QUALITY ASSURANCE OF PERFORMANCE-BASED MAINTENANCE PARTNERSHIPS

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ABSTRACT

Dutch housing associations develop new procurement methods for maintenance of their housing stock, namely performance-based partnership forms. Partnership forms promise the optimal use of know-how of parties involved. For contractors a performance-based approach means major changes in working processes, methods and need for information. A vital change is that within the performance-based approach, the contractor acts as a maintenance-engineering consultant to the client. This entails new activities, such as providing advice on maintenance strategies, the production of maintenance scenarios, performance measurements and the conduct of customer satisfaction surveys. These activities demand a different type of knowledge and expertise on the part of the contractor. The paper investigates the needed competences of contractors for maintenance-engineering consultancy in performance-based maintenance partnerships. The introduction of the quality mark VGO KEUR in the Netherlands is a first step in quality assurance of contractors working in a performance-based manner.

KEYWORDS
Performance-based maintenance, consultancy service, quality systems, quality assurance

INTRODUCTION

Dutch housing associations are not-for-profit organisations, which are obliged to operate in the interest of housing, in particular by providing decent, affordable housing to lower-income households. They account for approximately 99% of the entire social rented housing stock. In 2003, 527 Dutch housing associations together possessed more than 2,4 millions of rented dwellings (Ministerie van VROM, 2004). This entails that social rented housing account for 37 percent of the total housing stock, and 75 percent of the total rented stock. In the 1990s, the Dutch national government granted housing associations considerable more freedom of policy but also diminished the financial support. Furthermore, demand for social housing decreased, partly due to a booming economy and changes in housing preferences towards home-ownership. As a consequence housing associations began to adopt business-like approaches in their housing management. They had to operate more market-driven and client-driven (Gruis and Nieboer, 2004).

The professionalism of housing associations have led to a noticeably greater attention for maintenance processes and partnership forms in the procurement of maintenance: performance-based maintenance agreements. The growth in the size of the properties for which an individual housing association is responsible is an important factor in considering the adoption of performance-based maintenance contracting. Some larger associations have as many as 40,000 dwellings under their management, which renders it more or less essential to explore alternative means, which make maintenance processes to be managed efficiently and effectively. Another reason for considering performance-based agreements is the emergence of strategic housing stock policies at housing associations, leading to a clearer notice of desired performances (Straub, 2002).
Performance-based maintenance partnering concerns the dyadic relationship between the housing association and its key maintenance contractors. For housing associations, maintenance can usually be perceived as a component service of the entire housing service to tenants, the core service of housing associations (Van Mossel & Van der Valk, 2006). It means that the service is integral part of the service supply to tenants. This highlights the essence of extending the focus of quality assurance from only the housing associations’ processes to also the processes and results of the maintenance contractors.

Quality control entails all activities and decisions aimed at taking the organization’s products and services to the desired level and at maintaining that level. Quality control therefore requires intensive consultation and sound tuning between various departments in the organization and with outside suppliers and clients (Van Weele, 2002). For potential clients that want to co-operate performance-based in the maintenance of their buildings quality assurance is valuable and perhaps even decisive for them to enter into a partnership with some company. Quality assurance concerns keeping up the methods and procedures of quality control, i.e. systematically checking that they are efficient, that they lead to the desired objective, and that they are applied correctly (Van Weele, 2002). Quality assurance, therefore, provides valuable information to clients that maintenance contractors possess or have access to required resources and capabilities in order to be able to deliver high quality consultancy-services to them.

This paper focuses on quality assurance in performance-based maintenance partnerships. It highlights engineering-consultancy services that are delivered to enable design-build combinations in maintenance. The central case is the introduction of VGO KEUR, an independent quality mark in the branch of painting firms. Based upon interviews and expert meetings with directors of painting firms, purchasers and technical managers of housing associations, and representatives of the branch organisation of painting, relevant developments are being reflected. The research question is:

*Which resources and capabilities are necessary for maintenance contractors to be able to act as maintenance-engineering consultants to housing associations in performance-based maintenance partnering, and how can housing associations be assured of these qualities?*

First, attention will be paid to performance-based maintenance contracting by Dutch housing associations. After this, consideration is given to the needs of housing associations with regards to resources and capabilities of maintenance contractors in providing consultancy services. Finally, the VGO KEUR is being examined. To what extent can this be a satisfying system for the clients, the housing associations? Although this paper includes an assessment of opportunities that VGO KEUR offers, the quality mark is introduced only recently. Future outcome measurements should provide empirical results

**QUALITY ASSURANCE OF MAINTENANCE CONTRACTORS**

The Dutch construction industry is characterised by many small firms and some large companies and by heterogeneity in the types of firms. Particularly the housing building sector is characterized by competition between many firms (Bremer and Kok, 2000). The degree of specialisation varies considerable. A lot of (small) companies are specialised in only one aspect, for example paintwork. Another group of companies combine expertise from different fields and, if they act in the maintenance branch, exercise ‘total maintenance’.
The branch of firms that are specialized in painting and small construction work, can be broken up into two groups: a big group of very small firms (1-10 employees) and a small group of medium-sized firms (up to 150 employees). All 45 members of the branch organisation for the medium-sized firms, named WVB, have adopted the ‘Excellence model’ of the European Foundation for Quality Management (EFQM) as their generic management quality system. Some firms are assessed for ISO 9001 and/or ISO 14001 (environmental management systems).

Already in 1995, the Dutch branch organization FOSAG, including all painting firms, introduced the Approval System for painting firms: ‘AF-erkenningsregeling’. To become approved, firms should have all certificates of proficiency. Quality control of the maintenance service is done by performance measurement of a painting job once in three years. For non-professional clients this approval is important, because the firms observe the terms of delivery of the Dutch consumers’ organization. Besides, the painting work is guaranteed for two years.

Especially for professional clients like housing associations, it is essential that contractors working for them have implemented the voluntary quality assurance system Safety, Health and Sustainability Checklist: ‘VCA. This VCA exist for small firms with less than 35 employees (VCA*), usually working as subcontractor, and in a more comprehensive version also for larger firms (VCA**). While VCA* concerns direct safety control of working processes at site, VCA** also concerns the safety structure of the firm. Requirements are interrelated with requirements of ISO 9001 (Federatie van Afbouw Bedrijfsschappen, 2002). VCA-certification of contractors is used very often as a pre-qualification criterion of principals in the Dutch construction industry (Caniels, 2005).

Integrity of building companies has become a more important issue after inquiries of collusion practices in the Dutch building industry. For this reason, building contractors can be registered as honourable companies, observing the codes of the Corporation for the Assessment of Integrity of the Construction Industry (Stichting Beoordeling Integriteit Bouwnijverheid (SBIB), 2003). Besides more generic, and thematic quality assurance models for maintenance contractors, maintenance contractors can become approved for several working processes and skills at site, upon Dutch and/or international standards. A part of the WVB branch organisation members, for example, is approved contractor for various techniques for concrete repair and/or approved contractor for maintenance of wooden construction elements in facades. For the quality of working processes, the workmanship of workers who in fact do the job is quite important. Workers themselves may be even approved or certified. Registered surveyors are a well-known example of this. Generally, knowledge and experience of workers is part of a system and/or process quality system of approved firms. Table 1 shows different types of quality systems for Dutch maintenance contractors specialized in condition-based maintenance of facades.

To conclude we can say that many quality systems exist for overall management processes and technical processes of maintenance contractors. However, vital for a performance-based maintenance approach, is the factor that the contractor acts as a maintenance-engineering consultant to the client. A quality system for engineering-consultancy activities does not yet exist. Consultancy activities conducted by maintenance contractors for housing associations are 1) advice on maintenance strategies, 2) the design of maintenance scenarios, 3) specifying maintenance activities, 4) performance measurement and 5) conducting customer (tenant) satisfaction surveys. The latter two activities can, together, be called control and supervision. For these consultancy activities a quality assurance system is under development since only recently.
Table 1. Different types of quality systems for painting firms

<table>
<thead>
<tr>
<th>General</th>
<th>Aspects</th>
<th>Activities</th>
</tr>
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<tbody>
<tr>
<td>Management and organisation</td>
<td>ISO 9000 series</td>
<td>Approval System for painting firms (AF-Erkenning)</td>
</tr>
<tr>
<td></td>
<td>EFQM</td>
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<tr>
<td>Working processes at building site</td>
<td>VCA</td>
<td>Concrete repair</td>
</tr>
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<td></td>
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<td>Maintenance woodwork</td>
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<tr>
<td>Workmen skills</td>
<td></td>
<td>Concrete repair</td>
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<td></td>
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<td>Maintenance woodwork</td>
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<tr>
<td></td>
<td></td>
<td>AF-Erkenning</td>
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<tr>
<td>Workmen</td>
<td></td>
<td>Registration of surveyors</td>
</tr>
</tbody>
</table>

PERFORMANCE-BASED MAINTENANCE CONTRACTING AND MAINTENANCE ENGINEERING CONSULTANCY

Traditionally, housing associations tender maintenance services using a descriptive and detailed specification of work to be performed. The objectives are to achieve the lowest price or best price-quality ratio by means of a competitive tender. The specifications are drawn up using the available knowledge and experiences of the housing association, possibly with assistance from external maintenance advisors. By contrast, the performance-based approach centres on a set of desired performances or service levels, stated by the housing association. The objectives of housing associations for performance-based maintenance contracting and partnering are to improve quality, to achieve budget certainty and cost savings, to simplify the maintenance management process and to promote innovation on the part of maintenance contractors. Maintenance contractors do no longer act as suppliers of capacity, but they become active participants in the overall maintenance process. They give advice on maintenance strategies, performances, maintenance scenario and activities (Straub, 2005). In other words, they start to act as engineering-consultants.

In the following paragraphs, the consulting activities of maintenance contractors are explored and conclusions are drawn with respect to the needed resources and capabilities of these contractors in order to be able to adequately consult their clients.

Design of maintenance scenarios and specifying maintenance activities

In a long-term cooperation, maintenance contractors are consulted at an early stage of the process, and are therefore able to contribute their ideas on maintenance policies, taking into account aspects such as the housing estate strategy, performance requirements, exploitation period and finance. The housing association and the maintenance contractor jointly specify decisive performance requirements for housing estates, concluded in a general agreement. The contractor works out the desired performances, fitting them into the actual technical state of the housing estate and the expected exploitation period. The technical solutions are laid down in maintenance scenarios and activity plans. The contract duration is a maintenance scenario covering several maintenance intervals of returning maintenance intervention, eventually lasting the whole, expected, exploitation period of the housing estate. A maintenance interval can be defined as the period between (combined) conducted maintenance activities to the same building
component, e.g. the cycle of paintwork. The purchaser chooses the optimal maintenance scenario, based upon net present values and preferably a life-cycle costing analysis. The maintenance scenario and performance criteria are laid down in a performance agreement.

**Control and supervision**

In a long-term cooperation the contractors themselves monitor the degradation processes of building components by performing performance measurements. The primary purpose of control and supervision by the housing association is to review the performance achievements and to identify problems and subsequently, take the necessary action. Contractors also monitor the entire maintenance process and especially customer satisfaction during maintenance interventions. They keep responsibilities for laid down performances and customers satisfaction during the contract period. Performance control by independent third parties, may take the form of a random check rather than a full inspection of all performance criteria.

**Needed resources and capabilities for performance-based maintenance consultants**

The combination of consulting and realization activities is not restricted to the Dutch, let alone maintenance situations. Procurement systems as design and build and design-build-maintain have the same characteristics. Several authors examined the needed capabilities of contractors working as consultants in design-build projects, often in relation to contractor selection (e.g. Potter and Sanvido, 1995; Palaneeswaran and Kumurawamy, 2000). Palaneeswaran and Kumurawamy conclude that ‘traditional approaches to contractor selection do not usually directly meet the challenges or needs of design-build projects’. They propose a scoring system for design-build contractor prequalification criteria grouped under the headings finance, human resources, organization and management, project-specific requirements, past experience, past performance, technology, quality systems, health and safety system, and equipment.

The core competence of maintenance-engineering consultants is their ability to apply scientific and technical knowledge - mostly in a combined form of technical calculations and tacit knowledge of design, based on extensive experience - to a maintenance project. To exploit this core competence, the consultant, however, is dependent on resources and capabilities. Barney (1991) categorized resources into three groups: physical resources such as plant equipment, location and assets; human resources such as manpower, management team, training and experience; and organizational resources such as culture and reputation. Capabilities are defined as “architectural abilities or bonding mechanisms whereby resources are combined in new and innovative ways” (Duncan et al., 1998: 10).

The needed capabilities of maintenance-engineering consultants could be comparable with those needed for management consultants. Simon and Kumar (2001) have conducted studies to the strategic capabilities of management consultants, as identified by clients. Although the strategic capabilities of management consultants do not necessary reflect those needed to be a good performance-based maintenance consultant, it can be assumed that there are many similarities. The importance of communication and empathy skills towards the client is obvious for all consultancy activities. For engineering consultancy, the quality of the result of the service will be heavily dependent on the technical knowledge. Together with the integrity and honesty of the consultant, these seem to be the most important strategic capabilities from the viewpoint of the client of the consultant.
The resources of engineering consultancy firms rest firmly on the skills accumulated by their professionals as individuals and in project groups. To give an example, it can be argued that every new design or construction project involves innovative elements such as the adaptation of existing technology to local conditions, or unique combinations of technical components. For maintenance-engineering consultancy, of particular interest is knowledge of and experience with survey methods (condition assessment, performance measurement), methods regarding the diagnosis of the original cause of deterioration, planning and calculation methods (e.g. net present values, life-cycle costing) and knowledge of the life span of building components. Contractors must be able to present and substantiate the (financial) risks attached to the various maintenance scenarios. For example, they must be able to assess whether the likelihood of damage recurring, or damage being caused to other parts of the fabric, will increase, given certain methods of carrying out the planned maintenance work. In cooperation with suppliers and manufacturers, e.g. for paints and roofing systems, they have to guarantee life span of (new) materials and construction elements.

To a large extent, the real competitive assets of engineering consultancy firms are thus contingent on the quality and capabilities of their human resources (Baark, 2001). In addition to this, the quality of memorization of knowledge within the organisation affects the sustainability of these resources. Concurrently, as the consultant in this case is part of the maintenance contractor, and often even the managing director, a most important capability of this company seems to lie in the degree it succeeds in obtaining synergy by combining design and realization.

**CASE: VGO KEUR**

The branch organisation for medium-sized painting firms WVB, the Dutch Building Research Foundation (SBR) and quality assessment institute INTRON Certification have been working on a system of quality assurance. Major part of this approval system is a verification of performance-based competences of maintenance companies. It is primarily directed to maintenance, and in particular painting of the exterior of buildings. This certification is called VGO KEUR, which means ‘Quality Mark for Real Estate Maintenance’.

The application by maintenance contractors to the VGO KEUR starts with submitting the application form. After a superficial check on requirements, an in-depth assessment follows on four ‘excellence points’. If a maintenance contractor succeeds in meeting the requirements, it is granted the quality mark VGO KEUR. See figure 1. In the near future an independent institution with members from contractor as well as principal side, will manage this system. Then all maintenance contractors can be certified as contractors that are able to work according to a performance-based maintenance approach.

VGO KEUR has a specific character, in such a way that it requires from participating companies a rich combination of result demands and process demands. Result demands contain financial standards and requirements with respect to client and employee satisfaction. Financial performance standards contain net profit and solvency figures. Client satisfaction is measured through an inquiry of random selected principals of the contractor. The principals have to judge their satisfaction with the contractor on a ten point-scale. The average total score should be at least seven. Employee satisfaction is measured by absence through illness.
For the assessment of capabilities of maintenance companies, an extensive questionnaire has been developed. See table 2. Based on this questionnaire, knowledge, expertise and experience with regards to maintenance processes and consultancy activities in particular of the concerning company can be measured. For example, to what extent is the company capable of developing maintenance scenarios? For most of the questions the proof is provided in written documents as personnel and project files of the firm. Most of the questions concern human resources and past experience. Just a few questions concern the management and organization of the firm and the management and organization of performance-based partnering. Questions about innovative solutions, own viewpoints on maintenance strategies, management of subcontractors, communication with the client, communication with employees of the client at site and communication with tenants are lacking. Those aspects may be incorporated in the client satisfaction assessment.

**Evaluation VGO KEUR**

The character of the VGO KEUR is wide: the competences scan should measure performance-based maintenance competences of contractors. The measured result demands are important aspects in contractor selection, but most principals, especially housing associations, have their own more extensive selection criteria for financial standards and client satisfaction. The competences scan primarily measures resources. Conversely, client satisfaction in maintenance engineering consultancy is heavily determined by capabilities. Behavioural factors are very important in capabilities of management consulting (Simon and Kumar, 2001). Above all a proactive attitude of cooperation partners and an open relationship is needed. Besides, client satisfaction is determined by contractors’ performance outcome. The relationship between consulting activities and contractor’s performance outcome is not clear in the VGO KEUR. Linking a quality assurance system for performance-based maintenance to performance outcome needs outcome measurements of products and services. Contractor’s performance could be measured in terms of technical performance of the maintained building components, contractor prices during the cooperation period, and tenant satisfaction.
Table 2. Questions and proof competences scan VGO KEUR (examples)

<table>
<thead>
<tr>
<th></th>
<th>Questions</th>
<th>Proof</th>
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<tbody>
<tr>
<td>Firm</td>
<td>Financial turnover of current long-term relationships</td>
<td>Financial statements</td>
</tr>
<tr>
<td></td>
<td>Disciplines of available in-house employees</td>
<td>Files personnel</td>
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<tr>
<td></td>
<td>Relationships with subcontractors</td>
<td>Financial statements</td>
</tr>
<tr>
<td>Leadership and</td>
<td>Knowledge of and experience in business administration, financial</td>
<td>Certificates, diplomas</td>
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<tr>
<td>management</td>
<td>management, risks management</td>
<td></td>
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<tr>
<td></td>
<td>Information supply to employees about company strategy, including the</td>
<td>Minutes meetings, inquiry personnel</td>
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<tr>
<td></td>
<td>performance-based approach</td>
<td></td>
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<tr>
<td>Performance-based</td>
<td>Knowledge of and experiences in condition assessments, performance</td>
<td>Certificates, diplomas, personnel files,</td>
</tr>
<tr>
<td>maintenance process</td>
<td>measurements</td>
<td>project files</td>
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<tr>
<td></td>
<td>Knowledge of and experiences in drawing up maintenance scenarios and</td>
<td>Certificates, diplomas, personnel files,</td>
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<td></td>
<td>activity plans</td>
<td>project files</td>
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<td></td>
<td>Knowledge of and experiences in planning and calculation methods</td>
<td>Certificates, diplomas, personnel files,</td>
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<td>project files</td>
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<tr>
<td>Realisation</td>
<td>Knowledge of and experiences in process control</td>
<td>Certificates, diplomas, personnel files,</td>
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<td>project files</td>
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<tr>
<td>After care</td>
<td>Analysis of performance measurements</td>
<td>Project files, minutes work consultations</td>
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CONCLUSION & DISCUSSION

In this paper, two questions have been dealt with:

Which resources and capabilities are necessary for maintenance contractors to be able to act as maintenance-engineering consultants to housing associations in performance-based maintenance partnering, and how can housing associations be assured of these qualities?

Performance-based maintenance partnering entails new knowledge and expertise of maintenance contractors. Many quality systems exist for overall management processes and technical processes of maintenance contractors. However, vital for a performance-based maintenance approach, is the factor that the contractor acts as a maintenance-engineering consultant to the client.

The importance of communication and empathy skills towards the client is obvious for all consultancy activities. For engineering consultancy, the quality of the result of the service will be heavily dependent on the technical knowledge. Together with the integrity and honesty of the consultant, these seem to be the most important strategic capabilities from the viewpoint of the client of the consultant.

The introduction of the VGO KEUR is a first step in quality assurance of contractors. It aims to guarantee principals of a certain quality level of maintenance service suppliers working in a performance-based manner. This means that an external assessment establishes the degree to
which the methods and the procedures, applied by maintenance contractors, satisfy the conditions, which have been recorded in VGO KEUR standards.

We expect a higher performance of contractors responsible for consultancy (design) and realization than for contractors that are just responsible for the realization of maintenance work, based upon detailed technical specifications of work. A closer synergy of ‘design and build’ is possible because of this. As a result we expect lower quality costs (see e.g. Pheng Low and Yeo, 1997) in design-build procurement systems and performance-based procurement systems than in traditional procurement systems. However, another possible explanation is that a movement of maintenance contractors, such as painters, towards consultancy activities opens the way for other specialised maintenance companies. Specialised companies in certain crafts may be able to obtain costs and quality advantages that design-build companies may not be able to get. Future outcome measurements should proof results.

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