



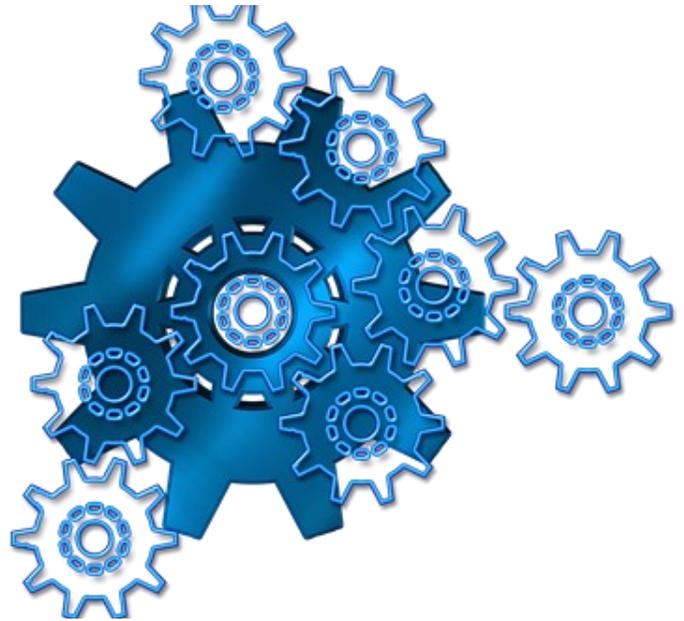
## ***Third Party Testing, Adjusting, and Balancing***

Last month we discussed building commissioning (Cx), what it is, how it is done, and how important it is to asset managers responsible for new building construction and renovations for existing buildings. Another important activity when it comes to construction, renovations, and building heating, ventilating, and air-conditioning (HVAC) systems is testing, adjusting, and balancing (TAB) of these systems.

Analogous to the information one finds on a new car window sticker stating the estimated miles per gallon (MPG) and the vehicle's standard features and optional features (e.g., electric windows, air-conditioning etc.), TAB and Cx of an existing building or a new building HVAC system(s) compare to window sticker compliance. What we mean by this is that the Cx agent is responsible for making sure the electronic features and options operate per the car manufacturer's design intent. The TAB contractor is that technician that tunes this automobile's engine up to achieve the GPM equivalent in an HVAC system: supply air cubic feet per minute (CFM), hot water and/or chilled water GPM, etc.

For all those people who have bought a new car and assume this vehicle will perform as stated on the window sticker, one would not accept their car coming out of the dealership yard sputtering, backfiring, and windows not automatically opening and closing. The same applies to the other features such as the audio system, heated seats, etc. The purchaser doesn't have to be an automotive mechanic to recognize this car is not operating correctly and per the design intent of the manufacturer. That said, it is safe to say that when one purchases a vehicle and it comes with its window sticker information, the car manufacturer has had the car commissioned and the engine tuned up (TAB) to perform as intended.

When a building owner has a building constructed and/or renovated one cannot assume the building is going to perform per the design intent. Unlike a car



manufacturer who is responsible to design, build, TAB, and commission each vehicle as a single-source provider, building program results don't assure this building will open its doors with its window sticker guaranteeing the asset manager that everything will perform per the design intent. The reason this cannot be guaranteed without Cx and TAB of HVAC systems is because there is not a single-source provider. Beginning with the design engineer being a consultant on a design team that produces construction documents that a prime contractor (general contractor or a construction manager) will be awarded a contract to build this project. This prime contractor will sub-contract the HVAC scope of work to an HVAC contractor who, in turn sub-contracts the equipment purchases to equipment manufacturers. Installation of piping and sheet metal will also be sub-contracted, and most importantly the automatic controls for these HVAC systems will be a combination of equipment manufacturers providing controls to operate their equipment while an automatic control sub-contractor will be responsible for making these controls function and interact with the remaining

HVAC controls e.g., overall building occupied-unoccupied sequence of operation.

Where a car manufacturer will have under one roof the equipment, materials, piping, tubing, wiring, etc. all furnished and installed by this equipment manufacturer, the HVAC sub-contractor will have possibly a dozen equipment manufacturers some with their own automatic controls and other manufacturers without needed controls. Other sub-sub-contractors may be for piping, sheet metal, insulation, and the automatic control company to finish out the list of separate firms involved with building the HVAC systems. When it comes to a warranty, the car manufacturer is responsible for this vehicle's warranty. The warranty for the HVAC system is far more difficult to define because the prime contractor is responsible for the entire building project and this company will look to the HVAC sub-contractor to take responsibility for the overall HVAC warranty issues. This warranty will need to be better defined so that the HVAC sub-contractor can direct the warranty issue to the appropriate sub-sub-contractor, which on many jobs may total 15 or more equipment manufacturers and trade contractors.

As a result, building owners and/or their asset managers today usually contract the services of a third-party Cx agent to orchestrate the building's features and optional features e.g., building automation system, so that the facility operates per the design intent. When a building operator is told the HVAC system will go into an unoccupied sequence of operation at 6PM then the operator will be confident that this will occur because the Cx agent observed and verified that the automatic controls operated as designed just like the new car owner knows with a push of a button the automatic door locks lock the doors.

But what about the building design team's energy budget? The building will not be sputtering and backfiring like an automobile would do if its engine was not tuned up (TAB). Instead, occupants would be moving into their space and some may be very uncomfortable because the heating and/or cooling system wasn't delivering the design flow (GPM, CFM) and/or the air or water temperature wasn't correct for the HVAC system to operate per the design intent. For the building owner, expecting an estimated energy budget and associated utility costs e.g., monthly gas bill,

electric bill, etc. he or she may be shocked that the cost to operate this new facility is 50% more money than originally led to believe by the design team. Unlike that window sticker on the car stating the estimated MPG in the city and on the highway will actually perform within these two MPG ranges, an asset manager sharing operation of a building with a facility manager won't have this advance assurance and this information will most likely be received by the utility companies a month later!

The solution for the building owner, asset manager, and facility manager is to contract the services of a third-party TAB company to work in sync with the Cx agent beginning in the Design Phase of the building program. Sure one may say this is an additional cost to the project, as is the third-party Cx agent, but the building program needs to replicate the car manufacturer overseeing the production of the automobile from design to fabrication, to commissioning, to TAB, to warranty. As a rule only the Cx agent is hired to provide third-party quality control of the project. The TAB contractor is usually a sub-contractor to the HVAC contractor awarded the job to furnish and install the HVAC systems. The technician responsible for tuning up the HVAC Systems answers to the contractor who hired the TAB firm. It is very difficult to do anything more than adjust and balance the equipment and air and water distribution based on what the HVAC contractor has installed. If there are improvements to make the project perform better it is usually too late in the process for an experienced TAB technician to offer suggestions.

Instead of having a TAB technician working under the direction of an HVAC sub-contractor and joining the project somewhere at the mid-point of a construction project, experience has shown that a third-party TAB firm with years of experience and TAB certified contracted in the Design Phase of the job brings a quality control point of view and expertise to the design, construction, start-up, and operation of the HVAC systems. Similar to the steps taken by the Cx agent (refer to last month's column) this third-party TAB specialist will provide the following Design Phase services:

**Design Review** – strategically targeted reviews at the end of the concept/schematic phase, end of the design

development phase, and then a final design review prior to the construction documents going out to bid. The TAB technician shall write a design review report at each phase

**Design Intent** – review and comment to the Design Team’s HVAC consulting engineer

**TAB Specification** – Review the Design Team’s HVAC consultant engineer’s document to be included in the contract documents that will go out to bid outlining notifying the contractors (general contractor, construction manager, and affected sub-contractors) of third-party TAB scope of work

**Deferred Seasonal TAB** – the contract specification shall address seasonal TAB requirements e.g., adjusting GPM’s for the heating components of the HVAC system in the heating season, etc.

At the completion of the project, including any seasonal deferred TAB adjustment, the TAB technician shall submit to the Building Owner the following TAB Report with all TAB documents produced beginning in the design phase as record documents

- Design Review Notes
- Field Visit Inspection for System Readiness
  - Standard TAB Checklist
  - Duct System Checks
  - Piping System Checks
  - Check Equipment
- Completed System Flow Diagrams with flow and pressure readings (minimum & maximum flows)
- Completed TAB Procedural Standard Checklists, TAB Readings, etc. (NEBB, AABC, TABB)\*
- Executive Summary Report

\*NEBB (National Environmental Balancing Bureau) <https://www.nebb.org>

\*TABB (Testing, Adjusting, & Balancing Bureau) <https://www.tabbcertified.org>

\*AABC (Association of Air Balancing Council) <https://www.aabc.com>

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