



Testing & Balancing

What Commissioning Providers Need to Know

AIA Quality Assurance



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Course Description

This discussion aims to:

- Deepen your understanding of the role of a TAB Contractor
- Illustrate how Cx Providers can evaluate a qualified TAB Contractor
- Offer guidance on how to review TAB Documentation
- Emphasize the importance of developing a cooperative relationship with TAB Contractors on your Cx projects
- Explain how to maximize the value of competent TAB Contractors for Cx Providers

Learning Objectives

1. Assess the qualifications and certifications of Testing and Balancing (TAB) professionals to ensure compliance with industry standards that impact building performance and occupant comfort.
2. Determine the appropriate timing and scope for engaging TAB contractors in the commissioning process to support system functionality, energy efficiency, and indoor environmental quality.
3. Interpret and verify key performance data in TAB reports using foundational formulas, ensuring systems are balanced for optimal air and water distribution that supports health and safety outcomes.
4. Develop strategies to foster effective collaboration between Commissioning Providers and TAB professionals, leveraging each party's expertise to resolve performance issues and deliver safe, efficient, and fully operational building systems.

Do I Really Need to Know About TAB?

- Per BCxA's "Essential Attributes":

"The CxP is an objective, independent advocate of the Owner" and "makes the final recommendations to the owner regarding the functional performance of the commissioned building systems."

Also: "the CxP has current engineering knowledge and extensive hands-on field experience regarding [...] Building systems start-up, balancing, testing, and troubleshooting."

If a system is not balanced correctly...Did the CxP do their job?

How Much TAB Do I Need to Know?

- Per BCxA New Building Construction Best Practices:
 - Commissioning Provider (along with the Design Team) should “Review Start-Up and TAB Reports”
- What does review of a TAB Report generally involve?
 - Check for:
 - Certification
 - Instrument Calibration
 - Readings ($\pm 10\%$)
 - Plotted fan and pump curves (if really thorough)
- What *should* I know?

Step 1: Know Who You're Working With

- Not All TAB Certifications are Created Equal
 - AABC
 - Test & Balance Engineer (TBE); Management Level:
 - 8 Years of TAB Experience (Optional 4yrs from Engineering Degree)
 - Pass an 8-hour computer-based exam on TAB technical, procedural, and management problems (95 Multiple Choice & Calculation mixed, numerical answer)
 - 50 points of Continuing Education every 3 years
 - Test & Balance Technician; Field Personnel:
 - 3 Years of TAB experience with at least 1 for an AABC-Certified Firm
 - Pass a 7-hour, computer-based exam on TAB technical and procedural problems (107 Multiple Choice)
 - 25 points of Continuing Education every 3 years

Step 1: Know Who You're Working With

(cont.)

- Not All TAB Certifications are Created Equal
 - NEBB
 - Certified Professional; Management Level:
 - 8 Years of TAB Experience (Optional 4yrs from Engineering Degree)
 - Pass a 4-hour computer-based exam on TAB technical and procedural problems
 - Pass a 2-hour Practical Airside TAB exam (In-Person, Proctored)
 - Pass a 2-hour Practical Waterside TAB exam (In-Person, Proctored)
 - 12 Continuing Education Credits (6 NEBB-Approved) every year
 - Certified Technician; Field Personnel:
 - Associate's Degree or Trade School/Apprenticeship Program and Minimum 1 Year of Filed TAB Experience - OR - 2 Years of Field TAB Experience and an alternative training course
 - Pass a 3-hour computer-based exam on TAB technical and procedural problems

Step 1: Know Who You're Working With

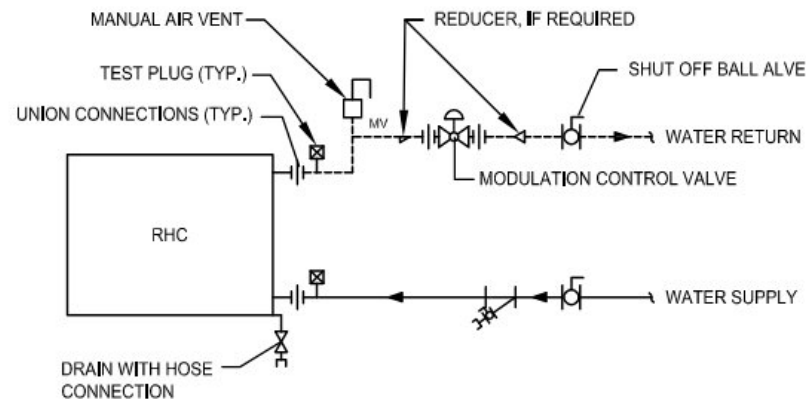
- Not All TAB Certifications are Created Equal
 - TABB
 - Certified Supervisor; Management Level:
 - SMACNA Member with 4yr Engineering Degree + 1yr in HVAC Installation/Design – **OR** – 2yr degree +3yrs - **OR** – Be a TABB Certified Technician + 5yrs – **OR** – 3 Yrs Experience with letter of recommendation from Employer
 - Pass a 110-question written exam on TAB technical and procedural problems (10 ungraded)
 - Certified Technician; Field Personnel:
 - SMACNA Member (through apprenticeship program)
 - Pass a 110-question written exam on TAB technical and procedural problems (10 ungraded)

Step 2: When Do We Start?

- In design, CxPs should be reviewing for “Commissionability” of systems. This includes:
 - Dampers located at diffuser/registers or noted on drawings
 - Balancing Valves located at coils
 - Gauges arranged to allow for pump readings
 - Confirming Sequence of Operations
 - *Occasionally* Reviewing TAB Method of Procedure (MOP)
 - Often TAB Contractors will quote directly from the Procedural Standard of their certifying organization, adjusted for project.

Step 2: When Do We Start?

- Really?



1 **HOT WATER REHEAT COIL**
REHEAT COIL SECTION DETAIL
SCALE: N.T.S

Step 2: When Do We Start?

- TAB Contractor can review design documents for “Balance-ability”
 - If Cx Design checks were adequate, the TAB Contractor can be brought in early in the Construction Phase
 - Why not the Construction-Phase Cx Kickoff Meeting?
 - The earlier you catch an issue, the less costly it will be to resolve it!

Step 3: What Am I Looking For?

- TAB Firm Certification
 - Which Certifying Organization is on the spec?
 - Does the Firm have Certified staff at **both** levels?
 - List of Calibrated Instruments (or individual certificates of calibration)
 - Some TAB Specifications require specific amounts of experience.
 - CxP may need a Qualifications Package from TAB Contractor!

Step 3: What Am I Looking For?

- TAB Procedure (MOP)
 - Does the Procedure adhere to the Standards provided by the certifying organization?
 - Is it project-specific?
 - Does it detail systems with diversity or unique sequences of operation?
 - Does it include Air and Hydronic systems (if applicable)?
 - Does it indicate familiarity with the project, or is it “cookie-cutter”?

Step 3: What Am I Looking For?

- TAB Field Verification
 - Standard:
 - Instruments Calibrated (stickers/certs)?
 - Instruments being used properly?
 - Readings are accurately recorded?
 - Typically missed:
 - Technician's name (Are they certified?)
 - Uncertified = Not Certified!

Step 3: What Am I Looking For?

- TAB Report
 - Check the numbers.
 - Nothing is perfect.
 - On Fan Profiles, check for:
 - Fan Laws (Does the speed, static pressure, calculated BHP, amperage make sense?)
 - Voltage and Amperage discrepancies ($\pm 2\%$ and $\pm 10\%$ from the average, respectively, per NEBB)
 - Fan Curve: Flow vs. Total Static Pressure
 - On Pump Profiles, check for:
 - Pump Laws (RPM, DP, Max Ft. Hd., amperage)
 - Voltage/amperage discrepancies
 - Report should include plotted pump curve showing actual flow vs head pressure!

Step 3: What Am I Looking For? (cont.)

- TAB Report
 - Check the numbers.
 - On air diffusers/registers:
 - Is everything perfect? Air TAB is not perfect. There should be a range ($\pm 10\%$)!
 - On hydronic balancing valves
 - Valve Size
 - Pressure drop
 - Setting (Manual Valves have dials or numerical settings that can be recorded)
 - Know your valves! (See example)

Step 3: What Am I Looking For?

- Example: B&G Balancing Valve (Circuit Setter)
 - What is Full Open and what is the lowest allowable setting for TAB?
 - You need to know!



Step 3: What Am I Looking For?

- What makes a certified report?
- More than you might think!
 - (Uncertified) Tricks of the trade:
 - Stamp (*Multiple Organizations?*)
 - Firm Certificate
 - Marked-up/Numbered Drawings
 - *Maybe*: List of calibrated instruments

Step 3: What Am I Looking For?

- What makes a *truly* certified report?
 - **Signed** Stamp (Firm Certificate generally not required)
 - Marked-up/Numbered Drawings
 - List of calibrated instruments **and...**
 - Executive Summary (with explanation of deficiencies)
 - Certification page (including any warranty or QAP statement)
 - Verify that the technician(s) performing the work are certified or that the Certified Management-Level staff was onsite
 - If it's uncertified, it's not certified!

Step 3: What Am I Looking For?

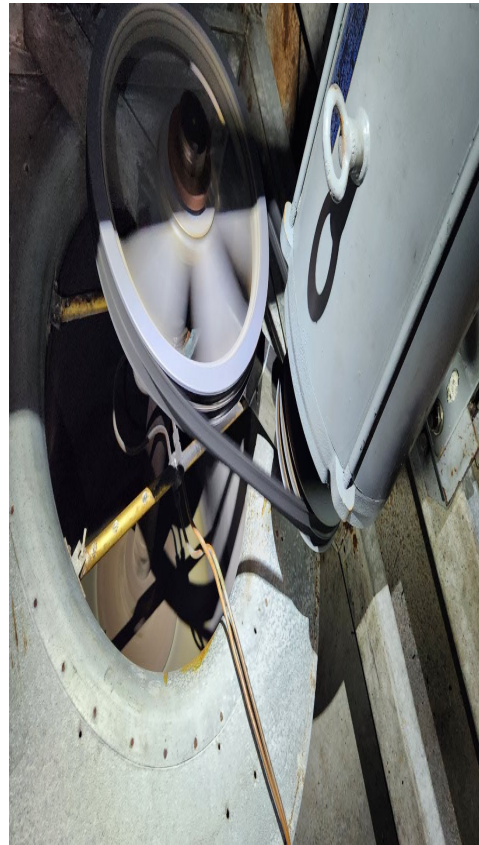
- Why require these items?
 - The value of Certification to our clients
 - Quality Assurance Program (or Warranty of TAB work)
 - Any troubleshooting performed by qualified personnel
 - CxPs include TAB Reports in the Final Cx Report
 - Is your report truly final, if the components are not?

Step 4: Don't Hate Me – I'm the CxP

- TAB Contractors are generally not fond of CxPs
 - Verification can slow down TAB work
 - Additional documentation costs time (money)
 - CxPs *(should)* ask questions!
 - Does the technician know the project-specific MOP?
 - Why doesn't this reading make sense?
 - What issues are causing the discrepancy?
 - Airflow, Water flow, Room Pressurization

Step 4: Don't Hate Me – I'm the CxP

- TAB Contractors know:
 - Air Flow Issues
 - Example:
Federal Building



Step 4: Don't Hate Me – I'm the CxP

- TAB Contractors know:
 - Water Flow Issues
 - Example:
Federal Building



Step 4: Don't Hate Me – I'm the CxP

- TAB Contractors know:

- Room Pressurization

- Example:

VA Medical Center
Rutgers University



Step 4: Don't Hate Me – I'm the CxP

- Advantages to collaborating with TAB Contractors:
 - Time is Money
 - Hands-On Field Experience
 - They are onsite ***before*** functional testing
- Issues TAB Contractors face:
 - Chain of command
 - Limited time
 - Coordination

Step 4: Don't Hate Me – I'm the CxP

- Build a bridge
 - TAB should be present for the Construction Phase Cx Kick-Off Meeting
 - Let them know you are there to support them.
 - Their product is part of your product!
 - Establish direct lines of communication, where possible.
 - Provide specifics on what you need from them
 - Certificates, MOP, TAB Report (including the requirements for their organization)
 - Open and upfront communication during this meeting makes all team members aware
 - Site visits can help build a rapport (NYC is smaller than you think!)

Step 4: Don't Hate Me – I'm the CxP

- Troubleshooting
 - TAB Contractors are beholden to the contract holder
 - They need to trust your discretion (Off the record)
 - Faults should be found during site visits (Verification)
 - Include their deficiencies on the Issues Log
 - Most Certified TAB Contractors *want* to do the right job
 - Owner involvement (through the CxP) results in better final product!

Step 4: Don't Hate Me – I'm the CxP

- Reporting
 - Review the report with an eye to “catching typos”
 - Confirm operational details are noted
 - Review Executive Summary for specifics on MOP/sequencing
 - Confirm fan and pump curves are included
 - Airside: Are S.P. setpoints noted? K-Factors on VAVs? Fan speeds?
 - Waterside: Are D.P. setpoints noted? Pump speeds? Balancing valve settings?
 - Verify readings (including amps/volts) by calculations
 - Is the report *truly* certified?
 - Where's the QAP/Warranty statement? Stamp? Certificates of Calibration?
 - Don't forget to check the technician's name on the database!

Why Can't We All Get Along?

- We're on the same team, but only 1 of us is free to defend the Owner's interests directly.
- Principle of cooperation carries through to all trades
 - CxP's need to know:
 - Who am I working with?
 - When should we start working together?
 - What do I need to know?
 - How can we work together?
- Cooperation gets the Owner a better product – The reason you do what you do!

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