Quality Standards - building site
Proposal for a Quality Label

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Project Request Disclaimer
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CHAPTER I Summary and Introduction

1. Summary

As a part of the REQUEST project, dena – the German Energy Agency – developed a quality assurance methodology for energy efficient refurbishment. This methodology could form the basis of a quality label to ensure that planned energy efficiency upgrades have been delivered in practice, and could help identify homes that have been refurbished to a highly energy efficient standard.

This document provides an initial view of how a REQUEST quality label could be developed, recognising that implementation in different Member States will depend on specific national circumstances and other prevailing quality schemes in the construction industry. An example of how to integrate the label with an existing quality scheme is given using the German Casa-bauen quality construction scheme. Furthermore, the document explains how the REQUEST & Casa-bauen programme could be taken forward within promotional and financing schemes for energy efficiency in the German context. Suggestions are also made as to how other countries could take over some key aspects of the Casa-bauen structure if they do not have a similar system already in place, for example, using the 7 questions of CASA-bauen in their system of company-management.

2. Introduction

The construction industry stands, like many other industries, before a profound change in its fundamental work that will restructure the entire value chain of construction dramatically. This change is largely determined by the modified behaviour of the clients’ demand and overall economic conditions.

The demand is shifting from new construction towards existing buildings. At the same time there is also increasingly more comprehensive construction management with, for example, supportive services related to construction such as maintenance and repair as well as fast-paced technological change, reflected in new, innovative work practices and new construction.

Against this background, the quality, communication and cooperation of all involved in construction, from the builders, the planners, to the workers on site, becomes more and more important for the effective and efficient implementation of a construction project.

In order to achieve competitiveness at a high level of quality, many small and medium-sized businesses need assistance in the construction industry with reliable partners and instruments. The REQUEST project, in work led by the Deutsche Energie-Agentur (dena), developed a quality standard based on checklists and a process diagram as essential new instruments for quality in energy efficient refurbishment. This document presents the quality standard, explains how it works and gives guidance on the first steps on how to apply this as a quality label for a quality-assured renovation process.

The instruments were developed in close cooperation with the REQUEST project partners. They serve in most of the partner countries as a good foundation for further implementation of quality assurance in the energy efficient refurbishment process.
1. Creating new instruments for quality assurance for energy efficient refurbishment

The renovation of a building, particularly where energy efficiency is concerned, is a very complex process. On site there are many firms and trades and they often lack the time necessary to communicate and coordinate themselves. The various trades can act uncoordinated or in the ‘wrong’ order, and often it is not entirely clear how far their responsibility extends. Therefore the quality of the refurbishment can suffer, particularly with regard to energy efficiency.

For these reasons, REQUEST developed new instruments in the form of quality checklists and a general process diagram to structure the renovation process and facilitate interfaces between the various trades. Through the German pilot project, conducted by dena in cooperation with the Chambers of Crafts in Münster and Leipzig, and the Italian pilot, the quality checklists were tested on concrete construction projects.

The quality assurance checklists are supplemented by a general process diagram illustrating the refurbishment process which clearly identifies all the necessary requirements.

1.1 The quality checklists

The checklists are divided into different phases, similar to the construction process. They consist of four packages:

- Diagnosis,
- Planning,
- Construction,
- Handover

The checklists are easy to use, with points to be ticked off and the dates to be entered. Queries are, for example, on whether construction meetings, component inspections or blower door tests have been conducted. For individual items, documents must be attached (e.g., the results of the hydraulic balance or the test of airtightness). The checklists are included in the ANNEX I.
General minimum requirements on the quality checklists and recommendations for quality assurance

When using the checklists, it is recommended that the quality assurance (QA) manager ensures that as a minimum the following elements have been completed:

- The required property data must be entered in all checklists
- Any subjects marked in red are the minimum requirements and must be completed in all cases
- It is important to note that one Energy Performance Certificate or one on-site energy consultancy session must be submitted or have taken place before the planning phase commences; a current Energy Performance Certificate may be issued as proof of completion and to enable review of energy performance.
- The preparation of a thermal insulation plan, an airtightness plan and a plan for minimising thermal bridges is recommended for all planned measures and must therefore be entered into the checklist.
- A hydraulic alignment is not required unless work is carried out on the heating or ventilation system.
- Where more than 1/3 of the windows will be replaced or more than 1/3 of the roof surface of a single-occupancy house is newly sealed, a ventilation plan should be prepared.

In the case of complete or whole house refurbishments, evidence of the airtightness test should be submitted and evidence of the QA minimum requirements should all be submitted as part of the REQUEST quality process. Thermal imaging photos are recommended. Explanatory tips for filling in the respective checklists in each of the 4 chapters are provided on the reverse of each chapter’s title page.

Basis for a quality process

Successful energy-efficient refurbishment depends on a thorough diagnosis (Chapter 1) of the building stock and on sound planning (Chapter 2). To ensure high-quality implementation, the first step is to meet with the experts and principals concerned in the renovation and review the building stock and planning information. This discussion would typically include the following aspects:
- Energy consulting, Energy Performance Certificate process and results
- Status-quo assessment
- Thermography, airtightness test BEFORE refurbishment
- Plans relating to thermal insulation, airtightness and the minimisation of thermal bridges
- Moisture uptake of the building envelope (steam diffusion, formation of condensation)
- Summer heat insulation (passive / active measures)
- Ventilation system
- Heat generation, storage and distribution
- Efficient use / generation of electricity

Figure 1: Checklist from diagnosis chapter
Figure 2: Checklist from planning chapter

On the building site

The implementation phase (Chapter 3) should always start with a kick-off meeting attended by all parties involved. At the meeting, the energy-efficiency targets and the refurbishment concept will be presented, the schedule explained and the crossover and handover between the different trades clarified. Further site meetings will take place throughout the refurbishment process, especially on the occasion of important inspections, e.g. completion of the shell construction. Records of the meetings should be provided to ensure comprehensive and continuous information of all parties involved. The following aspects should be considered in the preparation of the kick-off meeting:

- Briefing of craftsmen and handover of documents
• Joint review of the construction schedule and submission of a copy to all trades
• Handover of the address list relating to all parties involved in the project
• Signature of contact person in each trade confirming receipt of the above information
• Review of calls for tender regarding:
  o Quality requirements, energy efficiency
  o General information for construction companies regarding the implementation of energy efficiency measures (airtightness, consistent implementation, etc.)
  o Information regarding compliance with materials and material characteristics specified in the refurbishment plan

Throughout the implementation of the building measures, special attention should be paid to the following points:
• Monitoring of consistent insulation work (unplanned thermal bridges, gaps) and of the airtight layer
• Regular meetings dealing with, among others things, the following subjects:
  o Compliance with construction schedule
  o Exact work instructions
  o Request for amendments, if necessary
  o Definition of responsibilities
  o Definition of cooperation / interfaces between trades
  o Rules for acceptance of building elements that will be concealed
• Documented site inspections (with photos), including samples and visual inspections, together with site managers and representatives of the construction companies to confirm the acceptance of energy-relevant work. Appropriate occasions consist, for example, of:
  o Airtightness test BEFORE refurbishment
  o Completion of shell with fitted roof
  o Window installation
  o Façade insulation
  o Installation of thermal insulation layers in (suitable) roofs
• Review of completeness and plausibility of certificates of origin, compliance certificates and CE labels, etc.

Delivery to the user

As it is the last phase of the building process, particular attention should be paid to the handover (Chapter 4) of the refurbished building to the user. To ensure that no problems will arise once the user has taken over the refurbished property, extensive briefing of the principal in respect of the functioning, use and maintenance of new facilities and systems is essential. It should be ascertained that the respective briefing by the craftsmen has actually taken place. A second important point consists of the handover of all essential documents, including the following:
• Energy Performance Certificate AFTER the refurbishment
• Information regarding the building envelope and building services
- Information regarding the concepts for airtightness, thermal insulation, thermal bridges and the building envelope’s moisture uptake
- Acceptance protocols from all trades
- Manufacturer’s statement from all trades
- Complete, up-to-date documentation (implementation planning)
- Guarantee provisions
- Current address list of all trades including contact persons

Figure 3: Checklist one page from chapter construction
Figure 4: Checklist one page from chapter handover
1.2 The General Process Diagram

The General Process Diagram has been developed from the conclusions of workshops held with tradespeople in each of the partner countries and the results of the REQUEST work package "Bridging the gap between EPC and the supply chain", as well as market analysis of existing standards for the energy efficiency of buildings. The diagram makes the entire renovation process manageable and clearly visible. The diagram shows the individual phases of the construction process in columns (Diagnosis, Planning, Construction, and Handover) based on the developed standards, implemented in the form of checklists.

Figure 5 General Process Diagram

The diagram is intended to support the REQUEST or QA-representative as an accompanying instrument in the renovation process to ensure at least the minimum requirements for the checklists are achieved at the end of the renovation process. There are number of points in the building process where the various trades and experts interact for which key requirements must be defined to ensure good quality in energy-related renovations, and these are outlined in figure 6 below.
Figure 6: General Process Diagram schematic

To reflect the main requirements of communication, clearness and control the general process diagram is structured as follows:

The diagram (figure 5) is divided vertically into large columns that follow the actual construction process and horizontally the diagram is divided into five levels:

**Level 1** Action stage: Shows the construction phases

**Level 2** Tasks: Lists the specific tasks in terms of specifying quality assurance in the individual phases, such as in “Planning”: are all contracts, specifications available and are the responsibilities appointed?

**Level 3** Obligatory documentation: Obtain the required documents, such as in the “Diagnosis” phase: was either an energy consultation or an EPC carried out?

**Level 4** National REQUEST requirements: Ask for requirements specifically developed within the REQUEST project. For example in phase “Planning”: a copy of the contract is required for every trade involved in the renovation process.

**Level 5** National programmes, instruments, ordinances: In this line relevant national programmes and instruments can be listed.

The minimal requirements are marked in red to simplify the compliance checks.
1. **Content and structure of the REQUEST Label**

   The creation of a fully certified quality label is a complex process involving interaction with national accreditation bodies and training providers, depending on national arrangements. This proposal for the REQUEST Quality Label is a first outline for how a quality label linked to the REQUEST checklists could work.

   **1.1 Visibility for the quality of the renovation process**

   The idea of the REQUEST Quality Label is to make high-quality energy efficient refurbishment projects visible at the first glance. This allows the labelled companies to quickly and easily show customers examples of high quality work and target new customers for energy-efficient construction and renovation. Furthermore the companies can position themselves as quality partners in their region.

   As there is already a variety of existing certification schemes in many partner counties that address quality assurance within a company, it was felt it was not necessary to repeat this. For those countries where a scheme does not exist, the German ‘CASA-bauen’ quality scheme - a voluntary self-assessment of the processes of the building company itself and on the construction site - is detailed in chapter IV along with suggestions on how it could be implemented.

   The missing part within most quality assurance schemes is the part of energy efficiency. So bringing QA and energy efficiency together is a win-win situation for both the quality assurance certification process and the energy efficient building renovation process. Further thoughts on how the quality process could be implemented are given in chapter VI the Conclusions and Next Steps.

   **1.2 Requirements for REQUEST Quality Label**

   To achieve the REQUEST quality label it is necessary to go through two different procedures. First, the applicant has to detail the organisation structure on the site, and then fulfil the requirements of the checklists for quality assured refurbishment. The general building process diagram is a third instrument which helps give an overview of the whole building process.

   Combining the REQUEST checklists with the part of CASA-bauen concerning organisation of the construction site, the company meets the relevant requirements for the REQUEST label by:

   I. Completing the quality checklists (dependent on each renovation project, construction phase and participating tradespeople) ANNEX II

   II. Completing the checklists of self-assessment from “CASA-bauen” ANNEX III (see Chapter IV)

   The completeness of both documents should be checked by the REQUEST-quality assessor. Once all the documents, both the quality checklists, and documents relating to self-assessment are complete, the quality label would be awarded to the company.
1. The self-assessment from CASA-bauen

The following describes the background and content of the second part of the requirements for the quality seal using the example of CASA-bauen in Germany which is an established quality initiative in the construction industry.

1.1 Background to CASA-bauen

CASA-bauen is part of the German national initiative INQA-Bauen. INQA-Bauen aims to drive a value shift from the supply and demand side towards the construction quality, innovation and efficiency. INQA Bauen aims to promote a new, higher quality of construction and wants to build construction companies to help them make the transition to an innovative company offering new services, new working methods and products.

INQA-Bauen is widely supported across Germany and has several partners including:

- Central Association of German Construction
- Confederation of German Construction Industry
- Association of Private Building Owners
- Builders’ Welfare Association
- Association of Residential Property
- Federal Ministry of Labour and Social Affairs
- Federal Chamber of Engineers
- Federal Chamber of Architects
- Association of German Safety Engineers
- Association of the Health and Safety Coordinators Germany
- National Building Society
- and over 100 other organisations, service providers and enterprises.

CASA-bauen is a neutral industry standard in the construction industry, which checks the quality of the organisation and the quality of the work and analyses and improves construction companies. CASA-bauen allows weaknesses in organisation and construction processes to be identified and introduces improvements in working practices and makes use of existing resources to develop specific strengths. It is a practical aid for small and medium-sized companies in construction and related industries. It covers primarily the issues of quality, customer focus, health and safety at work and avoiding errors.

1.2 Self-assessment with CASA-bauen

CASA-bauen provides in few steps a simple self-assessment for companies. The complete self-assessment “Organisation for the Construction Site” is a tool that helps companies to learn their strengths, but also their potential and helps them to plan an improvement process.
Companies can make a voluntary self-assessment with CASA-bauen and document this. The seven steps (questions) of the "Organisation for the Construction site" must be completed, acknowledging the need for action and the associated measures.

With the two quality assurance instruments, the checklists and the part of CASA-bauen "Organisation for the Construction site" both the company's internal operations as well as the interfaces between trades on-site are quality controlled.

1.3 **The seven steps of self-assessment “Organisation for the Construction Site”**

CASA-bauen shows companies where they stand. The companies have the opportunity to improve themselves economically. With CASA-bauen, companies can analyse the quality, the organisation and their own work and take action to improve. At the same time, companies get a comparison to other companies, if they wish.

There are seven essential areas for the self-assessment. Within each of these there are different specifications to look at and give an assessment of. The range is from “acute need for action” via “need for action” to “no action needed”. However the important thing besides the assessment, is the commitment to address any areas where a need for action is identified; the responsibility for its implementation and the planned date for completion. The seven topics are:

1. Bid proposal and contract
2. Cooperation between parties involved in building
3. Planning and operations scheduling
4. Deploying personnel
5. Building construction
6. Control
7. Improvement and innovation

For further information please see ANNEX III.
CHAPTER V  

Implementation of the REQUEST quality process

For each renovation project a REQUEST person is appointed in charge (REQUEST-representative), responsible for tracking and documenting the process of quality assurance and communication.

The REQUEST-representative is determined in consultation with the contractor and the contracting companies. The REQUEST-representative may be an employee of a trade company, the site manager, the energy expert or architect. In the case of a very large renovation project, which is overseen by a supervisor, it is recommended the supervisor should be the person in charge. The REQUEST-representative receives the documents for implementation of the quality standards in the form of the quality checklists. The completed checklists could then be compiled and checked by an awarding body.

1.1 REQUEST Quality label criteria

- Minimum requirements and appendices (marked in red in the process diagram and in the quality checklists) are complete for the respective redevelopment projects (partial or complete renovation) and all relevant documents provided.
- All relevant processes related to the company and on-site QA are complete. For CASA-bauen this would mean the seven steps of the self-assessment must be complete, no module or action may be left out; traffic light assessment must be made for all actions and processes.
- At least 20 per cent of the basic processes and basic measures have to describe concrete measures - for example, "implementation", "time periods" or the comments section.
- The company recognises the need for continual improvement in their processes and structures – i.e. in the CASA-bauen process ‘no action needed’ is not looked upon favourably.
- The QA process or CASA-bauen self-assessment should not be more than two years old.
1.2 Draft design of the REQUEST Quality Label

This is a first draft design for the potential REQUEST Quality Label. For further development and implementation of the Quality Label, it is suggested that deeper analysis is required, for example to explore if existing symbols may have greater recognition.

Figure 7 Draft design of the label
CHAPTER VI

Conclusion and next steps

Quality assurance on the building site is very complex, especially finding a common base for all participating European countries who have different standards and schemes already in place. Feedback from the pilot projects that tested this quality assurance process was positive. The checklist, according to the stakeholders involved, was very useful from a coordination point of view and helped to lead the process on site. The general building process diagram was used as an important instrument to provide an overview of the building process as a whole. The proposed procedure for a quality seal for the refurbishment process is seen as valuable and enables the businesses involved to advertise and highlight the quality of their work. However one of the problems with the scheme is identifying the ‘REQUEST representative’ or person who will take responsibility for completing the checklists and ensuring the quality process is followed – as it is more work for no additional money. Below are some examples of ways the process could be taken forward, with practical examples given by Germany where they exist:

- Integrate the REQUEST QA instruments into existing funding schemes as a requirement for funding. The standards are then seen as a best practice standard in the market.
  - Germany are implementing the REQUEST - QA-Instruments into the existing KFW funding programme “Baubegleitung”. dena is in contact with the person in charge of the structure of the building survey within the KFW funding programme “Baubegleitung” (construction supervision), which is a programme for quality assurance on the building site, to make sure that the funding is justifiable. The goal is to implement the results of REQUEST into the standardising process of this programme.

- To support this work dena has started to develop a Web tool for automatically evaluating the completed REQUEST QA checklists. This web tool will include an input mask for the checklists, and links to other Web sites with information about the REQUEST project, as well as to the quality standards and the requirements of the quality label.

- Integrating the REQUEST QA instruments into existing Government grant requirements. Similar to above, where Government grants for energy efficient refurbishment are available so that only refurbishments to a very high standard need to fulfil QA-requirements to get the grant.

- Including the REQUEST - QA-Instruments alongside other energy renovation advice, particularly for organisations such as energy agencies and local and national governments.
  - In Germany the Effizienzhaus-Lotse” (Efficient House Guide) is a guide that assists building owners through the construction or refurbishment process. The guide is also promoted to tradespeople and multiplier organisations such as energy experts, architects, banks, building societies or associations for these organisations to offer as a special service for their customers. At the same time, the tradesman or energy expert receives guidance on the QA-process.

- Promoting the benefits in other EU-projects, e.g. Build Up Skills (pillar II)
  - The QA guide links in closely to the work of Build Up Skills and could be helpful for implementing improved working between the different trades on a building site, which for Germany in particular, was a key finding from the pillar I research.
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**Partners**

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- **Austrian Energy Agency**, AEA, Austria
- **German Energy Agency**, dena, Germany
- **Italian National Agency for New Technologies, Energy and Sustainable Economic Development**
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- **Polish National Energy Conservation Agency**, KAPE, Poland
- **Aalborg University**, AAU/Sbi, Denmark
- **Slovak Innovation and Energy Agency**, SIEA, Slovakia
- **Flemish Institute of Technological Research**, VITO, Belgium
- **Centre for Renewable Energy Sources and Saving**, CRES, Greece
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