QUALITY BY DESIGN: A QUALITY ASSURANCE PROTOCOL FOR WOOD-FRAME BUILDING ENVELOPES IN BRITISH COLUMBIA

Background

There have been many explanations put forth as to the reasons for the "leaky condo" issue in British Columbia. The Building Envelope Research Consortium, of which Canada Mortgage and Housing Corporation is a key member, has been established to determine why moisture problems have been experienced to such an extent in B.C. and to determine ways of preventing such problems from occurring in the future. One of the initiatives identified as necessary by this group was the establishment of a Quality Assurance Protocol for the design and construction of building envelopes of multi-storey wood-frame buildings located in the coastal climate of B.C.

Purpose of the Protocol

The Quality Assurance Protocol brings together thinking about building envelope quality from a representative sample of all the design and construction professionals who produce building envelopes. Based on the International Standards Organization ISO 9001: 1994 Quality Standard, the protocol consists of a set of recommendations and guidelines, which, if followed in design, construction, and maintenance, will produce an improved level of quality in the final building envelope. The protocol is intended for building envelope providers, who are defined as any designer, builder, supplier, or installer who is engaged in the provision of products and/or services that contribute to the construction of a building envelope.

Contents

The protocol consists of four parts: Introductory Document, Quality Manual, Best Practice Guides (BPG), and associated forms.

The Introductory Document explains the what, who, where, when, and how of the Quality Assurance Protocol. What is the Quality Assurance Protocol? Who is it intended for? Where does it apply? When should it be used? And how is it to be used? The Introductory Document also establishes the basis for Quality by Design.

The meat of the Quality Assurance Protocol is the Quality Manual. Throughout the manual, reference is made to the Best Practice Guides for details that have a well-developed theoretical basis. It is suggested that, where a designer or builder has an alternative approach to achieving an equal or better result, the reasons for the variance be described in relation to the BPG details.

References are also made throughout the Quality Manual to sample forms, which are provided in an appendix to the manual. These forms can be used for all aspects of the Quality Assurance Protocol, including, for example, document and data control, assigning quality responsibilities, and monitoring inspection, measuring, and test equipment. These forms can be used as presented or adapted to suit individual needs.

The Quality Manual itself consists of five chapters: Organizing for Quality, Designing for Quality, Buying Quality, Building Quality, and Completing and Servicing Quality.

Chapter 1
Organizing for Quality, of the Quality Manual provides general guidance on establishing, maintaining, and monitoring a Quality System. This chapter is based on the ISO 9001:1994 Quality Standard, with a simplified and focussed framework particular to design and construction activities. The key concepts in this chapter include the development of an overall framework for developing and maintaining quality in an organization and on a particular project, and the designation of the Quality Management Representative (QMR) responsible for the organization's quality performance. The QMR may be different people for different customers or projects.

Chapter 2
Designing for Quality, introduces the concept of a Water Management Strategy, which is a series of concepts and details specifically focused on keeping exterior water out while facilitating the removal of any water that inadvertently does get inside the building envelope. The key concepts in this chapter include the establishment of procedures for a properly managed document and data control system, the

requirement for as-built or "as inhabited" drawings, and mock-ups as an essential component of the quality process.

Chapter 3
Buying Quality, addresses how to inject quality considerations into the purchasing of materials, systems, and services. Specifically, the elements of a properly defined procurement program are outlined, including a defined purchase order procedure, a method of sourcing goods and services from qualified supplier/subcontractors, agreed quality verification criteria, provisions for settlement of quality disputes, and control of purchasing records. This chapter introduces the importance of identifying and tracing products and services in the building envelope, both to reduce errors in initial construction and to make "traceability" of problems easier, hence improving the ability to repair latent defects.

Chapter 4
Building Quality, forms the bulk of the manual. This chapter addresses the control of the building envelope construction process, including control of material quality, equipment calibration and machinery performance, training of personnel, timely delivery of suitable supplies, and the appropriateness of the construction practices with respect to applicable work instructions, trade practices, and regulations. Three areas of inspection and testing are covered, including: Receiving Inspection, which applies to the quality of purchased goods and services; In-Process Inspection, which applies to the work performed on-site by the builder, supplier, or installers; and Final Inspection, which applies to the finished product or completion to a specific stage of the project.

Chapter 5
Completing and Servicing Quality, explains the requirements for the control of quality records, the purpose and use of internal quality audits, the attention that should be given to training of all levels of personnel, and the important aspects of servicing, or the provision of post-commissioning warranties. Also covered in this chapter is the compulsory use of statistical techniques to establish, control, and verify process capability and product characteristics.

Implications for the Housing Industry

Quality does not just happen; it has to be planned. That is why this document, Quality by Design, is so important. It provides the Quality Assurance Protocol necessary to ensure quality in the design and construction of multi-storey wood-frame buildings. Such quality is particularly important in the coastal climate of B.C. due to its wet and temperate climate. And although the protocol is focussed on the exterior of multi-storey wood-frame buildings, its use can be expanded to other building forms as well.

The Quality Assurance Protocol is based on the International Standards Organization ISO 9001: 1994 Quality Standard. Building envelope providers who adopt this protocol will find that future ISO certification will be much easier because their operations are already consistent with ISO requirements.

The protocol is generic in nature. There are many approaches possible to applying this protocol to the activities of a particular individual or company. It is anticipated that each building envelope provider subscribing to the protocol would edit their Quality Manual to incorporate their particular activities and approaches, as well as their own experiences.

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Research Report: Quality by Design: A Quality Assurance Protocol for Wood-Frame Building Envelopes in British Columbia

Research Consultant: Pro Pacific Architecture Limited

A full report on this project is available from the Canadian Housing Information Centre at the address below.

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