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The growing importance of an accurate system of building control

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Abstract

Systems of building control have a long history. Technical regulations and control seems to be the subject of an ongoing debate between, on the one hand, those in favour of deregulation and reducing the administrative burden and, on the other hand, new quality demands that require government intervention. Currently in the Netherlands, both sides of this debate appear to be gaining in importance. Deregulation, as well as high targets for energy conservation, structural safety and reliable government are high on the politicians' agenda. The desire for deregulation is leading to the opinion that greater emphasis should be placed on the responsibility of property owners, which could lead to less government intervention. However, the existing forms of quality control for private actors in the Dutch building industry seem to be of quite a low standard. Accidents occur and physical quality does not appear to be sufficiently important. As the CO_2 and energy saving targets increase, stronger regulations and accurate building control become a priority. The paper addresses these developments. It presents an analytic model for systems of building control based on examples from European countries and conclusions and recommendations for developments in the Netherlands and possibly in other European countries.

Key words: Building Regulations, Housing Quality, Building regulations, Europe

1. Introduction

Systems of building control have a long history. The basic forms of control date back to the Middle Ages, when fire safety was an important issue in towns with mainly wooden houses. As a result of the Industrial Revolution at the end of the nineteenth century, health-related quality standards were introduced to

improve the living conditions of labourers. In most countries, regulations and control systems were organised locally. During the second half of the twentieth century, the technical building regulations in most European countries were centralised at national level and went through a reshape towards more functional and performance-based formulations. Since the 1970s, energy conservation has also become an issue. From the 1980s onwards, the influence of the EU has come to play a part via the Construction Products Directive(CPD) and later the Eurocodes and the Energy Performance of Buildings Directive (EPBD).

Building regulations are the subject of an ongoing debate between, on the one hand, those in favour of deregulation and reducing the administrative burden and, on the other hand, new quality demands that require government intervention. Currently in the Netherlands, both sides of this debate appear to be gaining in importance. Deregulation, as well as high targets for energy conservation, structural safety and reliable government are high on the politicians' agenda. The desire for deregulation is leading to the opinion that greater emphasis should be placed on the responsibility of property owners, which could lead to less government intervention. However, the existing forms of quality control for private actors in the Dutch building industry seem to be of quite a low standard. Accidents occur and physical quality does not appear to be sufficiently important. As the CO_2 and energy targets increase, stronger regulations and accurate building control become a priority.

In this paper we continue in section 2 with a summary of some evidence of failures in the Dutch building industry. In section 3 we describe developments of the system of building regulations and building control. In section 4 we present an analytic framework for systems of building control. Section 5 concludes with some suggestions for the future development of the Dutch system of building control.

2. Failures in the Dutch building industry

The cost of failures in the building industry amounts to more than 10% of turnover (USP marketing consult, 2007). Total investment costs (including maintenance) in homes was € 46 billion in 2005, which means annual wastage of € 4.6 billion in this part of the building industry. Vereniging Eigen Huis, a consumer organisation for homeowners, carries out final inspections on many new homes. In 2005 it was reported that construction companies are gradually improving their standards. The average number of deficiencies in more than 1,400 homes examined at new build housing areas was 17.5 per home. However, some homes had as many as 71 deficiencies. In recent years there have been many problems with construction safety: balconies in Maastricht, Bos en Lommerplein (De Boer et al., 2007) and the Stadshart in Almere (Visscher, et al., 2006) are just a few dramatic examples. Inventories drawn up by the 'Learn from Building Collapses' Committee (Derkink et al., 2005) show that such faults are not merely incidental. In many cases, the faults are not due to a lack of technical knowledge but to carelessness in the

building process. There are also many problems with aspects of building physics, as revealed in a study of 78 housing projects by the VROM Inspectorate (Kuindersma et al., 2007). The researchers observed acute health risks, reduced living comfort and, above all, poor energy performance. New homes must comply with the EPC (Energy Performance Coefficient), an important policy instrument for achieving CO_2 reduction targets. The study showed that 25% of the EPC calculations that were part of the building permit were not correct. The performance of the built homes was studied too, and it was unsatisfactory in 47% of homes! In order to comply with EPC regulations, a system whereby heat is recovered from the ventilation system (balanced ventilation) is often installed. In the past few years, this system has been installed in approximately 400,000 homes. Problems with the system in the Vathorst area of Amersfoort have featured regularly in the news (Duijm et al., 2007). An analysis of the problems has shown that they are not necessarily due to the ventilation system itself, but that poor quality management throughout the construction chain can lead to an accumulation of faults.

We suspect that the Dutch situation is not unique. At a meeting of the European Consortium of Building Control in Riga in 2008, representatives from many countries reported on problems in the individual countries. Although the problems are very diverse, it is apparent that in many countries there is a discussion about the organisation of building control in the context of quality problems.

There are major challenges in terms of realising and maintaining the physical performance of homes. Requirements will become much more stringent than is currently the case, particularly with regard to energy conservation, the indoor environment and integral environmental quality. Quality management and, above all, quality assurance are becoming more and more important. In the future, responsibility for these aspects will be increasingly transferred to parties in the building sector. We believe, however, that the government should set a clear framework for this process and continue to direct it, although the way in which it fulfils this role will change considerably.

3. Developments in building regulations in the Netherlands

The first laws relating to the quality of buildings were made as early as 1700 BC. The Codex Hammurabi of Ancient Babylon contained strict rules for the consequences of construction faults. In the Middle Ages, rules relating to building were set at local level in civic by-laws. This was done to manage the development of the townscape and to monitor fire safety. At the end of the nineteenth century, living conditions became increasingly unhealthy as urban populations increased during the Industrial Revolution. The health problems led in the Netherlands to the eventual introduction of the Housing Act (*Woningwet*) in 1901. The Act squarely placed responsibility for the quality of housing with the municipal authorities. For a long time, technical regulations continued to be drawn up at local level. Since the 1980s, successive Dutch cabinets have formulated objectives designed to simplify the regulations and, where possible,

reduce government intervention. A first step towards deregulation was the introduction of the Building Decree (*Bouwbesluit*) in 1992. Since then, a set of building regulations in the form of performance requirements has been introduced at national level (Scholten 2001). The regulations in the Building Decree focus on safety, health, practicability, energy conservation and the environment. The decree was revised in 2003 (Van Overveld, 2003). The main revisions were to the form and layout, but the content was also slightly amended.

The parties in the debate on regulatory pressure in the building sector readily point to the Building Decree, claiming that gains could easily be made by abolishing 'superfluous' rules. This assumption has often proved to be naïve. The regulatory pressure on the building sector is caused mainly by spatial-planning legislation and a large number of supplementary regulations. The Building Decree is responsible for only a relatively small proportion of the regulatory pressure. International comparisons show that the Netherlands is not over-regulated when it comes to technical requirements for buildings (Meijer et al., 2002 and 2006, Sheridan 2003). Within the limited contribution made by the Building Decree to regulatory pressure, we can consider whether there are relative gains to be made. Aspects such as safety, health, energy conservation and the environment will continue to be regulated at national level within the public domain, and in this area there is little that can be dispensed with. It is more likely that the number of regulations will increase. The indoor environment and other health-related aspects in the home are current issues for which additional requirements could be drawn up. Requirements relating to energy conservation are periodically tightened up, and this will continue in the years to come. The fifth cornerstone of the Building Decree, namely Environment, still has to be formulated. That leaves the domain of practicability requirements. But here, too, we must be careful. It is too simple to assume that designers and developers will ensure compliance with minimum practicability requirements. When the Building Decree was revised in 2003, the requirements for a balcony and storages place for bicycles were scrapped. The mayors of the four main cities in the Netherlands called on Minister Vogelaar to re-introduce these requirements into the decree because, in recent years, many flats had been built without these facilities, despite the fact that residents clearly needed them. This shows that the housing market is far from perfect and that residents themselves cannot safeguard their own quality-related interests in the process. In short: deregulation in the building industry must be organised in a different way.

Enforcement of the Building Decree

Furthermore, we assume that it serves no purpose to impose government regulations unless they are properly enforced (Hoogerwerf and Herweijer, 2003). Given the scope and detail of the regulations, the enforcement system must be seen in terms of its effectiveness for the full spectrum of the Building

Decree. This requires explicit testing of compliance with the building regulations and with construction-work inspections and final (completion) inspections.

When the Dutch building regulations were made more uniform in 1992, the changes were not reflected in the processes for assessing building plans or carrying out inspections of construction work. In the area of planning procedures, a form of deregulation was achieved by setting procedure deadlines and by enlarging the category of building activities that are exempt from planning procedures. As early as 1996, evaluation research by the OTB Research Institute (Meijer et al., 1995) showed that the introduction of the deadline for issuing a permit represented a shift of focus away from assessment and inspection by municipalities towards the monitoring of administrative and legal procedures. In the past ten years, it has become increasingly clear that the quantity and quality of assessments carried out by many municipal authorities leave something to be desired (VROM Inspectorate, 2007).

In this context we should remember that the client and the parties he engages for the design and construction stages have primary responsibility for complying with regulations. In recent years, it has not been clear where this responsibility rests. When a building permit is granted, this suggests that the plan has been shown to comply with all the regulations. But this is not the case. In practice, a permit is granted because, during the checking process, the plan was not found to deviate from the regulations. Until recently, it was also the case that a permit gave the holder the right to build in accordance with the design on which it was based, irrespective of whether a departure from the provisions of the Building Decree may have been overlooked. This is changing. The self-executing nature of the Building Decree will ensure that its provisions continue to apply in full.

We will now return to the continuing call by politicians for greater deregulation and easing of the administrative burden. In 1997 we contributed to the building-regulations project as part of the MDW (Market Forces, Deregulation & Legislative Quality) programme of the Ministry of Economic Affairs. The purpose of our research was to formulate deregulation proposals on the basis of examples from other European countries (Visscher, 1997). Notably, in those countries, many private-sector parties are involved in assessment and inspection. We have studied (Visscher, 2000) how the responsibility for these tasks could be transferred to the private sector in the Netherlands too, primarily through the certification instrument. The Ministry of Housing, Spatial Planning and the Environment (VROM) also took up this idea. Since the end of the 1990s, it has been developing a process certificate for assessing building plans against the requirements of the Building Decree. The assessment guideline, BRL 5019, which sets out the requirements for this form of certification, was completed some time ago. More than twenty organisations

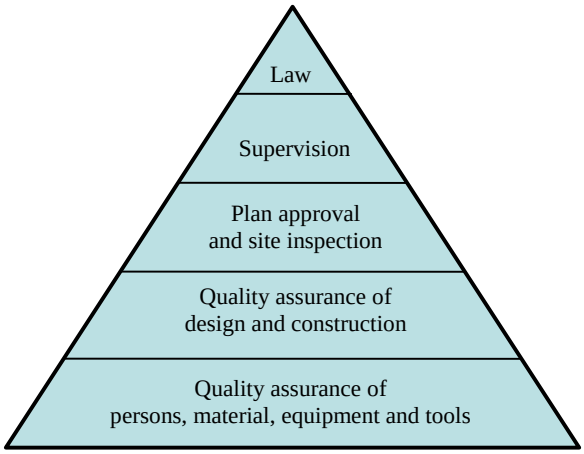
took part in trial projects, and the first four organisations almost reached the certification stage. The Certified Building-Plan Test was intended to serve as a voluntary equivalent alternative to assessment by the municipal authority. This vision is changing, however.

The current cabinet is aiming to reduce the administrative burden by 25%. Again, the field of building regulation is seen to have a great deal of potential in this regard. The Ministry of Economic Affairs and the Ministry of VROM appointed the Construction Sector Fundamental Review Committee (*Commissie Fundamentele Verkenning Bouw*) chaired by Sybilla Dekker, the former Minister for VROM, to draw up proposals for the far-reaching simplification of building regulations. The committee recommended the abolition of preventive assessment of building plans by local authorities. The client should be responsible for complying with the regulations and should also ensure that sufficient checks are in place. It can engage a certified body to do this, but there may be alternatives. The role of the municipal authorities will shift towards that of process auditing, i.e. supervising the checks. The question is then: how this can be operationalised?

Quality assurance is also becoming increasingly important. Apart from the traditional assessment of planning applications by a municipal authority in connection with planning permission, and the related site inspections, there are many more forms of quality assurance in the building process as a whole that help to ensure that the desired quality standards are met. For the most part, meeting private-sector quality targets also results in compliance with public-sector requirements. The content and form of legislation designed to ensure compliance with government regulations depends on the functioning of quality-management elements in the building process. The Dekker Committee's claim regarding the changing role of local authorities in preventive assessment rightly goes hand-in-hand with a call for the further professionalisation of parties in the construction sector.

4. Levels of quality assurance in the building process

The various levels of quality assurance in the building process can be illustrated in a pyramid (Figure 1). At the top of the pyramid we have the Law, the body of legislation and regulations that specify the aims of government intervention in the built environment, the building regulations, the tasks and responsibilities of various parties, and the compulsory procedures. The second level is 'Supervision', i.e. quality assurance for building-plan approval and inspections at the construction site. The processes for assessment and inspection are shown on level 3. Level 4 comprises the processes for design and implementation. Finally, at level 5, we have the elements needed for the processes: the persons, materials, equipment and tools.



Levels of quality assurance in the building process

A number of examples of quality assurance from the pyramid are discussed below.

Level 5: Persons, materials, equipment and tools.

The provisions of the Building Decree apply primarily when an architect is producing a design and when an adviser works on certain aspects. Architects and advisers must therefore have a thorough knowledge of the regulations and related standards. The most basic form of quality management involves ensuring that knowledge of regulations and standards is built into educational programmes. In many European countries (e.g. Belgium), only an architect may submit a building application. This form of professional protectionism is linked to extensive requirements attached to the title of 'architect'. In addition to the appropriate education, architects must have several years' experience and follow specific courses, including refresher courses. This means that the title 'architect' provides a degree of certainty in terms of complying with regulations. In many countries there are also professional qualifications for certain advisers who are involved in the design and/or construction process or for testing compliance with regulations. The government draws up the conditions for recognition. The recognised adviser may be authorised to carry out assessment and supervision (e.g. the *Prüfingenieure* in Germany). Norway has an extensive classification system for the various actors in the process (architects, advisers and site agents). The higher the classification, the more powers the party has for monitoring compliance with regulations.

There has been a long tradition of quality assurance in the construction sector in the form of certification for building materials. This includes product certificates and other forms of certificate. Since 1992, the Housing Act (*Woningwet*) has linked many of these certificates to the provisions of the Building Decree. For certain aspects of quality mentioned in the certificates, these quality certificates are sufficient proof of

compliance with the regulations. This form of product certification can be supplemented with certificates for standard building designs, as with the ‘Type Approval' in the United Kingdom.
Computer programmes are used for many parts of the design process (e.g. construction safety and building physics). The programmes are based on the prevailing levels of the regulations and related standards. It is very important that the programmes in use are checked and certified for their usability for this purpose.

Level 4: Design and implementation
This relates to guaranteeing the quality of the design and implementation processes. In fact, this concerns forms of self-regulation, often based on ISO 9000 quality-system certification. This usually involves an indication of quality assurance for general operational processes. In some cases, a more specific result is indicated. However, quality assurance for building regulations requires a much more specific approach. The question is whether process certification for these primary processes can provide sufficient certainty. There are examples from other countries where self-regulation applies for architects in the case of simple building projects. In Germany, for example, self-regulation applies for buildings up to and including the size of a family home. Integral process management appears to be an effective method for guaranteeing the quality of actual construction work at the site.

Level 3: Testing and supervision
The traditional preventive assessment of building plans by the municipality for the purpose of granting planning permission is the most important example. The equivalent in private law is the Certified Building-Plan Test, the requirements for which are set out in BRL 5019. On an international level, this has many variants. In some countries (United Kingdom) public-sector (municipality) and private-sector alternatives exist side by side. There are also countries (Norway, Sweden) in which the local authorities carry out no preventive (technical) assessments at all. In this case, assessment by a private-sector organisation is compulsory. In most of the examples, the private assessors are independent third parties.

Traditionally, quality assurance for implementation involves a combination of monitoring the implementation processes of construction companies, management by the architect on behalf of the client, inspection by the municipality at specific stages, and random checks. Currently, the various elements that lead to quality assurance are not very consistently organised. Yet quality assurance for the implementation process is extremely important. Not all faults are easy to detect after completion. If deviations are discovered at this stage, remediation is often very difficult or involves substantial costs.

In contrast to many other European countries, the Netherlands has no formal procedure for the end of the construction phase. In other countries, a building cannot be used until the owner has a completion certificate or occupation certificate. These are issued by the municipality or by recognised or certified private organisations. Final inspections can have a preventive effect, but this must go hand-in-hand with strict enforcement: buildings that do not comply with the regulations must be modified. Final inspections are very important for certain aspects. They have a limited added value in terms of construction safety. Final inspections are essential for energy conservation and health aspects (ventilation). Tests can be carried out for insulation, sealing and thermal bridges.

Level 2: Supervision

In the Netherlands, the VROM Inspectorate supervises the processe of checking compliance with technical building regulations by municipalities. For the Certified Building-Decree Test certified private-sector parties are supervised by a certification body, which in turn is supervised by the Dutch Accreditation Council (RvA). The requirements that parties must meet in order to be able to perform assessments under a certificate are set out in a national assessment guideline (BRL 5019). The system of certification and accreditation in the Netherlands is based exclusively in private law. In principle, the government has no role in it. The fact that the certificate holders are the clients of the certificate issuers is sometimes seen as a disadvantage of the Dutch certification system. It could result in reluctance among the issuers to take action against certificate holders. For this reason, many people are still reluctant to rely too heavily on certification.

Public-sector parties versus private-sector parties

In addition to the distinction that can be made with regard to quality assurance for the different elements of the design and implementation processes, it is also important to look at the characteristics of the assessment and supervision carried out by public-sector parties in relation to those carried out by private-sector parties. A great deal of international research has been carried out into the deployment of private-sector parties in the assessment of public regulations. The picture that emerges from the research is that the deployment of private-sector parties in the public domain has benefits that relate mainly to effectiveness and efficiency. Testing by private-sector bodies is better, particularly where complex legislation is involved, and is often done more quickly and cheaply than under the existing public system. However, the disadvantage of employing private-sector actors in the public domain appears to be that it impedes equal access to the system for different parties (equity), and has a negative effect on the reliability of the system (accountability).

In an ideal system, all parts of the process pay attention to compliance, and there is a form of assurance for each element. This usually consists of a combination of internal procedures for designers, advisers and construction companies, and procedures imposed through legislation and implemented by public-sector or private-sector parties. The key is to find a balance that assures sufficiently high quality and minimises the burden on those involved in terms of time and money. The most effective and efficient form of quality assurance is one that is as close as possible to the primary processes, for example: forms of self-regulation and process control. However, this can only work if there is a satisfactory level of supervision for the system of primary assessment and control. The model for quality assurance must be aligned with the characteristics of the construction sector and other circumstances in the country in question. It makes a difference, therefore, whether there are many small (e.g. self-employed) architectural firms, consultancy firms and construction companies, whether there is clear delegation of responsibilities in the building process, and whether project management or supervision is self-evident. Do professional or sector organisations have an influence in the area of quality control? What types of building projects are there – are there many small projects with individual clients, or are most of the projects implemented by the main developers?

5. Conclusion: the future of building control in the Netherlands

We now return to the question of how compliance with Dutch building regulations can be optimised. Our comparative international study offers no off-the-shelf solutions that should be directly implemented in the Netherlands. In order to measure the actual effectiveness and efficiency of a system, the study would need to analyse key figures such as turnover in the construction sector, construction capacity, deployment of staff and materials in primary processes, the costs of failures, accidents and poor quality, process checks, and the role of the government, etc. etc. Such information is not yet available. We base our claims for best practices on the objective characteristics of the systems and on observations from users of the systems in other countries. The following points are notable:

In many countries there are problems with a lack of compliance with building regulations, and this often serves as a stimulus for reviewing and improving the system. The considerable pressure to deregulate in the Netherlands is not evident in the same way in other countries. There is a clear trend towards increasing the role of private parties. In many countries, the role of local authorities in carrying out assessments and implementation inspections has virtually disappeared. It is also notable that other countries have many more regulations relating to internal quality assurance that apply to parties in the construction sector. In many cases, professional organisations have a role relating to assurance. The government emphasises this in building processes by stipulating, for example, that only architects are authorised to submit building plans, or that only ‘construction engineers’ are authorised to sign the construction design. The greater the

role of private-sector parties, the greater the role of insurance companies. Here, there is a danger that quality checks are aligned to financial risks, which are not always the same thing as quality risks. This could also encourage risk avoidance by designers.

In section 2 we reported about the indications that the current situation is not ideal in terms of meeting quality standards for homes. This will present an enormous challenge in the coming period because we want to achieve higher quality standards. From this perspective, we will have to attempt to realise the development perspective that the Dekker Committee outlined for the future of building control in the Netherlands, namely no role for municipalities in assessment and inspection, and professionalisation of the construction sector. One will not happen without the other. We come to the following points of attention:

1. Greater emphasis on regulation and quality assurance in educational programmes.
2. Strengthen the role of professional organisations in terms of raising awareness among their members.
3. Clear role for the government in defining and monitoring the system (supervision).
4. Provide clear and reliable quality instruments (incl. certificates) in order to facilitate the role of the client as the party responsible for quality monitoring.
5. Statutory recognition of the Certified Building-Decree Test.
6. Government involvement in that certification scheme.
7. Develop a similar instrument for inspecting construction work.
8. Compulsory final inspection.

Big versus small

Small construction projects deserve specific attention in the study of alternative models for enforcing the Building Decree. In terms of their number and time involved, they account for a large proportion of the construction projects dealt with by municipalities. In most cases there is a non-professional client (owner-occupier). This category of projects often ‘misses out’ in the various systems for privatising assessment and supervision. The Certified Building-Decree Test offers smaller firms a specific opportunity to more easily obtain certification for assessing small construction projects. Yet the question remains whether clients will opt for this. In the case of small construction projects, the relative costs for external parties are disproportionately high. Other possibilities can be considered that can also be applied to all three models described. In the first place, a decision could be taken not to require preventive assessment and supervision for construction projects up to a specified scale. Added to this, structural calculations by a recognised firm could be made compulsory for structural changes.

In many such projects (extensions/conversions) there are possibilities for improving the energy performance of buildings. There could be a role for the municipality (or other local information point for sustainable building) in terms of pointing out the possibilities for energy-saving measures. This is in line with the aims of the 'Meer met Minder' (More with Less) programme, a joint initiative by the government, home-owners and construction companies whereby high energy-saving targets have been set for existing homes. One of the programme's strategies is to persuade owners, at opportune moments (e.g. when they move house or make alterations), to make radical changes in order to conserve energy. A modification to the planning procedure for this type of construction work could provide a practical 'handle' for this.

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