Belgium and Germany.
- Technical building regulations or codes for energy efficiency can be set either in one main legislative document, in a coordinated suite of documents or in separate legal documents.
- In EU countries, typically a law (which can be in the form of an Act, decree or ordinance depending on the legal system), with implementing Ministerial order, provides the legislative framework defining the content and implementation of the regulations.
- The energy efficiency requirements always apply to new buildings, and usually also in part to construction and major renovation works in existing buildings.
- Prior to EPBD implementation, the energy efficiency requirements in EU countries were formulated either as an overall energy (or thermal energy) performance criterion, or sometimes only as prescriptive requirements for particular building components or characteristics (walls, roofs, floors, glazing, ventilation, boilers, air conditioning, storage vessels, heating or cooling controls, lighting etc.), or sometimes a combination of both.
- Through EPBD implementation, it is mandatory that energy efficiency requirements are formulated as an overall energy performance criterion, covering the main thermal and electrical energy uses. In the case of non-domestic buildings (commercial and public), the performance criterion set by Member States is always expressed in relation to a 'reference' building which is a notional or virtual building with the same dimensions and functions as the proposed building, and which has energy specification features set at a baseline level such as year 2005 requirements for insulation, HVAC, lighting systems etc. For example, performance standards introduced in year 2009, say, might be set so that the overall calculated energy consumption (and possibly associated CO_2 emissions) of the proposed building, using the approved methodology, is say 30% to 50% below that of the reference building.
- The performance approach has important advantages in terms of maximising design flexibility, consequent scope for cost-efficient trade-offs between different features, and of similarly encouraging the development and deployment of innovative energy efficiency products and systems.
- In several EU countries, the performance requirement is supplemented by minimum requirements (or 'backstop' values or criteria) for individual elements or components of the building.
- In most EU countries, direct references are made to specific national (or European) standards, covering matters including overall performance requirements, component requirements and calculation methods.
- In relation to building energy components, the EU Construction Product Regulations (CPR, http://ec.europa.eu/growth/sectors/construction/product-regulation_en) and European Standards (EN, https://www.cen.eu/work/areas/construction/buildingsenergyperf/Pages/default.aspx

) and 'Eurocodes' covering structural issues (https://eurocodes.jrc.ec.europa.eu/) lead towards greater harmonisation of the technical requirements across EU countries, in relation to various subject areas including energy efficiency.

2.3 Differences between EU Member States approaches

In addition to the above features and distinctions, the context of pre-existing building energy codes and their models of legal enactment and enforcement prior to the issuing of the EPBD showed a variety of different aspects and approaches, all of which would tend to influence the detailed responses of individual EU Member States in adopting and implementing the EPBD. Among these aspects have been:

- **Geographical jurisdiction:** Building codes in general, and building energy codes in particular, may have been set and applied at a national, regional, or municipal level. Within the larger Member States, regional climatic zoning has tended to apply.
- **Climate:** Climatic conditions have a natural determining effect on whether the emphasis in the code is on space heating versus cooling and humidity control. Annual degree days (base temperature 18oC) for heating range from over 5000 in the most northerly regions to less than 700 in some southern regions, while annual degree days for cooling range from near zero to over 1000. Solar energy, daylighting and humidity conditions can also vary significantly.
- **Technical scope:** Traditionally, there have been variations between EU countries in the technical scope of coverage (of energy use for heating, cooling, lighting etc.) and the form or grade of energy used in the performance criterion (useful delivered or primary). However, the recast EPBD of 2010 and associated development of European Standards is migrating towards the most comprehensive coverage, namely all major energy end uses and primary (fossil fuel) energy use, normally expressed in term of kWh per m2 and possibly also kg of CO_2 per m2.
- **Levels of ambition:** Independent of whether the approach was prescriptive (e.g. U-values) or performance based, different Member States, even in cases of similar climates, showed variation in the levels of ambition and stringency specified in their building energy codes.
- **Building control systems (compliance and enforcement):** Similarly, in relation to energy codes, while it is common for local/ municipal authorities to have a lead role in enforcement, different jurisdictions have shown differences in the assignment of responsibilities for demonstrating or certifying compliance and in their inspection, database, administrative and penalty regimes applying to the enforcement process.
- **Pre-existing capacity:** Different jurisdictions and construction sectors had somewhat differing levels of technical resources, tools, skills and experience in relation to the design, specification and modelling of buildings for superior energy performance.

In comparing with the situation across the States of India prior to the ECBC, it is understood that a lesser degree of diversity in building code regimes and building energy provisions

would have applied across the States of India, while recognising regional climatic differences (reflected in the zoning for ECBC) and likely differences in industry capacity for example.

3 PLANNING ARRANGEMENTS

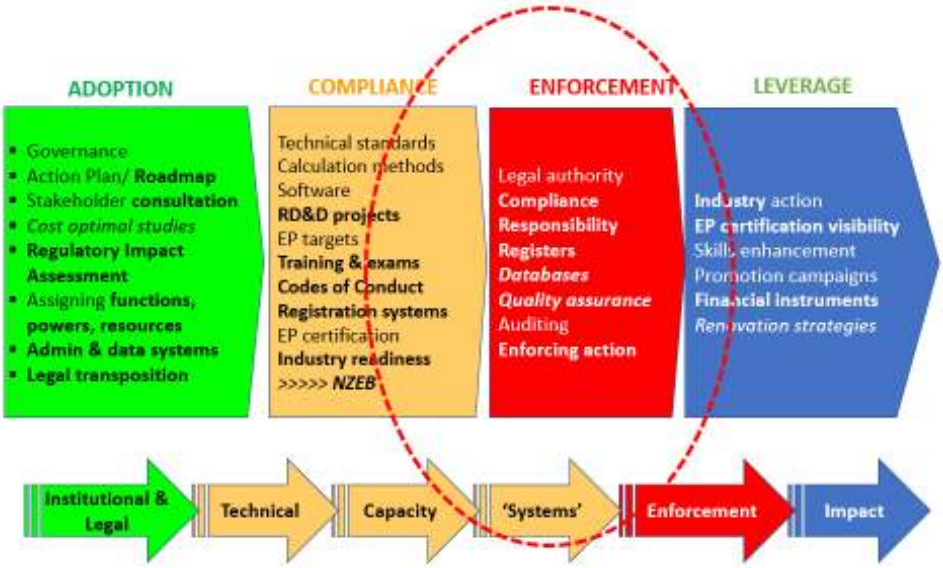
3.1 Positioning of compliance & enforcement processes

Figure 3-1, as introduced in Position Paper 2, is an overview of the overall process of EPBD implementation in relation to energy performance requirements and certification, as a good practice model showing a four-phase process of Adoption > Compliance > Enforcement > Leverage. These blocks of work constitute the platform for successful implementation.

The focus of the current Position Paper is primarily on the 'Enforcement' block of actions, as circled in the diagram. However, these are closely linked to the preceding actions in the Adoption and Compliance phases. In particular, they are dependent on the necessary resources, tools, systems and communication initiatives being put in place as part of the capacity building process, as detailed in Position Paper 5.

The preceding actions are aimed at ensuring that the necessary technical and systems capacity is in place to ensure that, at the point of coming into effect ('Adoption'), the legislation has credibility and material effect by (a) having sufficient qualified persons in the construction industry market with (b) the necessary software and tools to deliver and certify compliant buildings and by (c) having sufficient trained resources and systems (e.g. databases) within the assigned enforcement authorities (or delegated on their behalf) to operate a visibly effective enforcement regime. Throughout the process, there is also a need for promotion and publicisation to the building industry professions, trades, suppliers, and building owners (the 'Leverage' actions).

Figure 3-1 Primary blocks of tasks necessary for implementation and effectiveness of building energy codes under the EPBD



While the blocks of activities in Figure 3-1 are shown sequentially, in reality many of the processes of technical, administrative and legislative implementation of energy performance requirements were carried out in parallel. This is very much the case in relation to the legislative transposition process. Specifically, it was necessary for the setting of the legal requirements including assignment of obligations, powers and functions of different parties, to be accompanied by an ongoing series of awareness building measures and a chain of capacity building measures. This would include development of technical tools, skills, administrative systems and enforcement strategies.

3.2 Compliance framework and enforcement authority

The assignment of responsibilities for legal enforcement of compliance with the building energy codes (through 'building control') did not usually change relative to the previously established systems for building codes in general – which were normally local/ municipal authorities.

Building energy codes can be embedded as an integral module within the overall building code or else they can be separate or stand-alone codes. In EU Member States the EP requirements of the EPBD have usually been either embedded within the overall framework of building regulations requirements, or are applied and enforced through a separate stand-alone piece of building energy code legislation/regulation. However, both prior to and following the EPBD, only in a small number of EU Member States had the building energy code been a stand alone code separate from the other aspects of the building code (In contrast, in the case of the ECBC in India, a stand-alone approach is being taken).

This distinction has significant implications for the application, compliance and enforcement machinery necessary for successful operation of the code on the part of the construction industry, building owners and enforcement authorities. There are advantages and disadvantages to each. If embedded, then the demonstration and verification of compliance tends to be subject to the same authorities, compliance checking systems, and penalty frameworks in similar manner as for infringements related to safety, health or other environmental building requirements. Here the building industry is likely to be more accustomed with the established administrative procedure to meeting such requirements and able to adapt to incremental administrative changes with the embedding of energy performance (provided the other building requirements are already observed and complied with), but may find it rather difficult to understand and comply with the increasingly complex and demanding technical provisions in relation to energy performance.

However, officers responsible for checking compliance with other aspects of buildings may not always have the right level of experience and expertise to adequately assess compliance with energy-related requirements. The role of such authorities was sometimes confined to clerical type review of documentation plus sample inspections, and the training of their personnel did not always extend to the detailed technical methodologies, being reliant on the expertise of the certification specialists. In such cases, an independent EP system can

enable separate compliance checking and enforcement practices to be developed. Effectively this is so with the stand-alone form of building energy code.

About half of Member States had established compliance and control systems for their building regulations for more than 30 years, and about half of such States had introduced such systems in the past 15 years, coinciding with the EPBD. With the new concept of the EPC, the enforcement authorities for EP requirements compliance have often also been assigned responsibility for monitoring compliance in relation to evidence of the EPCs being produced and used in advertisements. However, in relation to compliance in terms of the quality/ veracity of the EPCs the responsibility has normally been assigned to an official energy agency in which case good liaison between these two authorities is an important requirement of the enforcement process.

Moreover, officers within the building control/ enforcement authorities (typically local/ municipal authorities) responsible for checking compliance with other aspects of buildings may not always have the right level of experience and technical expertise to adequately assess compliance with energy-related requirements. In principle, it is possible to address these issues through training for such specialized checking and enforcement, but this may be difficult in practice. In contrast, with a stand-alone form of building energy code such as the ECBC or its EU counterparts a dedicated cohort of assessors or verifiers can be established to engage with the complexities involved. This would appear to require more resourcing but could be expected to lead to more rigorous standards of compliance and competence throughout the system in relation to this increasingly complex field.

3.3 Decisions on assigning obligations, functions, powers, resources

In the drafting of the legislation enacting the building energy code, as indicated, the norm in EU Member States has been for local/ municipal authorities to be assigned the enforcement functions and powers, with the appointment of personnel to act as 'building control officers' or 'building standards enforcement officers'. As outlined earlier, this norm naturally arises from the pre-existing enforcement role that such officers would have held in relation to other parts of the overall building code. Advance notification to building owner or developer groups in relation to their foreseen obligations is clearly also important.

In those countries in which specialist certification and verification processes have been applied in relation to building energy code compliance and enforcement, the obligations, functions and powers of these specialist certifiers would also be referenced in the proposed legislation. But the ultimate lodgment of the documentation providing declared evidence of compliance would still typically be in a central database operated by the local/ municipal authorities, as outlined in the following Sections.

4 RESPONSIBILITIES FOR COMPLIANCE & ENFORCEMENT

Responsibility for the legislation and design of the system oversight, enforcement and reporting system in relation to EP and EPC requirements has laid with the relevant government Ministry of the Member State. Through the functions and powers assigned to them under the transposing EPBD legislation, day to day operational responsibility for assessing compliance and authorising works or occupation, and for regular reporting to the Ministry lies with the building code control authorities, normally local/ municipal authorities as outlined above. These functions are greatly facilitated by an underpinning database or databases of EP compliance submission and assessment records and of EPCs, as outlined further below.

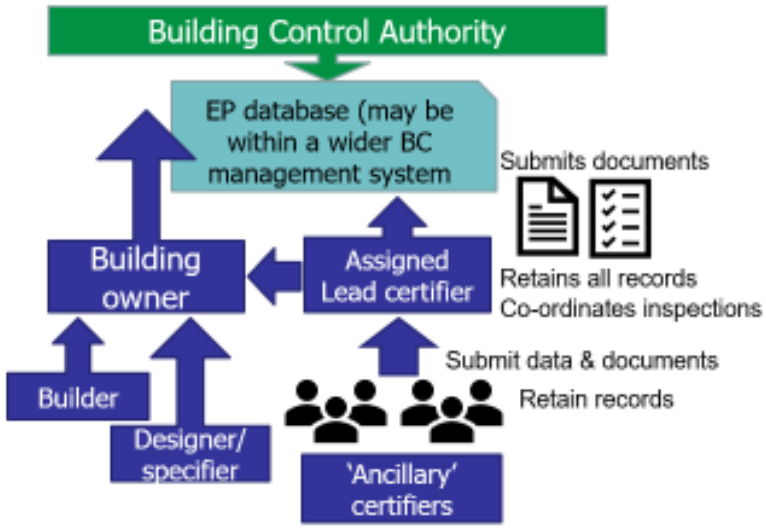
In the case of both EP and EPC requirements for new buildings and renovations, the building owner/ developer has the formal legal responsibility for compliance. In practice, this responsibility is then contractually delegated by the building owner/ developer to a registered builder, and to a competent building design professional, typically an architectural and/ or engineering practice. Directly, or by such delegation, the building owner/ developer engages a certified independent professional in the role of 'lead certifier' in relation to compliance of the design and building works. In some countries, the architectural or engineering design professional may also be permitted to act as the lead certifier.

In turn, a chain of ancillary specialist certifiers will have responsibility for inspecting and certifying compliance with individual aspects of the building code – structural integrity, fire etc. as well as specialist elements within the energy performance (thermal modelling, air leakage testing, etc.). For new buildings this is usually an extension of the design service provided by such professionals. Further, In the case of EPCs for either new or existing buildings the responsibility for procuring (and displaying) an EPC is with the building owner or their (selling or rental) agent, and is usually assigned to an energy professional who is registered to carry out EPC assessments – and is subject to the quality assurance regime operated by the EPC authority. The engaged professionals will be required to have appropriate insurances, including professional indemnity insurance. In some Member States, ensuring that an EPC is available in sale or rental transactions has been addressed by conveyancing lawyers being required to have this documentation in their search list before closing the contract. The process is schematically illustrated in Figure 4-1.

Figure 4-1 shows an indicative chain of responsibilities that would typically apply to the certification of compliance with EP requirements in many EU countries, in which the building energy code is embedded as an integral module within the overall building code. It shows the roles of the building owner, lead certifier and branches of ancillary or auxiliary specialist certifiers. This results in a chain of documentary evidence the full detail of which may be obliged to be retained by the lead certifier and with either complete or distilled records from such evidence being lodged to a central database operated by the building control authority. This system provides a clear chain of evidence and accountability and a clear assessment and

verification path to be pursued by the enforcement authorities when carrying out audit inspections during or after works completion.

Figure 4-1 Simplified schematic of building control process



As outlined later in this paper, inspections and lodgement of certificates may arise at different stages in the building process – typically at design approval and commencement stage (permit to proceed), at completion stage (permit to occupy) and possibly intermediate stages (such as when main superstructure is completed).

Figure 4-2 Schematic example of a chain of responsibility for certifying EP compliance within composite building code

Figure 4-3 shows a corresponding chain of responsibilities that would apply in the case of a stand-alone building energy code such as applies in India.

Figure 4-3 Schematic example of a chain of responsibility for certifying EP compliance within stand alone building energy code

As well as providing a permanent secure record of declared and/or verified compliance, such central databases are a key monitoring resource for the local/ municipal enforcement authorities (separate from the certifiers) in guiding the day to day planning and operation of their auditing and inspection regimes, and in tracking and reporting on compliance levels and patterns in the marketplace.

For the lodgement of EPCs to a central database there is a similar chain of responsibility as applies with the system indicated in Figure 4-3. However, in most EU Member States the databases and associated administration systems for EP and EPC requirements have not been (yet) unified. The detailed data from such a unified or coordinated approach is likely to be a valuable tool for assessing the level of compliance and in the QA strategies.

5 SYSTEMS DEVELOPMENT & CAPACITY BUILDING

5.1 Overview of primary capacity building actions

Three key groups of capacity building features are required to enable compliance and effective enforcement with a new building energy code such as mandated by the EU EPBD or India's ECBC. These are:

- **Tools:** Technical tools with sufficient functionality, user friendliness, accuracy, consistency and completeness to enable qualified building industry practitioners to deliver on their obligations in a cost-efficient manner;
- **People:** Training and upskilling of sufficient numbers of building industry practitioners to sufficient levels of competence to fulfil their role in delivering code compliant buildings (elaborated below in relation to the needs of volume, quality and quality assurance), underpinned by robust quality assurance systems;
- **Systems:** Efficient (time and cost) administrative systems to enable submission of certification documents and evidence of code compliance and with the facility for utilisation by enforcement authorities to inform quality assurance strategies.

Allied to this, research and development projects aimed at tackling knowledge, skills gaps and developing new and improved building materials, equipment, design tools etc. can be seen as part of an ongoing capacity building process. Promotional and dissemination activities also help to inform and reinforce the effectiveness of these actions.

5.2 Range of developmental actions

Expanding from the primary groups of capacity building actions above, the range of such actions for building designers, certifiers, builders and tradespersons has included:

5.2.1 Developmental actions

- The commissioning of **technical and strategic studies** to inform fundamental early decisions on the energy performance calculation methodology, supporting software and other tools, and choices in relation to the administrative and quality assurance systems.
- Development and provision of **technical tools** such as guidance documents, software, databases and other resources to assist the quality and efficiency of the analysis, design and specification of buildings. These have derived from preceding tasks including:
  - Development and adoption of the official EP calculation methodologies and support resources for demonstrating compliance with the energy performance requirements and for generating the energy performance certificate/ label
  - Development of the format and design of the EPC label

  - Development of software to facilitate user friendly application of the methodology and interfacing with a central database (also permitting validated commercial software packages)
- Arrangements for development, accreditation and delivery of **training and upskilling of the professionals** and site tradespersons responsible for delivering code compliant energy efficient buildings (including training of trainers). This may include establishment of qualifying examinations. Implementation of the new building energy code for non-domestic buildings was primarily an augmentation to the established services of architects and building services engineers.
- Likewise, arrangements for delivering **training of the relevant enforcement authority personnel** (local/ municipal building control professionals or panels of verifiers).
- **Decisions on training pathways** to ensuring adequate numbers of competent persons. Generally, training has been through existing accreditation oversight systems, involving some combination of public bodies, academic institutions, architectural or engineering professional bodies, and sometimes commercial trainers.
- **Preparation of a Code of Practice** covering professional competence and conduct as a precondition or accompanying condition to registration of competent persons as designers, certifiers and/or verifiers. This may be supplemented by codification of complaints, disciplinary and appeals procedures.
- Associated **development and establishment of on-line databases** for publicly registering such competent persons, and also enabling efficient quality assurance and administrative/ organisational systems and processes for verifying and recording compliance, underpinned with good quality ICT systems. Key aspects of these tasks would include:
  - Design and establishment of on-line databases/ registers for lodgement and recording of EP certificates and other documentary evidence of declared compliance
  - Establishment of central on-line database systems for lodgement of compliance calculations and documentation, and maintenance of records of same
  - Establishment of quality assurance systems for auditing of compliance declarations and associated information submitted by registered professionals, with consequential penalty/ sanctioning actions, and associated disciplinary and complaints procedures.
- The **availability of building products and services to deliver code compliant buildings** and the roles of commissioned studies and R&D projects in supporting product innovation and in informing detailed aspects of EPBD implementation.
- **Support for demonstration projects** which help to highlight the achievability of energy efficient buildings and thus provide evidence and confidence to the stakeholders.

Typically accompanying these actions were also the following:

- **Website development** to assist that market awareness and hosting of tools and resources to assist efficient practical delivery by the industry.
- Ongoing **helpdesks** for EP certifiers, verifiers, building owners and the general public.
- A **communication and promotional campaign** for the construction industry professionals and generally, and also politicians and the general public.

Under EU law, each EU Member State may decide its own operational approach to implementing the EPBD, and this has led to a range of different technical methodologies, training and recognition systems. It has led to significant differences of detail in the approaches in relation to registration and accreditation of assessors, training and professional development, examinations, audit inspection and quality assurance systems, and in the detail of their building control and certification administration systems.

Ultimately, this range of capacity building actions is aimed at achieving a consistent strengthening of the 'quality chain' of construction industry professionals and installation trades responsible for delivering code compliant buildings.

5.2.2 Examples of technical support resources

Deriving from the above actions, the following are examples of further support documents and tools, providing assistance on individual aspects and options. Ideally, all these resources will be accessible on-line and can possibly include:

- Lists of accredited computer software (which may be freeware or for purchase)
- Software manuals and guidance on calculation methods
- Databases/ registers of qualified design and certification professionals (individuals or companies)
- Databases/ registers of specialist service providers, e.g. thermal modellers
- Databases of registered product information (e.g. air conditioning, lighting systems, boilers, motors, renewable energy systems)
- Databases of eligible or certified energy efficiency products, e.g. products compliant with the EU EcoDesign Directive
- Detailed software tools for component calculations, e.g. for U-value calculations, sizing of HVAC systems, daylighting analysis, thermal bridging analysis, condensation risk analysis, solar overheating analysis, solar heating system performance
- Good practice guidance on indoor air quality issues
- Renewable energy methodological guidance, e.g. solar thermal, solar photovoltaics, air source heat pumps, ground source heat pumps, biomass systems
- Methodological guidance on district heating systems, cogeneration or polygeneration systems
- Certified testing methods (e.g. for air leakage testing) and registered service providers
- Reference to EN or national Standards
- Databases of accredited training bodies
- Recommended professional Codes of Practice and other good practice guides
- Good practice installation guidelines on building components and equipment.

5.3 Capacity building for enforcers

5.3.1 Training of assigned enforcers

The main capacity building feature in relation to the enforcement system is the training of enforcement officials (which could include assistance by specialist verifiers, where applicable). Such training would include familiarisation not only with the technical energy factors and issues, but also with the legislative rules and the practical application of the administrative systems.

Therefore in several EU countries, complementary to and in parallel with the capacity building through training of design and certification professionals, the lead Ministry or energy agency has organised and/or directly delivered briefing and training to the proposed enforcement inspectors and other officials in public authorities on the above technical and administrative content, and on the discharging of their roles in enforcing the new legislation. This would include rules and recommended procedures for document reviews, data reviews, field inspections, severity gradings of non-compliance findings, and strategy in relation to penalties. Where applicable, such training has been carried out in collaboration with the representative and educational bodies for Building Control officials. In principle, it could also be delegated to academic or professional institutions, but this would require the adoption of definitive protocols on independence and confidentiality.

Thus, the content of the training provided to enforcement personnel would typically include:

- The legislation
- The compliance requirements at all stages
- Familiarisation with the energy performance calculation methodology and software
- Familiarisation with technical guidance documentation and support resources -
- Familiarisation with special issues – indoor climate, ventilation, glazing systems, air leakage, thermal bridging etc.
- Familiarisation with new energy efficiency and renewable energy technologies
- Enforcement functions and duties
- Recommended rates of inspection
- Enforcement procedures
- Compliance requirements
- Enforcement elements at all stages:
  - Documentation reviews
  - Detailed reviews
  - Site inspections
  - Final certification reviews
- Enforcement powers
- Penalties.

5.3.2 Verifiers

As indicated above, officials within the building control/ enforcement authorities (typically local/ municipal authorities) responsible for checking compliance with other aspects of buildings may not always have the right level of experience and technical expertise to adequately assess compliance with energy-related requirements. In contrast, with a stand-alone form of building energy code such as the ECBC or its EU counterparts, a specialist cohort of assessors or verifiers can be established to engage with the complexities involved (however, the stand alone model has not been the norm in most EU countries).

The path to appointment of such a specialist panel of verifiers for this purpose would include a hybrid of the training elements that apply to building energy code designers and certifiers, and the elements described directly above in relation to enforcers. Logically, verifiers would require a similar standard of knowledge as personnel qualified to deliver training, and hence achievement of a minimum pass mark of 85% or 90% in the examination would apply.

5.3.3 Resourcing of authorities

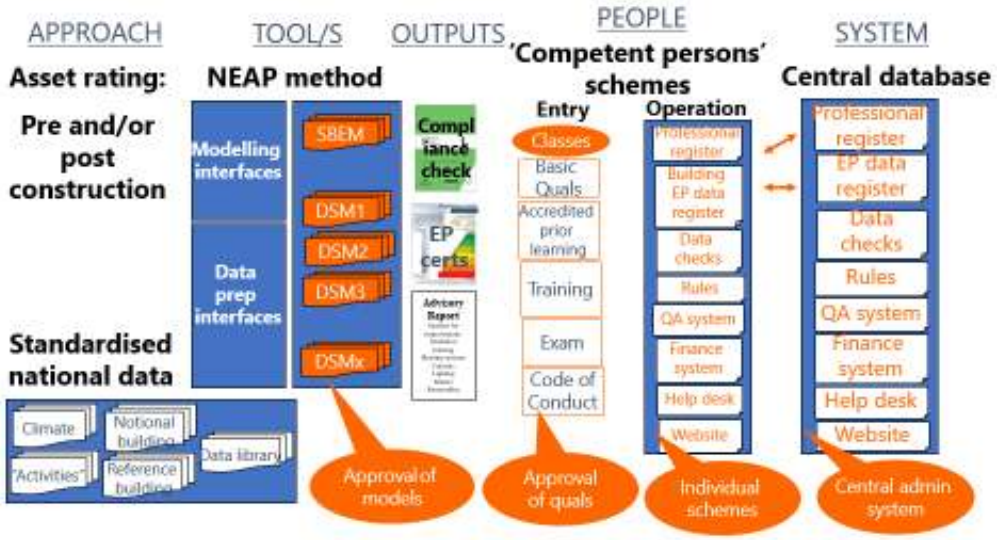
A lower level of human and financial resources at central government level would be required to enable the day to day operation (including software maintenance and upgrading) of the building energy code and the associated enforcement system. However, the local/ municipal authorities typically assigned responsibility for enforcement would require sufficient human and financial resources to do so. A common mechanism for funding these resources would be fees or levies applied at the application stage seeking a permit to proceed and/or at intermediate or final stages of the submission of compliance certificates seeking an occupancy permit.

6 FEATURES OF COMPLIANCE & ENFORCEMENT IN EU

6.1 Compliance & enforcement process flow

An example of a good practice integrated process flow overview in relation to compliance and enforcement as applied in a small number of EU countries is shown in Figure 6-1. Moving from left to right, this consists of three main subsystems - energy performance calculation **tools** (including inputs and outputs), appointment of 'competent **persons**' to deliver code compliant buildings, and the administration **systems** and their functions. In this particular case the possibility was permitted for different market-based bodies (such as institutes of architecture or engineering) to establish their own 'competent persons' schemes for the purposes of designing and certifying compliance in relation to the building energy code. The column of features to the right of the diagram contains elements of the overall building control management system operated by the national or regional authorities.

Figure 6-1 Example of EP calculation and certification tool, 'competent persons' schemes & administration system for non-domestic buildings



The national or regional authorities are invariably responsible for setting the rules for each part of the overall system. This includes approving the calculation tools, the qualification pathway to registration of 'competent persons' and the design and operation of the administrative system. In broad terms, the process flow model shown here has similarities to aspects of the ECBC administrative system that is being developed for India.

For quality assurance purposes, there are advantages in including all inputs as well as energy performance output results in the database, as it can help to highlight risk areas and prioritise audit inspections. Such detail might have been perceived in the past as excessive on in terms of micro-management and requiring substantial data storage backup, as file sizes can be very large. However, in today's data management context the use of comprehensive XML files, for example, capturing all input and output data in relation to EP calculation and certification,

is comfortably feasible. More detailed features of the central databases are discussed in Section 8.

6.2 Features of operational EU enforcement systems

As already emphasised, asset (calculation) based compliance is the norm in Europe. This has a value in enabling consistent comparison between properties. However, it is not supplemented by real operational (measured) performance as proposed in India using the EMIS system (except obliquely in some Member States in relation to display EP certificates in larger buildings frequented by the public).

Mandatory Building Energy Certification (labelling) in Europe helps the compliance process to some extent, particularly in those countries which have established EPC databases with strong content and functionalities. This is also based on asset rating rather than operational rating.

Overall, there is a devolved and diverse implementation (versus common or centralised rules and systems in India) in EU Member States – different EP requirements, software calculation tools, training programmes, registration systems, codes of practice/ conduct, data lodgement systems, compliance verifiers.

Therefore, the proposed India ECBC compliance verification system appears similarly robust as good practice systems in EU countries.

7 CODES OF PRACTICE

For persons registered by the authorities to act as competent persons, a typical Code of Practice for Inspecting and Certifying Buildings and Works might include the following contents shown in Figure 7-1. This illustrates significant elements of the inspection and certification process, including: key principles based on risk minimisation; specification of roles; recording of responsible parties (and any changes therein); stages of inspection and certification; lodgement of records; ethical obligations; insurance obligations.

Figure 7-1 Indicative contents of Code of Practice for inspecting & certifying building works

8 IMPORTANCE OF DATA MANAGEMENT SYSTEMS

While each Member State is permitted to develop its own monitoring and enforcement systems, common good practice elements include design and acquisition of the overall administrative and data management systems, the quality assurance system and the enforcement system. These principal elements are now outlined.

8.1 Value and features of central databases

Central databases are an essential platform for enabling user-friendly and efficient operation, systematic record keeping, monitoring, verification, interrogation, quality assurance and reporting in relation to ensuring that building energy code requirements are met. They are necessary in relation to technical issues (e.g. registers of approved professionals, registers of product performance, registers of services such as air leakage testing) for use by both building industry practitioners and enforcement authorities. They are similarly necessary in facilitating administrative issues (lodging compliance declarations, certificates, other documents, quality assurance) for both building industry practitioners and enforcement authorities.

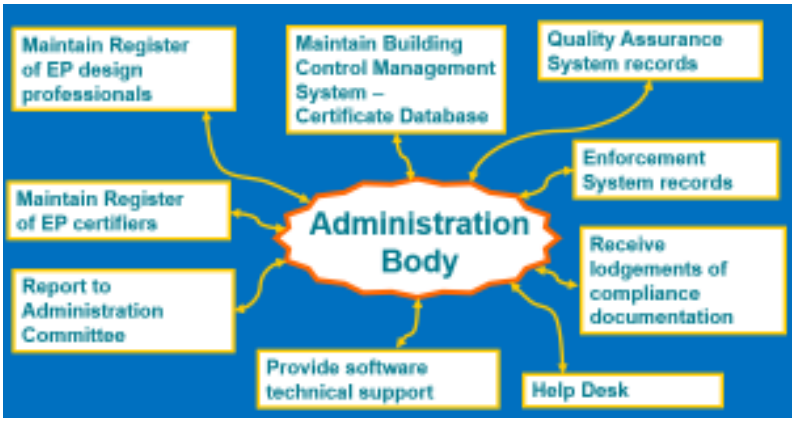
Substantial investment is required in a body of design, commissioning, procurement and testing work in order to develop the necessary administrative and process flow software to be used by applicants, certifiers and authorities. As these need to be in place as soon as the building energy code becomes operational, elements of this development process need to commence at an early point in Action Plan implementation. Other elements have a dependency on other systems development, e.g. the technical calculation software, and here the need for adequate lead times equally applies.

There is considerable design and financial overhead on the part of the authorities in the investment and set-up phase of such an on-line Building Control Management System (Section 4) or similar, intended for use by both compliance professionals and authorities. This procurement specification for a customised administrative software requires a clear and detailed specification/description of all business processes, data validation, user acceptance testing, user interfaces and ongoing operational and maintenance supports for the system. The full process of design specification, procurement, software coding and testing would commonly cost in the region of €200,000 (but considerably less for less comprehensive systems). As these needed to be in place as soon as the building energy code and certification system become operational, planning of this development process needed to commence at an early point in EPBD Action Plan implementation. But Member States that made this investment to help carry out the administrative burden of managing millions of documents have been able to achieve a robust system with a relatively small administrative staffing backup requirement.

The ideal is a single central database with oversight and day to day management by a national authority (e.g. energy agency, central service provider to local/ municipal authorities). Potentially, this can record several distinct operational areas – training, examination,

registration, calculation software, security protocols, quality assurance, finance, other administration, fee management and billing, credit control, user forum and help desks/ communications centre etc. – that could potentially be brought together in a single integrated administration system. (Alternatively, while not incorporating all these elements it can have access links to those elements). Figure 8-1 shows an example of functionalities contained in one such system. However, in a number of Member States the functionality of the registry and the extent of information gathered has been more limited.

Figure 8-1 Functionalities of building energy code administration system associated with key databases



The above functionalities can also include the following features:

- Certificate lodgement rules from EP calculation software and unique identifiers (e.g. electricity meter number) to prevent fraudulent certificates
- Inbuilt automatic validation checks to reject errors & improve EP certificate quality
- Autogeneration and issuing of EP certificates 24/7
- Providing a long-term document register enabling a full audit trail
- Enables cross-checking of specific EP certificates and patterns
- Enabling effective compliance control checks with reliable sampling, interrogation and targeting
- Enables efficient research/ datamining and statistical reporting, e.g. effectiveness of policy measures, influence of EP on building price, penetration of technologies
- Assists building stock analysis to inform policy makers, e.g. in targeting and implementing energy efficiency renovation strategies, design of incentives, communications campaigns etc.

Central national databases are also a useful means to collect statistical insights in the energy performance of both the newbuild and existing building stock, as well as enabling transparent harmonized benchmarking and building level performance indicators, e.g. concerning actual operational energy use. However, of the 24 centralized EPC registers established by Member States, only twelve are publicly accessible.

The investment in best practice systems thus yields strong dividends in terms of being a vital tool in ensuring efficient administration and effective implementation of the code – by

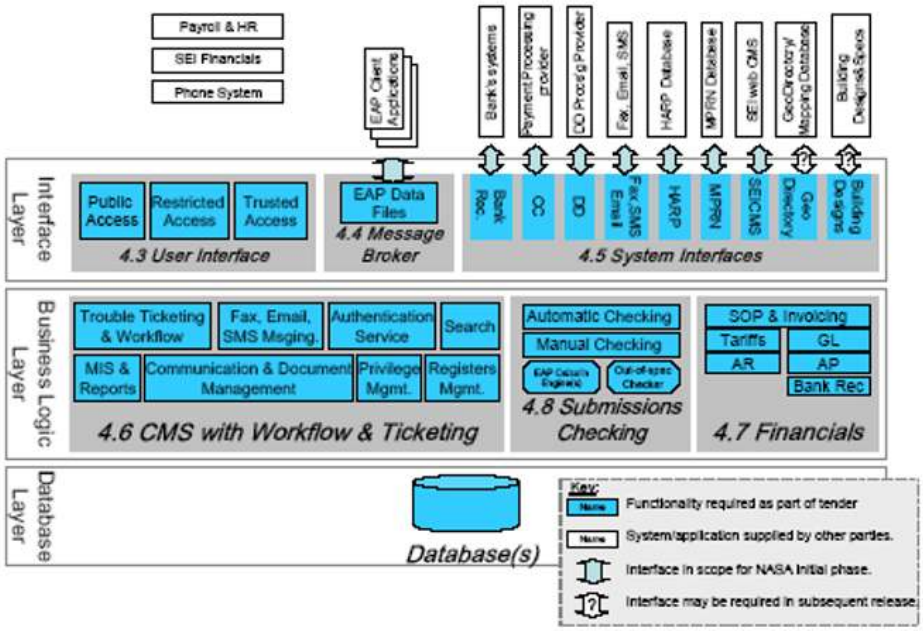
tracking activity, performance levels (allowing efficient lodgement and review of compliance data and supporting certification, informing quality assurance priorities and strategies, etc.

However in general, the underlying databases, compliance and enforcement functions in relation to EP requirements for new buildings or major renovations and in relation to mandatory EPCs for newly completed or existing buildings coming to market are not yet unified.

8.2 EU Member State databases and registers

A growing number of Member States have taken the step of establishing central databases for EPs and EPCs. For example, Portugal, Denmark, Ireland, Lithuania, Belgium-Flanders and others have now established mandatory registers/ databases of qualified EPC assessors and of EPCs, whereby EPC assessors were required to lodge their EPCs to a central database. These are secure fully integrated systems which have entailed significant investment in robust ICT systems, but this has brought considerable strategic benefit and provided a monitoring resource and a basis for systematic quality assurance. Its automated features enable major operational efficiencies. Some further functionalities associated with such a database as part of the EPC administration system are shown in Figure 8-2. These can include registration of EP/ EPC assessors/ certifiers, link with calculation tools and on-line validation of EPCs.

Figure 8-2 Example of detailed components of a central EP/EPC database and data management system



Management of central registries/ databases is almost always maintained within the relevant Ministry or a delegated energy or administrative agency (such as a central data management agency for local/ municipal authorities) but day to day operation may be outsourced (subject to confidentiality and other contractual protocols). Usage can be restricted to registered

professionals and enforcement authorities for security and confidentiality reasons. But the best examples allow controlled access for enforcement authorities, researchers and policy makers, with some data anonymised, to enable quality assurance strategies and inform future policies – such as national and regional plans for energy efficient renovation of the existing building stock. Customer support can be resource intensive. Some countries offer support mainly by email rather than by phone. Self-financing registries, in which annual costs are covered by registration and document lodgement fees, have been reported from EU Member States in relation to certification/ labelling databases.

Unlike the position in India, there is no central EU database of EP compliance records and EP certificates. But further EU-level harmonisation and guidance concerning methods for data collection, data analysis and protocols for data sharing would be an indispensable prerequisite for designing such a database containing aggregated data from Member States because otherwise no comparison is possible. The nearest approximation to such a database is probably the BPIE EU Building Stock Observatory, discussed further below.

Almost no EU countries have a formal link between actual energy use in the building and calculated energy use submitted for compliance purposes. Conversely, the proposed regime for ECBC monitoring in India has this positive feature. This is facilitated by the fact that energy use in buildings covered by the ECBC is 100% electricity, whereas this is seldom the case in Europe.

The topic of Energy Performance Certification (EPC) or labelling systems – their development, organisation, functionality, market presence and influence – will be addressed in Position Paper 9. Noting that demonstration of compliance with the building energy code and the generation of EPCs share a common calculation procedure, there is technical scope for the sharing of database information between these two functions in order to facilitate building standards enforcement authorities in fulfilling their functions efficiently. However, for this to be enabled to happen in practice it may be necessary, at least under the legal system in some Member States, to enact positive provision for this in further legislation.

9 QUALITY ASSURANCE STRATEGY & PROCESS

All EU Member States are running live building energy code compliance and certification schemes at this point, and therefore establishment and operation of a quality assurance system is an important operational support element within the overall enforcement process.

9.1 Quality assurance strategy

As indicated in Figure 9-1, a good practice QA strategy can consist of three phases, which will be elaborated in the following sub-sections:

- An **'upstream' control**, through verifying the quality of the calculation tools and associated tools, and through controlling the training accreditation pathway and verification gateway for professional practitioners. This could be reinforced, for example, by having an ongoing requirement that practitioners must sit and pass a refresher qualifying examination (which may be on-line) say every 2 years in order to maintain their registration.
- **'In-line' control**, through built-in data validation checks within the calculation software, through site inspections during the construction process, through a requirement for ongoing continuing professional development (CPD), and through checking lodged EP data.

'Downstream' control through QA inspections and audits post construction through interrogating data entries lodged into the EP/ EPC database. The intensity and visibility of such audits can contribute to a culture of compliance.

Figure 9-1 Elements and phases in the Quality Assurance process

Both the upstream and in-line measures can be assisted by the QA systems commonly in place among professional architectural and engineering practices.

Continuing QA systems thus have a vital role in assisting successful delivery of building energy codes and certificates, ensuring the reputation and effectiveness of the enacted legislation. They should be introduced from the outset, be transparent and with clear rules. Strategically,

good upstream control is most beneficial, as it allows through only people who show sufficient competence in the first instance, rather than afterwards striking people off a register upon serious failures found by audit. Conversely, there is also scope for downstream QA findings, for example patterns of common errors, to be fed back upstream in order to highlight areas for attention and improve the training process. QA can inform not only penalisation decisions on the part of enforcers but also educational and motivational ones, with the aim to constantly improve the scheme in general. Again, a constructive educational support approach to correcting and avoiding errors by experts is desirable.

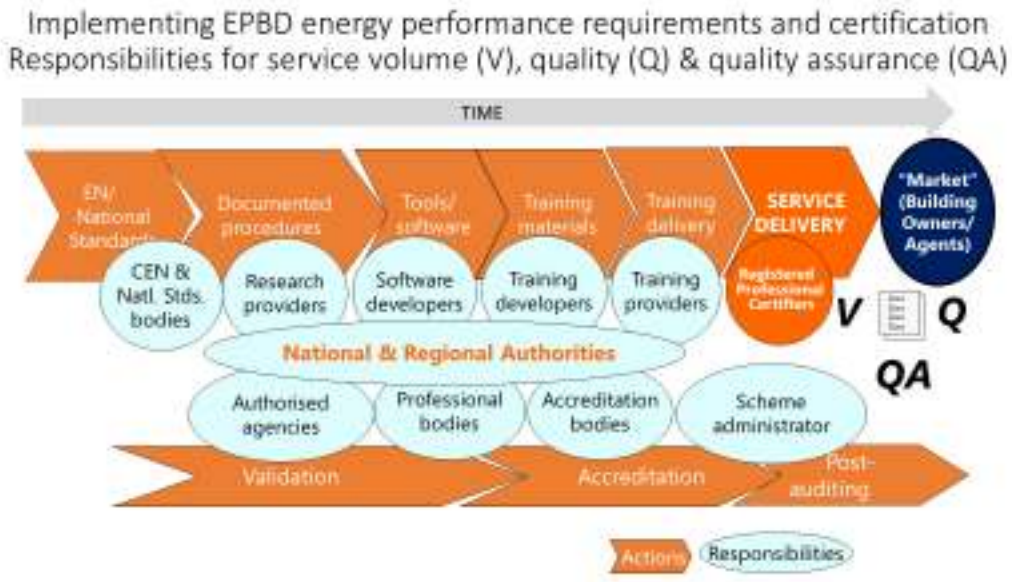
9.2 'Upstream' QA actions

Prior to bringing new EP and EPC requirements into effect, it was necessary to ensure that three sets of conditions were established in each EU Member State:

- Volume (V): Adequate numbers of relevant competent professionals are active in order to meet market demand and ensure healthy competition in the market;
- Quality (Q): These professionals are of adequate quality (competence);
- Quality Assurance (QA): Adequate quality assurance and administrative systems are in place to co-ordinate and oversee, on an ongoing basis, the reliable operation of these services.

These requirements constitute the 'upstream' elements of the overall QA strategy. They cannot be considered in isolation and are dependent on completion of a series of prerequisite tasks. An overview of the individual sets of tasks and players required to establish EP and EPC compliance services in the marketplace is given schematically in Figure 9-2.

Figure 9-2 Sequence of tasks and responsible parties for delivery of an EP compliance and certification service to meet volume, quality and quality assurance requirements.



This shows the integrated sequence of tasks that must be put in place ahead of establishing these services. The tasks shown as block arrows constitute a chain of dependencies, with the delivery of any individual task being dependent on the preceding task in the chain being complete. For example, in relation to the upper (V, Q) supply line, the presence of adequate numbers of qualified EP assessors demands that training has been delivered; this in turn demands that a training syllabus has been put in place, which in turn depends on the development and validation of the software to enable the application of the core methodology. The parties associated with these sets of tasks are shown as ovals. A similar sequential interdependency applies to the lower (QA) supply line.

A further form of upstream actions is the establishment of product technical databases to facilitate specifiers and certifiers (see Figure 9-3).

Figure 9-3 Example of product technical libraries/ databases

When these 'upstream' tasks and systems have been put in place, they can be expected to minimize the residual risks of poor practice in delivering on EP requirements and EP certification, to be tackled in the 'in line' and 'downstream' phases of the QA strategy.

9.3 'In line' QA actions – inspection and checking

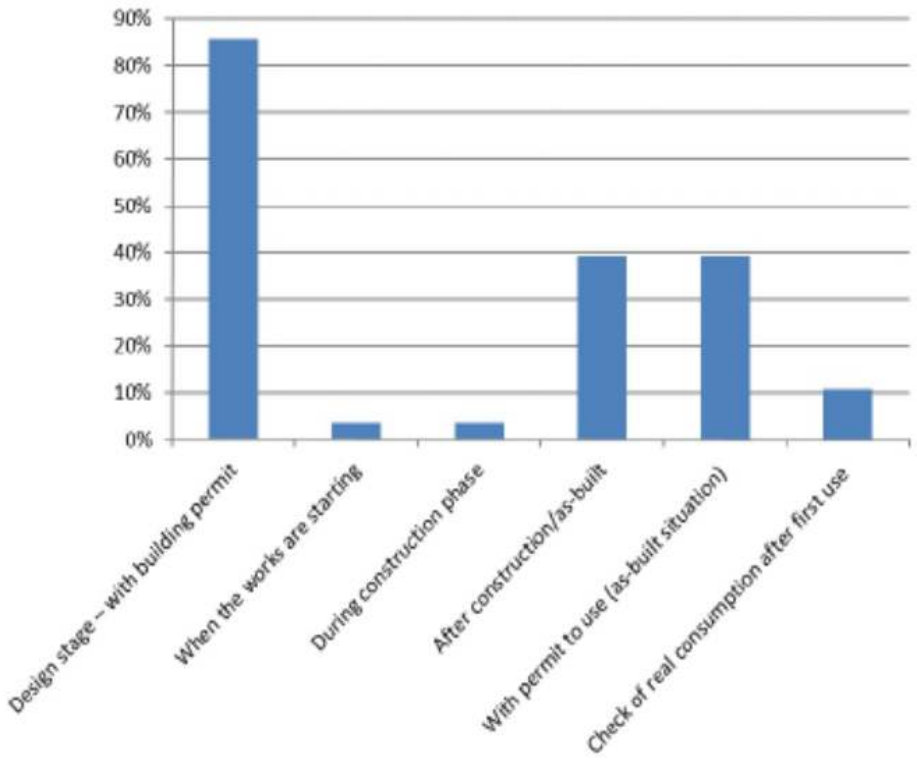
Within the building control system, 'In line' QA actions include (a) built-in data validation checks within the calculation software to highlight abnormal values to the design team, certifier or verifier, inviting re-checking of possible data input errors, (b) site inspections and other checks during the construction process, and (c) a requirement for ongoing continuing professional development (CPD). To a significant degree, items (a) and (c) can also be addressed in the upstream phase. Therefore, the focus here is on the inspection aspects,

which can include a mix of desk/ documentation audits, inspection of the premises/ files of the certifier and a site visit accompanying the certifier.

Within the EU, 22 Member States implemented the building control system at central government, regional government or government agency, while in the remainder third parties were appointed to carry out these functions operationally. In the model shown in Figure 4-1, it is the lead certifier that performs the final check in relation to submission of evidence of compliance. In relation to matching checks by or on behalf of the enforcement authorities, out of the total population of submitted records, for or practical resource reasons a sampling regime is applied in many countries. This can be a combination of targeted and random sampling, as discussed in Section 9.4.

There is variation across the EU in the scope and detail of the administrative systems used to monitor and verify compliance with both EP and EPC requirements. In 12 Member States, the systems have only been introduced since 2013. Compliance with EP requirements is checked at different stages of the building process in different Member States, in some cases with compliance being checked several times during the building process (Figure 9-4).

Figure 9-4 Range of points at which EP compliance is checked in EU Member States



These checks can relate to whole buildings or to components, e.g. U-values, thermal bridges, air infiltration, system efficiency, overall performance, etc., and authorities may choose to check different elements at different stages. Some strategies combine a mix of desk/ documentation audits, inspection of the premises/ files of the certifier and a site visit accompanying the EPC assessor. The particular example shown in the diagram based on a survey of EU Member States in 2014 indicated that, while checking was done at on 85% of cases at the design stage, the completed building was checked in 91% of cases (when

completion, permit seeking or post occupancy checks are combined). The latter was an improvement compared with the pre 2010 position, when just 42% of cases were checked.

In the case of new buildings, an often significant feature in the control strategy is a requirement that compliance is certified before a permit is issued to either commence building or, on completion, to occupy and use the building. It should be appreciated that a building that was originally compliant at the design stage may subsequently be found to be non-compliant in its execution, through on-site inspection at an interim or completion stage.

In Portugal, Denmark and many other Member States the building's energy efficiency must be declared before the building is constructed. This can be done by the architect or the developer responsible for the construction. After construction, a certificate must be issued by independent consultants including review of the self declaration. If the building fails to comply with the regulations, the use of the building can be denied until a compliant efficiency level has been obtained. Each of these compliance declaration stages can be matched by a checking and/or inspection by a member of the team of assigned lead certifiers or ancillary certifier as appropriate.

9.4 'Downstream' monitoring & verifying of compliance

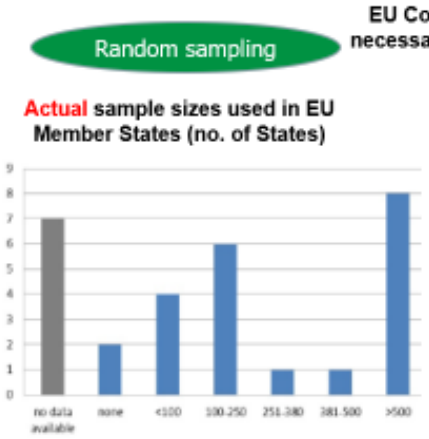
As part of a good practice control system for EP or EPC requirements, QA actions carried out either in conjunction with the 'in line' actions or at the post works/ post certification phase consist of a combination of random sampling and selective targeted checks, as illustrated in Figure 9-5. These can consist of a combination of desk audits and physical inspection of the works.

Figure 9-5 Control process based on random sampling and selective targeting

For practical resource reasons a random sampling regime is applied in most countries. Regarding such sampling, the EPBD (2010) specified a sampling rate for EPC quality purposes, which can in some cases equate to a rate of less than 1% per annum of the number of EPCs generated each year, but a minimum of almost 1000 audits per year. This can be a combination of targeted and random sampling. There appears to have been a growing adoption of these guidelines, as indicated in Figure 9-6. In practice, audit rates of between around 1% and 15% have been reported from different Member States. For resource reasons, it is common for the volume of desk reviews to be as much as ten times the volume of field inspections.

Targeting can be based on various risk considerations – such as the scale or complexity of the project, past performance of the project team, first design by the project team, complaints received, proximity of results to an incentive threshold, etc. Compliance data availability is higher for new buildings than for major renovations or for upgrade and replacement of individual building elements.

Figure 9-6 Actual versus EU recommended control sample sizes in initial stages



EU Commission guidance: Sample size necessary for 95% confidence of <5% error in compliance rate

Population size	Sample size	Significant percentage
100	80	80.000%
200	132	66.000%
500	217	43.400%
1,000	278	27.800%
2,000	322	16.100%
5,000	357	7.140%
10,000	370	3.700%
20,000	377	1.885%
50,000	381	0.762%
100,000	383	0.383%
200,000	383	0.192%
500,000	384	0.077%
1,000,000	384	0.038%

These combined approaches aim at deploying enforcement authority resources effectively to achieve a market culture of awareness, vigilance and compliance.

9.5 Complaints, disciplinary and appeals procedures

It is open to EU Member States to institute complaints and disciplinary procedures whereby complaints can be lodged by interested parties to the building control authority regarding concerns in relation to the validity of an EP certification submitted for compliance purposes. Investigation of such a complaint or random or targeted checking of such a certification could lead to application of disciplinary procedures to the designer/ specifier or certifier. Figure 9-7 shows a profile of disciplinary actions applied for EPCs across EU Member States.

The severity of the disciplinary action would align with the severity of the offence, graded under a 'penalty points' regime. Thus, a serious error leading to a significant impact on the validity of a compliance declaration, or serious professional misconduct, could lead to severe

action (suspension or removal from the register of professionals), whereas minor errors in applying the calculation methodology would lead to advisory and corrective action. In general, unless of deep severity, removal from a register would not arise from a first detected offence, unless of deep severity, but detection of such a first offence might lead to careful checking of previous submissions by the party in question if not previously checked.

Figure 9-7 Type of disciplinary process in place for EP certificates

ACTION	Country												
	CZECH	DENMARK	AUSTRIA	IRELAND	LITHUANIA	PORTUGAL	FRANCE	BULGARIA	ESTONIA	GREECE	NETHERLAND	UK	SLO VAKIA	SWEDEN
CANCELLATION OF CERTIFICATE		X		X		X	X			X	X	X		
WARNING TO EXPERT	X	X		X	X		X	X	X	X		X	X	
RE TRAINING OF EXPERT				X									X	
CANCELLATION OF EXPERT'S LICENCE	X	X	X	X	X	X	X		X			X		X
FINE								X	X				X	
OTHERS														
EXPERT TO ISSUE NEW CORRECT CERTIFICATE		X		X	X									
TEMPORARY SUSPENSION OF EXPERT'S LICENCE				X						X				X
CLOSE THE BUILDING						X								
SUSPEND BUILDING PERMIT						X								

With regard to natural justice, any such procedures may need to be accompanied by an appeals procedure.

Overall, the spirit and intent of the system is to avoid being punitive unless strictly necessary, with the preferred response to non-compliances being to take corrective educational action.

9.6 Potential role of energy utilities

In general, energy supply utilities in EU Member States do not view themselves as code enforcement agents. (This may be somewhat different in relation to the ECBC in India.)

However, as a supplementary consideration: it is understood that some non-EU countries utilities operate energy efficiency programmes whereby they fund and provide direct or contracted technical assistance for commercial buildings seeking to go beyond code requirements. A potential further role is in supporting code compliance, for example through funding training opportunities, providing trainers or providing training venues, and even possibly providing third party training for enforcers.

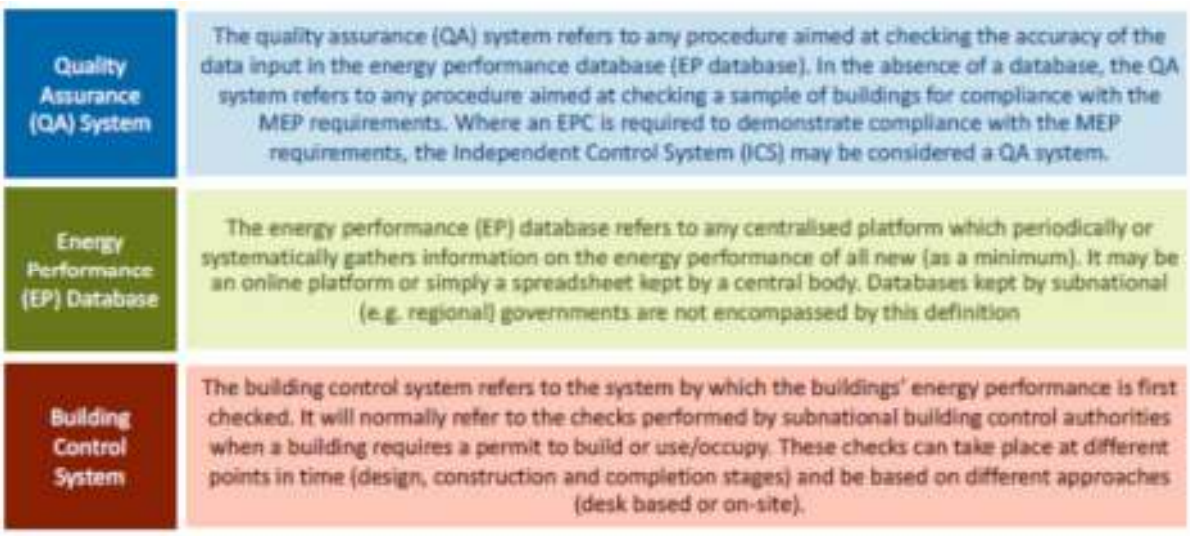
Motives for such initiatives may be receipt of credits towards energy efficiency programme goals such as the EU Energy Supplier Obligation in the Energy Efficiency Directive, towards meeting greenhouse gas emissions reductions and/or improving electricity system efficiency by moderating the peak demands for air conditioning.

10 LEVELS OF COMPLIANCE

10.1 Factors influencing compliance rates

A major study (https://ec.europa.eu/energy/sites/ener/files/documents/MJ-04-15-968-EN-N.pdf) carried out by ICF on behalf of the EU Commission in 2015 assessed the level of compliance of EU Member States with the EP, EPC and energy efficiency retrofit provisions set in the national legislation transposing the EPBD. The study employed the definitions shown in Figure 10-1.

Figure 10-1 Some working definitions in compliance study for EU Commission



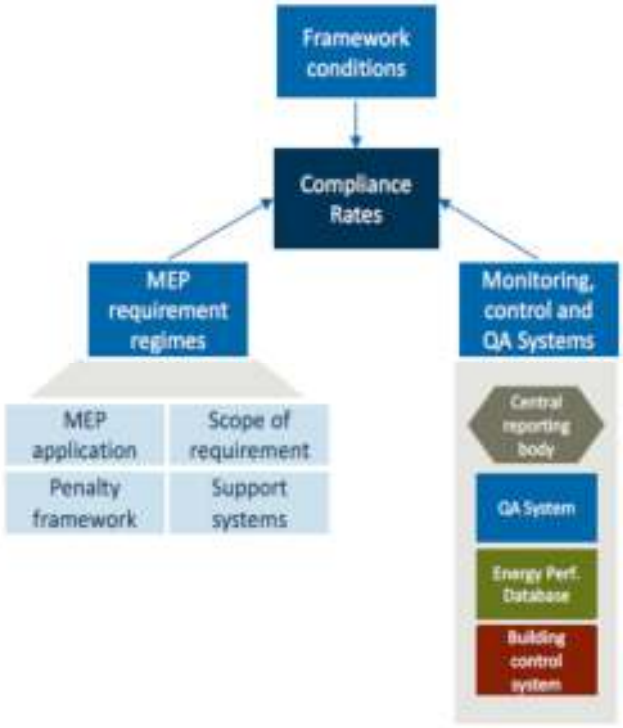
Factors influencing the compliance rate are summarised in Figure 10-2. These include the scope and ambition of the EP requirements, the support systems, the penalty framework and the effectiveness of the monitoring, control and QA aspects defined in Figure 10-1. Potential barriers to effective compliance include: a weak or incomplete penalty system, weak building code enforcement traditions and lack of resources to operate the system.

For countries which did not set ambitious EP requirements in their building code it may be easier to achieve high compliance rates but this has less energy saving value than in countries with more ambitious EP targets. The prospect of penalties appears to be an influence and good compliance is more likely to be achieved where financial and technical support systems are in place. Such systems are important where EP regulations have been introduced relatively recently and the industry and compliance bodies are still building capacity.

The assessment in the above study classified the EP monitoring, verification and QA regimes as being either high or very high 'strength' in 15 Member States (i.e. over 50%). However, this also means that a substantial proportion of Member States were not considered to have fully robust verification regimes. This potentially diminishes the reliability of the reported compliance rates in those latter countries. Compliance rates for EPC provision and quality

across the EU are less clear, but the experience with those Member States with good EPC databases is that after initial difficulties compliance rates have improved.

Figure 10-2 Factors influencing compliance levels

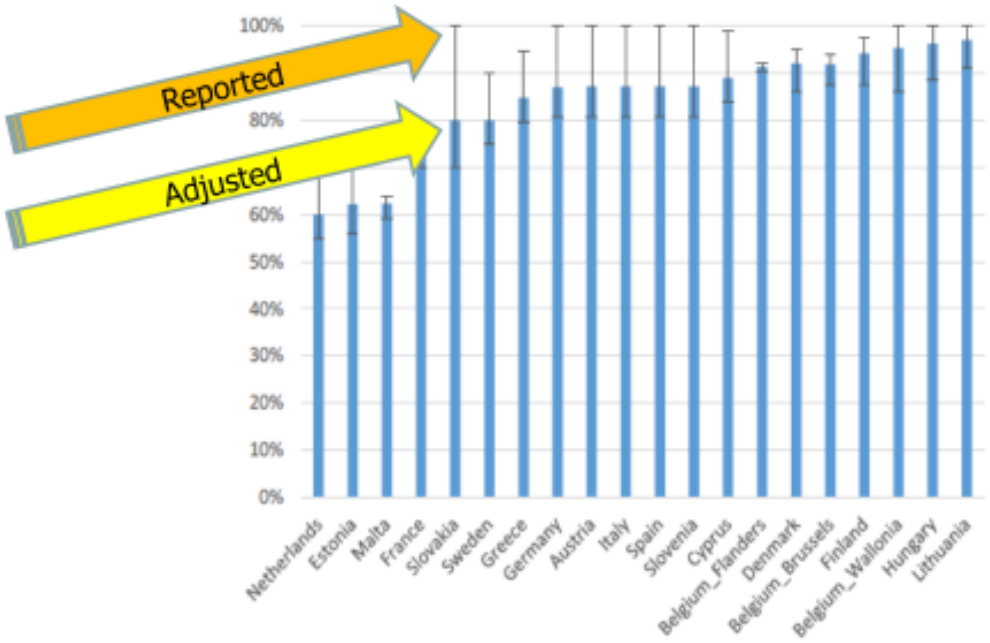


10.2 Compliance levels

The study found information deficiencies in several countries, which compromised their capacity to accurately and objectively report their levels of compliance. Despite this, a high proportion of Member States reported EP compliance rates for new buildings at or around 100%. Adjustments to take account of weaknesses led to a more realistic picture of compliance. This procedure resulted in the above overall compliance rate of 85% and adjusted compliance rate mid-points ranging from 57% (Netherlands) to 97% (Lithuania). For most Member States, even after adjustments rates remained above 80% (Figure 10-3).

The study also found a clear gradation in the ability of Member States to report compliance rates for the three main EP requirements, with States being more able to report for new buildings than for major renovations to existing buildings, and over three quarters unable to report compliance rates for retrofitted building elements. For major renovations, 7 countries reported rates of around 85%, with others reporting lower rates of 50% - 60%. After a similar cross-checking process as above, the adjusted compliance rates ranged from 30% to 79%. The lowest rates were for retrofitted building elements with adjusted compliance rates ranging from 50% (Italy) to 93% (Belgium, Flanders).

Figure 10-3 Reported versus assessed new buildings EP code compliance rates in EU countries



11 PENALTY FRAMEWORK

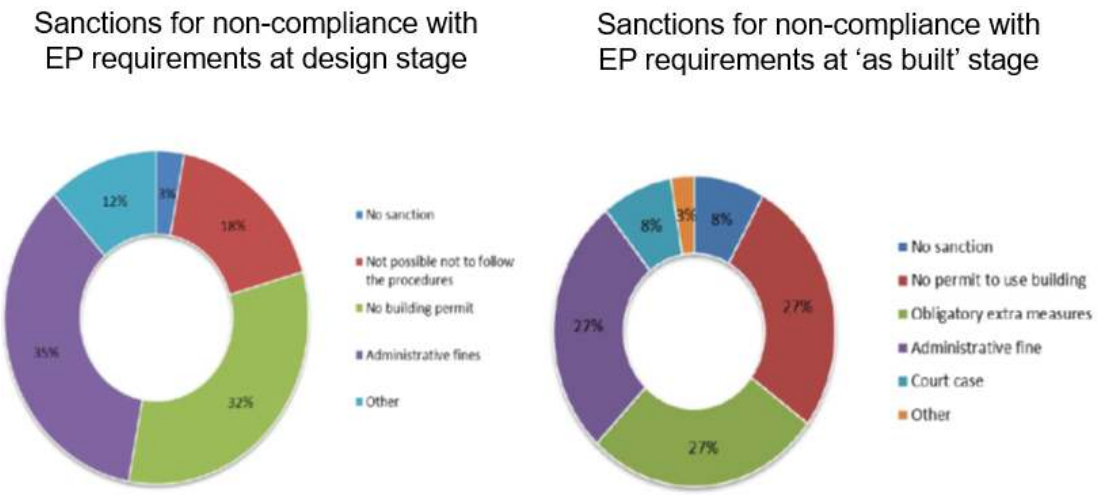
The EPBD requires Member States to establish "effective, proportionate and dissuasive" penalties for infringements which will be set in the transposing legislation. This can be interpreted to mean:

- Effective – to be determined by monitor and assessing impact;
- Proportionate – to the size and complexity of the building, and the seriousness of any infringement
- Dissuasive – insofar as the form and level of penalty is a sufficiently serious deterrent.

The penalty will normally apply to the primary responsible entity for compliance, that is the building owner/ developer. However, depending on the nature of the infringement, it can extend to corrective and/or disciplinary action against the relevant professional advisers (architect, engineer, specialist certifier). For example, in a number of Member States, for poor quality EPCs a penalty points system applies to the EPC professional assessor and lead to a requirement to issue a correct EPC to the client, and the prospect of suspension for repeat offences. As indicated in Section 9.5, this could lead to an escalation process ranging from correction on relatively minor infringements, probation in cases of multiple minor infringements, suspension in cases of serious infringements and temporary or permanent revocation of license in extreme cases.

Figure 11-1 shows a mix of sanctions applied in 24 EU countries for infringements at the design stage and at the 'as built' stage. A penalty framework can encompass financial penalties (fines) as well as sanctions and warnings. Regardless of the formal penalty framework, the denial of a permit to occupy/use unless and until corrective action is taken to make the building compliant with the code is the most effective deterrent sanction and generally considered preferable to financial sanctions because of the human resources, time delays and cost that would be associated with bringing cases of fines to court. (It is however a concern that the survey reported that a number of Member States had applied no sanctions to date).

Figure 11-1 Sanctions reported from 24 EU Member States



In the case of Flanders (Belgium), data on buildings which had been subject to penalty fines for non-compliance was stored in a database. The level and categories of non-compliance could then be estimated on the basis of the penalty formula applied. This allowed the enforcement authority to map and address key aspects of non-compliance. Also in Belgium, for the case of EPCs, over 100 real estate agencies were checked by authorities at random in 2013-14 to confirm the existence of EPC indicators in property display material in real estate agency shops or on their internet sites. At the end of 2014, the first administrative fine was issued, with a focus on agencies that were repeatedly non-compliant. Similarly, in Portugal a fine system was established to penalise real estate agencies which did not advertise properties' energy performance. As a result, the number of EPCs issued for existing buildings nearly tripled.

Rather than creating a penal and alienating culture, a common approach adopted in many countries has been for authorities respond to recurring causes of non-compliance by prioritising these issues for re-training of building professionals and trades, for example through website FAQs, guidance notes, site visits, workshops, webinars and CPD events. In many cases, professional and trade bodies and associations have been active in contributing to this constructive remedial approach.

12 MARKET VISIBILITY OF EPCS

While the compliance and enforcement pattern around Europe is variable, the introduction of EPCs for building construction, sale or rental is playing a growing role in informing building owners, potential buyers and tenants about their choices in relation to energy performance of buildings. This will be discussed in further detail in Position Paper 9.

With the EPBD obligations in relation to EPCs in property advertisements, adopted in 26 Member States, energy efficiency is becoming a visible market factor, influencing demand for more energy efficient buildings. This is expected to increase their market value, on which evidence is already emerging from research studies, and also provide a market driver to stimulate building owners to renovate their buildings. Figure 12-1 shows examples of such advertisements.

Figure 12-1 Examples of property advertisements containing an EPC rating

While a growing number of Member States have taken the step of establishing central databases for EPCs, not all have strong functionality, but the best examples allow access for enforcement authorities, researchers and policy makers, on an anonymised basis, to enable quality assurance strategies and inform national and regional plans for energy efficient renovation of the existing building stock. EU guidelines have been produced in relation to sampling of EPCs for quality assurance and associated enforcement purposes, and there appears to be a growing adoption of these guidelines, but further progress still remains to be made in this regard.

13 CONCLUSIONS

The focus of this paper has been on compliance and enforcement practices in EU Member States in relation to the energy performance (EP) requirements arising from the EPBD in relation to new buildings and major renovations and on the associated requirements in relation to energy performance certification (EPC) or labels being mandatory at the point of offer for sale or rental. It has outlined good practice processes applied among the leading EU Member States and has provided information in relation to compliance levels with new buildings, major renovations and with retrofitting of energy efficiency measures.

Success factors in implementation can be summarised as follows:

- **Adopt a legal framework which defines clear responsibilities, functions and powers**
- **Design and build an independent control system, including smart databases**
- **Apply an effective system of compliance checking at appropriate points for declaring performance/ inspecting/ checking compliance**
- **Monitor the compliance rate and take appropriate corrective educational action**
- **Sanctions need to be effective, proportionate and adapted to local context**
- **Establishing and operating an effective system needs policy commitment and investment of money and people in the necessary tools, people and systems.**

While the quality of implementation varied across Member States, ultimately the majority succeeded in putting the necessary human capacity, organisational, enforcement and communication systems in place to ensure the preparedness of the construction and property sectors to achieve compliance with the new energy performance requirements, and for the authorities to oversee, monitor, enforce and report on compliance. This is also relevant to ensuring readiness to meet the EPBD requirement for NZEB by year 2020. **It is anticipated that elements of the compliance and enforcement frameworks applied in EU Member States could also be beneficially applied in the circumstances of India. Indeed, particular elements of EPBD implementation in the EU show good resonance with elements of the ECBC implementation process to date in India.**

14 REFERENCES

The following are sources of analysis consulted and referenced in the course of preparing this paper. In particular, the EU Commission study carried out by ICF provided significant information and insight into the levels of compliance and associated enforcement profiles across EU Member States.

Also listed is a selection of websites from which useful information can be obtained on EPBD implementation.

Website title and address	Description
Study on EP and EPC compliance in EU https://ec.europa.eu/energy/sites/ener/files/documents/MJ-04-15-968-EN-N.pdf	Comprehensive study on strength and estimated levels of EP and EPC compliance carried out by ICF for EU Commission
Build Up www.buildup.eu	EU portal for energy efficiency in buildings. Extensive library of documents, webinars etc. relating to EPBD and related implementation
Building Performance Institute Europe (BPIE) www.bpie.eu	A European 'think tank' providing policy research and advice on energy in buildings, with publications and monitoring of progress with EPBD implementation
EU Commission – energy efficiency in buildings https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings	Covering EPBD and allied Directives, independent reports, national reports, events
EPBD Concerted Action www.epbd-ca.eu	Public website for collaborative forum of Member States to assist EPBD implementation
EU Build Up Skills initiative http://www.buildup.eu/en/skills	Strategic initiative to boost continuing or further education and training of craftsmen and other on-site construction workers and systems installers in the building sector