

Commissioning From the Agent's Perspective:

Commissioning Buildings in the Code



Adoption

In Arizona most all municipalities have adopted IECC 2012 in the last 3 years. Some have also adopted IECC 2015. While the prescriptive energy components of the code have adapted well, there is still lingering uncertainty about commissioning.

- **Am I** Required to do Commissioning?
- **Who** can Commission?
- **When** does Commissioning Happen?
- **What** is Actually Required?
- **Where** does Commissioning Go?
- **Why** is Commissioning Required

Am I Required to do Commissioning

Exception: The following systems are exempt from the commissioning requirements:

1. Mechanical systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140,690 W) cooling capacity and 600,000 Btu/h (175,860 W) heating capacity.
2. Systems included in Section C403.3 that serve dwelling units and sleeping units in hotels, motels, boarding houses or similar units.

YES if you have more than 40 Tons of cooling

NO if you have less than 40 Tons of cooling

NO if you they serve dwelling units

At 250 sf per ton that's about 10,000 sf. About the size of a Walgreen's Store

But Am I *Really* Required...

Who is responsible for Commissioning

C408.2 Mechanical systems commissioning and completion requirements. Prior to passing the final mechanical inspection, the registered design professional shall provide evidence of mechanical systems *commissioning* and completion in accordance the provisions of this section.

A: Registered Design Professional: Mechanical? Architect? Electrical? Structural?

Make it Happen: Design Professional

Perform it: Commissioning Agent

When Should Commissioning Happen

Construction document notes shall clearly indicate provisions for *commissioning* and completion requirements in accordance with this section and are permitted to refer to specifications for further requirements. Copies of all documentation shall be given to the owner and made available to the *code official* upon request in accordance with Sections C408.2.4 and C408.2.5.

A: Starts During Construction Documents. Why?

- Needs to be on drawings and in specs
- Needs to be bid out by the contractor
- Expensive add if it was not planned for
- Less value if not planned early

Example: “We have a grand opening tomorrow and I just found out I can’t get CofO unless I have commissioning. What is Commissioning and do you do it?”

What Should I See in a Commissioning Plan?

A: The Commissioning Plan should include:

- List of Equipment to be included in the Commissioning Scope
- Explanation of the Commissioning Agent's responsibilities (developing tests, sending issues logs, etc.)
- Narratives explaining the Contractors responsibilities (cooperating CxA to conduct testing)

At the Construction Documents Phase: ensuring that a CxA is engaged in the process and generating a Commissioning Plan is more important than the contents of the Plan itself.

What is Commissioning?

A: “IECC Inspection” is not Commissioning....But Commissioning could cover IECC Inspection. Just because it is there, doesn’t mean it works.

IECC 2015 Section #	Mechanical Strength Inspection	Phase Number Other	Code Number Other	Compliant?	Commissioning/Inspection
5.4.2.2 (M117)	Current building IAQ system commissioning or badge testing			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3 5.4.3.1 5.4.3.2 5.4.3.3 5.4.3.4 5.4.3.5	An economizer provided where required, meet the requirements for design capacity, control system, and integrated load of any integrated demand control			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.4 (M117)	Return air and outdoor air dampers meet minimum air badge requirements			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.6 (M117)	Alarms provided to release pressurized air during mechanical operation			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.7 5.4.3.8 5.4.3.9 5.4.3.10 5.4.3.11 5.4.3.12 5.4.3.13 5.4.3.14 (M117)	Water economizer provided where required, meet the design capacity, maximum outside air, and integrated load of any integrated demand control			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.14 (M117)	Commercial operation with minimum heating energy use during normal operation			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.15 (M117)	Energy controls control simultaneous heating and cooling and sequence heating and cooling to each zone			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.22 (M117)	Refrigerant leak repair systems connected to a central plant keep leak repair systems and repair action operational			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.23 (M117)	Dehumidification controls, automatic to prevent condensing, including, mixing of hot and cold airstreams or automatic heating and cooling of the entire airstream			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.24 (M117)	Water economizer equipped and outdoor cooling and temperature control (including) to maintain minimum humidity of 45% RH, demand if an economizer is required			<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.25 (M117)	coils [] for systems not larger than the total building water use greater than 600 gpm	HP _____	SW _____	<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.26 (M117)	Water Economizer (W/E) to be driven by variable speed drive, meet a capacity for use with 100 gpm coil (coils, in Table 5.4.3.26 to 5.4.3.28) for motor starts	<input type="checkbox"/> VFD	<input type="checkbox"/> VFD	<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.27 (M117)	W/E for 1000 gpm or greater systems provided as required in 5.4.3.26 and 5.4.3.28	<input type="checkbox"/> VFD	<input type="checkbox"/> VFD	<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.28 (M117)	Water economizer equipped and outdoor cooling and temperature control (including) to maintain minimum humidity of 45% RH, demand if an economizer is required	<input type="checkbox"/> VFD	<input type="checkbox"/> VFD	<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.29 (M117)	Water economizer equipped and outdoor cooling and temperature control (including) to maintain minimum humidity of 45% RH, demand if an economizer is required	<input type="checkbox"/> VFD	<input type="checkbox"/> VFD	<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.30 (M117)	Water economizer equipped and outdoor cooling and temperature control (including) to maintain minimum humidity of 45% RH, demand if an economizer is required	<input type="checkbox"/> VFD	<input type="checkbox"/> VFD	<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.31 (M117)	Water economizer equipped and outdoor cooling and temperature control (including) to maintain minimum humidity of 45% RH, demand if an economizer is required	<input type="checkbox"/> VFD	<input type="checkbox"/> VFD	<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	
5.4.3.32 (M117)	Water economizer equipped and outdoor cooling and temperature control (including) to maintain minimum humidity of 45% RH, demand if an economizer is required	<input type="checkbox"/> VFD	<input type="checkbox"/> VFD	<input type="checkbox"/> Complete <input type="checkbox"/> Done Not Comply <input type="checkbox"/> Not Applicable <input type="checkbox"/> Not Applicable	



IECC Inspection
“Is it there?”

IECC Commissioning
“Does it Work?”



What is Commissioning? (cont.)

A: Quality Assurance on behalf of the Building Owner: The primary focus of commissioning should always be to ensure the Owner's Project requirements (Code requirements are fulfilled as a secondary objective).

Commissioning Benefit to Owner

- Oversee Quality Construction
- Review Air Balance and Ventilation
- Clarify and Optimize Sequences
- Verify Controls Accuracy
- Demonstrate System Performance
- Follow-Through Resolution of Issues

IECC Section Fulfilled

- Implicit in IECC Inspections
- C408.2.2 and C408.2.5.3
- C408.2.3.1
- C408.2.3.2
- C408.2.3.1 through C408.2.3.3
- C408.2.4 and C408.2.5.4

Oversee Quality Construction



Construction errors make the best photographs. However, these issues are usually caught by a number of other entities (GC, owner, inspector etc).

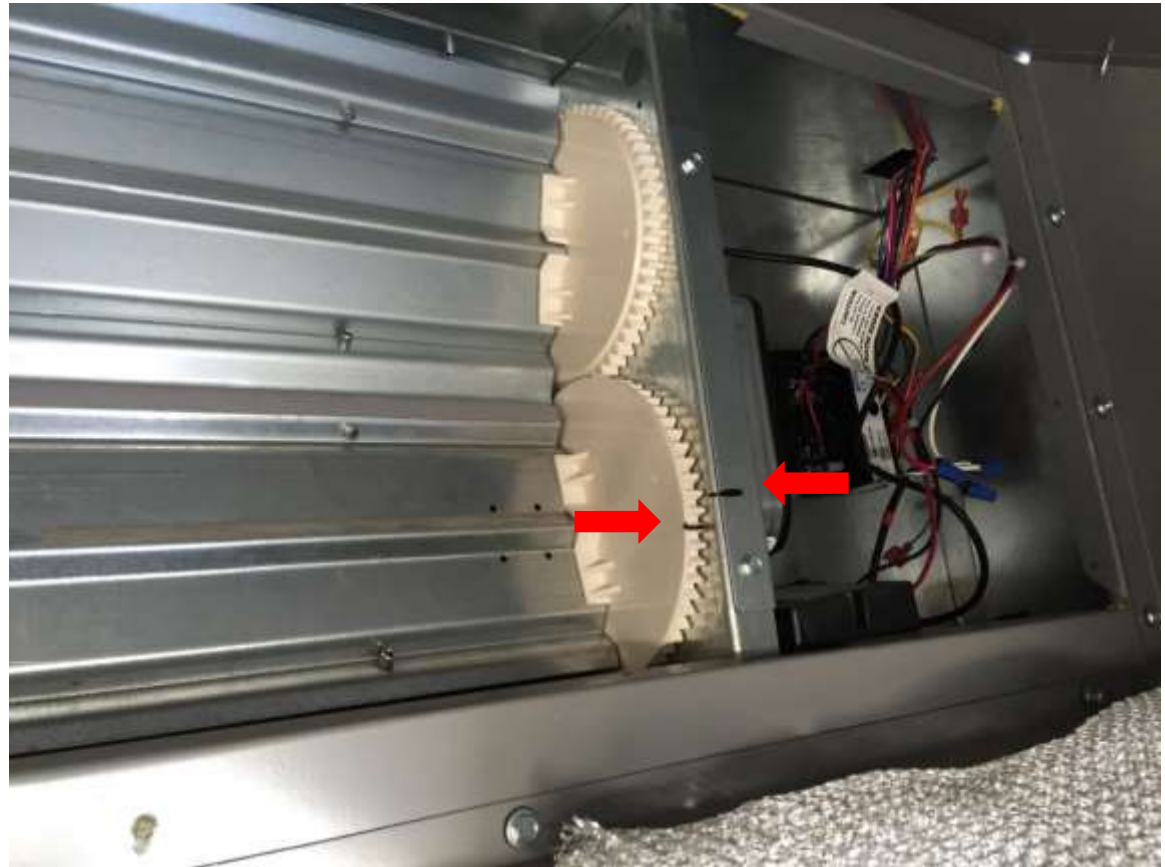
While not explicitly mentioned in IECC, field observations of construction quality is implicit in IECC Inspection/ComCheck forms.

Contrary to perception, construction quality is only a tertiary benefit of Commissioning, not the main goal.

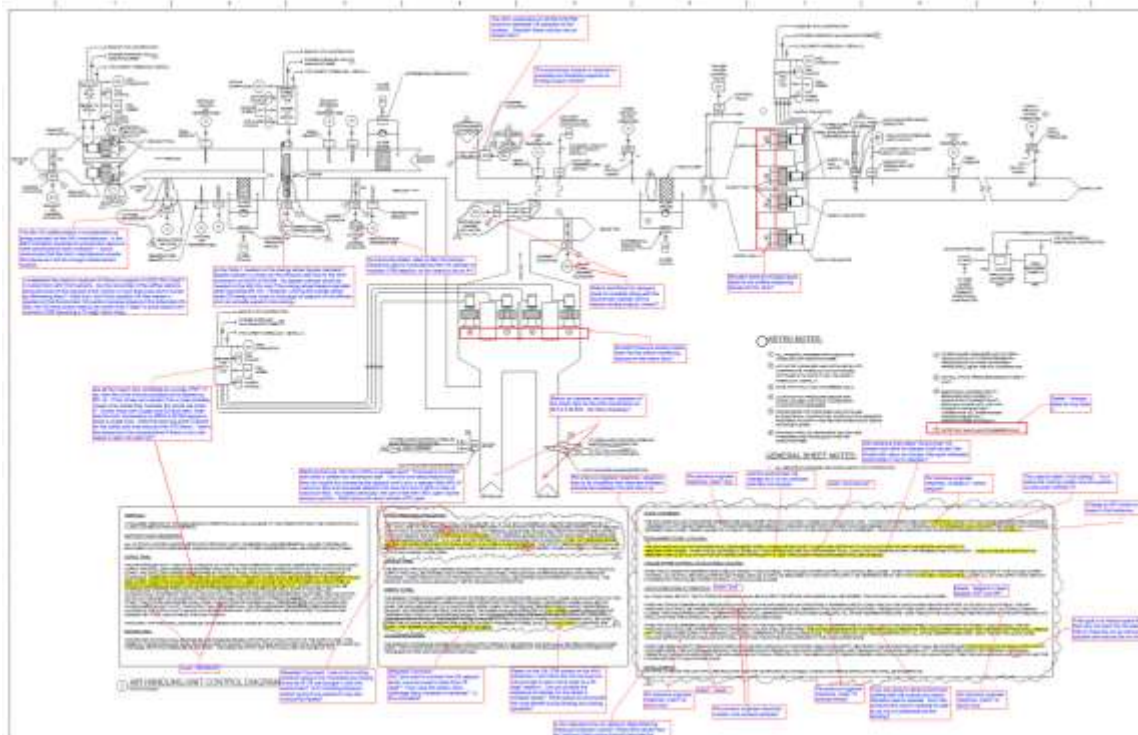
Review Air Balance and Ventilation

Test and Balance work is listed under the Commissioning Section in IECC, though the actual balancing work is typically completed by others (not the CxA).

However, the CxA has a responsibility to ensure airflow and ventilation controls are working properly. Reviewing and integrating the balancer's work is an important step.



Clarify and Optimize Control Sequences



The vast majority of problems identified during Commissioning are resultant from a poorly defined Sequence of Operations.

The primary focus of the CxA is to integrate three pieces of the same puzzle:

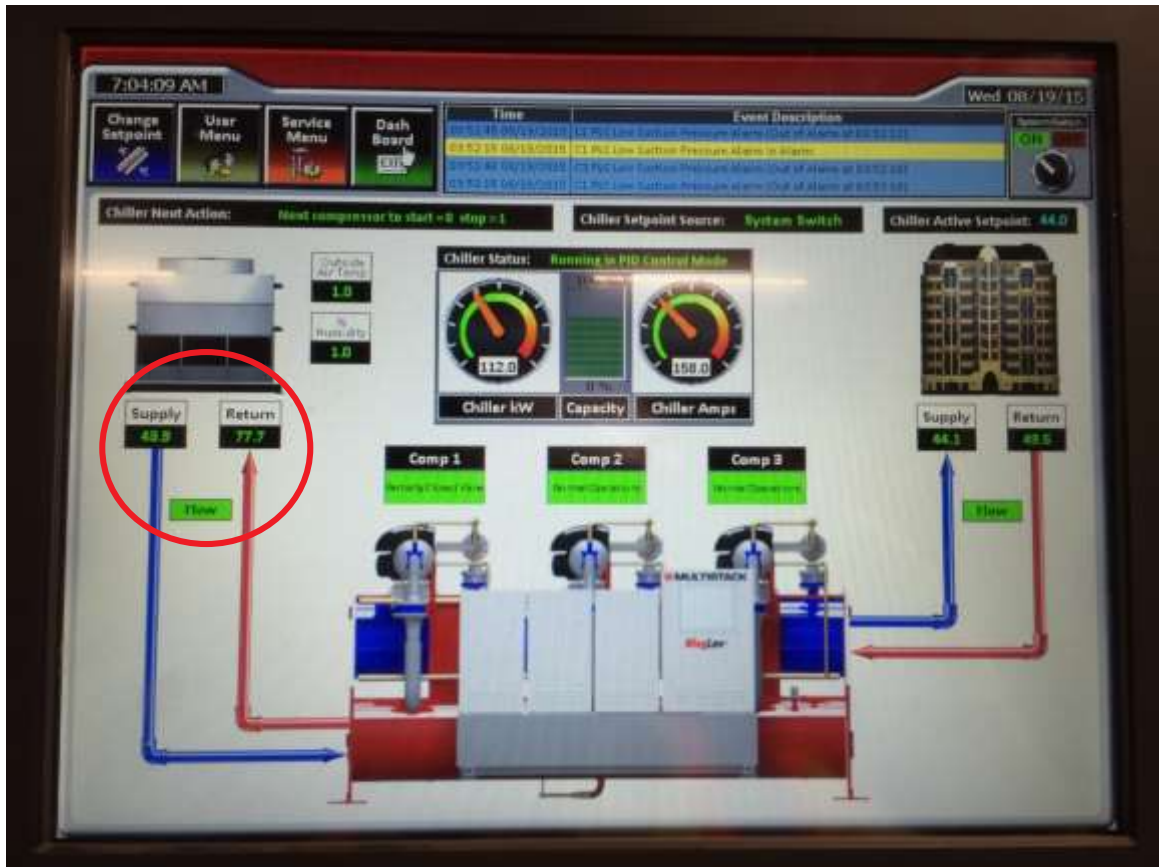
- Owner's desired operation
- Engineer's design intent
- Contractor's interpretation

Verify Controls Accuracy

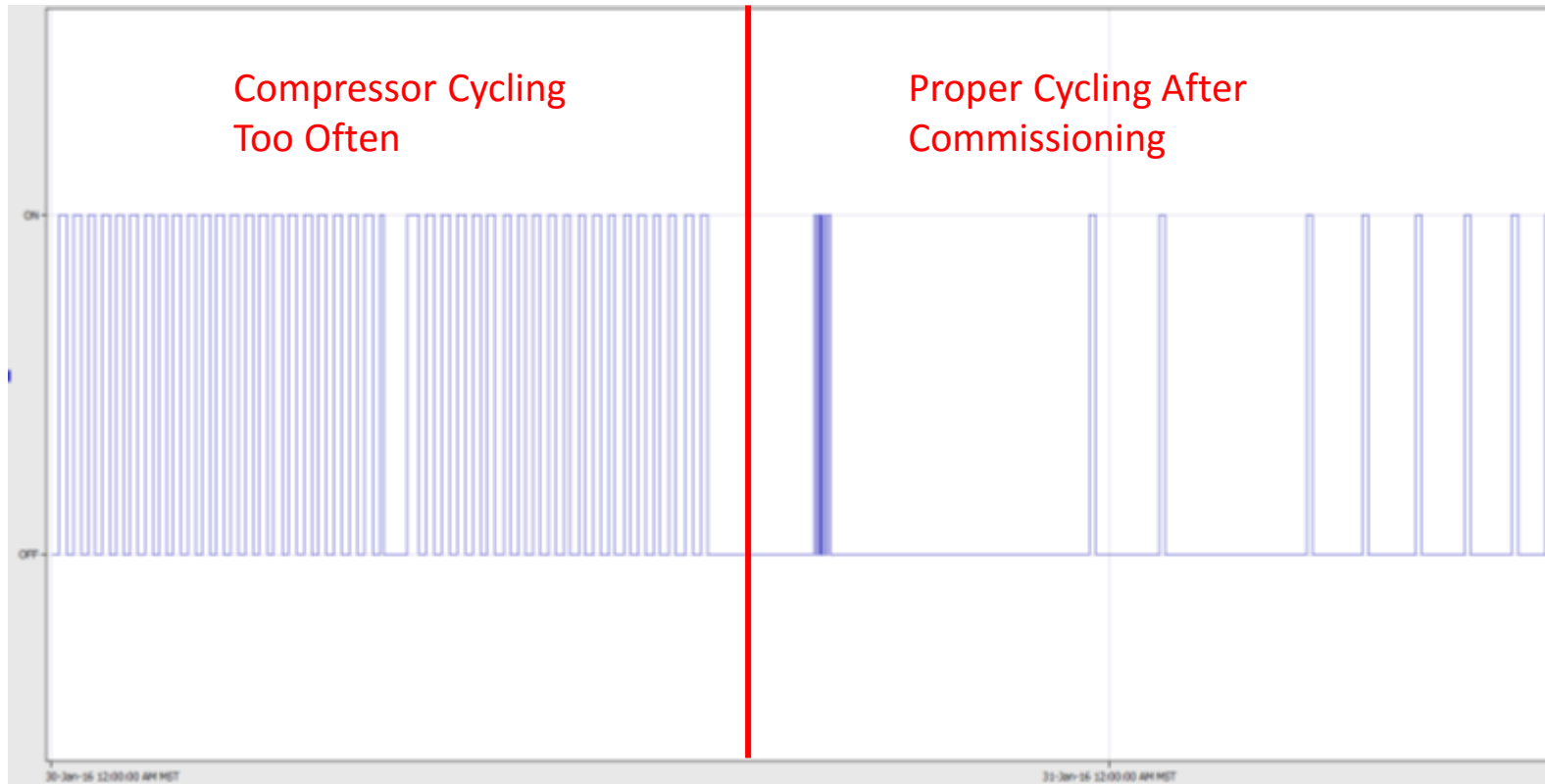
The “Controls” section in IECC is broad and non-specific, though the requirements are quite comprehensive.

It would be impossible to meet the intent of this section without the CxA conducting a full Point-to-Point verification.

Without PTP Verification,
Functional Performance Tests are meaningless.



Demonstrate System Performance



Functional Performance Tests are at the center of the whole commissioning process. Per IECC, tests should have “measurable criteria for performance”.

Follow-Through Resolution of Issues

The Commissioning Issues Log is the single most important deliverable of the CxA. This document tells the story of the whole commissioning process.

The CxA is in a unique position to bring contractor concerns and owner responses together.

#	Issue	Description	Action	Open/ Closed
1.	CRU Software Update	<p>Some of the CRU units are running outdated versions of the controller software that is creating limitations for TDI's programming of rotation and standby functions.</p> <p>All CRU units need to be updated to the latest software version, however this update will erase current setpoints and programming. Commissioning activities cannot continue until all CRU units are updated with the latest software. Note this software update may also have an effect on the addressing of BAS points.</p>	<p>11/14/2015: Contractor noted that CRU units need to be upgraded to latest software, and confirmed with tech support that setpoints and programming would be erased in the process.</p> <p>11/20/2015: Contractor was onsite to update all required software.</p> <p>12/14/2015: Confirmed during testing visit this issue has been resolved.</p>	Closed
2.	Final Graphics Incorrect Referencing	<p>The final graphics for CRU-AC-1B-001 did not match the values displayed at the front-end points (nor the physical values at the unit). The final graphics still need to be updated with correct referencing to match the front-end points.</p>	<p>11/14/2015: Observed referencing error in the final graphics for CRU-AC-1B-001.</p> <p>11/14/2015: Contractor corrected graphics issue for CRU-AC-1B-001 on-site.</p> <p>12/14/2015: Confirmed all graphics were referencing correctly during testing visit.</p>	Closed

What needs to be submitted to the city.

C408.2.4 Preliminary commissioning report. A preliminary report of commissioning test procedures and results shall be completed and certified by the registered design professional or approved agency and provided to the building owner. The report shall be identified as “Preliminary Commissioning Report” and shall identify:

C408.2.4.1 Acceptance of report. Buildings, or portions thereof, shall not pass the final mechanical inspection until such time as the code official has received a letter of transmittal from the building owner acknowledging that the building owner has received the Preliminary Commissioning Report.

C408.2.4.2 Copy of report. The code official shall be permitted to require that a copy of the Preliminary Commissioning Report be made available for review by the *code official*.

A: Successful Commissioning submittal Plan

Building Permit

- Commissioning Plan

Before Certificate of Occupancy

- Preliminary Commissioning Report
 - Review Issues Log

After Certificate of Occupancy (within 90 days)

- Final Commissioning Report
 - Review Issues Log (again)