

# Carrot and stick – how to reduce the amount of defects in Danish construction

Ernst Jan de Place Hansen<sup>1</sup>

## Abstract

Defects are considered a lack of product quality and represent an economic loss. Since 1986, systems or initiatives applying a carrot-or-stick approach have been implemented in the Danish construction sector to improve the quality of buildings. The initiatives range from mandatory solutions to more or less voluntary benchmarking or insurance-based systems aimed at specific sub-sectors.

Based on a literature review including web-pages the different systems and initiatives are presented. The different approaches and some of the fundamentals or institutional settings in which these systems operate are discussed.

Insurance-based mandatory systems for social housing and urban renewal introduced around 1990 showed remarkable reduction in the volume of defects, but when more or less voluntary systems were introduced for single-family houses a similar success was not seen. This is explained by too little information about the cost-benefit and the easy access to avoid taking out an insurance policy. Mandatory systems seem to be preferable, depending on the target group and the institutional settings.

Since 2009, authorities no longer examine the project documentation when issuing building permissions for smaller buildings. Together with the more performance-based Building Regulations this is criticized for favouring large contractors. The amount of requirements that companies must fulfil should be put against the risk of excluding small contractors, without knowing whether smaller contractors construct houses with lower quality.

**Keywords: Defects, construction sector, carrot-or-stick approach, cost-benefit, performance-based requirements**

## 1. Introduction

For several years the lack of quality and the volume of defects in the construction sector have been issues for debate in Denmark. Since 1971 when the law concerning governmental building projects was adopted, building projects for the Danish Government

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<sup>1</sup> Senior Researcher, Danish Building Research Institute, Aalborg University, Denmark; [ejp@sbi.aau.dk](mailto:ejp@sbi.aau.dk)

have to be carried out in the economically most advantageous way with consideration to their planned use and future operation (Ministry of Housing, 1971).

For a short period in the 1960s and 1970s when many large industrialised housing projects were constructed, completely horizontal roofs became popular in Denmark. Unfortunately, the roofing materials were not durable for completely flat roofs, and many roofs leaked. This resulted in expensive renovation projects which in 1986 in turn initiated an announcement and guidance on quality assurance in construction that counts for governmental and publicly subsidised building projects (National Building Agency, 1986a, 1986b).

The announcement was based on the expectation that preventing damage and defects is less expensive than doing repairs, for the society as a whole as well as for the construction sector. The period of liability was harmonised to 5 years for consulting engineers, contractors and suppliers, instead of 5, 20 and 1 year, which had resulted in differing incentives to ensure the quality. With the quality assurance reform, the Building Defects Fund (for social housing) (BDF) and the Building Damage Fund for Urban Renewal (BvB) were introduced in 1986 and 1990.

In spite of the reform in 1986, the Danish construction sector was repeatedly criticised in the press and in government reports during the 1990s for its apparent lack of efficiency and quality of work. Therefore, the Benchmark Centre for the Danish Construction Sector (BEC) was established in 2002 to run a benchmarking scheme with key performance indicators with the aim of improving quality and efficiency within the construction sector for the building process and the completed building (Danish Trade Promotion Authority, 2000).

In 2002, costs related to defects were estimated at about 10 % of the annual turnover in the Danish construction sector (Danish Enterprise and Housing Authority, 2004), which the Minister of Economy and Enterprise wanted to reduce by 50 % by the year 2008. A Danish index of defects based on six different sources including BDF, BvB and BEC was developed to measure whether this could be achieved (Nielsen and de Place Hansen, 2007), including data going back to 2001. The index showed a marked reduction in defects in 2001-2005, but the economic boom in the construction sector in 2004-2008 slowed down the reduction after 2005. It still remains to be seen, whether the financial crisis and the derived lower and less hectic activity in the construction sector have reduced the volume of defects.

Parallel with the initiatives launched since 1971 related to quality and defects, the Danish Building Regulations (DBR) has since 1961 gradually become less specific and more performance-based (Ministry of Housing, 1961). DBR sets minimum requirements for the performance of buildings, i.e. accessibility, structures, fire safety, indoor climate, energy performance and building services (Danish Enterprise and Construction Authority, 2010).

Performance-based requirements promote innovation of new design and new ways of constructing buildings, makes the aim of a specific requirement visible and clarifies the client's responsibility. However, the majority of building projects are relatively simple, e.g. construction or renovation of single-family houses, and often involves a non-professional client and small contractors but no architect or consulting engineer. It is discussed, whether

a development towards performance-based requirements is preferable for such buildings as non-professional clients need guidance to handle these. Often they prefer specific requirements that explain in detail what to do. Therefore, in 1985-2008 construction and renovation of single-family houses were regulated by specific Building Regulations (National Building Agency, 1985; Ministry of Housing, 1998) as many of the provisions in the general DBR were not relevant for these types of buildings.

## 2. Systems implemented in the Danish construction sector

Governmental building or social housing projects were often the first to be included by the systems implemented in the Danish construction sector to improve the quality of buildings applying the carrot-or-stick approach. These types of projects were the simplest to regulate and it was expected that it could motivate the construction sector in general to take similar initiatives on their own. Systems implemented in Denmark to improve the quality of buildings and discussed in this paper are summarised in Table 1. They also include more or less voluntary benchmarking systems and insurance-based systems for private housing projects.

**Table 1: Characteristics of systems intended to improve the quality of buildings**

System	Building Defects Fund (BDF)	Building Damage Fund for Urban Renewal (BvB)	Benchmark Centre for the Danish Construction Sector (BEC)	Insurance at sale of private housing projects (HIS)	Insurance of new private housing projects (BIS)
Year of introduction	1986	1990	2002	1995	2008
Coverage	Social housing	Publicly subsidised renovation	All types of building projects	Private housing	Private housing
Target group	Government and the construction sector	Government and the construction sector	Contractors and consulting engineers	Consumers	Consumers
Building inspection	After 1 and 5 year	After 1 and 5 year	At hand-over	At sale	After 1 and 5 year
Coverage period	20 years	20 years	Running	5 – 10 years	10 years
Financing	Payment of the construction cost	Payment of the renewal cost	Service charge (differentiated)	Insurance premium	Insurance premium
Access to data	Public	Restricted*	Restricted **	Seller and buyer	Client and buyer
Mandatory or voluntary	Mandatory	Mandatory	Mandatory when bidding for governmental projects	Voluntary	Mandatory except when buyer acts as client

\*: Will be public in the future.

\*\* : Public if the company gives permission.

### 2.1 Building Defects Fund (BDF)

The Building Defects Fund (BDF) was introduced in 1986 as a mandatory insurance-based system for social housing projects. The responsibilities are: 1) To carry out building inspections one and five years after the completion of the building, 2) To give financial

support for the repair of building damage, and 3) To communicate findings and experience to the construction sector with the purpose of preventing future building damage.

The Fund covers 95 % of the costs of the repair of significant building damage claims for the first 20 years after construction. Deficiencies are not covered. The Fund's expenses are covered by the payments of 1 % of the total construction cost from every housing scheme, paid by the client, a social housing association. The building inspections focus on those parts of the building where by experience defects and damage occur that have the largest consequences or the majority of the defects arise. They are solely made by companies who have experience of social housing projects, while the evaluation of the inspections is made by the Fund's own experts to ensure a uniform assessment.

Since the introduction of BDF in 1986, the volume of defects in social housing projects was greatly reduced; from defects in 36 % of the projects built from 1987 to 1992 to 4 % in the projects built from 2001 to 2011 (Building Defects Fund, 2012). Since July 2011, the Fund covers not only new social housing projects, but also major renovation of such buildings, if the renovation leads to improvement or modernisation of the buildings.

## **2.2 Building Damage Fund for Urban Renewal (BvB)**

The Building Damage Fund for Urban Renewal (BvB) was established in 1990 as a mandatory insurance-based system parallel to BDF to prevent damage and other problems in the building process in publicly subsidised urban renewal projects. The Fund has four responsibilities stipulated by the law: 1) To support the repair of building damage, 2) To inspect the renovated buildings one and five years after the completion of the renovation, 3) To communicate the findings and knowledge concerning the prevention of future building damage to the construction sector, and 4) To participate in other activities that can improve and promote quality and efficiency in construction.

The Fund's expenses are covered by the payments of 1.5 % of the total renewal costs, paid by the municipality for buildings that have received a subsidy for renovation. In return, the Fund provides the building owners the right to compensation for up to 95 % of the costs of the repair of substantial building damage until 20 years after the renovation. Like BDF, BvB operates with a separation of inspection and evaluation.

Since the first inspections made by BvB in 1995, significant building damage and defects have decreased from about 8 % of the projects inspected in 1995 to less than 3 % of the projects inspected from 2006 to 2011 (Building Damage Fund for Urban Renewal, 2012).

## **2.3 Benchmark Centre for the Danish Construction Sector (BEC)**

Established in 2002 as a private business foundation, the Benchmark Centre for the Danish Construction Sector (BEC) relies strongly on a government announcement stating that all contractors with more than 10 employees since Jan 1, 2005 must submit key performance indicators (KPI's) based on at least three previous building projects to qualify for government building projects with a contract sum of more than DKK 5 million (EUR 0.7 million) (Danish

Enterprise and Housing Authority, 2003). Contractors also have to deliver KPI's for the specific building project at hand-over and at the inspection one year after hand-over, including quality, expressed by the number of deficiencies at hand-over per DKK 1 million. The contractor himself chooses whether the KPI's should be public or not. Since September 2008, contractors also must submit KPI's to qualify for social housing projects (Ministry of Social Affairs, 2007). These are administered by the Building Defects Fund.

The number of deficiencies at hand-over per DKK 1 million in government building projects rose substantial from 2004 to 2007 but have since decreased to well below the level from 2004 (Danish Enterprise and Construction Authority, 2011). For social housing projects, it is too early to conclude on the effect of KPI's on the quality.

## **2.4 Insurance-based systems for private housing projects**

Two insurance-based systems exist for private housing projects in Denmark, at sale or at construction. Both systems focus on giving the consumer protection rather than communicating findings as this is difficult to do in a simple way, especially for houses at their sale as they are of different age and renovation or extension have taken place at different times. Therefore, the success of these systems is measured in the number of insurance policies, year by year, rather than the volume of defects as used by BDF and BvB.

### **2.4.1 Insurance at sale (House Inspection System, HIS)**

Since 1995, the seller of a house could be insured against claims from the buyer by requesting an offer for insurance, based on an inspection documented in a Home Condition Report made by a building expert (Ministry of Justice, 1995). The seller pays for the Home Condition Report and if the buyer accepts the offer, the insurance premium is split between seller and buyer. By using HIS, the seller is freed from a 20-year responsibility for damage and defects no matter whether buyer chooses to accept the insurance offer or not. For 5 or 10 years the insurance covers defects and deficiencies that are not mentioned in the Home Condition Report, which typically costs between DKK 7000 and DKK 14000. The building inspection is visual with the option of using simple hand-held instruments, if relevant, but with no destructive measures allowed.

The insurance is voluntary but about 10 years after the introduction of HIS, an insurance policy is taken out in about 90 % of all cases involving single-family houses (Realdania, 2006). However, in multi-storey housing estates (flats) insurance is taken out in less than 10 % of the cases as this involves both an inspection of the building or estate as a whole and an inspection of the specific flat, which would be very costly.

### **2.4.2 Insurance of new houses (Building Insurance System, BIS)**

In 2008 an insurance-based system for new private housing projects was introduced (Ministry of Economy and Enterprise, 2007), based on the remarkable effect of BDF and the fact that there had been cases where it was impossible to get a client to pay for substantial defects and damage arised during the construction of a house. The insurance should cover

such defects and damage. The client should pay the insurance premium, which in average is about 1.3 % of the construction cost (Danish Energy Agency, 2012), compared with 1.5 % as assumed when the bill was put forward in the Danish Parliament based on the level of the payment for BDF (1 %) and BvB (1.5 %). However, opposed to BDF and BvB, BIS solely cover defects and damage that stems from the construction, not those that arise afterwards.

If the buyer of the house declares that he is the client building the house for his own use, he is not forced to take out an insurance policy. This rule is mainly to avoid too expensive houses and maybe reducing the number of houses built. In 2009, 2010, 2011 and the first six months of 2012, insurance policies were taken out in 26 %, 48 %, 58 % and 69 % of the cases (Danish Energy Agency, 2012). Insured houses were found to have severe defects in 8 % of all cases but it was twice as high in houses without insurance (BYG-TEK, 2011). An increasing number of consumers to seem have realised that damage and defects can be very costly and that it will be harder to sell a house without insurance. Given that insurance policies were expected to be taken out in 85 % of all cases there is still room for improvement.

### **3. Performance-based building regulations**

Parallel with the different systems implemented in the Danish construction sector to improve quality and reduce the amount of defects the DBR has become gradually more performance-based. And since Jan 1, 2009 authorities no longer examine the documentation of constructional elements when issuing building permissions for single-family houses (detached or joined). Both changes have been criticized for favouring large contractors; performance-based requirements increase the need for guidance, i.e. the amount of documents that the companies in the construction sector are expected to know increases. And the lapse of examination leaves out the possibility of consulting the authorities when applying for a building permit.

#### **3.1 Guidance dealing with moisture in the construction phase**

As an example of performance-based requirements, DBR has since 2008 stipulated that building structures and materials should not, on moving in, have a moisture content that is liable to increase the risk of mould growth (Danish Enterprise and Construction Authority, 2008). This requirement minimises the risk of moving into overly damp buildings and the risk of mould growth, in both new buildings and renovation projects and is related to the rising number of cases with mould growth in buildings in Denmark.

The authorities have the possibility of requiring measurements or other types of documentation provided by a moisture specialist to verify compliance with the requirements. However, not until 2011 was a guideline introduced to help the client comply with the requirements and the intentions in DBR concerning dealing with moisture at each stage of the building process (Møller, 2010). This includes the categorisation of a specific building in a humidity risk class, as the risk of moisture damage is related both to the expected exposure to moisture during the construction phase and the building's susceptibility to moisture.

### **3.2 Examination of documentation of building projects**

Since 2009, building owners decide what kind of project documentation is important when constructing single-family houses. The documentation is not examined by the authorities unless a problem arises. It was done to move resources in the municipalities to the larger and presumably more complicated building projects. It was criticised for resulting in smaller buildings that were worse documented than before; at least that was the expected result. It was implemented shortly after the introduction of the requirements concerning moisture in the construction phase and before the appurtenant guidance was prepared.

Concurrent, the municipalities no longer had the possibility of requiring documentation of moisture content at hand-over. This explains why documentation of moisture content was non-existing for single-family housing projects (de Place Hansen and Aagaard, 2013), although it was mentioned as part of the appropriate documentation that the client should deliver to the municipality when he notified the completion of the building project (de Place Hansen, 2010).

## **4. Discussion**

Based on the presentation of the systems and initiatives implemented in the Danish construction sector and DBR to reduce the volume of damage and defects, the following issues are discussed:

- Are mandatory or voluntary systems preferable?
- Have systems aimed at protecting the consumer been a success, and if not why?
- Have the systems and initiatives favoured large contractors and companies manufacturing standard houses?
- Are performance-based requirements preferable to document standard of buildings?

### **4.1 Mandatory or voluntary systems**

As opposed to the availability of data from BDF, BvB and BEC, no kind of communication of data from BIS – not even generic – takes place, presumably because minimisation of costs was given high priority. This makes it impossible to evaluate the effect of BIS as opposed to the other systems. However, compared with the number of single-family houses built since 2008, very few inspections are made after one year. A majority of single-family houses are made by companies manufacturing standard houses and only a few of a specific type are inspected, even if they are built at different places around the country (Møller, 2012).

So why not make BIS mandatory like BDF and BvB as they have been successful in reducing the volume of damage and defects? As the housing projects covered by BDF and BvB are publicly subsidised, a mandatory system is reasonable in order to ensure that public resources are spent most economically. But it can be argued that a consumer constructing his own house should have the option of choosing whether to take out an insurance policy or not like he has the option of choosing whether he wants to insure his household goods.

BEC deviates from the other systems by focusing on the track-record of the contractor. This can explain why it is used not only by the primary target group as several contractors have voluntarily submitted KPI's to BEC without bidding for either government or social housing projects. Instead, they use the KPI's as a way to profile the company in the construction sector in general. A similar effect is seen when some manufacturers of standard houses add information about how to handle moisture during construction and documentation of the moisture conditions at hand-over even though they are not required to do so.

Therefore, both mandatory and voluntary systems could be relevant, depending on the settings and the target group. The question is rather whether the system is working or not in terms of reducing the volume of defects or ensuring that the owner is covered if building damage and defects detected at inspection can be ascribed to the construction phase.

## **4.2 Problems with systems aimed at protecting the consumer**

Two types of problems with BIS have been detected since the introduction in 2008. First of all, the possibility of avoiding insurance was misused by some contractors, as they made the buyer declare that he was the client, building for his own use, although the real client was the contractor. The main argument was that the buyer would save money but of course it could also make the offer from the contractor more attractive, increasing his chances of being chosen to build the house. This "solution" was widely used mainly in the first years after the introduction of BIS, explaining the low number of insured houses.

In 2010, it was emphasised in DBR that a municipality has the responsibility to ask the client to document that he did take out an insurance policy (Danish Enterprise and Construction Authority, 2010). If not, the housing project cannot be registered as completed by the authorities, apart from those cases where the client built the house for his own use. The increasing number of insured houses year by year and the authorities' reluctance to force price-raising steps on private housing projects is probably the reason for not making the system mandatory in all cases, as concluded in (Danish Energy Agency, 2012).

Secondly, the client may wait to take out an insurance policy until just before completing the project. This is a problem if the client, e.g. a contractor, goes bankrupt; one of the main reasons for introducing the system in 2008. In the future it will be registered in the Building and Housing Register that the house is not insured and why (Danish Energy Agency, 2012) in order to ensure that the owner is not put in a bad position when he wants to sell his house.

Neither the system aimed at houses at sale (HIS) was regarded as bullet-proof by the consumers. For several years 45 % of all claims were rejected by the insurance companies (Realdania, 2006). The consumers believed that the insurance covered all damage and defects not mentioned in the Home Condition Report; however it does not cover damage and defects that are common for a house of a specific type and age. For instance, that a house from the 1930s often has a damp cellar. Therefore a revision of the system in 2012 focused on giving the consumer more information on potential damage and more information about what is covered (Ministry of Housing, Urban and Rural Affairs, 2012). For houses that are built after the introduction of BIS in 2008, it is also planned to add information in the



Home Condition Report about whether an insurance policy referring to BIS was taken out, and if not then why (Danish Energy Agency, 2012).

The problems with the implementation of BIS and HIS show that a bullet-proof system in the sense of protecting the consumer against unwanted costs related to damage and defects including information about the cost-benefit is vital for a voluntary system to be a success.

### **4.3 Systems and Building Regulations favouring large contractors**

Besides of the debate about the protection of the consumers it is discussed whether BIS has favoured large contractors and companies manufacturing standard houses (Nørgård, 2012; Danish Energy Agency, 2012; Erhvervsbladet, 2008). Large, consolidated contractors that can document that they have a well-functioning quality assurance system and experience of the most common building systems will be offered a lower insurance premium than a small, less consolidated contractor with less documented quality assurance. The average BIS insurance premium (1.3 %) is at the same level as for the mandatory systems BDF and BvB, but in some cases the size of the insurance premium made it difficult for smaller contractors to compete. A task force was established in 2012 to investigate whether the setup of the insurance-based system gives the large contractors an advantage at the expense of the small contractors and whether the examples of very high insurance premiums are exceptional or typical (Nørgård, 2012; Danish Energy Agency, 2012).

The development towards more performance-based building regulations and the increasing demands for documentation are also criticised for favouring larger contractors. An investigation concerning the documentation of building projects (de Place Hansen and Aagaard, 2012) showed that the amount of houses that involved a company manufacturing standard houses increased significantly from 2008 to 2010. Why this is the case is not documented, but a reasonable explanation could be the economic development, resulting in a 67 % reduction in the number of constructed single-family houses from 2008 to 2010, which indicates that consumers tend to choose “safe solutions” when the economy is tight.

The higher amount of projects involving companies manufacturing standard houses also resulted in a significantly higher amount and average quality of the documentation in 2010 compared with 2008 as the amount and the average quality of the documentation in general was higher for standard house projects. This shows that strict control like in 2008 not necessarily gives the best-documented houses. It was not investigated whether the termination of examination has had any consequence for the quality of the house itself as only the documentation was studied.

Both HIS and the more performance-based building regulations indicate that large contractors and companies manufacturing standard houses are favoured. Of course this could be an underlying purpose but it presupposes that houses constructed by smaller contractors contain the most defects. However, the knowledge of the quality of private houses, opposed to social housing or governmental projects is very scarce, as there is no collection of data in BIS and HIS opposed to BDF, BvB and BEC.

#### **4.4 Documentation of standard using performance-based requirements**

With (more) performance-based building regulations there will be less focus on compliance with measurable requirements, e.g. a specific minimum ceiling height or a specific minimum sound insulation. However, with performance-based requirements it is difficult to document that a specific house is constructed with a higher standard than stipulated by the DBR, which is relevant for instance when the house is put up for sale. Such levels of standards exist in Denmark but only for some of the properties included in the Building Regulations, e.g. for sound insulation, structures and energy performance.

Therefore, performance-based requirements should be followed by recommendations for the levels of standard, where each step represents a marked increase in standard. Such recommendations were introduced in 2008 for some of the subjects included in DBR as the specific Building Regulations for single-family houses ceased to exist (Dela Stang, 2008).

### **5. Conclusion**

The main findings of this study were:

- Mandatory systems seem to be preferable, depending on the target group and the institutional settings. Mandatory systems based on KPI's may be attractive to use for other companies than the target group depending on the cost benefit
- Thorough information directed at the target group is crucial for a voluntary insurance-based system to succeed
- The setup of systems and the amount of requirements that companies must fulfil should be put against the risk of excluding small contractors, without knowing whether smaller contractors construct houses with lower quality
- The increasing use of performance-based requirements in the building regulations highlights the need for recommendations for levels of standard and for communication about the experience with building materials and systems.

Whether carrot-or-stick approach is applied or not, systems that aims at reducing the volume of defects and increase the quality will be necessary in the future with the continuous development of the Building Regulations stipulating higher – and may be novel – requirements to the performance of buildings.

### **References**

Building Damage Fund for Urban Renewal (2012). *Annual report 2012* (in Danish). Copenhagen.

Building Defects Fund (2012) *Annual report 2012* (in Danish). Copenhagen.

BYG-TEK (2011) *Fewer defects with a building insurance system* (author's translation from Danish) 2: 8.

Danish Energy Agency (2012) *Building Inspection System. Recommendations to increase the knowledge of the system – and to ensure a higher subscription share* (author's translation from Danish). Copenhagen.

Danish Enterprise and Construction Authority (2008) *Building Regulations 2008*. Copenhagen.

Danish Enterprise and Construction Authority (2010) *Building Regulations 2010*. Copenhagen.

Danish Enterprise and Construction Authority (2011) *Amount of failures, defects, damages and deficiencies in Danish construction 2001-2009* (author's translation from Danish). Copenhagen.

Danish Enterprise and Housing Authority (2003) *Announcement on the use of Public Private Partnership, partnering and Key Performance Indicators*. (author's translation from Danish) (BEK nr. 1135 af 15/12/2003). Ministry of Economy and Enterprise, Copenhagen.

Danish Enterprise and Housing Authority (2004) *Failures in construction. Economic consequences and possibilities for a reduction*. (author's translation from Danish). Copenhagen.

Danish Trade Promotion Authority (2000) *Future of construction – from tradition to innovation* (author's translation from Danish). Copenhagen.

Dela Stang B (ed.) (2008) *Guidelines on Building Regulations 2008* (1<sup>st</sup> ed.) (SBI Direction 216). Danish Building Research Institute, Hørsholm.

de Place Hansen E J (ed.) (2010) *Guidelines on Building Regulations 2010* (1<sup>st</sup> ed.) (SBI Direction 230). Danish Building Research Institute, Hørsholm.

de Place Hansen E J and Aagaard N J (2013) *Constructional documentation in Denmark 2008-2010. Investigation of extent and compliance of requirements for construction of limited complexity* (author's translation from Danish) (SBI 2013:07). Danish Building Research Institute, Hørsholm.

Erhvervsbladet (2008). *Massive criticism of a new law on Building Insurance System* (author's translation from Danish). Copenhagen. (available online <http://www.erhvervsbladet.dk/ejendomme-byggeri/massiv-kritik-af-ny-lov-om-byggeforsikring> [accessed 09/11/2012])

Ministry of Economy and Enterprise (2007). *Law regarding change of law on construction, law on social housing etc., and law on building and housing registration* (author's translation from Danish). (LOV nr 575 of 06/06/2007). Copenhagen.

Ministry of Housing (1961) *Building Regulations for market towns and the country 1961* (in Danish). Copenhagen.

Ministry of Housing (1971) *Act on Government Construction Activities*. (author's translation from Danish) (LOV nr. 228 af 19/05/1971). Copenhagen.

Ministry of Housing (1998) *Building Regulations for Small Buildings (BR-S 98)* (in Danish). Copenhagen.

Ministry of Housing, Urban and Rural Affairs (2012) *Announcement on the House Inspection System* (author's translation from Danish) (BEK nr. 18 af 13/01/2012). Copenhagen.

Ministry of Justice (1995) *Law on consumer protection at purchase of property etc.* (author's translation from Danish) (LOV nr. 391 af 14/06/1995). Copenhagen.

Ministry of Social Affairs (2007) *Announcement on Key Performance Indicators for Social Housing etc.* (author's translation from Danish) (BEK nr 136 af 09/02/2007). Copenhagen.

Møller E B (ed.) (2010) *Guideline on handling of moisture in construction* (author's translation from Danish). Prepared by the Danish Building Research Institute for the Danish Enterprise and Construction Authority, Copenhagen.

Møller E B (2012). Private communication. Hørsholm.

National Building Agency (1985) *Danish Building Regulations for Small Buildings (BR-S 85)*. Copenhagen.

National Building Agency (1986a) *Announcement on quality assurance in construction* (author's translation from Danish) (CIR nr. 166 af 12/11/1986). Copenhagen.

National Building Agency (1986b) *Guidance on quality assurance in construction* (author's translation from Danish) (VEJ nr 4024 af 31/12/1986). Copenhagen.

Nielsen J and de Place Hansen E J (2007) *Making failures in construction visible* (author's translation from Danish) (SBI 2007:09). Danish Building Research Institute, Hørsholm.

Nørgård J H (2012). "Clash with insurance companies that rip small construction firms" (author's translation from Danish) *BYG-TEK 7*: 4-5.

Realdania (2006) *House Inspection System – plus, minus ten years* (authors' translation from Danish). Copenhagen.