

TC 7.9 – Commissioning Draft Meeting Minutes

2024 ASHRAE Winter Conference in Chicago
IN Person & Virtual main committee Meeting – January 22, 2024
By Lixia Wu, Ph.D., CEM

Introductory Committee Business – Main Meeting

- Call to Order at 2:35pm Dave Shipley
 -
- Voting Member Role Call Dave Shipley
 - 7 of 11 here see list below
 - ❖ David Shipley – Y
 - ❖ Michael Amstadt - Y
 - ❖ Lixia Wu - Y
 - ❖ Ted Leonard - Y
 - ❖ Soph Davenberry - Y
 - ❖ Michael Sulva – Y
 - ❖ Larry Ollice - Y
 - ❖ Thomas VandeWeerd
 - ❖ Tommaso Dallavalle (Member non Quorum)
 - ❖ Mina Agarabi
 - ❖ Charlie Shieh

- Quorum Determination Dave Shipley
 - Quorum met 7/11
- Review / Approval of Prior Meeting Minutes Dave Shipley
 - Soph Motioned, Larry Seconded, 5-0-0-5 motion passed, chair not voting
- Notes from TC Chair’s Breakfast Dave Shipley
 - Speaker on Building Decarbonization Task Force
 - i. Lixia: Commentary on TFBD updates – a copy provided to the TC
 - Dave’s notes from Chair’s breakfast are included as an attachment
 - 124/170 proposed programs/papers were included in the final schedule
 - i. Lee R: Question why program subcommittee chairs are not given information presented to the TC chairs
 - Upcoming Roster Update Training
 - i. Roster to be updated between Winter 2024 and Summer 2024 meetings
 - ii. Discussion on Secretary to VC to Chair pipeline
 - Government Affairs Department – Productive conversation
 - ASHRAE Strategic Plan
 - i. Separate from research plan
 - ii. Slide deck available if needed
- Correspondence & Committee. Activity since last Meeting Dave Shipley

- JR Anderson Scholarship Award presented to Praside Dharmasena, a graduate student at U of Cincinnati
- Society Liaison Communications as available
 - Satheesh Kulankara – TC Section Head
 - Fill out activity form & TC Survey form ASAP
 - Website & Webmaster – request to keep up to date

Subcommittee Reports

- **Programs** Soph/Michael
 - Sponsors for MEP Commissioning Process
 - Cosponsor for Building Operations Under the New Normal of Reduced Occupancy
 - Cosponsor for O&M Program on 1/23 Get Name
 - Proposals are open now for Summer Conference, Abstracts Due 2/26
<https://www.ashrae.org/conferences/2024-annual-conference-indianapolis/2024-annual-conference-technical-program>
 - Lee R. appreciated support for the program at the Tampa conference

- **Handbook subcommittees** Ted Leonard
 - Deadline for submitting: upcoming deadline for submission
 - 2023 revision: what's the purpose of the document, SSPC300
 - 40+ referred to handbook subcommittees. They need to be reached out to for any changes.
 - Need more experts to join besides Ted and Charles
 - Comments from Li: continue to reference SSPC 300 library and documents; Ted's response: adopt the one or direct members to the right document
 - On-going maintenance
 - Could be a brief version, instead of full version or constant update. The goal is to make sure it's one comprehensive guide to direct people to where the Cx content is needed.

- **Membership** Tom Cappellin
 - PCM: 61
 - CM: 175
 - VM: 10 members plus 1 member non-quorum
 - 2 non-voting members working on sub-committees
 - Total members: 249, 28 YEA
 - Anyone else can apply to be PCM on ASHRAE website → Technical Resources → Technical Committees → Apply for Membership
 - Stay for two years
 - After 2 years, invitation from chair to become committee member or eventually voting member

- Standards and Mike
 - Pull minutes from Basecamp

- David Shipley
 - Pull minutes from Basecamp
 - Draft RTAR, accepted with comments, Dave looking for assistance with work statement
 - Topic: Evaluation of Std. 207 (FDD System effectiveness)
 - Likely Sponsored by TC 7.5, co-sponsored by TC 7.9
 - Still in RTAR stage, TC7.5 revised it to respond to RAC comments but no further comments received from RAC yet (Lixia checked with TC7.5 and updated)
 - If anyone is interested in other topics, let Dave know. Examples for good RTAR statements should be available if needed.
 - ASHRAE Strategic Plan Research Initiatives: Dave looking to find research options that fit within the 6 Initiatives
 - Larry: Considering an RTAR on the amount of time a building is considered “commissioned” after occupancy and if it makes the case for monitoring-based commissioning or ongoing commissioning
 - Jim: Suggestion to look for prior research indicating no major long-term

- Handbook (Applications Ch 42) David Lewis and Ted Leonard
 - 2023 chapter approved after Toronto meeting
 - 1-week turnaround for final proof reading
 - Next chapter 2026 applications, due May 2025 – open for updates/recommendations

- Standards & Special Publications Michael Sulva/ Walter Grondzik
 - No new updates
 - Title 24 proposing to introduce Cx requirements for all buildings

- Web Site Mohammad Nasir Mallick
 - Dave: Reach out to Mohammad for anything that should be included on the Website

- Journal and Insights David Sinclair
 - No current Journal articles, let David Sinclair know if there are suggestions for journal entries

- Honors and Awards Thomas VandeWeerd
 - None to report

Cognizant Committee Liaison Reports

- ALI Commissioning - related courses Walter Grondzik
 - Walter doing ALI course

- SSPC 300 activities Michael Sulva
 - All guidelines and standards in various stages of updates and approvals
 - Discussion on developing guideline of enclosure commissioning, working to collect information from other organizations at this time
 - Common annexes are available on SSPC 300 website

- Cx industry activities (outside of ASHRAE) Jerry Kettler

- Certifications: Putting together qualifications on certifications
 - ACG/BCA Certifications
 - Requirements are being revised
 - IIBEC developing BECxP
 - NIBS Whole Building Design Guide(WBDG)
 - Cx requirements have been revised over last year
 - 3 sections increased to 8 sections
- See industry activities sent by Jerry on 2/2, available on Basecamp
- Certifications
 - ACG/BCA Certifications
 - Requirements are being revised
 - IIBEC developing BECxP
 - NIBS Whole Building Design Guide
 - Cx requirements have been revised over last year
- Overall Cx requirements have increased (IECC, IgCC, local AHJs, etc.)
- Energy conservation codes: published every 3 years 2015/2018/2021/2024; coordination between IEEC with standard 202; ASHRAE standard 9.1 has a Cx section but not detailed; ISECC 2021 version is the latest update; ICC is publishing a new G4 guideline for building commissioning. ICC is expected to put together a training program. Existing buildings also have a requirement. NYC/DC/San Francisco requires BEPS with a reference to ASHRAE standard 211.
- SSPC has a subcommittee of guideline 1.7P on on-going Cx.
- GL 13 – Building Specifications – Eventually will be an ISO document

Other Liaison Reports- Please provide reports before meeting

- SPC 90.1 Energy Eff. Des of New Bldgs. Justin Garner
 - Discussed during the SSPC300 morning meeting, addressing some concerns between SSPC 300 & 90.1 in terms of verifying performance.
- SPC 90.4 Energy Eff. For Data Centers Gwenn Ivester
 - TC9.9 Updated to building decarbonization
 - Appendix L: calculation, aim to move towards net zero
 - Still speaking energy efficiency, GHG emissions by 2030
 - A seminar will be developed in Spring
- SPC 62.1 Iona Johnson
 - Not here
- SPC 111 TAB for HVAC Justin Garner
 - Did not attend the meeting.
- TC 7.1 Integrated Building Design David Allen/Steve Krupka
 - Not here
- TC 7.3 O&M Management Open Position
 - Still open, no updates
- TC 7.7 Testing and Balancing Justin Garner
 -

- Pursuing research re: standard testing for flow capture hoods
 - Kitchen ventilation TC to standardize kitchen ventilation ratings between manufacturers (need to follow up)
- TC 9.6 Healthcare Roger Lautz
 - Not here, no updates
- TC 9.10 Laboratory Systems Wade Conlan
 - Not here, no updates
- Advanced Energy Design Guides Jay Enck
 - Not here, no updates
- MTG. EBO Effective Building Operations Mina Agarabi
 - Mina is in a debate
- Bldg Decarbonization Task Force Lixia Wu

Association Reports - Please provide reports before meeting if possible

- BCA Liz Fischer
 - New & existing bldgs fit into module 1 online certificate program
 - Oct 2nd Las Vegas conference
- NEBB Peter Rawls
 - Not here
- ACG Jim Magee
 - Ray Burt ACG Executive Dir.
 - ACG systems commissioning guideline was fully built out and published in Spring 2024
 - Continue to add contents on specific building types and system types
 - CxEnergy: 4/29 – 5/2 Registration for conference open in San Diego, CA
 - Webinars due in December 2024
 - ACG endorse training courses in Houston, TX
 - 20+ federal programs
 - MOU between ACG and EAB Training Center re: standard training
 - Updating ANSI standards & training manual
 - AABC Annual meeting scheduled in Texas
- ASTM Jay Enck
 - Not here
- TABB Soph Davenberry
 - Annual conference 4/29-5/2 in St Louis, MO
 - Working on supervisor certifications

New Business

- Activity Form
 - Mike has been working on it to complete.
- Roster Update
 - Dave to complete.

- ASHRAE technology awards
 - Awards from 3 different categories: new construction, existing buildings, EBCx
 - ASHRAE technology committee
 - Need to define new judging criteria
 - Call for volunteers to review and make recommendations on how to modify those judging criteria to differentiate between those 3 different -Larry Ollice and Dave Shipley volunteered.
- Open Discussion on TC main meeting upcoming topics
 - Inspired by YEA “Load calculation in 50 minutes”, Larry Ollice proposed to organize a YEA seminar or talks
- Interim Subcommittee Meetings – continue virtual meetings
 - Dave will send out a new doodle poll for a different date other than Friday
- Next Meeting – June in Indianapolis, IN: Annual Conference

Adjournment – 4:16pm

Attendees

1. Jeremy White
2. David Sinclair
3. Jim Vallort
4. Sarah Maston
5. Espen
6. Ole Tiesen
7. Derek Birdsong Carrier
8. Liz Fischer BCA
9. Marcus Meyers
10. Mina Agarabi
11. Alamelu Brooks
12. Joy Altwies UW Madison
13. Steve Krupka
14. Dave Shipley
15. Mike Amstedt
16. Larry Ollice
17. Ted Leonard
18. Lixia Wu
19. Gwenn Ivester
20. Mike Rosenburg
21. Justin Seder
22. Phone- William Morales
23. Ray Burt AABC
24. Justin Garner

25. Online – Matt Grice
26. Online – Dave Blaylock – Jacobs DFW
27. Online – Soph Davenberry
28. Online – Michael Sulva
29. Online – Tom Cappelin
30. Online – Bill Stump
31. Online – Craig Hutch
32. Online – George G...
33. Online – Jerry Kettler
34. Online – Gretchen Schoelz
35. Online – Gwenn Ivester
36. Online – Hendrick Shank NYS Buildings and Codes
37. Online – Ibrahim
38. Online – Jim Magee FCG, AABC
39. Online – Kyle Knudten
40. Online – Lee Riback
41. Online – Mike Fleming
42. Online – Roger Lautz
43. Online – Shaun Walton

Voting Members – 7 here

1. Dave Shipley - Here
2. Mike Amstadt - Here
3. Lixia Wu – Here
4. Ted Leonard - Here
5. Soph Davenberry - Here
6. Michael Sulva - Here
7. Thomas VandeWeerd – Not Here
8. Tommso Dallavalle – Not Here
9. Mina Agarabi - Here
10. Larry Ollice - Here
11. Charlie Shieh – Not Here

Voting Members

1. Dave Shipley
2. Mike Amstadt
3. Lixia Wu
4. Ted Leonard
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Notes from TC Chairs Breakfast

I have the slide deck if anyone is interested in having a look at what was presented on any of these topics.

We had speakers on:

- International collaboration efforts and how to get involved
- Task Force for Building Decarbonization
- Program Training
 - They scheduled 91 out of the 170 programs proposed. There are 124 programs in Chicago, including the paper sessions.
- Roster Update Training
 - This is a big upcoming task for the chair. It happens between the winter meeting and a deadline in spring.
 - We have to determine whether our VC will roll up to Chair and our Sec roll up to VC after June, and identify a new secretary. You can put yourself forward if you want.
 - I have to look at voting members whose terms will end after June and identify new voting members. You can put yourself forward, but you need to have been attending regularly and likely be able to continue attending during your term.
 - I have to look at the PCM who are reaching the end of their two-year term and identify which ones want to roll up to CM.
 - Pruning the CM list would be good, but I don't know if I will get to that. (Could do it by sending out an email to all of them and asking for a response if they want to continue. Then take off anyone who doesn't answer. Too harsh?)
- Government Affairs Department
- ASHRAE Strategic Plan

Appendix A1: TC 7.9 Research Subcommittee Meeting Draft Minutes

2023 Winter Meeting

Friday, January 13th, 1:00 – 3:30 pm EST, Online

1. **Call to Order:** David Shipley
Present: (did not record)

2. **Planned Research Activities**

Priority	Title	Author	Documents	Most recent status
1	Evaluation of ASHRAE Standard 207P	David Shipley	Draft RTAR available upon request (from author)	<p><i>January 2023: John House submitted this RTAR and it was returned from RAC with some comments. The most difficult one is the request for a literature review. The most relevant literature would be something that shows some previous standard (either from ASHRAE or some other organization) had been difficult to use or given erroneous results. That would show the need for this research project. If anyone has ideas on such studies, John would certainly appreciate knowing about them. Soph will ask around. John should also ask the RL for suggestions.</i></p> <p>June 2022: TC 7.9 voted to co-sponsor and I believe John House submitted this RTAR. We should find out at this meeting whether it gets approved.</p> <p><i>January 2022: TC 7.5 is getting ready to vote on submitting this RTAR. We continue to follow its progress.</i></p> <p>June 2021: John House has produced a new draft of this RTAR. It is being reviewed by a small committee. It has not yet been submitted.</p> <p><i>January 2021: John House of TC 7.5 is now the lead author for this RTAR. Dave will continue to follow it and will be talking with John shortly to discuss how he can help.</i></p> <p>June 2020: This RTAR is now in the hands of TC 7.5. Dave will continue to follow and support it and will seek a response from TC 7.9 if TC 7.5 requests co-sponsorship.</p> <p>February 2020: This draft RTAR will be discussed in the FDD subcommittee and the research subcommittee of TC 7.5 (Smart Buildings). We are hopeful that someone from 7.5 will take it on and modify it appropriately before it gets submitted. 7.5 is the natural home for the RTAR</p>

Priority	Title	Author	Documents	Most recent status
				<p>and should have the expertise to improve it substantially. Dave will not attend TC 7.5's FDD subcommittee, because it meets during TC 7.9's main meeting (and Dave is taking over as TC secretary at this meeting). Dave will get to the 7.5 research subcommittee and the main TC meeting and will monitor the progress of this RTAR. If it proceeds as hoped, we can offer to co-sponsor it.</p> <p><i>June 2019: Draft RTAR from 207P. Dave asked whether the group would like to review this RTAR if it becomes more ready for submission, to consider whether TC 7.9 should co-sponsor it. The consensus was that we should consider it.</i></p>
	<p>Identification and Collection of Performance Metrics for Building Construction Projects</p>	<p>Soph Davenberry</p>		<p>January 2023: They were trying to find evidence that not having done Cx was detrimental to building operation. We should probably approach this from a different angle. Let's drop this one and if people have ideas for a new project idea, please bring them forward.</p> <p><i>June 2022: No further progress. Soph has found an additional volunteer to work on it, but they are still working on a draft.</i></p> <p>January 2022: No further progress. They still have the documents and the interest. Natalia expressed interest and Soph will post a note on Basecamp asking for other volunteers.</p> <p><i>June 2021: Soph Davenberry reported that she and Steve Krupka got the old version but were too busy to move this along in the last few months. Their time should be freer in the next while. They will report back to the group when they have something for us to look at.</i></p> <p>January 2021: Steve Krupka is interested in the topic. Soph Davenberry also interested. Dave will provide them with Kristin's email address and they will both reach out to her to offer help.</p>

Priority	Title	Author	Documents	Most recent status
				<p><i>January 2019: Kristin has had some discussions with reviewers of the RTAR on whether the initial study is to include both commissioned and non-commissioned buildings. The study that compares two groups of buildings may be more attractive to research topic reviewers. The downside is that it would be more complicated to collect data on both commissioned and non-commissioned buildings. The study would collect metrics from construction projects that may potentially be affected by commissioned, to establish a baseline in non-commissioned buildings. There has been a white paper from BCA/LBNL (recently redone) that presents some of the costs and benefits of commissioning. One idea would be to try to make our study, in addition to what else we collect, compile a dataset of metrics BCA/LBNL used to serve as a control group for that study. We could look for the largest subset of their dataset, in terms of building type and region, and focus our study on the same building type and region. Kristin will change the topic to "Identification and Collection of Performance Metrics for Building Construction Projects." In a lot of places, people are now commissioning minimally, only because they are forced to by regulation. Should we change the study to compare buildings that are commissioned only to code versus buildings that are commissioned more thoroughly? Kristin will review the LBNL report to figure out how we can provide some linkage between that and our study, so we can provide some kind of control group for that study. She will rewrite the RTAR, with help from Dave Shipley, Reinhard Seidl. She will reach out to Elliott Crowe, who led the LBNL study. Mina Agarabi is providing Kristin the contact information for Ole Teisen. He has been working on quality management and digitalization for building performance. The draft RTAR will be distributed to the group for consideration by November.</i></p> <p>June 2018: The challenge of this project is that the only way it can provide a statistically valid sample for comparing against the commissioned buildings we might collect in a subsequent study, you would probably need a much larger number of buildings. 12 of each building type will have too much variability to provide a good baseline. It might be better to narrow this down to one building type or one region, in order to reduce the variability and get better statistical validity for the same study. You need sample size to overcome the noise in the data.</p>

Priority	Title	Author	Documents	Most recent status
				<p data-bbox="911 256 1929 492"><i>January 2018: Kristin has drafted the start of an RTAR. The current working title is "Identification and Collection of Performance Metrics for Non-Commissioned Building Construction Projects." She will not be attending the meeting, but would like the group to discuss this draft and provide feedback. Others who are interested in the topic would be welcome to help develop it. Contact Dave Shipley or Kristin Heinemeier to obtain a copy of the draft. Dave will send this draft to Reinhard Seidl and Chuck Dorgan, so they can provide feedback to Kristin.</i></p> <p data-bbox="911 574 1929 672">June 2017: Nothing has happened on this project since the idea was first suggested in June 2016. Kristin has not made any progress yet, but will commit to moving it forward. Ideally this would identify the difficulties with buildings that are not commissioned.</p> <p data-bbox="911 755 1824 820"><i>January 2017: Dave should move this up into the current research ideas. Nothing has happened on it since June, as far as we know.</i></p> <p data-bbox="911 902 1892 1065">June 2016: What can ASHRAE do about alleviating the one big barrier to the widespread adoption of commissioning? What is that? Probably convincing the owner that commissioning is required to obtain a building that works properly. The owner thinks he is already paying for a building that works properly and doesn't understand why he needs to pay more for commissioning in order to get that.</p> <p data-bbox="911 1148 1902 1278">Problem of the cost of an "epidemiological" study of buildings commissioned versus non-commissioned. Can we find a metric that is cheap to collect, to be able to quickly assess the cost of not commissioning a building? Can we find a quick way of assessing the commissioning of a building?</p>

Priority	Title	Author	Documents	Most recent status
				Kristin will volunteer to work on an RTAR on this topic. John Gibbemeyer will review whatever Kristin drafts.

3. Completed Research Projects

Title	Author	Documents	Most recent status
WS 1587: Improved Tools for Control Loop Performance Measurement and Evaluation	Steve Taylor, TC 1.4		June 2017: This project is complete. The final report is available on the ASHRAE website.

4. Other Items

Ideas mentioned at recent meetings:

- a. Beth Tomlinson: There is a need for a standardized method for risk assessments that could be developed and might possibly become part of the CA's role. 189 is interested in including guidance on this. TC 2.5 and 2.10 are both potential cosponsors. David Shipley, David Sinclair, Peter Rawls, Mohammad Nasir Ahmad Mallick. *We're not sure what Beth had in mind, but the topic could include an assessment of the cost of failure from various building systems, so that this risk assessment could feed prioritization of different Cx tasks and a cost/benefit analysis. Duane is interested in the topic. Dave will help with how to write an RTAR.*
- b. Dave Shipley: it is still on my list of things to do to get Mina Agarabi's notes on her idea about testing comfort conditions in ASHRAE meeting rooms. This topic is probably more appropriate as an individual project, not an ASHRAE activity. There are some portable monitoring systems we might be able to borrow as a demo. Mina wanted to combine the learning experience of attending a conference with hands-on measuring, and have a way to engage YEA in understanding the different factors in comfort, and tie that into commissioning and site visits. Came from the experience of sitting in uncomfortable rooms and thinking about our comfort standards,

but morphed. *Liz Fisher suggests that she approach the Marriott to find out whether they would be receptive to having this happen in their facility in Tampa.*

A reminder of the strategic plan:

There are six research initiatives in the ASHRAE Research Strategic Plan. While there is nothing wrong with generating ideas and then thinking through how they might fit with the plan, it may also be worthwhile to start with things ASHRAE already wants to do and see if we could generate some ideas that way. Here are some notes on our discussion of the initiatives last meeting:

Resilience:

- Commissioning participation: prove that systems are validated and operate effectively in commissioned buildings. Could we survey buildings commissioned versus not and find out how much downtime their life safety systems had in an extreme event? Data centre industry and health care facilities might have that data. Draw on the paragraph in the Performance Metrics research idea to divide commissioned from non-commissioned. Would then want to break this down into loss of power and other conditions you might be guarding against.

IEQ:

- Generator usage – measurement and verification from generator exhaust. Might be mostly the area of other industries. Research case to compare IEQ and operating practices in non-commissioned versus commissioned buildings. What is the frequency with which you should have your building recommissioned to maintain IEQ standards?

Sustainability:

- Commissioned buildings are more efficient, but that's probably been well covered. Commissioned versus ongoing commissioning – how much difference does that make? Look at the carbon intensity of buildings instead of just energy.

Equipment, Components and Materials:

- Battery-based power systems – electrical, not HVAC. Relates to resilience and sustainability.

Tools and Applications:

- We've worked on tools, such as collections of documents, tests, etc., before. Nothing new.

Education and Outreach:

- The idea described above of testing comfort conditions at conferences. What if you had a small team of YEA members do this at a conference, take measurements, look at occupancy, to monitor the parameters and see how they change. Then present their findings at the next conference, while another set of YEA start doing the monitors at the next conference. Have a panel discussion and discuss trends and findings. Learn about which parameters are the most important to monitor. Which ones would be important in other types of facilities? What should you check?

New idea from Jim Bogart:

Idea of specifying the specific commissioning priorities in different types of buildings. A commissioning design guide.

Idea from Larry Ollice:

How quickly do buildings fall out of their commissioned state? This relates to ongoing or monitoring-based commissioning. Some of the people who do that kind of work would have an idea of how quickly the performance of the building changes from its optimized state. There's a committee developing guidelines for ongoing commissioning. Larry will do some research. Marcus Meyers is the chair of the committee for the ongoing commissioning guideline.

Michael Rosenberg:

They see a lot of prescriptive sequences of operations from engineers, and the controls contractors often don't fill in the details. The CA then has a lot of difficulty commissioning it because they don't have the details of the sequence. There seems to be a need for a commission ability review. There seems to be a lot of copy-paste work used to develop the scripts, which sometimes results in things being left out. Liz Fisher talked about a hospital client deciding that the CA needs to handle developing the sequence. Commissioned/not commissioned/commissioned well. ASHRAE has some pretty bullet-proof sequences now for VAV boxes, but it seems like more of that is needed.

Appendix A2: TC 7.9 – Commissioning

IN Person & Virtual Meeting – February, 2023

Report on Commissioning Industry Programs

By Gerald J Kettler, PE, CCP, CPMP, BEAP, BEMP

1. *The Commissioning Stakeholder's Guide* publication has been published as a special publication of ASHRAE and BCxA. It contains Cx process and application information for all Cx team members as well as over 50 checklists that are available on the ASHRAE cloud.
2. USDOE/NIBS CWCC Program and Certifications – Commissioning Provider
 - a. DOE completed program development in 2015. It licenses organizations that meet the ISO 17024 and DOE requirements to certify individuals. ACG, ASHRAE, and BCxA have been ANSI certified and approved by DOE.
 - b. A NIBS CWCC BCxP Scheme Review process has been started and a NIBS committee is in place to review requirements and make recommendations for changes if necessary. The CxP Job Task Analysis is the initial document being reviewed which is currently underway.
 - c. This DOE program has certification and certificate programs.
3. Building Enclosure Commissioning
 - a. An Industry Standard and related training program for building enclosure commissioning are being developed by IIBEC. The plan is for that program to be available in 2023. It will include processes to tie the BECx process into the overall Cx process.

4. National Institute of Building Science (NIBS)

- a. A centralized resource library for commissioning and other documentation is available on the NIBS program and website as “Whole Building Design Guide”.
- b. These commissioning sections have been updated and expanded from four to eight chapters including basic new building commissioning process and definitions, Cx team responsibilities, OPR development, documentation, existing building Cx, On-going Cx, emerging issues, and additional Cx resources.
- c. These revised chapters are now available on the WBDG website.

5. International Standards Organization (ISO)

- a. An ISO standard is being developed (based on Standard 202) for the application of Commissioning starting at the planning and design phase. It is titled ‘Building Commissioning Process Planning – Part 1: New Buildings’. Development time is anticipated to be three years. This development is being conducted by ASHRAE TG 205 and the ISO TG 205 Work Group as part of an ISO committee.
- b. An ISO standard has been published that covers the building enclosure commissioning process and the related risk assessment procedure for selecting the level of commissioning.

6. International Code Council (ICC)

- a. The 2015, 2018 and 2021 versions of International Energy Conservation Code (IECC) requires the performance of HVAC test and balance, and commissioning. They require the application of “industry accepted” commissioning process.

- b. The IECC is generally based on the requirements of ASHRAE 90.1. The 2019 version of ASHRAE 90.1 is very similar to the commissioning requirements in ASHRAE 189.1. A process to update the commissioning requirements in 90.1 is being developed with input from SSPC 300.
- c. The International Green Construction Code (IGCC)-2022 is based on ASHRAE Standard 189.1-2020 except for IGCC administration chapter One and has a Cx section that basically conforms to Standard 202 and coordinates with IECC. The TAB and commissioning requirements have not changed substantially from the previous IGCC code and are not expected to change in the next 189.1 and IGCC issues.
- d. ICC Guideline G-4 – *Guideline for Commissioning*, has been revised by ICC and industry committee and has been republished in 2018 and conforms to the STD 202 process. It is intended to assist the building officials in the application and enforcement of commissioning.
- e. ICC has instituted a certification program for Green Code reviewers and inspectors.
- f. The ICC training department has requested that an ICC training program be developed on the commissioning requirements in the codes. This Cx training program is under development and is being coordinated with ASHRAE and BCxA.

7. CAL Green – Title 24

- a. Includes Commissioning requirements.
- b. Has developed checklists for new construction.

8. Retro-Commissioning and City Ordinances

- a. Several cities including: Seattle, New York, Washington DC, Chicago, Atlanta, San Francisco, Los Angeles and others have passed ordinances mandating energy auditing and retro-commissioning or “Building Tune Up” for many of their buildings.
 - b. Many of these programs utilize ASHRAE Standard 211-2018, Standard for Commercial Building Energy Audits, as the energy audit process. The DOE website has extensive process and checklist information already available for the audit process. The DOE website does not currently have any related commissioning information in this subject area at this time.
 - c. The USDOE and PNNL lab are currently working with several cities and ASHRAE to develop a commissioning process and instructions to utilize with the building audit and Tune Up process. This information on commissioning could then be utilized for additions to the DOE website.
9. Commissioning Industry Interface with Existing Processes and Documents and New Developments
- a. Documents and organizations that utilize or relate to commissioning need representation and participation from the commissioning industry. This will facilitate the correct utilization of the commissioning process. The design and regulation documents often include other ASHRAE and other organization standards that relate to facility design and construction.
 - b. Several of the sustainability programs such as LEED, Green Globes, WELL Building, FITWELL, and others have elements of commissioning included. These are under nearly continuous revision and need upgrades to the testing and commissioning processes.
 - c. New developments such as the Sustainability, Working Environment Conditions, Resilience, and ESG movements are also examples for the need for commissioning input and representation.