

Using the Commissioning Process Guidelines: ASHRAE/NIBS Guideline 0-2005 and Supporting Guidelines HVAC&R 1-200X and Exterior Envelopes 3-2005

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Synopsis

This is an introduction to using the new ASHRAE/NIBS Guideline 0-2005: *The Commissioning Process*. In addition, a brief overview of the role of the *Guidelines for Technical Support of the Commissioning Process* is included. Two guidelines are relatively complete and are included in this paper. These are: Guideline 1-200X, *HVAC&R Technical Requirements for the Commissioning Process* and Guideline 3-2005, *Exterior Envelope Technical Requirements for the Commissioning Process*.

About the Authors

Dr. Charles E. Dorgan has been involved in professional education and applied research at the University of Wisconsin – Madison since 1971. Since 1976 he has been active in consulting practice with several architectural and engineering firms. He has been a leader in energy efficiency and cost effective designs and education. His leadership includes: energy management, thermal cool storage, cold air distribution, commissioning process and sustainable design. Dr. Dorgan has worked on international projects in ten countries. He has been involved in implementing the formal commissioning process through practice, education, and development of guidelines since 1984. He has received many honors and awards in recognition of his contribution to advancing engineering, science, quality, productivity, and management, including the Sadi Carnot and Benner Awards for his contributions to society and business/industry/construction. He is an ASHRAE Fellow, ASHRAE Exceptional Service award, and current chair of ASHRAE GPC 0P and GPC 1-1996R.

Introduction

The Commissioning Process Guidelines have been developed to provide consensus information on a quality process for delivery of constructed projects; this includes: commissioning of new buildings and facilities, rehab and additions, as well as retrocommissioning existing facilities. . In 1998, ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) formed a new project committee, GPC 1-1996R to develop an updated commissioning guideline. This has evolved into two ASHRAE guidelines, Guideline 0-2005, “*The Commissioning Process*” and Guideline 1-200X, “*HVAC&R Technical Requirements for The Commissioning*”. Guideline 0-2005 is essentially the same as NIBS(National Institute of Building Sciences) Guideline 0-2005 “*The Total Building Commissioning Process*”. ASHRAE and NIBS have continued to provide the leadership in formulating the commissioning process for the building industry. NIBS will have the key role in expanding the commissioning process to all building assemblies and systems.

NIBS Guideline Series

There is a list of NIBS technical supporting guidelines that will be developed by the working groups within various organizations that are members of the NIBS Commissioning Process Guideline Committee. Each guideline will be coordinated through a working Commissioning Process Committee, sponsored and chaired by the National Institute of Building Sciences and currently chaired by Earle Kennett. These guidelines will be developed using the format developed and included in Annex A of Guideline 0-2005. The current working list of guidelines is as follows:

- Guideline 1 - ASHRAE, HVAC&R System
- Guideline 2 - ASCE, Structural Systems
- Guideline 3 – BETEC, Exterior Envelope Systems
- Guideline 4 – NRCA, Roofing Systems
- Guideline 5 – AWCI, Interior Systems
- Guideline 6 – NEII, Elevator Systems
- Guideline 7 – ASPE, Plumbing Systems
- Guideline 8 – IES, Lighting Systems
- Guideline 9 – IEEE, Electrical Systems
- Guideline 10 – NFPA, Fire Protection Systems
- Guideline 11 – TIA, Telecommunications Systems

Although all of these organizations initially and unofficially agreed to develop a guideline for their area of expertise and practice, they are not all actively working on a technical guideline for the commissioning process. It is expected that, in addition to these topics, additional guidelines will be developed. These include: technical guidelines that will focus on energy, indoor air quality, sustainable design, systems manuals, training, pavements, landscaping, and other special topics that are of interest to owners. It is anticipated that there may be several ‘commissioning’ guidelines developed by organizations that do not following the structure of Annex A of Guideline 0-2005. How these will fit into the overall picture is uncertain. However, all of them should have value as informative resources to owners, designers, contractors, and commissioning providers in the delivery of constructed projects and retro-commissioning of existing buildings.

From the above list, only Guideline 3-2005 is near completion and ready for publication. This guideline includes all exterior envelope components and may include the requirements of Guideline 4, roofing systems in the list above.

Guideline 0-2005, “The Commissioning Process”

Guideline 0-2005 provides guidance for implementing the commissioning process to improve the success and quality of a construction project or new building. It can be applied to all of the systems and assemblies or selected systems and assemblies. Such as: fire and life safety, landscaping, roofing systems, HVAC, electrical distribution and emergency power, controls, and communications systems. Further, the commissioning process can be used for rehab and retro-commissioning of existing buildings and facilities. The approach of the current series of commissioning process guidelines is to have a single guideline on the application of the commissioning process (Guideline 0-2005). This is supplemented with specific technical guidelines (like 3-2005, *Exterior Envelope Technical Requirements for the Commissioning Process*) that are developed by experts related to specific building assembly and system. This provides the maximum information for owners, designers, and commissioning process professionals and providers to maximize the benefits of implementing the commissioning process.

The Forward, Purpose, and Title of the Guideline 0-2005 includes the following descriptions (abbreviated version):

“The Commissioning Process is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria.

The Commissioning Process assumes that owners, programmers, designers, contractors, and operations and maintenance entities are fully accountable for the quality of their work. The Commissioning Team uses methods and tools to verify that the project is achieving the Owner’s Project Requirements throughout the delivery of the project. For example, the contractor is responsible for fully constructing, testing, and ensuring that its employees’ work has provided the level of quality expected. The Commissioning Authority then randomly samples the contractor’s work to verify that it is achieving the Owner’s Project Requirements. If systemic issues are identified, then the contractor is expected to recheck all of his/her work and correct any deficiencies. This quality-oriented process is different than when the Commissioning Authority does 100% checking or non-quality-based sampling. Guideline 0-2005 has been developed to present an approach based on these assumptions.

The Commissioning Process begins at project inception (during the Pre-Design Phase) and continues for the life of the facility (through the Occupancy and Operations Phase). Because this Guideline details a process, it can be applied to both new and renovation projects. The Commissioning Process includes specific tasks to be conducted during each phase in order to verify that design, construction, and training meet the Owner’s Project Requirements. This Guideline describes the overall Commissioning Process in order to provide a uniform, integrated, and consistent approach for delivering and operating facilities that meet an owner’s on-going requirements.

The Commissioning Process is a quality-based method that is adopted by an Owner to achieve successful construction projects. -----

The use of a common content organization and the focus upon specific information achieves a

closely coordinated set of documents that can be used together or in any combination to accommodate varying owner requirements. This Commissioning Process guideline allows the technical commissioning guidelines to avoid repeating information on the commissioning process, making them more concise and focused relative to their technical requirements.

The fundamental objectives of the Commissioning Process are to:

- (a) Clearly document Owner's Project Requirements;*
- (b) Provide documentation and tools to improve the quality of deliverables;*
- (c) Verify and document that systems and assemblies perform according to the Owner's Project Requirements;*
- (d) Verify that adequate and accurate system and assembly documentation is provided to the owner;*
- (e) Verify that operation and maintenance personnel and occupants are properly trained;*
- (f) Provide a uniform and effective process for delivery of construction projects;*
- (g) Deliver buildings and construction projects that meet the owner's needs, at the time of completion;*
- (h) Utilize quality-based sampling techniques to detect systemic problems, as such sampling provides high value, efficient verification, accurate results, and reduced project costs; and,*
- (i) Verify proper coordination among systems and assemblies, and among all contractors, sub-contractors, vendors, and manufacturers of furnished equipment and assemblies. -----*

Emphasis is placed on documentation of the Owner's Project Requirements at the inception of the project and the proper transfer of this information from one party to the next. Owners adopt the Commissioning Process to achieve their stated objectives and criteria—starting with the inception of a project instead of after a facility is occupied.

While circumstances may require owners to adopt the Commissioning Process during the Design or Construction Phase of a project, such later implementation must capture the information that would have been developed had the Commissioning Process begun at project inception. Beginning the Commissioning Process at project inception will achieve the maximum benefits.

Annexes have been included to assist in further understanding the Commissioning Process and to aid in the development of the technical guidelines. -----

The Commissioning Process has been structured to coincide with the phases of a generic project with Pre-Design, Design, Construction, and Occupancy and Operations phases. This Guideline describes the Commissioning Process; the responsibilities of Commissioning Team participants; the role of the Commissioning Authority; and a model framework for developing a Commissioning Plan, specifications, and reports. This Guideline also describes the general requirements for a training program for continued successful system and assembly performance. Documentation necessary to meet the Guideline requirements is also described.

Sections in the guideline include information on Utilization, Definitions, Pre-Design, Design, Construction, and Occupancy/Operations. In addition, there are fifteen annexes to assist in the successful implementation of the commissioning process. Annex A is a guide for developing uniform technical support guidelines. There are an additional nine supporting annexes for the technical guidelines.

Uniform Numbering of Sections and Annexes

The NIBS format is to have the same topic addressed in the same numbered section and annex. This will make it easy to cross-reference a specific topic. The goal is to have the following numbering systems for each guideline:

Foreword

Sections

1. Purpose
2. Scope
3. Utilization
4. Definitions
5. Pre-Design
6. Design
7. Construction
8. Occupancy and Operations

In addition, the sub-sections will be the same within all phase sections. For example, for Section 5, this will be:

- 5.1 Pre-Design Phase Commissioning Process Objectives
- 5.2 Pre-Design Phase Commissioning Process Activities
- 5.3 Pre-Design Phase Acceptance Requirements
- 5.4 Pre-Design Phase Documentation
- 5.5 Pre-Design Phase Training Identification Requirements

This same format will be followed by sections 6 - Design, 7 - Construction, and 8 - Occupancy and Operations. Therefore, section X.5 can be referred to in all phases and the supporting technical guidelines can be referenced to find the requirements for Training.

A uniform format for the Annexes has also been developed. The current specified Annexes are:

Annex A – Guide for Developing Supplementary Technical Guidelines for the Commissioning Process (used only in Guideline 0)

Annex B – Commissioning Process Flowchart (normally used only in Guideline 0)

Annex C – Cost and Benefits of the Commissioning Process (typically only in Guideline 0)

Annex D – Commissioning Process Documentation Matrix (typically only in Guideline n)

Annex E – Commissioning Process Request for Qualifications (typically only in Guideline 0)

Annex F – Roles and Responsibilities

Annex G – Commissioning Plan

Annex H – Acceptance Plan

Annex I – Owner’s Project Requirements Workshop Guidance

Annex J – Owner’s Project Requirements

Annex K – Basis of Design

Annex L – Specifications

Annex M – Construction Checklists

Annex N – Quality-Based Sampling Examples

Annex O – Systems Manual

Annex P – Training Manual and Training Needs

Annexes Q through X – In addition to the annexes (above) that are included in Guideline 0-2005, *The Commissioning Process*, all supplemental technical guidelines should include the following annexes with specific technical topic guidance or requirements, as appropriate. It is the intent to have all technical guidelines use the same reference letter for each topic. That is, all examples of Checklists would always be included in Annex M. The technical Commissioning

Process guidelines should include annexes that provide examples and guidance on the following topics or should include notes such as “Not used” or “This annex is intentionally left blank,” or “There is no supplemental information required.”):

Annex Q – Publications, Articles, References, Codes, Regulations, and Standards

Annex R – Integration Requirements

Annex S – Interference and Coordination with Other Systems and Assemblies

Annex T – Communications: What, When, and Who

Annex U – Test Procedures and Data Forms

Annex V – Pre-Design Phase Commissioning Process Specific Needs

Annex W – Design Phase Commissioning Process Specific Needs

Annex X – Construction Phase Commissioning Process Specific Needs

Annex Y – Occupancy & Operations Phase Commissioning Process Specific Needs

Annex Z (and, if needed, Annex AA and beyond) can be used as required for other topics that are determined to be useful for a specific assembly or system.

Guideline 1-200X and 3-2005

There are two technical supporting guidelines that are nearing completion. Guideline **3-2005** is expected to be published in the summer of 2005. These guidelines will provide a wealth of information on specific topics. The Guideline 3-2005 committee has assembled extremely valuable information on what is required for a successful exterior envelope.

How to Use the CxP Guidelines

One of the primary values of the commissioning process guidelines is to provide a format for implementing the commissioning process in a somewhat uniform manner. However, the greatest value they provide is in helping owners to understand what is meant by the terms ‘commissioning’ and ‘the commissioning process’. In Guideline 0-2005 the definition of commissioning and commissioning process is the same. In addition to providing information on the process from inception to occupancy, the supporting guidelines provide a wealth of information on needs and problems associated with specific building assemblies and systems. It is recommended that these guidelines provide the requirements and basis of the integration of the commissioning process into owner’s construction delivery methods. The commissioning process in Guideline 0-2005 can be used for re-commissioning or retro commissioning of existing buildings and facilities. The process has been developed to enhance and bring some uniformity to applying commissioning to existing facilities, including retro commissioning activities. There are many times more existing buildings than newly constructed buildings. The commissioning process provides a means to enhance the value of existing facilities, as well as to improve newly constructed, rehabilitated, or renovated structures.

The information in the commissioning process guidelines is not something to be read once in order to glean information and a fresh understanding. They are a reference to be continuously used to improve the commissioning process on new and existing construction projects.

The guidelines are useful for implementing the commissioning process for a specific owner. However, an owner should not just order, “Use Guideline 0-2005 for the commissioning of my project.” Owners need to use the guidelines as just that, *guidelines*. In all cases, the guidelines need to be modified to meet the specific needs of the owner. This may vary from project to project and between new and existing construction.

Another value of the guidelines is to provide a starting resource that can be expanded upon by owners, design teams, commissioning providers, and building service and trades professionals. For example, an owner may add specific requirements for training at all phases. The guidelines are formatted so that the details will always be in section X.5. This is much better than just to be provided with guidance on training needs. With the commissioning process there is information (if any is required) about what needs to be considered and on the steps taken during all phases. With the current non-commissioning process the owner may state that they want appropriate training. However, with the commissioning process we will eventually have the initial guidance on what should be done at every phase. For example, during pre-design: there will be a training-needs development workshop, with specific questions to ask (i.e., what are training needs for the professional occupants of the hospital?) to insure that fire and life safety training is defined and included in design considerations. This may not only lead to including the specific requirements in the specifications or scope to the contractor, but may also lead to directions for the design team. For example: this may lead them to consider alternatives that meet fire and life safety with reduced knowledge and training of professional occupants in mind.

Summary

The commissioning process guideline has been developed by a committee sponsored by ASHRAE, with coordination of N.I.B.S. This committee has made an effort to capture the essential body of current best practice. It allows guidelines that are orientated towards meeting owner's project requirements and having a process to transfer project knowledge from pre-design through one or more years of operations using a commissioning team lead by a commissioning authority to the occupants and the operations and maintenance team. N.I.B.S. is developing a series of technical supporting guidelines aimed at developing an industrial set of commissioning process guidelines. These can be used by owners, designers, and commissioning providers to improve the quality of constructed projects and buildings. All the guidelines provide valuable information for all stakeholders involved in the delivery of constructed projects. If nothing else, they are a condensed resource of important information and guidance on how to improve the quality of construction and meet the expectations and needs of owners, occupants, and users of buildings and facilities.