

Construction Industry Misconceptions on Building Enclosure Commissioning



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Building enclosure commissioning (BECx) has been deemed additional work and added cost by many general contractors. Unfortunately, many haven't had the opportunity to work with a Building Envelope Commissioning Process Provider (BECxP) who was brought in at the right time, for the right reasons, and by the right party. Commissioning has received some resistance in our industry as most contractors see it as an additional process that requires them to fill out forms, attend more meetings, submit and resubmit submittals, and the list goes on and on. There is a misapprehension that commissioning is only about reducing the owner's risks and comes with a high price tag—not only to the owner, but also to the design team and the contractors. This comes from a misunderstanding of the commissioning process, the scope of commissioning, and when a commissioning provider should actually be brought onto the team. Many BECxP professionals are equally frustrated with what should be a very beneficial and smooth process. They share the anxiety the rest of the design team, the general contractor, and enclosure trades feel when the process is not implemented as designed. Owners who hire commissioning professionals may not even fully understand this process and may only see these services as an insurance of sorts. These perceptions

have been plaguing the construction industry for the last couple of decades and have given commissioning a bad name, despite a measurable improvement in performance outcomes on projects where commissioning (Cx) and BECx were successfully integrated into the project delivery process.

To general contractors and installers, BECx providers seem to wear the proverbial black hat more than they wear the white hat. Sadly, this perception is an incorrect depiction of what commissioning should bring to a project. This skewed judgment of commissioning is part of the reason why contractors are skeptical of the process, which can truly be an enhanced part of their quality assurance and quality control program. All contractors have experienced the costs of not commissioning: The “we have always done it this way” attitude and overemphasis on schedule at the expense of craftsmanship and quality often result in call-backs and rework that go straight to the bottom line, reducing margins and depleting contingency funds. A BECxP can be a general contractor's saving grace when it comes to finishing a project on schedule, within budget, and with minimal rework and call-backs. This only occurs if the process is followed and the commissioner is doing (or allowed to do) his or her job as the collaborator among all members of the design and construction team.

The problem is not simply a “contractor

resistance” problem. The problem with commissioning lies with the general understanding of the process and procedures that should be a benefit to all parties. When done as intended, commissioning can be a quality-oriented process throughout the design phase, from design inception, to schematic design, design development, construction documents, as well as pre-construction, construction, and through post-construction as shown in *Figure 1*.

Before we can have a sensible discussion about the BECx process, it is important to understand the history and rationale behind standards development. Over the past several decades, it is generally understood that a rapid increase in the advancement of building enclosure technology and the liability associated with failure of a building has led to a compartmentalization of the design profession. This trend is arguably reflected on the cover sheet of a typical set of construction documents. In the past, the cover sheet produced by an architect would typically contain references to a very small range of consultants, usually limited to the structural and M/E/P practice areas and disciplines. Today, a cover sheet often includes a myriad of consultants, many of whom are directly engaged through some level of delegated design¹ to participate in or otherwise be responsible for the design of the building enclosure. This trend, together with an insufficient level of formal education



Figure 1 – BECxP process.

When its program is developed and implemented, IIBEC will be the only place a professional can become ISO 17024 certified in BECx.

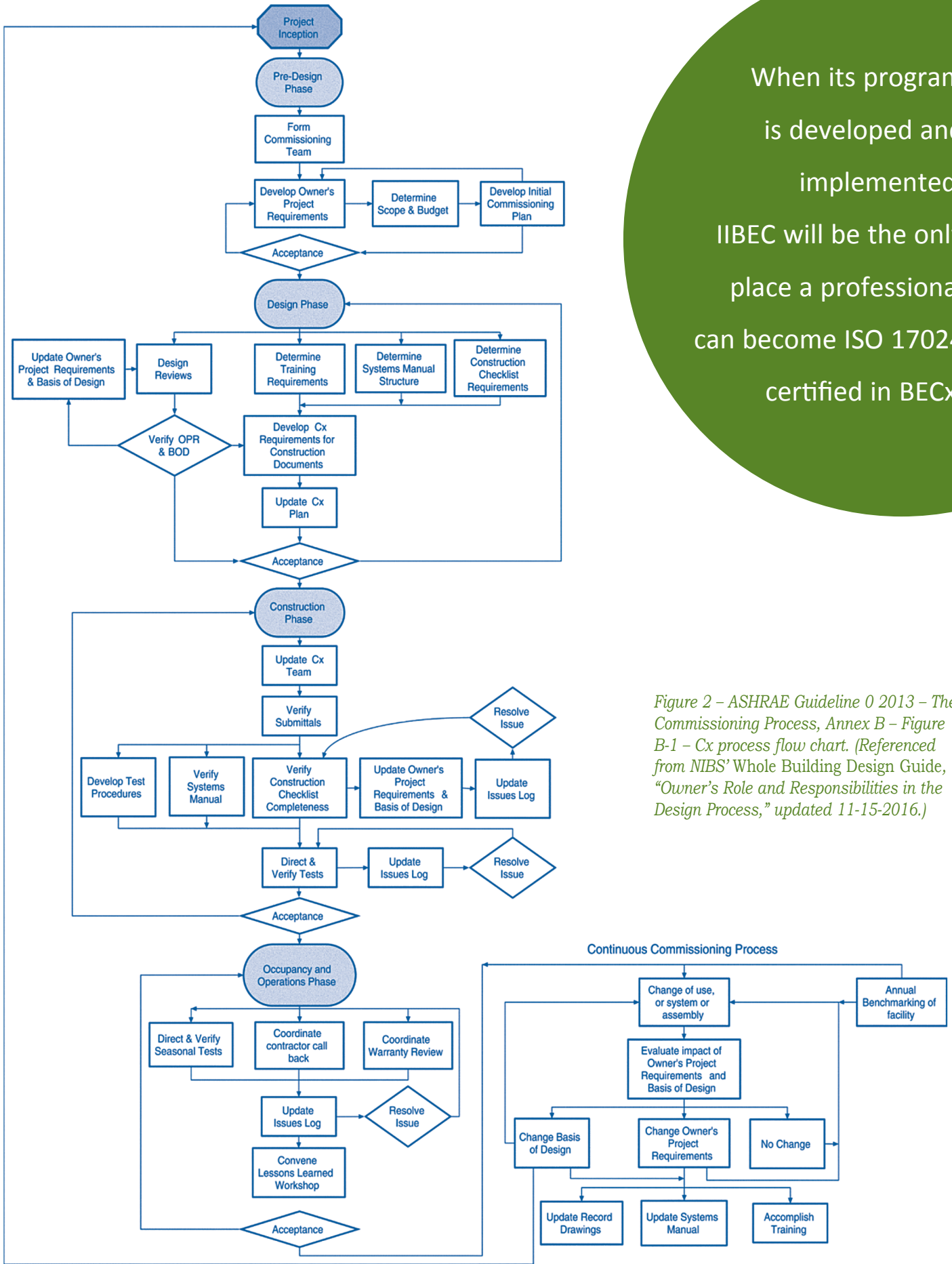


Figure 2 – ASHRAE Guideline 0 2013 – The Commissioning Process, Annex B – Figure B-1 – Cx process flow chart. (Referenced from NIBS' Whole Building Design Guide, "Owner's Role and Responsibilities in the Design Process," updated 11-15-2016.)

and training of architects in building science and the physics of building enclosure performance,² and a parallel decline in the skill levels available from the construction trades,³ combined to create a “perfect storm” of sorts that resulted in buildings that failed to meet even the most basic expectation of an owner of his or her design and construction team: to provide shelter from the environment.

This misalignment of expectations and corresponding demand for the delivery of environmentally conscious, energy-efficient, higher-performing buildings led directly to a call from the marketplace for enforceable guidelines and standards meant to reassure owners and investors in real estate in the near-term until more generational changes could be realized in the education and training of the next generation of design and construction professionals. This is the genesis of BECx standards development and the foundation on which training-based certificate and fully accredited personnel certification programs will be built.

There are currently only two published documents that fully describe and provide guidance for the BECx process: ASTM E2813, *Standard Practice for Building Enclosure Commissioning*, and its companion document, ASTM E2947, *Standard Guide for Building Enclosure Commissioning*. As a Standard Practice, ASTM E2813 was developed in response to the demand in the marketplace for higher-performing buildings and the need for a document that would provide mandatory minimum enforceable levels of building enclosure performance, as well as an outline of the core competencies required of the BECx service provider. As a Standard Guide, ASTM E2947 replaced NIBS Guideline 3 in 2014 and provides guidance to the owner/developer and his/her design and construction team regarding the appropriate development of an owner’s project requirements (PR) and best practices for the successful delivery of the BECx process.

Today, both standards remain the first and only BECx standards developed and published entirely through an independent, consensus-based standards development process and have been selected alongside ASHRAE Standard 202 and the still-developing BECx standard to be balloted and published by the International Standards Organization (ISO) to form the basis of the first fully accredited International Building Enclosure Commissioning Personnel Certification Program. Together, these documents are

the only recognized and enforceable standards available to the marketplace that are reviewed, updated, and maintained on an annual basis. These two standards are scheduled for direct reference in USGBC LEED v4.1 for new construction and will form the basis for both of the BECx Training-Based Certificate Programs currently under development.

After several years of discussion among members of ASTM International, the National Institute of Building Sciences (NIBS), the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), the International Code Council (ICC), and stakeholders from across the real estate development, property management, design, construction, legal, and insurance professions, the International Institute of Building Enclosure Consultants (IIBEC)—formerly RCI, Inc.—has stepped forward to lead the relaunch of this program, which will be developed and maintained in full compliance with the requirements of ISO/IEC 17024. Laverne Dalgleish of Building Professionals has been contracted by IIBEC to organize and coordinate this effort, while ASTM, ASHRAE, and similarly aligned organizations—both public and private—are providing the subject matter experts necessary to develop the technical content that will underpin and sustain this program.

One misconception regarding ASTM E2813 is that the guidance provided in that document for performance testing requires that all of the tests listed in that standard are mandatory to achieve either the “Fundamental” or “Enhanced” levels of BECx outlined in the standard. Nothing could be further from the truth. The intention is that the design team, working in close collaboration with the owner/developer and BECx provider, must first establish the operational project requirements (OPR) for a project, after which the appropriate range of mandatory minimum pre-construction laboratory and/or field tests can then be selected from the list provided in ASTM E2813, with additional guidance available in ASTM E2947.

Using this approach, an appropriate and enforceable level of BECx can be developed and adapted to suit the performance requirements unique to each project and provide the owner/developer and the project team with the added level of quantifiable reassurance they need to achieve, rather than hope, for an environmentally conscious, energy-efficient, high-performance building enclosure. The return on this investment is



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clear and increasingly evident in the performance metrics now being gathered for buildings designed and built with the benefit of an appropriately developed and successfully integrated Cx and BECx process.⁴

As defined in ASTM E2947, BECx is “architecture or engineering-related technical services or both, performed on behalf of the owner that implements a quality-focused process for enhancing the delivery of a project by focusing on validation during the design phase and verifying during the construction phase that the performance of building enclosure materials, components, assemblies, and systems are designed and installed to meet the owner’s project requirements.”

ASHRAE Guideline 0, *The Commissioning Process*, provides a sample flow chart for best practices on how to implement commissioning as shown in *Figure 2*. In this process, the commissioning team is formed following the pre-design phase. The flow-chart shows the collaboration between the owner, design team, and the commissioning provider. It also shows what task should be completed as part of the construction process. During the construction phase, test procedures, construction checklists, and

issue logs are created. These tasks affect the contractors directly and present a challenge if the contractor is not familiar with these tasks and expectations.

ANSI/ASHRAE/IES Standard 202, *Commissioning Process for Buildings and Systems*, states “The commissioning process is a quality-focused process for enhancing the delivery of a project. The process focuses upon evaluating and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner’s project requirements.” It is very clear that the ultimate goal of commissioning is to construct buildings to meet the project requirements established by the owner. The commissioner’s scope of work is to be involved throughout this process. Both the standard and the guidelines give BECxP professionals standard procedures and protocols to be followed, but it does not clearly guide or educate the design team, the construction team, or even the owner as to what their part and involvement is in the commissioning process. These guidelines and standards speak more to the process and expectations of the team member pro-

viding the commissioning services.

The owners know that they want a building that meets their project requirements, and most architects realize that the commissioner is yet another resource to the design team, but where does this leave the contractor? The process of commissioning is not typically taught to contractors or even the system installers of the buildings we are constructing. This creates somewhat of a disconnect for the contractor and an unclear understanding of what commissioning can do for them.

Before we jump into the benefits of commissioning, we have to look at the “why” of commissioning. Commissioning is intended to define the project expectations; focus on quality assurance, quality control, and verification of system performance; and provide the owner with training and maintenance guidance. This seems pretty similar to what the design team and contractor provide, right? In essence it is very close. The commissioning process is intended to complement both of these team players by enhancing the quality and reliability of the design and construction of buildings. To do this, the commissioner works hand

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in hand with the design and construction team. The difference is that a commissioner is able to focus on the building enclosure assembly and environmental dividers, and brings a knowledge base that is founded in building science and scientific performance, analysis, and testing. With the vast number of products offered and the multitude of assemblies available to the design team and contractors, this is a critical piece of the puzzle. The building enclosure commissioner can offer specialized knowledge about the six-sided cube that is the building enclosure, the environmental separators within the structure, and how it relates and performs within the parameters of the mechanical system.

So, what does all of this mean? In simple terms, the BECx process focuses on product selection, the generation of details that minimize air and water leaks, and it ensures the building is energy efficient, durable, and meets the owner's anticipated service life of the building. The process is designed to prove that the systems work as intended by design and reduces overall risks for all parties. The main focuses are durability, sustainability, and the service life of systems and components that are used to make a building. This sounds like a great idea, so why isn't our industry embracing this process?

The problem is that true commissioning is rarely done, and this has created a stigma that commissioning is not what it's cut out to be. We often forget the collaboration that must occur and the team effort that is required to construct a building from inception to completion. I dare say that very few projects actually undergo the holistic BECx process as it was designed and intended to be conducted. The nirvana of BECx is not typically achieved. Our industry has chosen to do what I call "enhanced building enclosure consulting," or even "quasi-building enclosure commissioning," and tried to label it as BECx. This creates a broken and divided industry full of skepticism and typically results in lost faith in the benefit the process can bring to projects. Not all projects need commissioning, but with the construction industry pushing the envelope on schedules, design, and performance, commissioning should be implemented.

Let's face it, buildings these days leak! I suspect more new buildings leak than not. Owners and contractors battle these leaks for months and even years after the building is substantially complete and the owner takes the keys. Because contractors are

often faced with challenging or otherwise unrealistic deadlines, weather conditions, and product lead times—not to mention the numerous new products available and specified—they have a greater chance of failing than succeeding. Many of these products may not have been installed and used in the past by the "bid winner." Not only are contractors dealing with deadlines, but now they are dealing with installations and details that are unfamiliar to them, with unfamiliar construction sequencing that wreaks havoc on their schedules and deadlines. Many of these products are so new that even the design team does not know or clearly understand how to terminate or transition them, leaving it up to the contractors to "figure it out" to the best of their knowledge.

Did I mention the contractor is the "winning" bidder here? Often, in my opinion, the "winning" bidder is taking on an uphill battle that results in their designing solutions in the field. Wait, contractors are designing? Yes, many are left to provide transition details that most manufacturers do not touch as they do not want to assume the "risk" or liability, thereby introducing the "by-others" nonexistent persona. This has brought many contractors to hire building enclosure consultants to assist them and to minimize their risks.

This is not to suggest that architects and designers are not doing their job. But the system is broken. Most of the time, owners are selecting the lowest fees for professional services. The architect is selected for a percentage of the budgeted project amount. So, the lower the percentage, the less the owner pays for that service. The problem is that the owner fails to see that architects' fees generally don't vary much from firm to firm. What they don't realize is that the design package is what is minimized, not the fee the architect receives. Architects allow for a certain number of hours to provide a set of construction documents as a deliverable. The less the owner pays, the less that package contains. The result is "thin" specification manuals and construction drawings that do not possess sufficient detailing. I like to call these "permit drawings" rather than bidding/construction documents. This reality is why commissioning has become an enticing option for owners. We could argue that the owner could pay the design professionals more so that the documents would be more complete; however, architects are still limited to what they can specialize in.



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Larger firms are afforded the opportunity to have a staff member who is well versed and educated in building enclosures, but most smaller architectural firms are challenged with a lack of building enclosure resources at their disposal.

These facts are why commissioning is so critical to the design and construction process. Looking at the construction industry without commissioning, we typically see construction that results in unsatisfied owners who are handed leaky buildings that do not perform as expected. The design team is typ-

ically challenged with numerous requests for information (RFIs), supplemental instructions (SIs), change orders, and submittal packages that are not project-specific. Finally, a contractor is left with challenges in the field that typically end up costing them profits in call-backs, rework, and construction insurance claims. The disconnect between the design and construction teams is more real than most would like to admit—often resulting in forensic investigations, costly litigations, and construction insurance claims.

This brings us back to why contractors

are not buying into commissioning. Why are they so skeptical of the value and advantage of the process—a process that could be so beneficial to them and could lower their risks? Simply because it is different, and it is a change that they do not understand. We could offer contractors the best design, we could hire the best subcontractors, and the owner may even hire a BECxP, but if we do not educate the whole construction team (contractors and design professionals) on this process, we are setting them up to fail, and I propose that we are even cutting into their profits. Education and empowerment of our construction companies and the trades who are tasked to deliver leak-free, energy-efficient, and sustainable buildings are the keys to success. We should consider that lack of the commissioning process and/or education of the process is why most construction teams are struggling with delivering leak-free, efficient, and sustainable buildings.

So, how can we fix this somewhat broken industry? I propose that commissioning be considered at the inception of the project by the owner and design team selected. If it is deemed that the project would benefit from commissioning, the owner, designer, and commissioning professional must select construction contractors who understand the process and procedures.

Unfortunately, we have a commissioning process that is not being implemented as designed, and even when it is implemented as designed, the contractors do not understand the process. Well-educated contractors who have quality control and quality assurance programs still do not fully understand the benefits of the BECx process. As an industry we need to bring education to our contractors and building enclosure trades. If they are given a clear understanding as to why commissioning can be a benefit to them, contractors will embrace the commissioning process.

As noted previously, NIBS and ASTM are currently working together to develop education and training focused on BECx. The University of Wisconsin also offers BECx education and a certificate program. But when its program is developed and implemented, IIBEC will be the only place a professional can become ISO 17024 certified in BECx. The framework for that effort—which is subject to further refinement and change as subject matter experts begin to gather to develop this program, is outlined in *Figure 3* and is anticipated to include the develop-



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After several years of discussion among members of ASTM International, the National Institute of Building Sciences (NIBS), the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), the International Code Council (ICC), and stakeholders from across the real estate development, property management, design, construction, legal, and insurance professions, the International Institute of Building Enclosure Consultants (IIBEC)—formerly RCI, Inc.—has stepped forward to lead the relaunch of this program.

ment of ISO-accredited personnel certification for each of the following:

- Certified Building Enclosure Commissioning Provider (CBECxP)
- Certified Building Enclosure Commissioning Technologist (CBECxT)

Also under consideration is a Certified Building Enclosure Commissioning Specialist (CBECxS)—an endeavor to be implemented down the road. But currently, IIBEC, NIBS, and ASTM remain focused on development of the CBECxP and CBECxT. The curricula developed for both the training-based certificate and personnel certification programs will be a reflection of the core competencies outlined in ASTM E2813, with the individuals outlined above supported by a team of building enclosure experts as appropriate to respond effectively to building enclosure material selection, integration, and performance requirements that are unique to each project. The position titles referenced here are referenced in

and further described by ASTM E2947 and, together, are collectively referred to in that standard as the BECx “Group” (BECxG).

As an industry, we must join forces and collaborate to bring education to the construction teams who are building owners’ visions. By giving them this education, we can empower them to be successful in the construction of our future structures. 

Special acknowledgement to Daniel J. Lemieux, AIA, NCARB for his role in providing a comprehensive contribution in regard to the historical background on ASTM E2813, *Standard Practice for Building Enclosure Commissioning*, and its companion document, ASTM E2947, *Standard Guide for Building Enclosure Commissioning*, included in this article. His contribution, review, and support on this subject are greatly valued.

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- ANSI/ASHRAE/IES Standard 202, *Commissioning Process for Buildings and Systems*, Foreword.
- ASHRAE Guideline 0 – The Commissioning Process, Annex B.
- ASTM E2813, *Standard Practice for Building Enclosure Commissioning*.
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- “NIBS, ASTM International, and RCI Issue Joint Statement; Agree to Avoid Duplicating Building Enclosure Commissioning Efforts.” RCI Newsfeed. July 2018. <https://rci-online.org/nibs-astm-international-rci-issue-joint-statement/>.
- NIBS Guideline 3 – 2012.
- NIBS WBDG “Owner’s Role and Responsibilities in the Commissioning Process.” The WBDG Project Management Committee. Updated: 11-15-2016, <https://www.wbdg.org/building-commissioning/owners-role-and-responsibilities-commissioning-process>.

FOOTNOTES

1. Delegated design legal definition: §3.2.2. Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract



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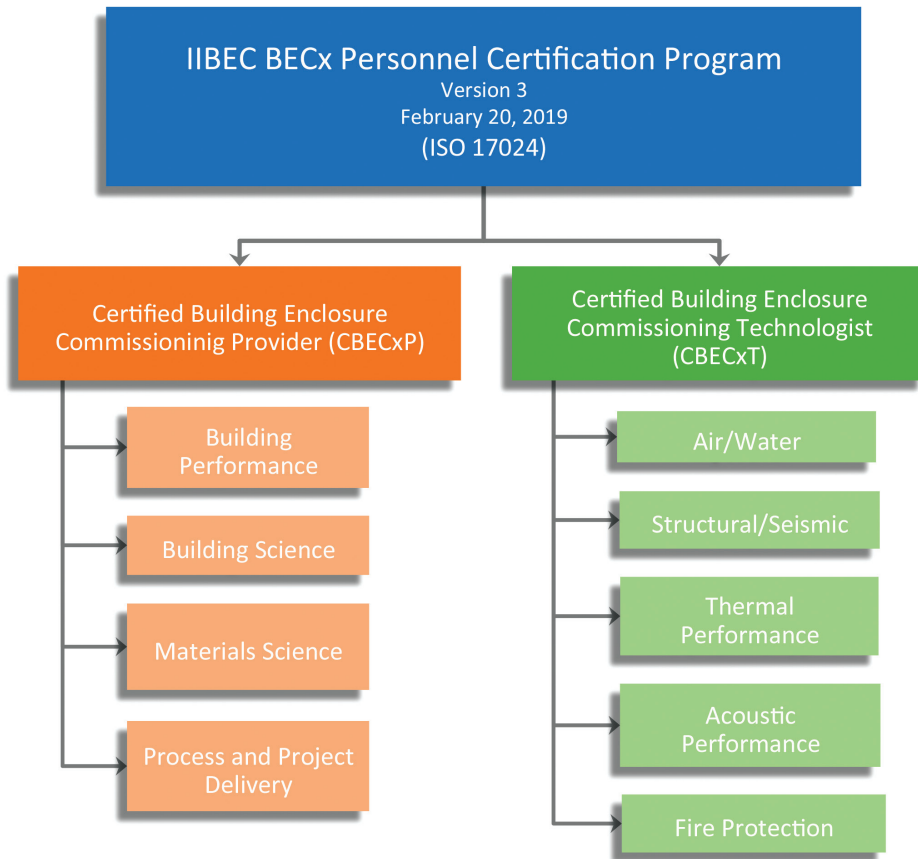


Figure 3 – IIBEC (formerly RCI) Certified Building Enclosure Commissioning Personnel Chart, Version 3, February 20, 2019. This chart depicts the ISO-accredited personnel certification designations of the CBECxP and CBECxT and the knowledge base exams that each personnel designation will be required to successfully pass as part of the accreditation process.

Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omission discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. A201-2017, General Conditions of the

Contract for Construction (electronic). Available at: www.aiacontracts.org/contract-documents/25131-general-conditions-of-the-contract-for-construction.

2. "In 1970s, an academic discipline of Building Physics was firmly established in Central and Northern Europe. Born as the academic discipline, for many years, the Europeans attempted to separate the industrial know-how from the academic knowledge. It was quite opposite to North America, where (until recently) little or no building physics has been taught at the Universities and the progress in construction achieved by consultants was mainly based on the know-how. In Canada, for years, N.B. Hutcheon tried to introduce building science (physics) to the schools. In his 1973 lecture he said: But the mere existence of building science is not enough. It must be put to use throughout the building industry wherever technical deci-

sions are made about building. It must be introduced appropriately into the education and training of all who are in a position to use it." Mark Bomberg. (2012). *Building Science or Building Physics*. *Frontiers of Architectural Research*, December 2012, p. 422.

3. "Eighty Percent of Contractors Report Difficulty Finding Qualified Craft Workers to Hire as Association Calls for Measure to Rebuild Workforce." *AGC News*, Associated General Contractors of America, 29 August 2018. www.agc.org/news/2018/08/29/eighty-percent-contractors-report-difficulty-finding-qualified-craft-workers-hire.
4. "Benefit of Commissioning for GSA Buildings – Industry sources indicate that on average, the operating costs of a commissioned building ranges from 8% to 20% below that of a non-commissioned building." U.S. General Service Administration Public Building Service "The Building Commissioning Guide." Available at: www.gsa.gov/real-estate/design-construction/commissioning/commissioning-program.



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Payne is a board member of the Southwest Missouri Construction Specification Institute (SWMO CSI) and chair of the Ozarks Regional Chapter of the Building Enclosure Council. She is a member of the ISO/TC 163, Thermal Performance and Energy Use in the Built Environment committee. She maintains certificates from the University of Maryland as an accredited Building Enclosure Commissioning Process Provider and a Commissioning Authority + Building Enclosure specialist (BECxP and CxA+BE). Payne is on IIBEC's Building Enclosure Commissioning Certification Committee.