

HVAC SYSTEMS COMMISSIONING MANUAL



ANSI/SMACNA 014-2013



**SHEET METAL AND AIR CONDITIONING CONTRACTORS'
NATIONAL ASSOCIATION, INC.**
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SECOND EDITION 2013



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4201 Lafayette Center Drive

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4201 Lafayette Center Drive
Chantilly, VA 20151-1219

Printed in the U.S.A.

FIRST EDITION 1994
SECOND EDITION - 2013

ISBN 978-1-61721-097-6 Print
ISBN 978-1-61721-099-0 PDF

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FOREWORD

Commissioning includes the final act of verifying compliance with project specifications and the owner's project requirements. The term commissioning has evolved to represent a total quality management process in the construction trades. It includes demonstrating and verifying system and subsystem operational performance and is a detailed testing and documentation of building systems and components. Finally, it is the foundation of and includes training provided to facility managers to be used by building management throughout the operational life of the building. While commissioning can be applied to all components of a structure, this manual only focuses on the HVAC systems and the parties responsible for the proper design, installation, verification, operation, and maintenance of these systems.

HVAC systems are typically the most energy intensive systems in a building. HVAC systems can be the source of indoor air quality (IAQ) problems or the vehicle to the solution of those problems. Poorly designed, improperly installed, or inadequately maintained HVAC systems can cause high operating costs, occupant discomfort, affecting the long term financial viability of a building. The purpose of this manual is to introduce the commissioning process and to provide all stakeholders an understanding of the skills and expertise required to apply the concepts to the most critical element in most buildings—the HVAC system. Contractors who understand the process will be in position to offer this service to building owners and designers. Owners who understand the value commissioning adds to their building will demand it be an integral part of the construction process.

The original group tasked with developing the first edition of this standard, the SMACNA Building Services Committee, decided to introduce the commissioning process as a multi-level concept applicable to projects large and small, simple and complex. The current task force agreed with multi-level concept which is continued in this edition. The manual treats the subject in sufficient detail to provide a professionally run organization, with a commitment to the total quality management process, the tools to direct the activities of a commissioning team. The concept of commissioning an existing building which is sometimes called re-commissioning or retro-commissioning is covered in this standard. The commissioning process can be utilized in renovation and retrofit projects as well as part of an ongoing building maintenance program for any building.

New to this edition is a chapter on LEED® projects. As the United States Green Building Council is evolving and changing its system for rating buildings it is important that all parties involved in these types of projects be familiar with the changing requirements. LEEDv3 (2009) is the basis for the chapter on LEED® commissioning requirements.

The manual includes sample specifications and sample commissioning reports. Also included are samples of commissioning checklists for a wide variety of HVAC systems and components. Although these checklists are comprehensive, they are intended as guidelines to develop forms specific for the building or components being commissioned. Since each building and its systems are unique, forms used in the commissioning process are customized for the equipment and systems involved and to reflect the requirements of the commissioning authority.

This manual will be updated in the future as industry needs change and evolve. Continuing efforts will be made to provide the industry with the latest methods and engineering data from recognized sources, supplemented by SMACNA research, the services of local SMACNA chapters, and the growing experience base of SMACNA contractors.

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CHAPTER 1

PURPOSE AND SCOPE

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1.1 DEFINITION

Commissioning may be defined as: “the process of advancing systems from a state of static physical completion to a state of full, demonstrated, and documented working order, according to the owner’s project requirements and the design requirements, during which time the owner’s operating staff are instructed in correct systems operation and maintenance.”

In order to carry out the full commissioning process, it is necessary to plan and document it. Planning should begin as early as possible to ensure the owner’s project requirements are understood and suitable quality assurance strategies are utilized. The results of the quality assurance process should be documented to provide an auditable record of the process.

1.2 PURPOSE

Since the publication of the first edition of this manual, the use of the commissioning process in the building construction industry has grown dramatically. Many organizations have made building commissioning “business as usual” on each construction project. Building commissioning has been recognized as a critical process in the design, construction, and operation of a sustainable or “green” building. While the commissioning process has been expanded to apply to other systems, e.g., fire alarm, security, electrical, building envelope, the primary focus of building commissioning remains on heating, ventilating, and air conditioning (HVAC) systems. First, HVAC systems are among the most complex and interconnected of building service systems. Second, considerable energy is consumed in HVAC systems. Inefficient operation increases operating cost. Third, HVAC systems must be designed properly, then installed, operated, maintained, and serviced correctly, if both comfort and indoor air quality are to be attained and maintained.

The primary purpose of this manual is to provide guidance to contractors on how an effective HVAC systems commissioning process should be planned and carried out. A second purpose is to provide a clear explanation of the reasons for commissioning to make it understandable for a broad cross section of the industry. Contractors who understand commissioning are in a position to sell its use to owners, designers, and others.

Another purpose of the manual is to provide guidance on commissioning HVAC systems in existing buildings. Any existing building with poor temperature

control, dissatisfied occupants, excessive energy or maintenance costs, or other evidence of improper design or operation is a candidate for commissioning. Because there are many existing buildings with these characteristics, and owners often contact contractors directly for remedial work on them, provision of commissioning services for these buildings is a potentially important field for knowledgeable contractors.

This manual covers commissioning during the construction phase of a project in considerable detail. It puts particular emphasis on the commissioning agent, the commissioning authority, the commissioning plan, communication and coordination during construction, and commissioning documentation. This is to give the clearest possible guidance to contractors and others whose involvement is primarily during the construction phase of a project. In some cases, the contractor has the opportunity to join the process prior to the completion of design. When this occurs the contractor is able to contribute ideas and suggestions regarding quality and constructability during the design or pre-design phases. Understanding the commissioning process enables the contractor to engage more effectively early on.

This manual does not provide material specific to any particular building. The material within is intended to cover the entire commissioning process, providing not only organizational and procedural steps, but also the rationale behind them. This assists users of the manual to adapt the information to the successful commissioning of any type of building project.

1.3 SCOPE

The *HVAC Systems Commissioning Manual* is intended to cover the full range of HVAC equipment and systems typically found in commercial and institutional buildings.

The level of commissioning varies to suit the specific requirements of each project as determined by the owner.

The manual describes in detail the commissioning process for three different levels of commissioning. The manual provides guidance on the use and application of the commissioning process in the green building rating systems developed by the U.S. Green Building Council (USGBC). In addition, as an aid to users, it provides examples of delivery receipt, prestart checklists, and functional performance test checklists for many types of equipment and systems. These include:

