



Achieving Design Document Quality Alignment

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Introduction

The majority of efforts to date by the DCX Quality Exchange on QA and QC have focused on construction management, best practices, field implementation, metrics, and reoccurring problems related to all of the above. These can be considered lagging indicators of a more basic and system wide problem in the design and construction industry. It is hardly a revelation that interfacing between architects and builders continues to be the root cause of many issues in the field that affect quality, schedule, budget, and project safety.

This “interfacing” is almost entirely based on the implementation and interpretation of the contract documents, specifically the documents dealing with the design – the “design documents”. These documents comprise the drawings, specifications, and bid requirements, along with ancillary documents such as the schedule, submittals, and shop drawings. The design documents can be greatly improved through the adoption and implementation of a robust quality process.

It is important to differentiate between design document quality, which is the focus of this assessment, and that of *design quality*. Design document quality focuses on the quality, consistency, and alignment of the contract documents that are created through the design and early construction quality planning phases. We intentionally do not address Design Quality, or what could be interpreted as the “Quality of Design”, as this topic is subjective and the purview of the Owner and Design Team.

The intent of identifying the issues, considerations, and recommendations contained herein is to provide the project team with areas of focus as they strive for better alignment on achieving design document quality. Three main areas of focus include:

1. Incomplete documents
2. Constructability of documents
3. Timeliness of documents

This list of items is not all-inclusive and should be used by the project team to start the discussion on potential issues that could degrade the document package and recommendations to consider for improving document quality. The goal should be for the project team to align their definition of document quality and how they will achieve it throughout the design process and early construction planning.

Precursors to Design Rework, Project Delay and Owner Dissatisfaction

Often, initial project development and implementation phases are created based on a set of assumptions that remain unverified or substantiated until well after the project expectations are set. These expectations, right or wrong, are then used to monitor the proceeding project development, becoming the precursors that could hinder a successful design and construction outcome:

- Ineffective management of the Owner’s expectations of the project within the nonadjustable requirements of the project, many of which are base programmatic and scope items.
- Artificial or erroneous assumptions of design and construction timelines by the Owner and/or Design Team prior to assembling the complete Team.
- Artificial or erroneous scope and cost assumptions by the Owner and/or Design Team prior to assembling the complete Team.

Any one of these precursors can directly influence the resulting document quality in the areas of Completeness, Technical Fitness, and Timeliness.

Areas of Concern and Improvement of Design Document Quality

Developing a comprehensive coordinated set of documents is critical to clearly define and represent the proposed design.

Completeness of the Design Documents

The first aspect to consider on documents is how complete they are in their development.

1. Issues

- Cost reduction(s) and/or Owner directed changes not reflected in the drawings or specifications that are bid or used in the field.
- Insufficient development and detailing of the definable features of the design and their sub-components, transitions, and plane changes appropriate for a specific cost milestone requirement.
- Insufficient and/or conflicting building dimensioning and dimensional control.
- Lack of technical coordination between the design disciplines.
- Generic detailing of critical items and/or relying on future shop drawings or manufacturer details.
- Key architectural details and other building component design deferred to other entities for development.
- Omission of critical or inclusion of non-applicable information in specifications and drawings.
- Limited internal quality control regarding document references and coordination; outdated or non-applicable information.
- Conflicting or uncoordinated document standards as they relate to CAD, BIM and other documentation programs.
- Lack of objective document content and development benchmarks scaled to the appropriate point of the design development session to effectively price and schedule major definable features of work.

2. Considerations and Recommendations

- Identify the specific “definable features of the design” at a formal design kick-off or no later than the completion of “schematic design”.
- Definable features should be categorized and “critical features” of the design should be clearly segregated with specific development goals and timelines aligning with construction priorities.
- In the Owner’s RFP/RFQ for design and in the Owner/Architect Agreement, a required internal Design Team quality control review by a senior level Architect and Engineer who is not directly working on the project to maintain a “fresh eye” approach. The QC individuals should be named along with their qualifications in the RFP/RFQ and Agreement.
- Development of an accountability matrix detailing the "who", “when”, and "what" critical technical reviews are needed by the Design and Construction Teams.
- Identified definable features of the design and sub-components to be the focus of a series of “detailing charrettes”, either internal to the Design Team or inclusive of the Construction Team. The charrettes would be tied directly to the timelines of construction.
- Assess (or audit) the documents for required and contractual completion and risk prior to review by the Owner (and Construction Team if applicable) and prior to approval to proceed to the next design development phase.

- Develop a scalable “toolset” that lists typical definable features of the design based on the project type. This could act as a guide for the Owner, Design and Construction Teams on scaling critical deliverables
- The toolset could be referenced or be an exhibit in the Owner RFQ/RFP and also become a contractual deliverable by the joint team or the individual stakeholders.

Technical Fitness of the Design Documents

When properly developed drawings, details, and specs are specific and well researched for a particular project, the possibility for misinterpretation is diminished.

1. Issues

- Inappropriate material and systems selection and their interfacing for the definable features of the design and their sub-components.
- Inadequate or non-existent communication of Facilities and Maintenance requirements and expectations.
- Insufficient knowledge of definable features of the design’s performance requirements and potential issues.
- Genericized details not applicable or appropriate for the conditions they are meant to explain.
- Conflicting direction between specifications and drawings.
- Conflicting direction between professional disciplines.
- Uncoordinated, deferred, or delegated definable features of the design and sub-components.
- Lack of timely input by the Construction Team during detail development resulting in design rework.
- Inadequate provision for construction tolerances (+/-) in detailing and layout.
- Unfamiliarity with safety, quality control, maintainability, and construction means and methods in developing the design.
- Lack of expertise or experience to conduct constructability reviews by the Design Team, 3rd Parties, or by the Builder and Trades placed in that capacity.
- Design Rework resulting from any of the above cited issues, which changes and degrades the focus, momentum, accuracy, and completeness of the documents.

2. Considerations and Recommendations

- Owner RFP/RFQ and subsequent contractual requirements clearly define expectations of document constructability and risk review and its incorporation into the development of the documents for the entire design and construction team.
- Owner RFP/RFQ requirement to demonstrate qualifications, expertise, and experience in conducting constructability and risk reviews of specific critical features of the design for the entire design and construction team.
- Owner consideration of a qualified 3rd Party to review the documents, contracted directly with the Owner.
- Clear identification and discussion of all deferred and delegated design items at the beginning of a definable feature of the design and their sub-components.
- As a Best Practice, commitment by the Owner to have their Facilities and Maintenance staff be active contributors to the design and constructability efforts.
- Development and adoption of Best Practice requirements of Constructability Review that is “scalable” to the project complexity. The review or “audit” becomes an Owner contractual element, transparent to the entire project team.

Timeliness of Design Document Completion

Design Teams have difficulty adhering to agreed upon design phase schedules, which have significant downstream impacts to the construction cost, quality, and schedule. This also impacts the development of the critical features of the design and the quality assurance and control processes of previously cited issues, considerations and recommendations.

1. Issues

- Design and/or Construction Teams' lack of knowledge or clarity of who are the Owner's delegated decision maker(s).
- Misunderstanding or lack of clarity regarding Owner acceptance criteria (i.e. conditions of satisfaction) and changing Owner acceptance criteria.
- Unfamiliarity with specific local authorities' jurisdiction and the permitting process and time constraints.
- Unfamiliarity with local basic Service Providers (water, electrical, gas, sewer, telecommunications) and their processing time constraints.
- Delayed resolution of critical features of the design and their sub-components due to lack of Owner information, input, and/or constructability review. (*examples: site constraints, soils report, exterior wall assemblies, owner supplied equipment, FM input on Building Envelope and MEP systems.*)
- Lack of awareness or understanding about the ways in which design schedule delays impact the critical path of construction.
- Lack of timely technical feedback and/or constructability review from stakeholders (Owner, primary and special Consultants, Construction, 3rd Party building envelope review and Trades)
- Late Owner changes due to a multitude of factors and an immovable construction completion date.
- Lack of clarity of who is leading, managing, and coordinating technology (i.e. BIM) and the standards that will govern contributing disciplines and trades.
- Design rework as the result of any of the above cited issues.

2. Considerations and Recommendations

- Use the Construction Master Schedule format and logic to break-down design into micro tasks in a pull-planning format at the start of the critical features of the design, resulting in the "Master Project Schedule".
- Build buffers into the Master Project Schedule at hard to predict tasks. (*examples: all permitting, long lead items, entitlements, financing, legal, etc.*)
- Set clear time and schedule expectations of all stakeholders, particularly the Owner, its representatives, Facilities and Maintenance staff, and other Owner entities.
- In the RFP/RFQ to the design and construction teams, include the requirement of a Master Project Schedule (Master Schedule format as an example) and also include in the Owner/Contractor or Owner/Architect contracts.
- Identify and detail in the Mater Project Schedule the Owner's participation in providing specific information, reviews, and approvals during design.
- Identify the Owner's decision requirements (two dimensional plans, models, mock-ups, etc.) for the critical features of the design.
- Define Owner accountability for late changes and/or lack of decisions that affect design timelines and/or costs (*potentially a contract requirement or at least a very serious discussion early on*).
- Identify who the decision makers are, including Board of Directors, councils, advisors, et al.

- Track design delays by type for possible schedule or financial adjustments to the impacted parties. (*examples: indecision, inadequate information, programmatic changes and cost related changes.*)
- The Owner Contract ties the Design Team to the Master Project Schedule in a flow-down approach.
- Facilitate Design and Construction Stakeholder Work Session(s), Relationship Building, Effective Communication--Practicing Workflow. (D/B parlance: Partnering Session).

Summary

Focusing on improving the quality of the design documents maximizes the value to the Owner. By increasing collaboration between all stakeholders and leveraging each other's strengths, we can ensure design documents are:

- Complete – include all necessary details, dimensions and other supporting information.
- Coordinated – no contradictions or program/scope misalignments in the documents.
- Accurate - details and clearly define all features of the design and their sub-components.
- Constructible – can be built using standard construction means & methods.
- On-Time – uphold and support the Project Master Schedule.
- On-Budget – uphold and support agreed on cost targets within the full project budget.

If any one of these six elements is not addressed early in the development of the documents, it causes a significant impact to the design and construction effort and will lead to delays, RFI's, rework, cost over-runs, and dramatically impact the success of the project.

There are many reasons issues occur during the development of the design and many are not in the control of the Design Team. By defining areas of improvement in the documents, they cannot become “weapons” or excuses for poor performance and quality by the Builder.

A special topic to devote more time to, is the matter of “Design Rework”. Design rework has every downside that construction rework has and is most often the contributor to any number of the issues cited above and can often harm the project AND the design irreparably. We as Builders must recognize this and be partners with the Architects by bringing our expertise and experience to the table to help prevent unnecessary rework and recover successfully when it is unavoidable.