



Construction Management Platform Quality Program Functionality

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Overview

The DCX Quality Exchange is dedicated to the advancement of quality in the design and construction industry through defining common practices and processes. A key element of gaining consistency on implementing quality is integrating quality processes into the standard Construction Management Platforms (software) used in the industry. This document is intended to detail the functionality required to accomplish this and make quality an integral and seamless part of the design and construction process.

Functional Elements

The required quality elements can be divided into four primary functions that allow the Construction Management Platform to be scalable for both project and firm size and complexity:

1. Observation/Checklist Functionality
2. Definable Feature of Work/xBS Process
3. Quality Process Management
4. Business Intelligence

Observation/Checklist Functionality

At the core of any quality program is the identification and resolution of issues found during the construction process – this could be as part of a general observation or due to a formal event (punchlist, inspection or checklist completion). The key criteria for an observation include:

- Core fields automatically associated based on observation type or assigned trade partner (e.g., CSI and/or MasterFormat Section).
- Tracking of completion (e.g., automatic or signatures).
- Can easily customize the types/sub-types of observations for tracking and reporting.
- Pushpin functionality (assign on drawing or system diagram) and associate to DFOW/xBS – see DFOW section below).
- Create RFI directly from observation.
- Punch list items should have same function as observations, and should be able to be grouped in a similar fashion (see DFOW and xBS process below)
- Predefined workflows for typical observations (e.g., hole in wall go to drywall, then painter, etc.).

Beyond the ad hoc observations, the next level in a quality program is the use of checklists to gain alignment on what is success and to aid the trade partners in managing, executing and documenting their scopes of work. The checklists should be preventative in nature, tiered based on system/assembly, trade partner assignable and graphical in nature.

Preventative

1. Developed During Installation Planning
2. Details "What is Success"
3. Used During Mock-up Process
4. Completed by Trade "As Work is Completed"

Tiered

1. System to Equipment to Activity
2. Assembly to Component to Activity
3. Activity is at Individual Trade/Crew Level
4. Activities Could be Concurrent/Serial/Other

Trade Partner Assignable

1. Easy Access to Their Scope of Work
2. Help Trade Superintendent Manage Work

Picture Based

1. Add Picture Elements for "What is Right"
2. Text Only for Tracking/Data Purposes

Non Fan Powered VAV Box with Hot Water Heat

Item	Task Description	Response	
		Submitted	Delivered
1	Delivery		
A	Model Verification	Submitted	Delivered
1	Manufacturer	Trane	
2	Model	VFR-215	
3	Serial Number	N/A	
4	Size (in)	15	
5	Min/Max Airflow (cfm)	50/400	
6	Heating Capacity (MBH/gpm)	15,000/45	/
B	Physical Checks		
1	Unit is free from physical damage	Yes	No
2	The air openings are sealed with plastic	Yes	No
3	The water openings are sealed with plastic plugs	Yes	No
4	The airflow sensing tubing is plugged	Yes	No
2	Construction Checklist		
A	Hanging		
1	Unit is supported as required by manufacturer and specifications	Yes	No
2	Metal to metal connections eliminated to prevent noise problems	Yes	No
3	Adequate clearance around control panel for maintenance	Yes	No
4	Clear access below unit for easy maintenance	Yes	No
B	Ductwork		
1	Balancing damper present on inlet duct	Yes	No
2	Sufficient length of straight ductwork installed upstream of unit	Yes	No
3	Downstream ductwork free of transitions for sufficient length	Yes	No
4	All components are accessible for maintenance	Yes	No
C	Piping		
1	All piping components have been installed (in the correct order) as required by detail drawing	Yes	No
2	Piping is arranged for ease of unit/coil removal	Yes	No
3	Piping supported as required by specifications	Yes	No
4	Piping is clean	Yes	No
D	Controls - Installation		
1	Temperature sensor calibration verified	Yes	No
2	Airflow sensor calibration verified	Yes	No
3	Point-to-point connections of control wiring verified	Yes	No
4	Central system accurately represents conditions of unit	Yes	No
E	Controls - Startup		
1	Cooling/heating sequence of control verified	Yes	No
2	Warm-up/cool-down sequence of control verified	Yes	No
3	Unoccupied sequence of control verified	Yes	No
F	TAB		
1	Minimum airflow (cfm) (design measured)	/	/
2	Maximum airflow (cfm) (design measured)	/	/
3	Entering and leaving coil air temperatures (deg. F)	/	/
4	Entering and leaving coil water temperatures (deg. F)	Yes	No
5	Coil flow and air/water pressure drops verified	Yes	No

In addition to the functionality of the individual checklists, there are several items required to support managing the implementation of checklists at the Trade, Project and Company levels:

- Ability to modify the checklist once you start using it, without having to create a new one.
- Quick and automatic access to relevant other information (e.g., submittals, installation instructions, model content, drawings, RFI's, etc.).
- Ability to have mandatory data fields cascade through checklists and subsequent issues (e.g., CSI Section).
- Company (and Industry) Libraries – have the ability to create and promote company level (and industry level) libraries to minimize recreating checklists again and again – able to lock certain fields as mandatory and track data regardless of parent-child changes.
- Visibility of changes to checklist at project level by management – also visibility of use of standard checklist (library) versus creating own checklist – or even if they are using a checklist when they are supposed to (see quality process management).
- Ability to build the checklist through the trade partner on-boarding process (e.g., submittals, RFI's, specifications, etc.) – see Quality Process section below.

Definable Feature of Work/xBS Process

The next level above checklists is packaging status items and checklists for a definable feature of work (DFOW) or a xBS Process, where x stands for a location, system, component or other category item. The DFOW/xBS approach is intended to allow projects to define their process for completing a specific scope of work and use the construction management platform to support accomplishing their work in a defined sequence of activities and checklists, as well as notifications to subsequent trades once this is completed. This workflow approach could include series and parallel flows, hold points, checklists, inspections or other activities.

An example of this could be the installation of a pump, which has the following workflow with status gates and checklists:

- Install Concrete Pad – checklist and status change
- Install Pump – checklist and status change
- Additional Installation Steps (parallel)
 - Piping
 - Electricity
 - Controls
- Status change once physical installation completed
- On-going maintenance (rotate motor) to maintain warranty
- Fill and flush
- Start-up
- Testing, adjusting and balancing

For the DFOW/xBS functionality to be successful, some additional elements to consider include:

- Visual creation or viewing of workflows (logic diagrams).
- Can link directly to DFOW package from RFI, inspection checklist or stand-alone observation creation
- Industry Library
- Integrates inspection management into workflow
- Quick access to relevant manufacturer's information (e.g., submittals, installation instructions, checklists, work plan documents, etc.).
- Pre-populate anticipated inspection requirements so you can track what is done and what is still required
- Identify hold points in the workflow (next checklist cannot start until previous is completed)

Quality Process Management

The next level up is for the Construction Management Platform to support the implementation and management of the quality process on the project (and across the organization). This is intended to support implementing and tracking the quality process from trade partner on-boarding through owner operating their new facility.

For each trade partner (and subsequent DFOW), the typical items being accomplished (customized at trade partner level) related to a quality program include:

- Trade Partner Contract Executed
- Project Orientation Meeting Completed
- Project Administration Submittals Completed
 - Insurance Certificates
 - Quality Plan
- Scope of Work Submittals Completed
- RFI's/CO's
- Construction Checklists Drafted
- Pre-installation Meeting convened
- Construction Checklists Finalized
- Procurement Tracking (this needs to be tied directly to submittal status)
- Installation Verification (manages completion of Construction Checklists by Trade Partners, as well as what to be verified by the General Contractor on an on-going basis)
- Inspection Management (the formal inspection request and completion process with the AHJ)
- As-built documents
- O&M documents
- Owner Training
- Warranty Start
- Warranty Management
- Quality Incident Management

Ideally, the construction management platform would automatically track and report status on the completion (or lack of) the quality related items and provide a quality health for each trade partner and for the project overall. The tracking and reporting should incorporate Quality Incidents for those companies that are utilizing this metric – need to be through platform or pulling information from 3rd party system through an API.

In addition, for projects where the contractor is involved during the design phase, the quality process tracking would include design quality-based activities.

Finally, throughout the process, access to past lessons learned (knowledge base) items through an API is desirable.

Business Intelligence

Over all the quality-based information within the construction management platform needs to be seamless access and presentation of the data to drive preventative and proactive behavior to quality, as well as quick resolution of issues when they occur. From a business intelligence perspective, this includes:

- Identifying key BI fields to be cascaded through the system
- Ability to trend all locked fields
- Ability to trend custom fields
- Visual reporting of status (green, yellow, red) and workflow status
- Visual reporting based on xBS (e.g., heat map of floorplan)
- Scalable to view results from Trade Partner, to project, business unit, region and company levels
- Ability to easily and quickly export to multiple data warehouse solutions
- Ability to use data warehouse to consolidate data from multiple sources

Business Intelligence should ultimately drive the preventative quality activities that support doing work right the first time:

- Application of Lessons Learned/Best Practices – present key performance indicators (e.g., pass rate) on past performance in the system at the checklist item level to identify opportunities to focus team on avoiding issues.
- Measure of Expectation Alignment – system provides a measure of expectation alignment through participation in meetings for the creation of construction checklists (e.g., if owner, designer, contractor and trade partner participate, assume 100% alignment).
- Quality Process Health – the system provides the health of completing the quality process on the project for each DFO. This would include proper completion and sequence of activities, including:
 - Submittal Reviews
 - Pre-Installation Meetings

- Initial and On-Going Verifications
- On-Going Project Quality Evaluations
- Risk Analysis – based on the identification of high risk items during quality planning, the system should highlight activities and checks related to high risk to indicate to those using the system a higher priority of focus.

Sample DFW Workflow

