Canadian Construction Association

Quality of Documents Workshops

A REPORT FROM THE CCA STANDARD PRACTICES COMMITTEE

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Introduction

In the Canadian construction and building industry, the completeness and quality of design documents remains a fundamental issue. All parties on a project, from owner to consultant to contractor, are impacted by design documents. If documents are incomplete, lack important information, or are of poor quality, projects can be plagued by delays, cost increases, and reduced productivity. As noted by Bob Keen, a senior consultant with Revay and Associates, "For all parties to a construction contract, incomplete contract documents at the time of awarding a contract substantially increase the risk of major cost overruns and project delays."

At its 2014 Industry Summit, the Canadian Construction Association (CCA) and its partner associations across Canada identified the issue as one that will have a major impact on the industry over the next five years. Because of this, CCA, with industry associations across Canada, undertook a series of workshops to bring together stakeholders to discuss the causes of, and potential solutions to address poor quality and incomplete construction documents.

In total, there were twelve workshops held across Canada, with each following a similar format to encourage conversation and dialogue. The agenda began with a panel discussion that provided a local analysis on the topic, and then asked all workshop participants a series of questions concerning causes, how to achieve good quality in design documents, and most importantly, potential solutions to address the issue. Participants were also asked to fill out an anonymous survey, identifying frequency and impact of potential causes and issues related to poor documentation.

It should be noted the workshop format allowed for a broad and diverse set of viewpoints to be presented, resulting in different judgements and opinions regarding the issue. While this variance can be viewed as somewhat contradictory, it ensured the data and anecdotes collected were representative of industry opinion, and not just one individual sector.

The solutions discussed across Canada will go a long way in helping CCA work with partners and likeminded organizations on solutions to this issue.

Workshop Summary

The information gathered at the cross-country workshops represents the opinions and experience from a broad cross-section of industry stakeholders in their local region.

The questions asked to participants were done so in a way to initiate conversation about the topic, while giving consideration to the ideal scenario that would allow for high-quality design documentation.

Separated into tables with cross-sectoral representation, participants were given a series discussion questions, before presenting to the full workshop. Following these presentations, participants were asked to discuss potential solutions to the issue of document quality.

Quality Control And Document Coordination

One of the first questions asked of workshop participants concerned quality control and the coordination of design documents.

1A   Who Is Ensuring Quality Control over the Documents before They Are Issued as Bid Documents?

At workshops across the country, there was very little dispute that quality control of design documents fell to both owners and consultants.

As the first stage before design documents are issued as part of a bid package, the design team members, i.e. (prime) consultants and subconsultants, are primarily responsible for quality control and ensuring the bid package contains complete and high quality design documents.

Meanwhile, owners have an important role to play in terms of communicating their expectations, allowing for sufficient time to prepare documentation, and remaining available to provide feedback and instruction during the design process.

FINDINGS:

Prior to the issuance of bid documents, each respective group has a role to play in order to achieve high quality documentation.

➡ **Prime Consultants**
   - Be responsible for the overall coordination, with input from subconsultants.

➡ **Design Team Members** (consultants and subconsultants)
   - Be responsible for their own internal quality control, e.g. internal peer reviews.
   - Be active in the quality control process to identify issues.
   - Ensure coordination between design disciplines.

➡ **Owners**
   - Specify the requirements of quality control.
   - Be active in providing timely feedback and instructions during the design process.
   - Consider appointing a quality control officer and/or engaging an independent peer review of the design.
   - Be more involved in the quality control process if they impose special design conditions/restrictions.
   - Involvement in the quality control process should be subject to their knowledge, experience and human resources.

Workshop participants often cited education, experience, and communication as key to achieving better quality documentation.

1B   Who Is Responsible for Coordination?

When managing the coordination of design documents, workshop participants identified prime consultants and owners as the parties responsible for coordinating.

The prime consultant should take on the overall coordination of the documents, while the owner has a responsibility to have a representative in place who can provide timely and relevant feedback as needed.

In brief, participants identified the following information regarding document coordination:

- Prime consultant should be responsible for the overall coordination.

- Owners should specify or appoint a project coordinator.

Again, communication between the prime consultant and owner is pivotal when coordinating documents. This includes the communication of overall expectations, as well as ongoing communication throughout the design process. The owner has a responsibility to remain actively involved throughout this process to ensure the prime consultant is working with the most relevant and current information.

The creation of or use of an industry standard checklist, a suggestion at several workshops, could assist in document coordination.

The Sharing of Risk

One of the common themes identified at the workshops is the notion that all stakeholders have a responsibility to share risk, rather than shedding it, in order to improve the quality of design documents and project overall delivery.

2   How Can Industry Embrace Sharing the Risk Rather than Trying to Shed It?

In these discussions, the themes of communication, collaboration, respect and trust were all prominently identified to reduce the number of disputes and cost overruns on a project, and ultimately increasing productivity.

It is also important to note that all parties were identified as having a role to play when it comes to sharing risk. This includes identifying roles and responsibilities early in a project, and ensuring all expectations on a project are well defined and understood.

Summary
- Communication amongst all parties is key in identifying/managing risks early and to mitigate their impact.

- Working as a team is vital, including communication, respect and trust among all parties.

- A team culture should be promoted, as opposed to adversarial relationships.

- Contractors can be considered as part of the design detail, such as sprinkler systems.

Roles and Responsibilities
- All parties are responsible to mitigate impacts.

- Owner and consultants are responsible for manage risks during the design process. Contractors are good in identifying risks, but would require contingency to manage those risks.

- Reasonable, and clearly defined expectations should be communicated to all parties (e.g. schedule, cost, responsibilities, outcome etc.).

- Owners should:

  (1) take responsibility for clarity of scope. If no in-house staff, should seek professional help.

  (2) specify independent peer review before calling for bids.

  (3) allow sufficient time for consultants to prepare bid documents.

  (4) Prepare realistic schedule and budget.

- Consultants should:

  (1) commit to internal quality control process,

  (2) communicate the time and cost impact of implementing changes at any time throughout the design.

- Contractors should ensure competent staff to perform the Work.

Project

- Find the right consultants and contractors

- Early involvement of contractors in the design process

- Use standard documents, e.g. to address design scope and timeframe.

- Lowest fee/price selection methods for consultants and contractors cause high risks

- Consider other project delivery methods to drive team culture and behaviour, e.g. integration of design and construction under design-build, team approach under construction management, multi-party teaming agreement under integrated project delivery

- Allow adequate time for consultants to design, and contractors to prepare bids

- Upfront planning from start

- Constructability review

- Mandatory site visits

- Better manage the RFI process

- Specify appropriate contingency to manage risk associated with project

- Post construction evaluation

Measuring Completeness

In order to ensure high quality and complete documentation exists on a construction project, it is also imperative that a measurement exists for all parties to understand the difference between good and poor quality documents.

3   How Do We Measure Completeness? How to Distinguish between Good Quality vs. Bad Quality Documents?

In many cases, workshop participants were able to identify several indications about the quality of documentation after the issuance of the bid documents. This includes the number of RFIs required, number of addenda issued, or a large variance in bid prices, all of which suggest an incomplete availability of information in the project documentation.

Recognizing that these are lagging indicators, and only serve as a measurement after the issuance of bid documents, the stakeholder groups were also asked to suggest a number of ways by which completeness could be measured prior to the release of the bid package, including independent peer review, and the use of checklists for both owners and consultants to measure owner requirements against design.

The following outlines commentary concerned with measuring completeness and quality of documents:

- Signs of incompleteness of documents:

  During Bidding Phase – number of addenda, large spread of bid prices (suggesting different interpretation)

  During Construction Phase – number of RFI, delays in permit process, number/value of changes (Change Orders and Change Directives), number of supplemental instructions, and number of claims.

- Consultants are currently relied on to benchmark the milestones for development of design documents, e.g. 33%, 66%, 99%.

- Consultants' perspective of completeness may not match that of Owners and Contractors.

Currently, the measurement of completeness falls primarily to consultants and owners. However, in many cases, there is not a standard level of completeness that consultants or owners adhere to. As discussed previously, the establishment of a standard checklist to measure completeness could address this. Working with other industry organizations could help establish this list, and ultimately help distinguish between complete and incomplete design documents, prior to their issuance as bid documents.

Other suggested improvements include the use of independent peer reviews in order to verify the quality of documentation.

Time Frames

Participants were also asked to identify the appropriate amount of time required to achieve high quality and complete documentation.

In many cases, the discussion centred on the type of project delivery method being utilized, as well as the nature, complexity and size of the project.

However, it is important to note that many felt the amount of time required to ensure high-quality documentation was the same regardless of project size, but that some delivery methods provided opportunity for document preparation at different stages. In other words, design-build may not always require complete documentation as part of the bid package because some design can take place during construction.

As well, there were several issues noted relating to timing and the development of construction documents. As an example, owners, particularly for publicly-funded projects, may have time constraints regarding funding approval. As well, labour shortages and knowledge transfer were also cited as issues regarding time. For example, without a skilled workforce, the amount of time becomes less important than the skills available to develop the design documentation.

The themes of communication were once again prominent during these discussions. It was felt that owners, consultants and contractors alike had a responsibility to communicate their expectations early and completely in order to achieve complete and high quality documents.

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4   **How Much Time Is Required to Develop Documents for the Various Procurement Methods?**

- The greater the amount of time to prepare documentation is the best to ensure completeness, notwithstanding the access to skilled workers.

  - This includes owners, consultants and contractors (if involved in design assist).

- The number of parties involved in the design process can help achieve higher quality documentation, but also requires more time to coordinate.

- Sophisticated and knowledgeable employees can assist in cutting down the amount of time required.

Workshop Conclusions

The "Quality of Documents Workshops" held across Canada provided an excellent forum to discuss this important issue with all parties involved and impacted by poor documentation. The information gathered was varied, and provided a myriad of opinions on the issue, the cause of poor documentation, and potential solutions to address the problem.

Key findings and takeaways from the workshops include:

- All parties have a role and need to understand their responsibilities as it relates to the construction project and the coordination of high quality documentation.

- Education, training and experience are potential impediments to improving quality, particularly as experienced employees reach retirement age or leave the industry.

- Technology, while helpful, can also be a hindrance to quality control, as it can suppress critical analyses of constructability; the proper utilization of technology is essential.

- Communication, trust, and collaboration are all key to improving quality of documents

- Introducing standardized industry best practices can help achieve better quality documentation.

It should once again be emphasized that quality of construction documents remains an industry-wide issue, and one that affects owners, consultants and contractors alike. There is no party that is infallible, and all stakeholders have an important role to play in addressing this issue.

Utilizing the findings from the nationwide workshops, and collaborating with other industry associations will be essential to help improve the quality of documentation in the Canadian construction and building industry, and help the industry move forward in a positive and progressive manner.

Survey Results Summary

As part of the "Quality of Documents Workshops," participants were provided with an anonymous questionnaire, outlining 12 potential issues that affect the quality of documentation on construction projects. The anonymity of the surveys was intentional, however respondents were asked to indicate which sector they represented: Architect, Consulting Engineer, Owner, Contractor, or Other.

With each potential issue, respondents were asked the following:

- Rate each potential issue in terms of its frequency and its impact (Scale from 1 to 5)
- Suggest potential solutions
- Identify any other potential issues not included on the survey

On the third point, it should be noted that the response rate was minimal, and that the suggestion of potential solutions was covered during the roundtable discussions at the workshop.

The survey questions and potential issues were drawn from two sources. The first five were sourced from the "Design and Documentation Quality Survey – Comparison of Designers' and Contractors' Perspectives" conducted in 2000 in Australia. The remaining seven questions were suggested by the CCA Standard Practices Committee, the Winnipeg Construction Association, and various other forums where this issue has been discussed in recent years.

The following were the potential causes/issues related to documentation quality that were identified in the CCA "Quality of Documents Workshop" questionnaire/survey:

1. Insufficient fee/design contingency

2. [1] Owners place unnecessary pressure on consultants (e.g. unrealistically high expectation, inability to make timely decisions)

3. [2] Lack of final coordination, checking and proofreading

4. [2] Lack of coordination between architects and engineers

5. [2] Insufficient time for design

6. Inexperienced contractors requiring more details

7. Shortage of skilled and quality people

8. Shortage of experienced specification writers (generic specifications are not tailored to meet specific project needs)

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[1] **Most frequent causes**

[2] **Causes that have the greatest impact** (as identified in the "Design and Documentation Quality Survey – Comparison of Designers' and Contractors' Perspectives" – CSIRO in collaboration with the Australian Construction Industry, May 2000)

9. A perception that new technology will dramatically reduce design time, while producing perfect design. Cut and paste may water down the quality of thinking

10. Fragmentation of consulting services (limited service contracts and 3rd party project management etc. may reduce the depth of understanding by all involved)

11. Design responsibility is assigned to contractors by intentionally leaving out pertinent data or details that are difficult to communicate through documents

12. New trends of BIM and IPD increase collaboration, which includes more sharing of design responsibilities amongst all parties, including contractors

Frequency of Potential Cause / Issue

When measuring the frequency of the identified causes and issues, the top three results were as follows:

- **Lack of final coordination, checking and proofreading**

- **Insufficient time for design**

- **A perception that new technology will dramatically reduce design time, while producing perfect design. Cut and paste may water down the quality of thinking.**

On the topic of final coordination, checking and proofreading, it was primarily owners and contractors that ranked this high, indicating a desire to see more review of documents prior to their being issued as bid documents. At several of the roundtables, owners indicated they too had a role to play in reviewing documentation to ensure it meets project requirements. Consultants, meanwhile, still ranked this issue/cause high, suggesting that a lack of internal review is being seen by consultants as a reason for poor documentation.

Insufficient design time was often discussed as well. The relationship between time and quality was often cited during roundtable discussions. All parties recognized the need for an appropriate amount of time to prepare design documents, review the documents, and issue the documentation as a bid package.

Interesting to note was the relationship between technology and poor quality documentation. Discussions around technology pointed to both the positive and negative aspects of technological advances. As an example, BIM was often referenced as an extremely beneficial technology if used effectively. However, if used ineffectively, or in a way that lacks coordination and collaboration among all parties (different software packages, interoperability issues), BIM can be seen to decrease the quality of design documents.

At the same time, technology can actually be seen to supress the critical analysis of constructability because of the ability to repeat design elements easily, without proper thought given to owner or project requirements.

Impact of Potential Cause / Issue
In terms of measuring the impact of potential causes/issues related to poor documentation, the overall survey results identified the following as having the highest impact when it comes to the quality of documents.

- **Lack of final coordination, checking and proofreading**
- **Lack of coordination between architects and engineers**
- **Insufficient time for design**

Also ranking high were:

- **Insufficient fee/design contingency**
- **Owners' (unnecessary) pressure**
- **Shortage of skilled/qualified people**

On the lack of final coordination, checking and proofreading, contractors once again ranked this as having the highest impact. However, it is also important to note that both architects and others also ranked this as having a very high impact on design documents. This would seem to once again indicate that consultants are cognizant that more internal review would enhance document quality, while contractors would like to see review prior to the issuance of documentation as bid packages.

Regarding the lack of coordination between architects and engineers, all groups ranked this highly, except in the case of engineers. That said it still ranked higher for engineers than other potential causes/issues, suggesting that all parties recognize the importance of communication and coordination as it relates to quality documentation. Part of the issue cited is that engineering design time is sometimes compressed after sign-off between architect and owner, or drawings are at times almost completed before engineers are able to start design.

Similar to high frequency issues, the relationship between time and quality once again ranked highly, again illustrating the relationship between the amount of time during the design phase and the quality of design documents. Of the different respondent groups, contractors ranked this area the highest, indicating that consultants view other causes/issues as having a greater impact on document quality. However, consultants still recognized the importance of time as it relates to quality of documents.

Other considerations from these results include the relationship between owners and consultants, and the importance of skilled workers.

In both the survey and roundtable discussions, the relationship between consultants and owners remained a significant factor in the quality of

documents. In cases where there is little communication, or an ineffective detail of expectations, the quality of documents often suffers. Consultants noted on several occasions that the ability to understand owner expectations, and communicate throughout the design phase is critical to ensuring the success of a project and higher quality documentation.

Access to highly skilled and knowledgeable workers is a critical component to the quality of documents. With less experienced workers, documentation often suffers.

Frequency Rating x Impact Rating

Taking into account both the frequency rating and the impact rating provides the top five causes and issues as identified by survey participants.

- **Lack of final coordination, checking and proofreading**
- **Insufficient time for design**
- **Lack of coordination between architects and engineers**
- **Owners' (unnecessary) pressure**
- **Insufficient fee/design contingency**

Identifying these primary potential causes of poor quality documentation allows for discussion regarding potential solutions to address the issues.

Summary Conclusions

A full examination of the survey results (see Appendix A) can provide more insight into the relationship between certain causes/issues and a particular sector (owner, contractor, consultant etc.). However, those responses repeated by different industry sectors illustrates a number of common themes as it relates to the quality of documents.

Primarily, the importance of communication and collaboration between all parties remains a very important element in facilitating high quality documentation. At the same time, peer reviews, checklists and proofreading have also been identified as areas that can enhance, or in their absence be detrimental, to the quality of documents. Skilled and knowledgeable workers also remain critical, suggesting that training, education and mentorship are extremely important in addressing this issue.

While this summary does not go so far as to make suggestions related to solutions to this industry-wide issue, it does provide demonstrable data that outlines areas that can be improved in order to enhance the quality of documentation in the industry. Once again, it cannot be overstated that the quality of construction documentation is an industry-wide issue, and one that can only be addressed through a concerted and collaborative effort from all industry participants.

Appendix A
Survey Results

The following were the potential causes/issues related to documentation quality that were identified in the CCA "Quality of Documents Workshop" questionnaire/survey:

1. Insufficient fee/design contingency

2. [1] Owners place unnecessary pressure on consultants (e.g. unrealistically high expectation, inability to make timely decisions)

3. [2] Lack of final coordination, checking and proofreading

4. [2] Lack of coordination between architects and engineers

5. [2] Insufficient time for design

6. Inexperienced contractors requiring more details

7. Shortage of skilled and quality people

8. Shortage of experienced specification writers (generic specifications are not tailored to meet specific project needs)

9. A perception that new technology will dramatically reduce design time, while producing perfect design. Cut and paste may water down the quality of thinking

10. Fragmentation of consulting services (limited service contracts and 3rd party project management etc. may reduce the depth of understanding by all involved)

11. Design responsibility is assigned to contractors by intentionally leaving out pertinent data or details that are difficult to communicate through documents

12. New trends of BIM and IPD increase collaboration, which includes more sharing of design responsibilities amongst all parties, including contractors

In total, there were 413 completed copies of the questionnaire/survey, with the following sector breakdown:

Architects   71

Engineers   57

Contractors   138

Owners   84

Others   63

The rating of each potential cause/issue related to quality documentation was averaged to provide a Total Score.

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[1] **Most frequent causes**

[2] **Causes that have the greatest impact** (as identified in the "Design and Documentation Quality Survey – Comparison of Designers' and Contractors' Perspectives" – CSIRO in collaboration with the Australian Construction Industry, May 2000)

Frequency of Potential Cause / Issue

Survey respondents were asked to rate on a scale of 1 (low) to 5 (high).

		1	2	3	4	5	6	7	8	9	10	11	12
Total Score	413	**3.40**	**3.44**	**3.66**	**3.34**	**3.59**	**3.02**	**3.40**	**3.28**	**3.59**	**3.27**	**2.95**	**2.59**
Architects	71	3.72	3.67	3.16	3.00	3.56	3.09	3.47	2.81	3.72	3.33	2.30	2.57
Engineers	57	3.46	3.44	3.13	2.89	3.60	2.89	3.21	2.79	3.49	3.30	2.56	2.33
Contractors	138	3.67	3.66	3.92	3.75	3.85	3.19	3.49	3.58	3.78	3.50	3.61	2.79
Owners	84	2.77	3.09	3.93	3.41	3.24	2.73	3.23	3.22	3.27	2.76	2.61	2.39
Others	63	3.25	3.16	3.77	3.18	3.51	3.03	3.52	3.70	3.50	3.40	3.05	2.69

FREQUENCY OF POTENTIAL CAUSES (1 – 5)
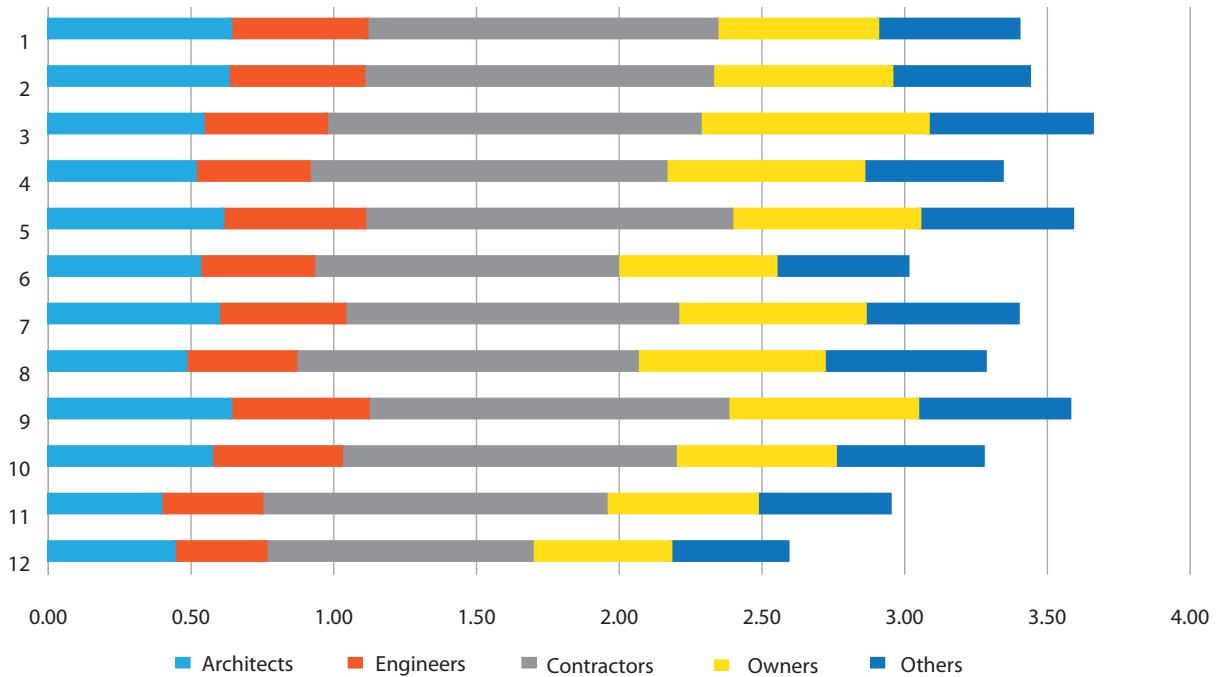
Impact of Potential Cause / Issue

Survey respondents were asked to rate on a scale of 1 (low) to 5 (high).

		1	2	3	4	5	6	7	8	9	10	11	12
Total Score		**3.95**	**3.94**	**4.31**	**4.12**	**4.05**	**3.54**	**3.89**	**3.60**	**3.64**	**3.62**	**3.55**	**3.30**
Architects	71	4.01	4.11	4.34	4.06	3.97	3.66	4.03	3.41	3.59	3.69	3.13	3.25
Engineers	57	3.95	4.14	4.00	3.84	4.04	3.56	3.93	3.35	3.66	3.64	3.08	3.00
Contractors	138	4.15	4.03	4.40	4.32	4.16	3.48	3.73	3.65	3.89	3.76	3.96	3.50
Owners	84	3.49	3.59	4.25	4.05	3.94	3.53	4.00	3.62	3.33	3.24	3.44	3.19
Others	63	4.05	3.87	4.47	4.11	4.09	3.53	3.92	3.94	3.57	3.76	3.71	3.30

IMPACT OF CAUSES (1 – 5)