

ICC G4-2018

GUIDELINE FOR COMMISSIONING



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ICC G4-2019 Guideline for Commissioning

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Foreword

An important yet underused path to energy savings, reduced greenhouse gas emissions and increased overall building performance is through the commissioning of new buildings and the retro-commissioning and tune-up of existing stock. In recent years commissioning has found its way into voluntary rating systems such as LEED and Green Globes, among others. It has also been included in the *International Energy Conservation Code*® (IECC®), the *International Green Construction Code*® (IgCC®), CALGreen building codes and standards such as ASHRAE 189.1, which is helping to move it into the mainstream of construction practices. ASHRAE has developed Standard 202-2018, *The Commissioning Process for Building and Systems*, and several supporting guidelines to define the process and facilitate its application.

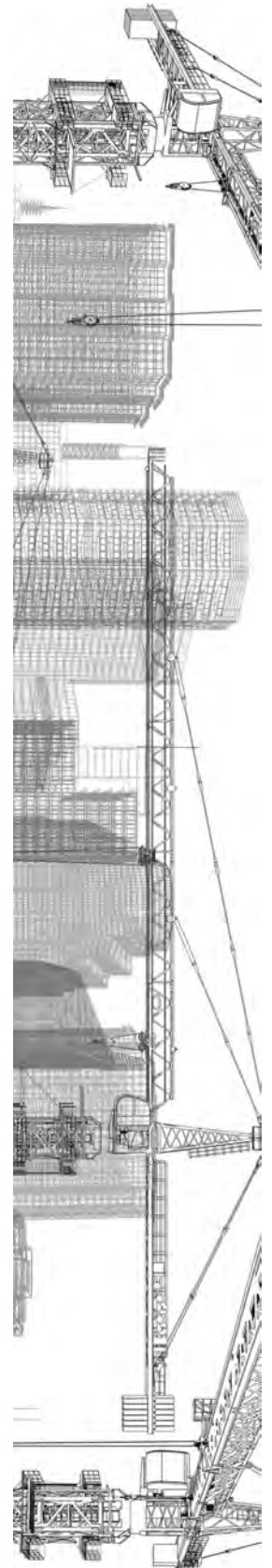
The term “commissioning” comes from ship builders that “commission” their ships to ensure that they are ready for service prior to the ship’s initial voyage and then are routinely inspected or “retro-commissioned” during their service life to maintain their performance. The commissioning of buildings initially focused on energy performance but now includes other building and site considerations such as mechanical, landscaping, acoustics, water use, electrical systems, building enclosures and air quality.

Many code officials have recognized the challenge and expressed concern over the enforcement of building commissioning since most building officials are not familiar with the process, as it has never been part of the building code. Recognizing the need for a national guideline that addresses the application and enforcement aspects of commissioning, the International Code Council (ICC) formed a committee tasked with developing and revising this guideline.

The committee members that developed this guideline were industry experts and professionals from the design, construction, commissioning and enforcement communities. They recognized the importance of developing a guideline focused on the commissioning process as it pertains to enforcement and implementation, and that encompasses the quality program activities needed to improve and maintain building performance levels.

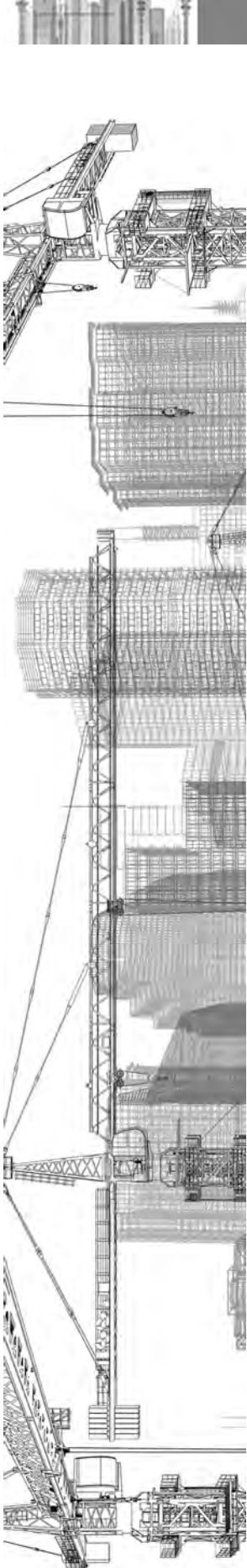
Although it would seem that commissioning would be standard industry practice, in truth, not all buildings and systems are commissioned. Where buildings have been commissioned, the building performance results are impressive. Case studies of large-scale commissioning efforts show positive energy savings and reasonable payback on the investment.

The authors of this guideline provided an extensive diversity of expertise and experience. The guideline was publicly vetted and the committee fully considered the numerous comments to make this a very comprehensive document that will assist the design, construction commissioning and enforcement communities in the successful implementation of building commissioning.



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Preface

Introduction

The principal purpose of the ICC Guideline series is to provide a state-of-the-art volume of knowledge that will contribute to public health, safety and general welfare in the built environment. Guideline projects are established based on market relevancy, demand and the realization that existing technical information, regulations or standards, if any, do not adequately address the subject or that such existing technical information needs to be enhanced, clarified and made more user friendly. ICC Guidelines are in-depth, topic-specific technical publications that have global relevancy and may be used internationally. They are different from codes or standards in that they will generally use nonmandatory language.

Current building commissioning practice does not have a standard for the minimum number of equipment and components within a system that need to be tested. It is left up to the owner and commissioning provider to decide.

Development

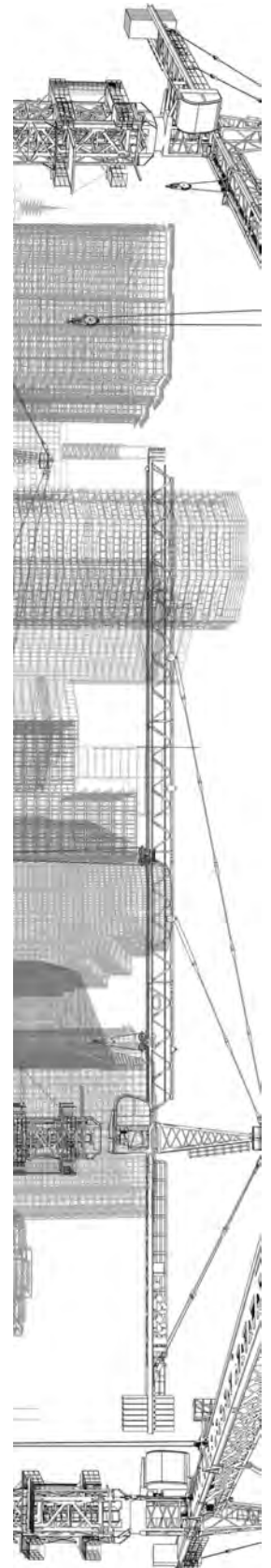
Development of the ICC Guideline series was approved by the ICC Board of Directors in September 2008. ICC Policy GP 33-08 governs the development of ICC Guidelines and can be viewed on the ICC website at www.iccsafe.org. ICC Guidelines are developed with the establishment of a Guideline Development Committee (GDC). The GDC is made up of a diverse stakeholder population and the participants are focused on ensuring high-quality and timely technical information for use in the built environment. Upon the GDC reaching consensus, the final draft is posted for a "Public Comment" period for 30 days. The GDC considers all public comments, revises the public comment draft as appropriate and sends its recommendations to ICC for publication.

Adoption

The Guideline for Commissioning is available for use around the world. Its use within a governmental entity or responsible agency is intended to be accomplished through adoption by reference in accordance with proceedings established by local laws, regulations and procedures. At the time of adoption, provisions requiring specific local information, such as the name of the adopting entity or agency, should be inserted.

To accommodate the standardization of the Guideline for Commissioning into local law, the text passages of the guideline may need to be interpreted in a specific manner. Where definitive procedures are needed, mandatory language will become necessary and the following substitutions, definitions and rules can be applied to conform to definitive procedures with mandatory language.

- The words "may," "should," "could" and "can" are permissive in nature. Where definitive procedures must be followed, the mandatory words of



“must,” “shall” and “will” should be interpreted or substituted for the permissive words found in the guideline as follows:

Permissive Words

may

should

could

⇒

⇒

⇒

Mandatory Words

must

shall

will

- ☑ The use of “and” in a provision means that “all” elements in the provision must be complied with, or must exist to make the provisions applicable.
- ☑ Where compliance with one or more elements suffices, or where existence of one or more elements makes the provision applicable, “or” (rather than “and”) applies.

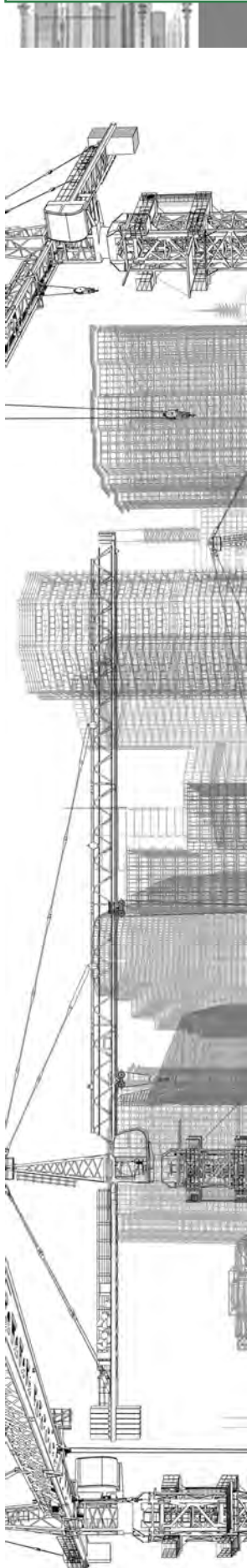
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The data contained in this guideline are being provided for reference purposes only and in no event shall the ICC, or the partners in preparation of this report be liable for any general, consequential, indirect, incidental, exemplary or special damages arising from the use of or reliance upon, in whole or part, the information obtained from this study. This guideline does not intend to overrule national building codes or practices, but to provide a reference for minimum levels of quality to safeguard health, property and public welfare.

This guideline may be adopted and used as a regulatory requirement or standard. If this document is adopted as a mandatory code, all permissive language such as “should” and “may” shall be replaced with mandatory terms such as “shall” and “must.”

Maintenance

ICC Guidelines are not required to be updated on a specific cycle; however, they will be reviewed periodically and may be updated through a GDC-established process as needed based on changing trends, technology or relevant technical information.



About This Guideline

ICC G4-2019 Guideline for Commissioning

This Guideline is an update to the previously published ICC G4-2012 Guideline for Commissioning. It was designed to support the adoption and application of the *International Energy Conservation Code*® (IECC®), the *International Green Construction Code*® (IgCC®) and the ICC 700, as well as regional green building codes such as CALGreen.

As in other codes and standards, neither the IECC nor the IgCC addresses how building commissioning should be verified by the building official, nor do they address the process of commissioning or how it should be performed. The IECC and IgCC specify which systems need to be commissioned as a minimum, usually the energy using systems, and note that additional systems may be commissioned as required by the building official or facility owner.

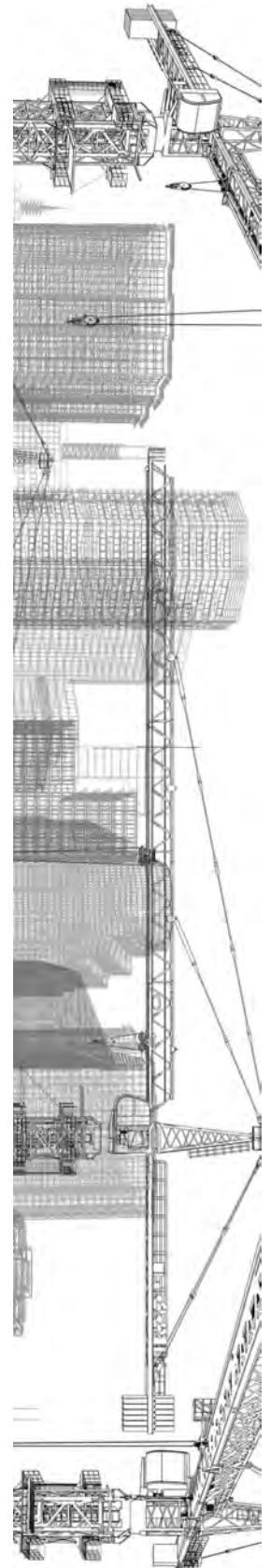
In order for the building official to verify that building commissioning is performed appropriately and by qualified personnel, the authoring committee developed minimum requirements to specify the components that should be examined within each system being commissioned, the forms that should be completed, and the minimum information that must be provided in the commissioning plan, as well as other documents. The committee provided information regarding the qualifications and skills that a commissioning provider should have, but left setting the standards for minimum qualifications to be addressed by the jurisdiction.

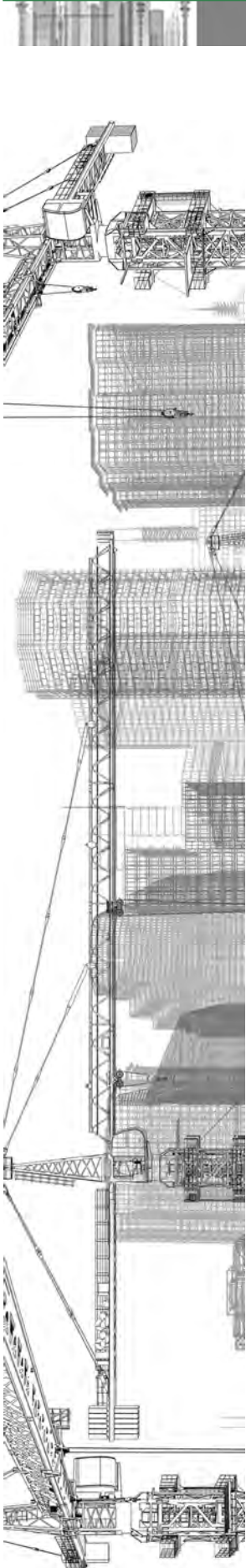
Building commissioning has been practiced for many years, but only recently has it become a code requirement. As a result, it has not been regulated and varies in how it is applied. Additionally, industry practices and codes are moving into areas of commissioning other than HVAC, plumbing and lighting, such as landscape irrigation systems, building enclosures and renewable energy systems. Based on the expansion of building commissioning into other areas, its growing popularity and the desire to make this document suitable for other codes and standards, the committee addressed more areas than required by the IECC and IgCC, such as elevators, power systems and fire suppression systems.

Effective Use of this Guideline

This guideline covers an extensive number of building commissioning activities that may be necessary and included on a project. Every project is unique and the required activities will vary on every project depending on the applicable code, standard, or specific requirement. This Guideline provides recommendations, minimum requirements and best practices based on industry guidance for system commissioning. The use of the Guideline can improve consistency in the implementation and enforcement of building commissioning.

Although building Commissioning (Cx) has conventionally covered mainly HVAC and other energy using systems, this guideline covers more disciplines to aid local jurisdictions that may be adopting codes and standards that require commissioning beyond just HVAC and energy use. Chapter 3 of this guideline provides the framework for the Commissioning process.





Before applying the provisions of this guideline, it is important to identify which code or standard is applicable to the project. The guideline includes requirements and references to the IECC and the IgCC, however, the project may be based on other recognized and approved codes or standards such as ASHRAE 202, ASHRAE 189.1 or CALGreen.

This guideline is divided into five chapters; the following is a chapter-by-chapter synopsis:

- ☑ Chapter 1 provides background information about the guideline's development, purpose and referenced standards.
- ☑ Chapter 2 highlights all acronyms and terms defined in the guideline and lists them in alphabetical order. The guideline often uses terminology that has a unique meaning that may differ from the commonly understood meaning of the term.
- ☑ Chapter 3 describes the processes involved in commissioning and provides information regarding the intent, compliance methods, and enforcement and other pertinent information related to commissioning.

The provisions of Chapter 3 establish the framework for the building commissioning process. These elements include the Owner Project Requirements (OPR) which establish the facility goals and performance criteria desired by the owner; the Basis of Design (BOD), which describes the design team's approach to the OPR; Commissioning Plans; Process Documentation; and Training and Commissioning Reports.

- The OPR becomes the criteria for the design of the building and thus for the Basis of Design (BOD) document. The BOD must incorporate all of the criteria from the OPR.
 - The commissioning plan, which must be prepared to document how the project will be commissioned, must include roles and responsibilities, lists of systems being commissioned with performance criteria, checklists and documentation requirements, and schedules.
 - Documentation of the operational aspects of the building systems being commissioned shall be completed and included within the systems manual.
 - A complete report of commissioning process activities must be undertaken through the design, construction and verification phases.
- ☑ Chapter 4 provides information relating to the process and documentation necessary to meet code required commissioning. This includes the Commissioning Process during design and construction as well as post occupancy. It also includes documentation and compliance checklists.
 - ☑ Chapter 5 contains information on selecting personnel for commissioning of a project. The code official may use this information in determining qualified personnel that are performing code-required commissioning in a jurisdiction.

Appendices provide information for the application of the commissioning process.

- ☑ Appendix A provides information on documentation that should be provided for each instance of a commissioning requirement in an applicable

code or standard. Checklists are also provided to assist in each Commissioning document and phase.

- ☑ Appendices B.1 and B.2 provide informational charts relating to various building types. Each building type usually has unique systems that benefit from commissioning. The lists in the charts can be used to assist the code official on commissioning during the entire project.
- ☑ Appendix C includes sample skills, knowledge and abilities that Commissioning Providers and inspectors should have or be familiar with to facilitate the commissioning process.
- ☑ Appendix D is a summary of the requirements for or references to the commissioning process in the International Codes® (I-Codes®).
- ☑ Appendix E provides a list of additional standards and organizational resources available for commissioning.

About the International Code Council®

The International Code Council is a member-focused association. It is dedicated to developing model codes and standards used in the design, build, and compliance process to construct safe, sustainable, affordable, and resilient structures.

Most US communities and many global markets choose the I-Codes. ICC Evaluation Service (ICC-ES) is the industry leader in performing technical evaluations for code compliance fostering safe and sustainable design and construction.

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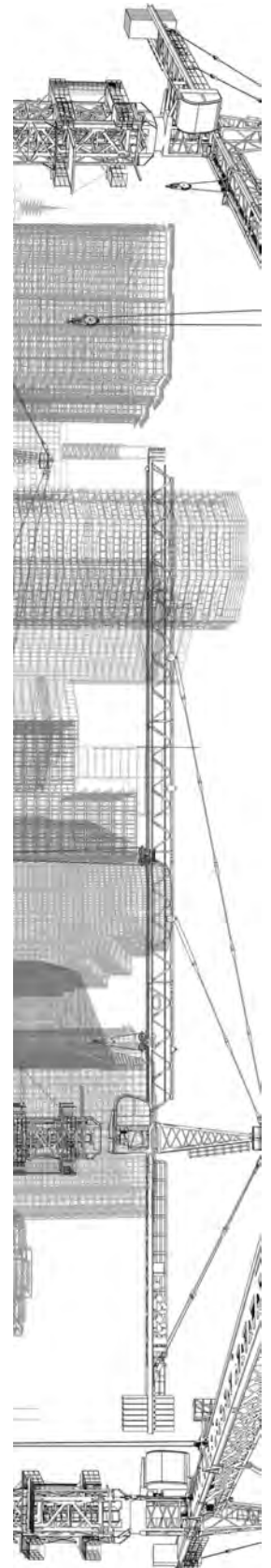
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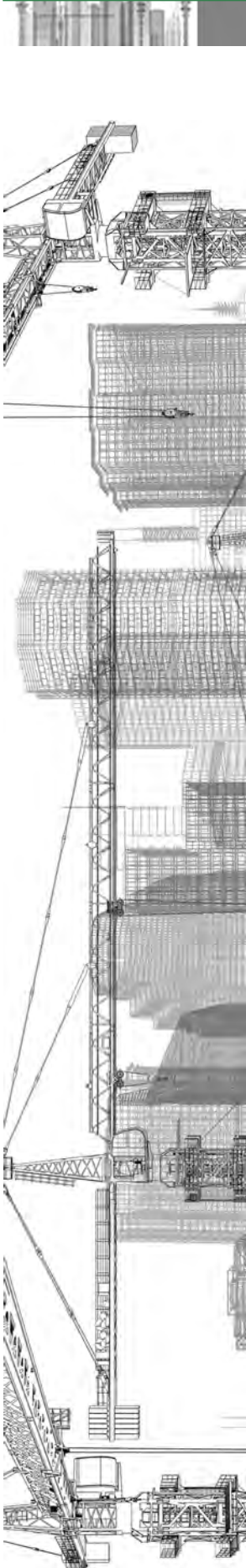
ICC G1-2010 Guideline for Replicable Buildings

ICC G2-2010 Guideline for Acoustics

ICC G3-2011 Global Guideline for Practical Public Toilet Design

ICC G5-2019 Guideline for the Safe Use of ISO Intermodal Shipping Containers Repurposed as Buildings and Building Components





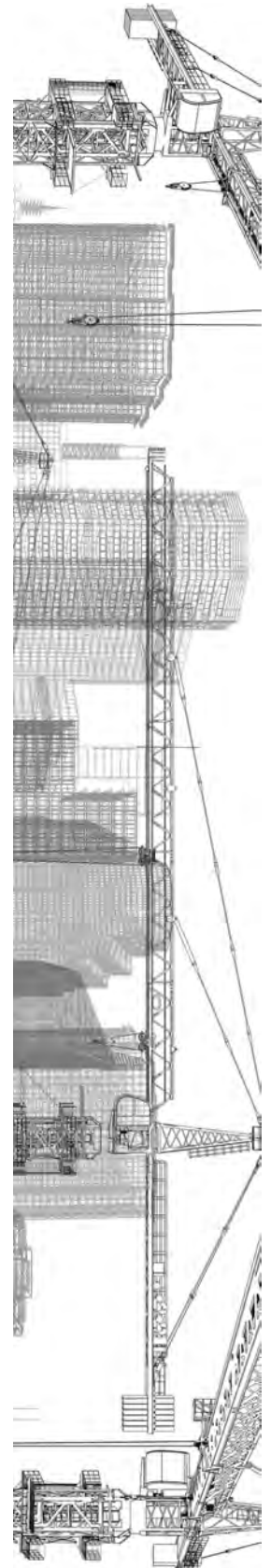
DEVELOPMENT COMMITTEE

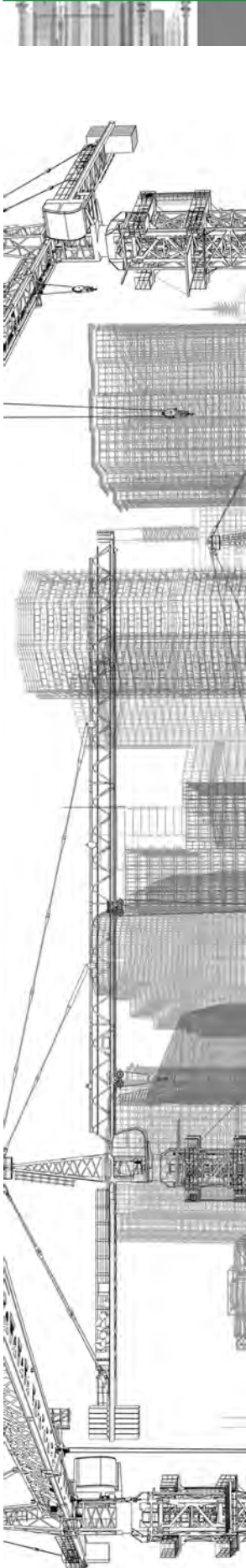
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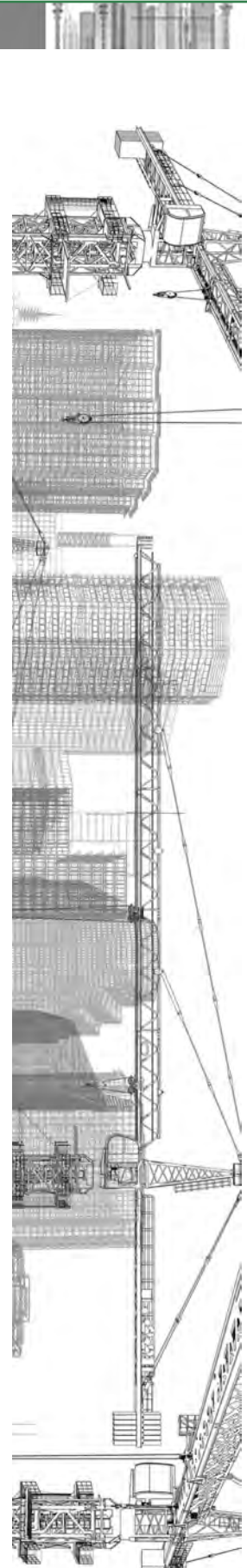
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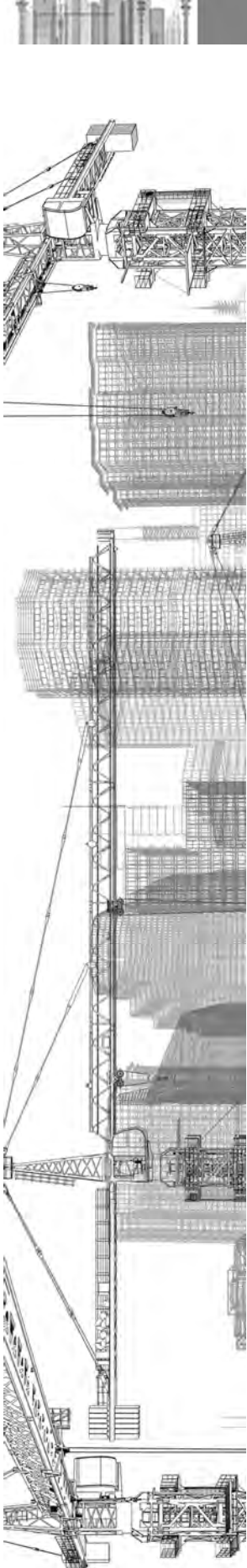




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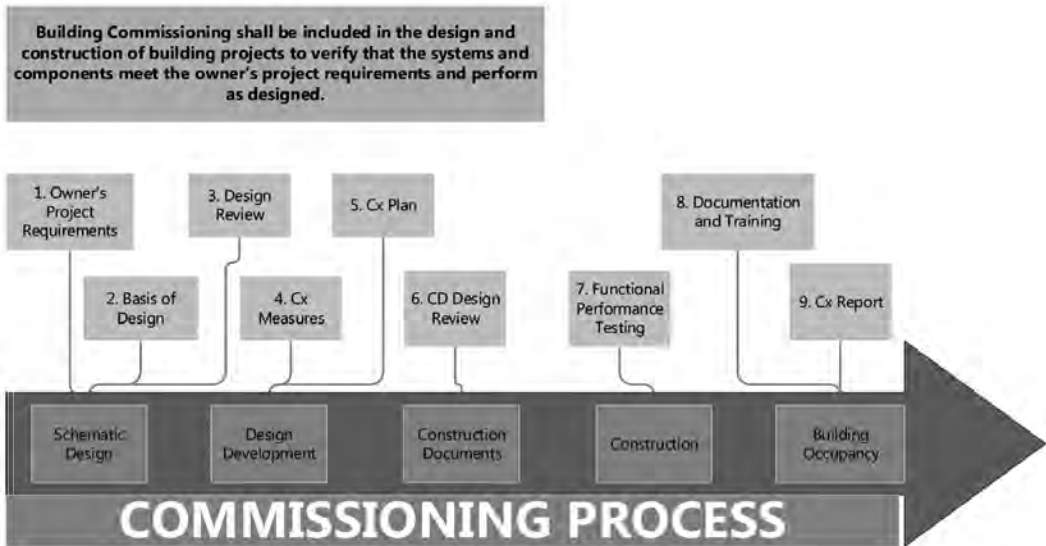
Chapter 1

Introduction



1.1 Guideline Purpose and Scope

The purpose and scope of this document are to guide officials and regulators toward understanding and effectively enforcing application of the commissioning process application on new construction projects, either with in-house staff or the use of a third party agency. It is not intended to specify what the various aspects of the commissioning process are; rather it deals with the issues related to the above goals and criteria (to accept, implement, enforce and document the commissioning provisions established in codes to accepted national commissioning standards). This guideline can also be used by entities utilizing the commissioning process for complying with code requirements or developing owners' project requirements and project documentation. This guideline is not a code and, therefore, is not written in enforceable language. However, this document could be adopted in whole or in part by the authority having jurisdiction (AHJ) and utilized by other entities. In writing this document, an effort was made to make this document as comprehensive as possible, so that it can be used in conjunction with codes and standards that require or include commissioning.



In most codes and building standards, the document does not address how building commissioning should be verified by the building official or AHJ, nor does it address the process of commissioning, it simply specifies which systems need to be commissioned. The enforcement and verification is usually determined by the local AHJ.

In order to facilitate the building official's or enforcement agency's verification that building commissioning is performed appropriately and by qualified personnel, this guideline provides process recommendations to specify the components that must be examined within each system being commissioned, the forms that should be completed, and the information that must be provided in the commissioning plans and reports, as well as other documents. This guideline also provides recommendations on the minimum qualifications, knowledge, equipment and skills that commissioning providers should have.