

Commissioning: Impact on IEQ

A Guide for Owners and Occupants

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What types of commissioning exist?

Types of Commissioning

- Commissioning (Cx) for new buildings (ASHRAE Standard 202-2024 and supporting Guidelines)
- Existing Building Commissioning (EBCx) (ASHRAE Standard 230-2022 and supporting Guidelines)
- Monitoring Based Commissioning (MBCx)
- Ongoing Commissioning (Ocx)

What is Commissioning? (Per "The Strategic Guide to Commissioning")

Building Commissioning is a process, defined as "a quality-focused process for enhancing the delivery of a new and existing building project. The overall process focuses upon verifying 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 (OPR) of a new building and/or major renovation, and the Current Facility Requirements (CFR) of an existing building."



Who leads the process?

Who should lead and execute the commissioning process (Cx) for your facility or systems?

- Commissioning Provider (CxP) is the term adopted by ASHRAE to identify those who lead the process. ASHRAE's certificate is for the Building Commissioning Professional (BCxP)
 - Please note, that there are other certifications from other entities that designate a CxP
- Please note the term Cx Authority and Cx Agent are used in the industry that are equivalent to Cx Provider.
 - ASHRAE's reasons for not using Authority or Agent is that misnomer that the CxP has authority to direct or change work by the construction team. They are there to identify issues and work to the resolution with the Engineer of Record (responsible with the local authority having jurisdiction (AHJ) for the design meeting code) and the Owner to end with systems that are operating as intended.





What isn't commissioning?

What should not be considered Commissioning?

 Testing, Adjusting, Balancing (TAB) – while important to the equipment's operation and ability to provide quality IEQ, TAB is a separate service provided by certified individuals and companies

 $_{\odot}\,$ Refer to NEBB or AABC for more information on the TAB Process and role

- Equipment Start-up while important to have manufacturer's trained personnel to start-up major equipment (e.g., chiller, boiler, generator), start-up is part of the construction and getting the systems ready to operate. It is recommended that the CxP witness major equipment, it should not be considered as Cx.
- Construction Indoor Air Quality Measures or IAQ Management Plan while these help with overall IAQ for duct cleanliness and general condition of the spaces this scope falls to the contractor in charge of the site and is not a Cx activity.



Commissioning HVAC Systems

HVAC System Performance

- Commissioning verifies that HVAC systems are properly designed, installed, and operating. This includes the following key items:
 - o System ability to maintain space comfort conditions (temperature, relative humidity, dewpoint)
 - System provides design outdoor air via the code ventilation rates in all modes of operation that include constant outside air, demand-controlled ventilation, building pressure control, and economizer that impact the quantity of outdoor air introduced to the spaces.
 - \circ System filtration meets the design intent and is no less than code levels.
 - System is not creating objectional noise in the spaces via air noise
 - Hiss at a diffuser or air outlet
 - Rumble via motor sounds through the wall or duct
 - Water noise via higher than anticipated velocities of water (think of hearing the shower water or toilet refill through the wall in a home)
 - Change in noise via equipment turning on and off, such as the fan in fan powered terminal unit that changes the ambient noise level in the space.
 - System is able to have proper controls with some potential adjustments by the occupants for comfort.
- System should be operating efficiently, but the system energy consumption goal should not impact IEQ!



Commissioning Lighting Systems

Lighting Systems

- Commissioning ensures that lighting systems are installed and controlled correctly. This includes the following key items:
 - Adequate illumination levels on the work surface to align with IES levels per the tasks happening in the spaces.
 - Minimizing glare, which impacts occupant comfort and productivity.
 - Adequate and appropriately located control points for the lighting systems.
 - Occupancy and Vacancy sensor locations can impact the lighting levels in the space and negatively impact productivity if the sensor is not properly located.
 - Control points are important for open office spaces, especially if connected to occupancy sensors.
- System should be operating efficiently, but the system energy consumption goal should not impact IEQ!





Building Enclosure Commissioning (BECx)

Building Enclosure Commissioning (BECx)

- Commissioning the enclosure assists the contractors in creating a very tight building that helps keep the outside "out" of the building unless brought in via outside air in HVAC systems. This includes the following key items:
 - Potential Blower Door Testing for the building to achieve a low infiltration rate for the building.
 - Roof Testing that checks the roof seems, uplift, and water leakage issues with the roof. This helps keep the water outside of the building that can create IEQ issues over time.
 - Window or glazing testing that is to keep rain from entering the building in areas that could create biological growth and impact the IEQ.
- Enclosure should be built to achieve the intended goals for infiltration (leakage of the building) and to keep water from entering the building.



Commissioning Acoustics and Vibration

Acoustic and Vibration Performance

- Commissioning can help identify and address issues related to noise levels and acoustics. This includes the following key items:
 - HVAC equipment generating noise as well as unwanted vibration levels
 - Powered equipment on the roof or adjacent to occupied spaces that are not isolated properly (e.g., air-cooled chiller on a roof)
 - Electrical equipment noise and vibration
 - Powered equipment on the roof or adjacent to occupied spaces that are not isolated properly (e.g., emergency generators)
 - \circ Lighting fixture noise
 - Waterflow in pipe noise (including rainwater leaders)
- The Cx Process should be checking the noise and vibration levels to achieve IEQ





Issue Resolution Process

- Commissioning helps identify potential issues and corrective measures for building systems.
 - For new construction, this should be found early in the process and allow for timely corrective actions and preventing costly repairs or occupant discomfort.
 - CxP shall maintain an issues log that captures the issue, images of the items, and then include the Typically, resolution to the issue.
 - CxP shall use levels for the issues for the team to know the status. Typically, this includes the following:
 - Open
 - Pending (meaning the contractors believe it has been corrected with the corrective measures noted)
 - Closed (meaning the CxP or Owner has confirmed the correction)
 - ✤ Retired (this could be the Owner accepting a change in system operating intent).
 - For existing buildings, this should be reported on with the following items:
 - Issue observed description to provide enough detail for the facility staff to understand the issue
 - Suggested corrective action, that indicates at a high level what should be fixed or adjusted, and any justification as to why other actions were not recommended
 - Financial impact of the correction that includes the first cost, potential energy or soft-cost savings, and payback.

Maintenance and Operation

- Commissioning helps identify potential issues for ease of maintenance and thereby the capabilities of the operating systems.
 - Buildings whose equipment and systems that are not maintained are more likely to go into disrepair, impacting the systems ability to provide proper IEQ. The following are typical items observed:
 - Space temperature or relative humidity cannot be maintained
 - Outside air is reduced and even at times closed off due to energy concerns or not making space RH
 - Cooling equipment is not able to create the designed tonnage, impacting the systems ability to dehumidify or condition the air.
 - Exhaust fans are turned off and spaces that should be exhausted are now recirculated throughout the entire building
 - Building pressure can become negative which creates an increased opportunity for biological growth in the building for hot and humid climates
 - The Cx Systems Manual should indicate the proper maintenance and control end device recalibration schedule.
 - Control devices lose calibration and therefor impact the ability of the HVAC system to operate as intended and the IEQ it can create in the spaces.
 - Studies have shown that even properly maintained buildings can have their performance decline within 3 to 5 years, which is why re-commissioning or retro-commissioning is recommended at that interval.

For more resources related to this guide, visit the <u>Commissioning</u> topic page within <u>IEQ Resources</u> on ASHRAE.org.

